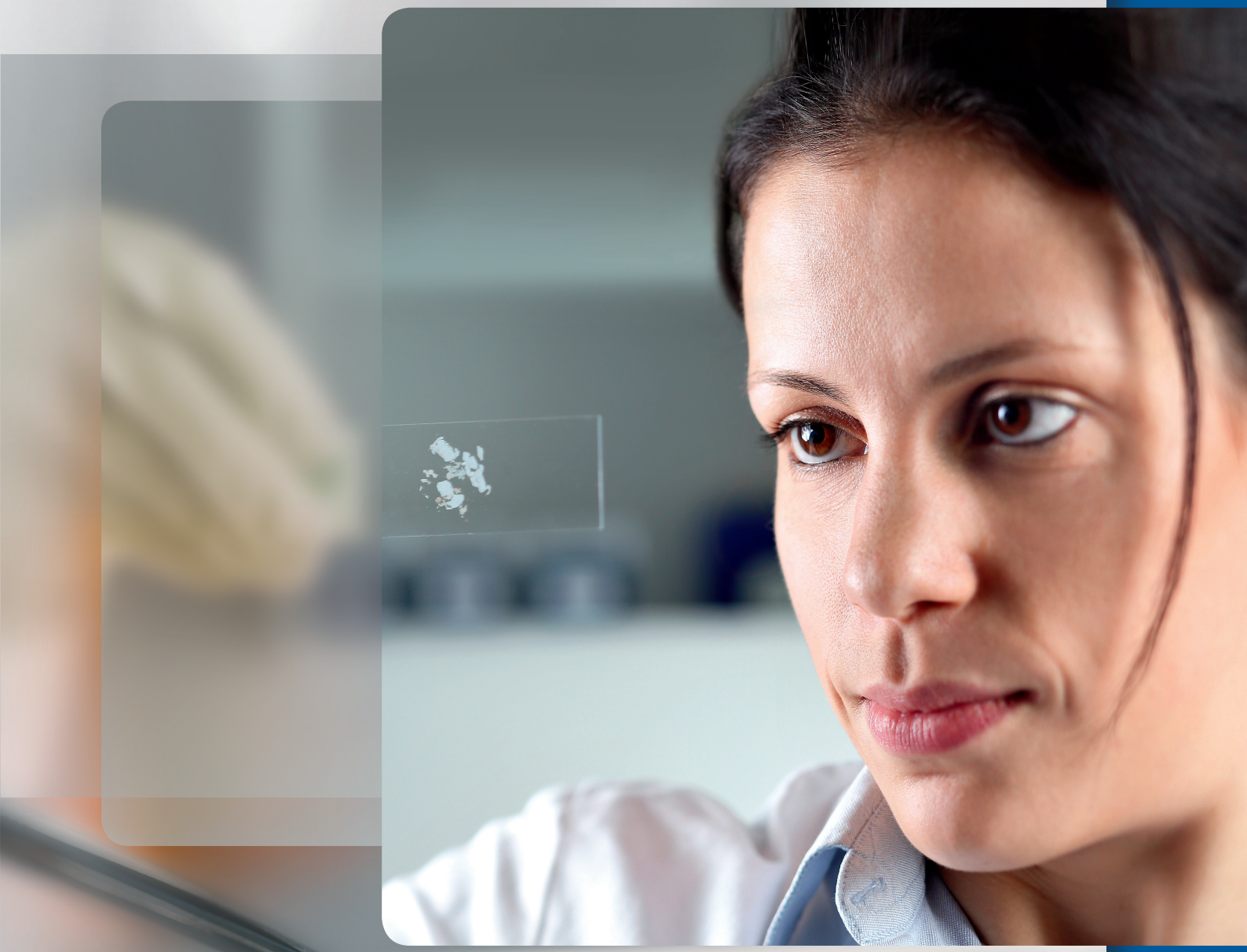
New Product Names
according to
HUGO Naming Guideline

Catalogue 2016



ZYTOVISION
Molecular diagnostics simplified

For finding your local dealer visit www.zytovision.com

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany · www.zytovision.com

ZYTOVISION
Molecular diagnostics simplified

Dear Valued Customer,

ZytoVision GmbH is known to be an innovative German company focused on the development and production of high quality, state-of-the-art diagnostic products of prognostic, predictive and therapeutic value. We fulfill this claim by a continuous product development process in cooperation with many international clinical partners as well as strict and thorough quality controls during our production processes.

Throughout our 11-years history, ZytoVision has been first-to-market with dual color CISH for the simultaneous detection of ERBB2 and centromere 17 copy numbers as well as several uniquely designed probes as e.g. our ALK/EML4 TriCheck™ FISH probe for the detection of ALK gene rearrangements in non-small cell lung cancer (NSCLC). In order that treatments can be tailored with the utmost precision to the clinical profile of an individual patient, ZytoVision offers clinical trial service comprising the development of companion diagnostics.

We believe in a long-lasting relationship with our customers and support you via our worldwide network of highly qualified local distributors allowing us to respond to your needs immediately.

This catalogue presents our most current product portfolio of *in situ* Hybridization (ISH) probes and associated reagents, introducing many new products especially for the diagnosis of lung cancer and sarcomas.

We hope to always fulfill your expectations and would like to thank existing customers for their partnership and would like to give a warm welcome to those of you, who are new customers.

Sincerely,

Your ZytoVision Team

Table of Contents

ZytoVision
Molecular diagnostics simplified

ZytoLight® Products for FISH analysis

ZytoDot® Products for CISH analysis

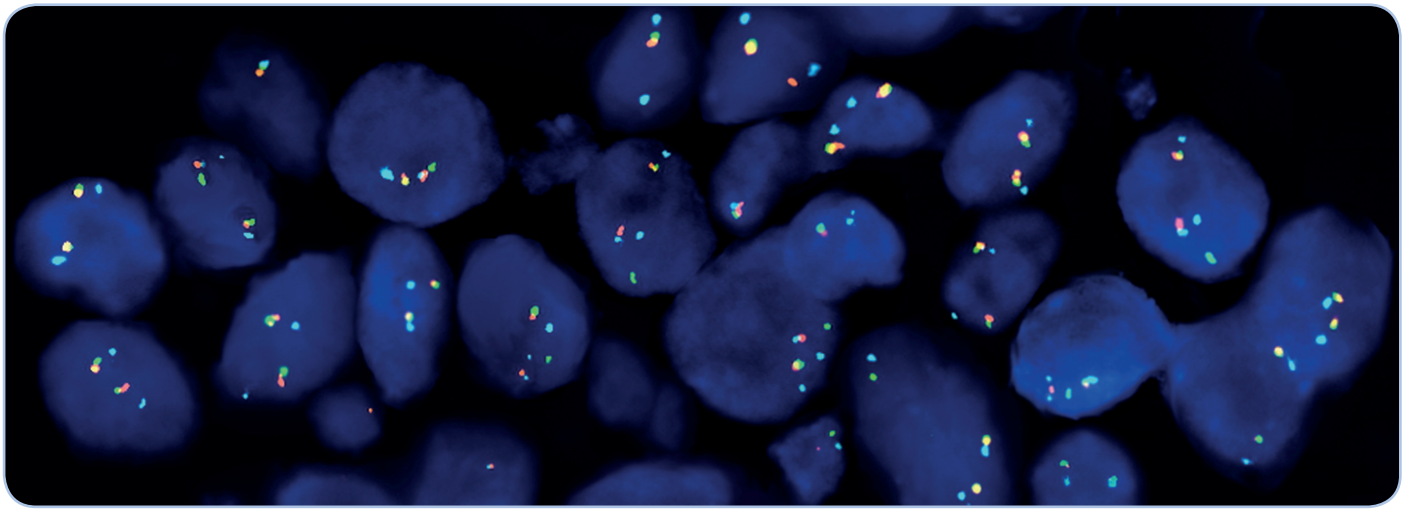
ZytoFast® Products for CISH analysis

5

ZytoLight® *Products for FISH analysis*

6

Reliable Multi-Target Detection using Fluorescence *in situ* Hybridization!



Introduction

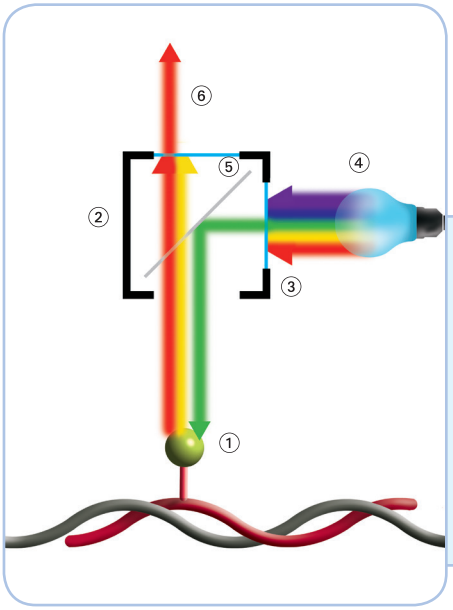
ZytoLight® products are designed for the identification of genetic aberrations e.g. translocations, deletions, amplifications, and chromosomal aneuploidies by Fluorescence *in situ* Hybridization (FISH) in formalin-fixed, paraffin-embedded tissue sections, cell samples, blood or bone marrow smears, and metaphase chromosome spreads.

High Sensitivity and Specificity

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. All ZytoLight® single copy (SPEC ™) probes are processed by the unique ZytoLight® *Repeat Subtraction Technique* resulting in advanced specificity and less background. No further blocking of repetitive sequences is needed!
ZytoLight® CEN ™ probes hybridize to highly repetitive human satellite DNA sequences of chromosomes producing sharp, bright signals specific for each individual chromosome.

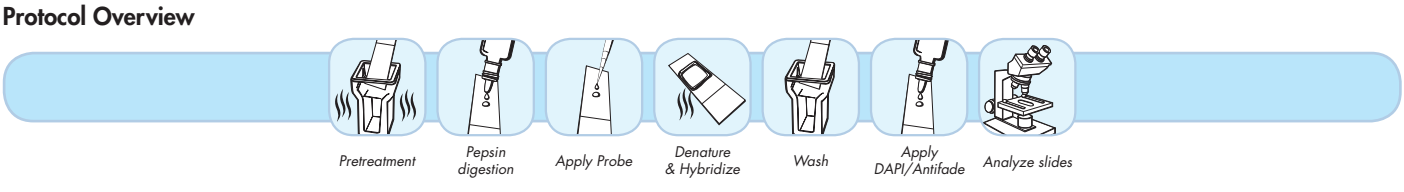
ZytoLight® Kits – Convenient Solutions

For making FISH analysis reliable and user-friendly, all ZytoLight® FISH probes can be combined with the ZytoLight® FISH-Tissue Implementation Kit (Z-2028-5/-20) or the ZytoLight® FISH-Cytology Implementation Kit (Z-2099-20), for FISH analyses on cytology specimens. Both Implementation Kits include all necessary pretreatment solutions, wash buffers and DAPI/DuraTect™ -Solution and a detailed protocol to perform successful FISH experiments.
Additionally, for some major targets, complete kits including probes and all necessary reagents are available.



The ZytoLight® system uses direct labeled FISH probes ①, eliminating the need to detect the probes with fluorophore-coupled antibodies. The probes are detected by fluorescence microscopy using appropriate filter sets ②. Due to an exciter filter ③, full-spectrum light, emitted by the microscope lamp ④, is reduced to light of a defined wavelength that specifically excites the fluorophore of the probe. This light is reflected onto the specimen by a dichroic mirror ⑤. The fluorophore emits light of longer wavelengths that passes the mirror. Finally, a barrier filter ⑥ reduces the emitted light to a defined wavelength that can be detected.

Protocol Overview



MLE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

7

Chromosome Index, human

Chr. Band	Product Name	Product No.	Quantity	Page
1				
1p36.3	ZytoLight SPEC 1p36/1q25 Dual Color Probe CE IVD	Z-2075-50/-200	50 µl/200 µl	24 f.
1p36.1	ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	Z-2019-50/-200	50 µl/200 µl	104 f.
1p12	ZytoLight SPEC 1p12 Probe CE IVD	Z-2101-200	200 µl	136 ff.
	ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	Z-2102-200	200 µl	39 f.
1q21	ZytoLight SPEC MCL1/1p12 Dual Color Probe CE IVD	Z-2173-200	200 µl	26
1q23.1	ZytoLight SPEC NTRK1 Dual Color Break Apart Probe CE IVD	Z-2167-200	200 µl	27
1q25.2	ZytoLight SPEC ABL2 Dual Color Break Apart Probe CE IVD	Z-2200-200	200 µl	28
1q25.3	ZytoLight SPEC 1p36/1q25 Dual Color Probe CE IVD	Z-2075-50/-200	50 µl/200 µl	24 f.
1q32.1	ZytoLight SPEC MDM4/1p12 Dual Color Probe CE IVD	Z-2080-200	200 µl	29
2				
2p24	ZytoLight SPEC MYCN/2q11 Dual Color Probe CE IVD	Z-2074-200	200 µl	30
2p23	ZytoLight SPEC ALK/EML4 TriCheck™ Probe CE IVD	Z-2117-50/-200	50 µl/200 µl	31
	ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	Z-2124-50/-200	50 µl/200 µl	32
	ZytoLight SPEC ALK/2q11 Dual Color Probe CE IVD	Z-2161-200	200 µl	33
2p21	ZytoLight SPEC EML4 Dual Color Break Apart Probe CE IVD	Z-2136-50	50 µl	34
	ZytoLight SPEC ALK/EML4 TriCheck™ Probe CE IVD	Z-2117-50/-200	50 µl/200 µl	31
2q11.2	ZytoLight SPEC 2q11 Probe	Z-2049-200	200 µl	136 ff.
	ZytoLight SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe CE IVD	Z-2118-200	200 µl	41 f.
2q13	ZytoLight SPEC MERTK/2q11 Dual Color Probe CE IVD	Z-2155-200	200 µl	35
2q34	ZytoLight SPEC ERBB4/2q11 Dual Color Probe CE IVD	Z-2057-200	200 µl	36 f.
2q36	ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	Z-2018-50/-200	50 µl/200 µl	104 f.
3				
3p25	ZytoLight SPEC VHL/CEN 3 Dual Color Probe CE IVD	Z-2084-200	200 µl	38
	ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	Z-2102-200	200 µl	39 f.
3p14.2	ZytoLight SPEC FHIT/CEN 3 Dual Color Probe CE IVD	Z-2062-200	200 µl	43
3p11.1-q11.1	ZytoLight CEN 3 Probe	Z-2001-200	200 µl	136 ff.
	ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	Z-2081-50/-200	50 µl/200 µl	76
3q12	ZytoLight SPEC TFG Dual Color Break Apart Probe CE IVD	Z-2133-50	50 µl	44
3q26.3	ZytoLight SPEC PIK3CA/CEN 3 Dual Color Probe CE IVD	Z-2140-200	200 µl	45
	ZytoLight SPEC SOX2/CEN 3 Dual Color Probe CE IVD	Z-2127-200	200 µl	46
3q27	ZytoLight SPEC BCL6 Dual Color Break Apart Probe CE IVD	Z-2177-200	200 µl	47
4				
4p16.3	ZytoLight SPEC FGFR3 Dual Color Break Apart Probe CE IVD	Z-2170-200	200 µl	48
	ZytoLight SPEC FGFR3/4p11Dual Color Probe CE IVD	Z-2082-200	200 µl	49
4p11	ZytoLight SPEC 4p11 Probe	Z-2083-200	200 µl	136 ff.

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

Chr. Band	Product Name	Product No.	Quantity	Page
5				
5p15.3	ZytoLight SPEC TERT/5q31 Dual Color Probe CE IVD	Z-2091-200	200 µl	51
	ZytoLight SPEC EGR1/5p15 Dual Color Probe CE IVD	Z-2107-200	200 µl	50
5q31.2	ZytoLight SPEC EGR1/5p15 Dual Color Probe CE IVD	Z-2107-200	200 µl	50
	ZytoLight SPEC TERT/5q31 Dual Color Probe CE IVD	Z-2091-200	200 µl	51
5q32	ZytoLight SPEC CSF1R Dual Color Break Apart Probe CE IVD	Z-2202-200	200 µl	52
	ZytoLight SPEC NRG1/CD74 TriCheck™ Probe CE IVD	Z-2194-200	200 µl	66
	ZytoLight SPEC PDGFRB Dual Color Break Apart Probe CE IVD	Z-2197-200	200 µl	53
6				
6p24	ZytoLight SPEC RREB1/MYB/CEN 6 Triple Color Probe CE IVD	Z-2152-200	200 µl	54
6p21.1	ZytoLight SPEC VEGFA/CEN 6 Dual Color Probe CE IVD	Z-2195-200	200 µl	55
6p11.1-q11	ZytoLight CEN 6 Probe	Z-2002-200	200 µl	136 ff.
	ZytoLight SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe CE IVD	Z-2118-200	200 µl	41 f.
6q22.1	ZytoLight SPEC ROS1 Dual Color Break Apart Probe CE IVD	Z-2144-50/-200	50 µl/200 µl	56
	ZytoLight SPEC ROS1/CEN 6 Dual Color Probe CE IVD	Z-2162-200	200 µl	57
6q23.3	ZytoLight SPEC MYB Dual Color Break Apart Probe CE IVD	Z-2143-200	200 µl	58
	ZytoLight SPEC RREB1/MYB/CEN 6 Triple Color Probe CE IVD	Z-2152-200	200 µl	54
6q25.1	ZytoLight SPEC ESR1/CEN 6 Dual Color Probe CE IVD	Z-2069-50/-200	50 µl/200 µl	59
7				
7p21	ZytoLight SPEC ETV1/CEN 7 Dual Color Probe CE IVD	Z-2141-200	200 µl	60
7p15.2-p15.1	ZytoLight SPEC JAZF1 Dual Color Break Apart Probe CE IVD	Z-2132-50	50 µl	61
7p11.2	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	Z-2033-50/-200	50 µl/200 µl	62
7q11.1	ZytoLight CEN 7 Probe	Z-2003-200	200 µl	136 ff.
	ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	Z-2081-50/-200	50 µl/200 µl	76
	ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	Z-2102-200	200 µl	39 f.
7q31.2	ZytoLight SPEC MET/CEN 7 Dual Color Probe CE IVD	Z-2087-200	200 µl	63
7q34	ZytoLight SPEC BRAF Dual Color Break Apart Probe CE IVD	Z-2189-200	200 µl	64
	ZytoLight SPEC BRAF/CEN 7 Dual Color Probe CE IVD	Z-2191-200	200 µl	65
8				
8p12	ZytoLight SPEC NRG1 Dual Color Break Apart Probe CE IVD	Z-2181-200	200 µl	67
	ZytoLight SPEC NRG1/CD74 TriCheck™ Probe CE IVD	Z-2194-200	200 µl	66
8p11.2	ZytoLight SPEC FGFR1 Dual Color Break Apart Probe CE IVD	Z-2168-200	200 µl	68
	ZytoLight SPEC FGFR1/CEN 8 Dual Color Probe CE IVD	Z-2072-50/-200	50 µl/200 µl	69
8p11.1-q11.1	ZytoLight CEN 8 Probe CE IVD	Z-2004-200	200 µl	136 ff.
8q21.3	ZytoLight SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe CE IVD	Z-2112-200	200 µl	70
8q24.21	ZytoLight SPEC MYC Dual Color Break Apart Probe CE IVD	Z-2090-200	200 µl	71
	ZytoLight SPEC MYC/CEN 8 Dual Color Probe CE IVD	Z-2092-200	200 µl	72
	ZytoLight SPEC MYC/IGH Dual Color Dual Fusion Probe CE IVD	Z-2105-200	200 µl	73

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
9	9p24	ZytoLight SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe CE IVD	Z-2179-200	200 µl	74
	9p21	ZytoLight SPEC CDKN2A/CEN 9 Dual Color Probe CE IVD	Z-2063-200	200 µl	75
		ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	Z-2081-50/-200	50 µl/200 µl	76
	9q12	ZytoLight CEN 9 Probe	Z-2067-200	200 µl	136 ff.
	9q22.3-q31	ZytoLight SPEC NR4A3 Dual Color Break Apart Probe CE IVD	Z-2145-50	50 µl	77
	9q34.1	ZytoLight SPEC ABL1 Dual Color Break Apart Probe CE IVD	Z-2199-200	200 µl	78
		ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	Z-2111-50/-200	50 µl/200 µl	79
10	10p11.2	ZytoLight SPEC KIF5B Dual Color Break Apart Probe CE IVD	Z-2131-50	50 µl	80
	10p11.1-q11.1	ZytoLight CEN 10 Probe	Z-2079-200	200 µl	136 ff.
	10q11.2	ZytoLight SPEC RET Dual Color Break Apart Probe CE IVD	Z-2148-50/-200	50 µl/200 µl	81
	10q23.3	ZytoLight SPEC PTEN/CEN 10 Dual Color Probe CE IVD	Z-2078-200	200 µl	82
	10q26.1	ZytoLight SPEC FGFR2 Dual Color Break Apart Probe CE IVD	Z-2169-200	200 µl	83
		ZytoLight SPEC FGFR2/CEN 10 Dual Color Probe CE IVD	Z-2122-200	200 µl	84
11	11p15.4	ZytoLight SPEC CARS Dual Color Break Apart Probe CE IVD	Z-2137-50	50 µl	85
	11p13	ZytoLight SPEC WT1 Dual Color Break Apart Probe CE IVD	Z-2142-50	50 µl	86
	11p11.11-q11	ZytoLight CEN 11 Probe	Z-2005-200	200 µl	136 ff.
	11q13.3	ZytoLight SPEC CCND1 Dual Color Break Apart Probe CE IVD	Z-2108-200	200 µl	87
		ZytoLight SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe CE IVD	Z-2118-200	200 µl	41 f.
		ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
		ZytoLight SPEC CCND1/IGH Dual Color Dual Fusion Probe CE IVD	Z-2125-200	200 µl	89
		ZytoLight SPEC FGF3,4,19/CEN 11 Dual Color Probe CE IVD	Z-2158-200	200 µl	90
	11q21	ZytoLight SPEC MAML2 Dual Color Break Apart Probe CE IVD	Z-2014-200	200 µl	91
	11q22.2	ZytoLight SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe CE IVD	Z-2146-200	200 µl	92
	11q22.3	ZytoLight SPEC TP53/ATM Dual Color Probe CE IVD	Z-2159-200	200 µl	93 f.
	11q23.3	ZytoLight SPEC KMT2A Dual Color Break Apart Probe CE IVD	Z-2193-200	200 µl	95
12	12p13.2	ZytoLight SPEC ETV6 Dual Color Break Apart Probe CE IVD	Z-2176-200	200 µl	97
		ZytoLight SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe CE IVD	Z-2157-200	200 µl	98
	12p12.1	ZytoLight SPEC KRAS/CEN 12 Dual Color Probe CE IVD	Z-2115-200	200 µl	99
	12p11.1-q11	ZytoLight CEN 12 Probe CE IVD	Z-2050-200	200 µl	136 ff.
	12q13.2	ZytoLight SPEC ERBB3/CEN 12 Dual Color Probe CE IVD	Z-2056-200	200 µl	36 f.
	12q13.3	ZytoLight SPEC DDIT3 Dual Color Break Apart Probe CE IVD	Z-2100-50	50 µl	100
	12q14	ZytoLight SPEC CDK4/CEN 12 Dual Color Probe CE IVD	Z-2103-200	200 µl	101
	12q15	ZytoLight SPEC MDM2/CEN 12 Dual Color Probe CE IVD	Z-2013-50/-200	50 µl/200 µl	102

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
13	13q12.1	ZytoLight SPEC 13q12 Probe CE IVD	Z-2085-200	200 µl	136 ff.
		ZytoLight SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	Z-2095-50/-200	50 µl/200 µl	136 ff.
		ZytoLight SPEC 13/21 Dual Color Probe CE IVD	Z-2164-200	200 µl	136 ff.
		ZytoLight Aneusomy Probe Set CE IVD	Z-2104-10/-40	2x 50 µl/2x 200 µl	136 ff.
	13q14.1	ZytoLight SPEC FOXO1 Dual Color Break Apart Probe CE IVD	Z-2139-50	50 µl	103
		ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	Z-2018-50/-200	50 µl/200 µl	104 f.
		ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	Z-2019-50/-200	50 µl/200 µl	104 f.
	13q14.2	ZytoLight SPEC D13S319/13q34/CEN 12 Triple Color Probe CE IVD	Z-2160-200	200 µl	93 f.
		ZytoLight SPEC RB1/13q12 Dual Color Probe CE IVD	Z-2165-200	200 µl	96
	13q34	ZytoLight SPEC GAS6/13q12 Dual Color Probe CE IVD	Z-2156-200	200 µl	106
14	14q11.2	ZytoLight SPEC BCL2L2/14q32 Dual Color Probe CE IVD	Z-2172-200	200 µl	107
	14q32.3	ZytoLight SPEC IGH Dual Color Break Apart Probe CE IVD	Z-2110-200	200 µl	108
		ZytoLight SPEC BCL2/IGH Dual Color Dual Fusion Probe CE IVD	Z-2114-200	200 µl	125
		ZytoLight SPEC CCND1/IGH Dual Color Dual Fusion Probe CE IVD	Z-2125-200	200 µl	89
		ZytoLight SPEC MYC/IGH Dual Color Dual Fusion Probe CE IVD	Z-2105-200	200 µl	73
15	15q24	ZytoLight SPEC PML/RARA Dual Color Dual Fusion Probe CE IVD	Z-2113-200	200 µl	109
16	16p11.2	ZytoLight SPEC FUS Dual Color Break Apart Probe CE IVD	Z-2130-50	50 µl	110
17	17p13	ZytoLight SPEC TP53/17q22 Dual Color Probe CE IVD	Z-2198-200	200 µl	111
		ZytoLight SPEC TP53/ATM Dual Color Probe CE IVD	Z-2159-200	200 µl	93 f.
		ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	Z-2153-200	200 µl	112
		ZytoLight SPEC USP6 Dual Color Break Apart Probe CE IVD	Z-2151-50	50 µl	113
		ZytoLight SPEC YWHAE Dual Color Break Apart Probe CE IVD	Z-2175-50	50 µl	114
	17p11.1-q11.1	ZytoLight CEN 17 Probe CE IVD	Z-2006-200	200 µl	136 ff.
		ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	Z-2081-50/-200	50 µl/200 µl	76
		ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	Z-2102-200	200 µl	39 f.
	17q12	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD	Z-2015-50/-200	50 µl/200 µl	115
		ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD	Z-2020-5/-20	5 Tests/20 Tests	115
		ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD	Z-2077-50/-200	50 µl/200 µl	116
		ZytoLight SPEC ERBB2/D17S122 Dual Color Probe CE IVD	Z-2190-50	50 µl	117
		ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	Z-2093-50/-200	50 µl/200 µl	118
	17q21.2	ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	Z-2093-50/-200	50 µl/200 µl	118
		ZytoLight SPEC PML/RARA Dual Color Dual Fusion Probe CE IVD	Z-2113-200	200 µl	109
	17q21.3	ZytoLight SPEC COL1A1 Dual Color Break Apart Probe CE IVD	Z-2121-200	200 µl	119
		ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	Z-2116-50/-200	50 µl/200 µl	120

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
18	18p11.32	ZytoLight SPEC TYMS/CEN 18 Dual Color Probe CE IVD	Z-2098-200	200 µl	121
	18p11.1-q11.1	ZytoLight CEN 18 Probe	Z-2007-200	200 µl	136 ff.
		ZytoLight SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	Z-2095-50/-200	50 µl/200 µl	136 ff.
		ZytoLight Aneusomy Probe Set CE IVD	Z-2104-10/-40	2x 50 µl/2x 200 µl	136 ff.
	18q11.2	ZytoLight SPEC SS18 Dual Color Break Apart Probe CE IVD	Z-2097-50	50 µl	122
	18q21.3	ZytoLight SPEC 18/CEN X/Y Triple Color Probe CE IVD	Z-2163-200	200 µl	136 ff.
		ZytoLight SPEC BCL2 Dual Color Break Apart Probe CE IVD	Z-2192-200	200 µl	123
		ZytoLight SPEC BCL2/CEN 18 Dual Color Probe CE IVD	Z-2174-200	200 µl	124
		ZytoLight SPEC BCL2/IGH Dual Color Dual Fusion Probe CE IVD	Z-2114-200	200 µl	125
		ZytoLight SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe CE IVD	Z-2146-200	200 µl	92
		ZytoLight SPEC MALT1 Dual Color Break Apart Probe CE IVD	Z-2196-200	200 µl	126
19	19p13.3	ZytoLight SPEC 19q13/19p13 Dual Color Probe CE IVD	Z-2076-50/-200	50 µl/200 µl	24 f.
	19q13.2	ZytoLight SPEC AXL/19p13 Dual Color Probe CE IVD	Z-2154-200	200 µl	127
	19q13.3	ZytoLight SPEC 19q13/19p13 Dual Color Probe CE IVD	Z-2076-50/-200	50 µl/200 µl	24 f.
20	20q11.2	ZytoLight SPEC BCL2L1/CEN 20 Dual Color Probe CE IVD	Z-2171-200	200 µl	128
21	21q22.1	ZytoLight SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe CE IVD	Z-2112-200	200 µl	70
		ZytoLight SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe CE IVD	Z-2157-200	200 µl	98
	21q22.1-q22.2	ZytoLight SPEC 21q22 Probe CE IVD	Z-2086-200	200 µl	136 ff.
		ZytoLight SPEC 21/CEN X/Yq12 Triple Color Probe CE IVD	Z-2180-200	200 µl	136 ff.
		ZytoLight SPEC 13/21 Dual Color Probe CE IVD	Z-2164-200	200 µl	136 ff.
		ZytoLight SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	Z-2095-50/-200	50 µl/200 µl	136 ff.
		ZytoLight Aneusomy Probe Set CE IVD	Z-2104-10/-40	2x 50 µl/2x 200 µl	136 ff.
	21q22.2	ZytoLight SPEC ERG Dual Color Break Apart Probe CE IVD	Z-2138-200	200 µl	129
		ZytoLight SPEC ERG/TMPRSS2 TriCheck™ Probe CE IVD	Z-2135-200	200 µl	130
	21q22.3	ZytoLight SPEC ERG/TMPRSS2 TriCheck™ Probe CE IVD	Z-2135-200	200 µl	130
22	22q11.2	ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	Z-2111-50/-200	50 µl/200 µl	79
		ZytoLight SPEC SMARCB1/22q12 Dual Color Probe CE IVD	Z-2178-50	50 µl	131
	22q12.2	ZytoLight SPEC EWSR1 Dual Color Break Apart Probe CE IVD	Z-2096-50	50 µl	132
	22q13.1	ZytoLight SPEC PDGFB Dual Color Break Apart Probe CE IVD	Z-2119-200	200 µl	133
		ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	Z-2116-50/-200	50 µl/200 µl	120

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

Chr. Band	Product Name	Product No.	Quantity	Page
X				
Xp22.33	ZytoLight SPEC CRLF2 Dual Color Break Apart Probe CE IVD	Z-2201-200	200 µl	134
Xp11.23	ZytoLight SPEC TFE3 Dual Color Break Apart Probe CE IVD	Z-2109-200	200 µl	135
Xp11.1-q11.1	ZytoLight CEN X Probe	Z-2008-200	200 µl	136 ff.
	ZytoLight CEN X/Yq12 Dual Color Probe CE IVD	Z-2016-50/-200	50 µl/200 µl	136 ff.
	ZytoLight CEN X/Y Dual Color Probe CE IVD	Z-2120-200	200 µl	136 ff.
	ZytoLight SPEC 18/CEN X/Y Triple Color Probe CE IVD	Z-2163-200	200 µl	136 ff.
	ZytoLight SPEC 21/CEN X/Yq12 Triple Color Probe CE IVD	Z-2180-200	200 µl	136 ff.
	ZytoLight Aneusomy Probe Set CE IVD	Z-2104-10/-40	2x 50 µl/2x 200 µl	136 ff.
Y				
Yp11.32	ZytoLight SPEC CRLF2 Dual Color Break Apart Probe CE IVD	Z-2201-200	200 µl	134
Yp11.1-q11.1	ZytoLight CEN Y (DYZ3) Probe CE IVD	Z-2123-200	200 µl	136 ff.
	ZytoLight CEN X/Y Dual Color Probe CE IVD	Z-2120-200	200 µl	136 ff.
	ZytoLight SPEC 18/CEN X/Y Triple Color Probe CE IVD	Z-2163-200	200 µl	136 ff.
Yq12	ZytoLight CEN Yq12 Probe	Z-2010-200	200 µl	136 ff.
	ZytoLight CEN X/Yq12 Dual Color Probe CE IVD	Z-2016-50/-200	50 µl/200 µl	136 ff.
	ZytoLight SPEC 21/CEN X/Yq12 Triple Color Probe CE IVD	Z-2180-200	200 µl	136 ff.
	ZytoLight Aneusomy Probe Set CE IVD	Z-2104-10/-40	2x 50 µl/2x 200 µl	136 ff.

Chromosome Index, porcine

Chr. Band	Product Name	Product No.	Quantity	Page
X				
Xp2.1-2.2	ZytoLight porcine X/Y Dual Color Probe	Z-2094-200	200 µl	139
Y				
Yp1.2-1.3	ZytoLight porcine X/Y Dual Color Probe	Z-2094-200	200 µl	139

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ILE001-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
ABL1	ABL	c-ABL	ZytoLight SPEC ABL1 Dual Color Break Apart Probe CE IVD	Z-2199-200	200 µl	78
			ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	Z-2111-50/-200	50 µl/200 µl	79
ABL2		ARG	ZytoLight SPEC ABL2 Dual Color Break Apart Probe CE IVD	Z-2200-200	200 µl	28
ALK		CD246	ZytoLight SPEC ALK/EML4 TriCheck™ Probe CE IVD	Z-2117-50/-200	50 µl/200 µl	31
			ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	Z-2124-50/-200	50 µl/200 µl	32
			ZytoLight SPEC ALK/2q11 Dual Color Probe CE IVD	Z-2161-200	200 µl	33
ATM		AT1, TEL1	ZytoLight SPEC TP53/ATM Dual Color Probe CE IVD	Z-2159-200	200 µl	93 f.
AXL		ARK, Tyro7	ZytoLight SPEC AXL/19p13 Dual Color Probe CE IVD	Z-2154-200	200 µl	127
BCL2		Bcl-2	ZytoLight SPEC BCL2 Dual Color Break Apart Probe CE IVD	Z-2192-200	200 µl	123
			ZytoLight SPEC BCL2/CEN 18 Dual Color Probe CE IVD	Z-2174-200	200 µl	124
			ZytoLight SPEC BCL2/IGH Dual Color Dual Fusion Probe CE IVD	Z-2114-200	200 µl	125
BCL2L1		BCLX	ZytoLight SPEC BCL2L1/CEN 20 Dual Color Probe CE IVD	Z-2171-200	200 µl	128
BCL2L2		BCL-W	ZytoLight SPEC BCL2L2/14q32 Dual Color Probe CE IVD	Z-2172-200	200 µl	107
BCL6		BCL5, BCL6A	ZytoLight SPEC BCL6 Dual Color Break Apart Probe CE IVD	Z-2177-200	200 µl	47
BCR		ALL, BCR1	ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	Z-2111-50/-200	50 µl/200 µl	79
BIRC3		C-IAP, MALT2	ZytoLight SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe CE IVD	Z-2146-200	200 µl	92
BRAF		BRAF1, NS7	ZytoLight SPEC BRAF Dual Color Break Apart Probe CE IVD	Z-2189-200	200 µl	64
			ZytoLight SPEC BRAF/CEN 7 Dual Color Probe CE IVD	Z-2191-200	200 µl	65
CARS		CARS1	ZytoLight SPEC CARS Dual Color Break Apart Probe CE IVD	Z-2137-50	50 µl	85
CCND1		BCL1, U21B31	ZytoLight SPEC CCND1 Dual Color Break Apart Probe CE IVD	Z-2108-200	200 µl	87
			ZytoLight SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe CE IVD	Z-2118-200	200 µl	41 f.
			ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
			ZytoLight SPEC CCND1/IGH Dual Color Dual Fusion Probe CE IVD	Z-2125-200	200 µl	89
CD274		PD-L1, PDL1	ZytoLight SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe CE IVD	Z-2179-200	200 µl	74
CDK4		PSK-J3	ZytoLight SPEC CDK4/CEN 12 Dual Color Probe CE IVD	Z-2103-200	200 µl	101
CDKN2A	p16	ARF, INK4	ZytoLight SPEC CDKN2A/CEN 9 Dual Color Probe CE IVD	Z-2063-200	200 µl	75
			ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	Z-2081-50/-200	50 µl/200 µl	76
COL1A1		OI4	ZytoLight SPEC COL1A1 Dual Color Break Apart Probe CE IVD	Z-2121-200	200 µl	119
			ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	Z-2116-50/-200	50 µl/200 µl	120
CRLF2		CRL2, TSLPR	ZytoLight SPEC CRLF2 Dual Color Break Apart Probe CE IVD	Z-2201-200	200 µl	134

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
CSF1R		FMS	ZytoLight SPEC CSF1R Dual Color Break Apart Probe CE IVD	Z-2202-200	200 µl	52
DDIT3	CHOP	CHOP10, GADD153	ZytoLight SPEC DDIT3 Dual Color Break Apart Probe CE IVD	Z-2100-50	50 µl	100
DLEU1		BCMS1, LEU1	ZytoLight SPEC D13S319/13q34/CEN 12 Triple Color Probe CE IVD	Z-2160-200	200 µl	93 f.
EGFR		HER1, ERBB1	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	Z-2033-50/-200	50 µl/200 µl	62
EGR1		KROX-24	ZytoLight SPEC EGR1/5p15 Dual Color Probe CE IVD	Z-2107-200	200 µl	50
EML4		ROPP120	ZytoLight SPEC EML4 Dual Color Break Apart Probe CE IVD ZytoLight SPEC ALK/EML4 TriCheck™ Probe CE IVD	Z-2136-50 Z-2117-50/-200	50 µl 50 µl/200 µl	34 31
ERBB2	HER2	HER-2, NEU	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD ZytoLight SPEC ERBB2/D17S122 Dual Color Probe CE IVD ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	Z-2015-50/-200 Z-2020-5/-20 Z-2077-50/-200 Z-2190-50 Z-2093-50/-200	50 µl/200 µl 5 Tests/20 Tests 50 µl/200 µl 50 µl 50 µl/200 µl	115 115 116 117 118
ERBB3	HER3	HER3	ZytoLight SPEC ERBB3/CEN 12 Dual Color Probe CE IVD	Z-2056-200	200 µl	36 f.
ERBB4	HER4	ALS19	ZytoLight SPEC ERBB4/2q11 Dual Color Probe CE IVD	Z-2057-200	200 µl	36 f.
ERG		erg-3, p55	ZytoLight SPEC ERG Dual Color Break Apart Probe CE IVD ZytoLight SPEC ERG/TMPRSS2 TriCheck™ Probe CE IVD	Z-2138-200 Z-2135-200	200 µl 200 µl	129 130
ESR1		Era, NR3A1	ZytoLight SPEC ESR1/CEN 6 Dual Color Probe CE IVD	Z-2069-50/-200	50 µl/200 µl	59
ETV1		ER81	ZytoLight SPEC ETV1/CEN 7 Dual Color Probe CE IVD	Z-2141-200	200 µl	60
ETV6		TEL	ZytoLight SPEC ETV6 Dual Color Break Apart Probe CE IVD ZytoLight SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe CE IVD	Z-2176-200 Z-2157-200	200 µl 200 µl	97 98
EWSR1		EWS	ZytoLight SPEC EWSR1 Dual Color Break Apart Probe CE IVD	Z-2096-50	50 µl	132
FGF3		HBGF-3	ZytoLight SPEC FGF3,4,19/CEN 11 Dual Color Probe CE IVD	Z-2158-200	200 µl	90
FGF4		HBGF-4, HST	ZytoLight SPEC FGF3,4,19/CEN 11 Dual Color Probe CE IVD	Z-2158-200	200 µl	90
FGF19		–	ZytoLight SPEC FGF3,4,19/CEN 11 Dual Color Probe CE IVD	Z-2158-200	200 µl	90
FGFR1		FLT2, BFGFR	ZytoLight SPEC FGFR1 Dual Color Break Apart Probe CE IVD ZytoLight SPEC FGFR1/CEN 8 Dual Color Probe CE IVD	Z-2168-200 Z-2072-50/-200	200 µl 50 µl/200 µl	68 69
FGFR2		BEK, CD332	ZytoLight SPEC FGFR2 Dual Color Break Apart Probe CE IVD ZytoLight SPEC FGFR2/CEN 10 Dual Color Probe CE IVD	Z-2169-200 Z-2122-200	200 µl 200 µl	83 84
FGFR3		CD333, JTK4	ZytoLight SPEC FGFR3 Dual Color Break Apart Probe CE IVD ZytoLight SPEC FGFR3/4p11 Dual Color Probe CE IVD	Z-2170-200 Z-2082-200	200 µl 200 µl	48 49

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
FHIT		FRA3B	ZytoLight SPEC FHIT/CEN 3 Dual Color Probe CE IVD	Z-2062-200	200 µl	43
FOXO1		FKHR, FKH1	ZytoLight SPEC FOXO1 Dual Color Break Apart Probe CE IVD	Z-2139-50	50 µl	103
			ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	Z-2018-50/-200	50 µl/200 µl	104 f.
			ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	Z-2019-50/-200	50 µl/200 µl	104 f.
FUS		FUS1	ZytoLight SPEC FUS Dual Color Break Apart Probe CE IVD	Z-2130-50	50 µl	110
GAS6		AXSF, AXLLG	ZytoLight SPEC GAS6/13q12 Dual Color Probe CE IVD	Z-2156-200	200 µl	106
IGH		IGH@	ZytoLight SPEC IGH Dual Color Break Apart Probe CE IVD	Z-2110-200	200 µl	108
			ZytoLight SPEC BCL2/IGH Dual Color Dual Fusion Probe CE IVD	Z-2114-200	200 µl	125
			ZytoLight SPEC CCND1/IGH Dual Color Dual Fusion Probe CE IVD	Z-2125-200	200 µl	89
			ZytoLight SPEC MYC/IGH Dual Color Dual Fusion Probe CE IVD	Z-2105-200	200 µl	73
JAZF1		TIP27, ZNF802	ZytoLight SPEC JAZF1 Dual Color Break Apart Probe CE IVD	Z-2132-50	50 µl	61
KIF5B		KNS	ZytoLight SPEC KIF5B Dual Color Break Apart Probe CE IVD	Z-2131-50	50 µl	80
KMT2A		MLL	ZytoLight SPEC KMT2A Dual Color Break Apart Probe CE IVD	Z-2193-200	200 µl	95
KRAS		KRAS1	ZytoLight SPEC KRAS/CEN 12 Dual Color Probe CE IVD	Z-2115-200	200 µl	99
MALT1		MLT	ZytoLight SPEC MALT1 Dual Color Break Apart Probe CE IVD	Z-2196-200	200 µl	126
			ZytoLight SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe CE IVD	Z-2146-200	200 µl	92
MAML2		MAM3	ZytoLight SPEC MAML2 Dual Color Break Apart Probe CE IVD	Z-2014-200	200 µl	91
MCL1		BCL2L3	ZytoLight SPEC MCL1/1p12 Dual Color Probe CE IVD	Z-2173-200	200 µl	26
MDM2		HDM2	ZytoLight SPEC MDM2/CEN 12 Dual Color Probe CE IVD	Z-2013-50/-200	50 µl/200 µl	102
MDM4		MDMX	ZytoLight SPEC MDM4/1p12 Dual Color Probe CE IVD	Z-2080-200	200 µl	29
MERTK		MER, c-Eyk	ZytoLight SPEC MERTK/2q11 Dual Color Probe CE IVD	Z-2155-200	200 µl	35
MET		HGFR, RCCP2	ZytoLight SPEC MET/CEN 7 Dual Color Probe CE IVD	Z-2087-200	200 µl	63
MYB		c-myb	ZytoLight SPEC MYB Dual Color Break Apart Probe CE IVD	Z-2143-200	200 µl	58
			ZytoLight SPEC RREB1/MYB/CEN 6 Triple Color Probe CE IVD	Z-2152-200	200 µl	54
MYC	CMYC	bHLHe39, c-Myc	ZytoLight SPEC MYC Dual Color Break Apart Probe CE IVD	Z-2090-200	200 µl	71
			ZytoLight SPEC MYC/CEN 8 Dual Color Probe CE IVD	Z-2092-200	200 µl	72
			ZytoLight SPEC MYC/IGH Dual Color Dual Fusion Probe CE IVD	Z-2105-200	200 µl	73
MYCN	NMYC	N-myc	ZytoLight SPEC MYCN/2q11 Dual Color Probe CE IVD	Z-2074-200	200 µl	30

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
NR4A3		CHN, CSMF	ZytoLight SPEC NR4A3 Dual Color Break Apart Probe CE IVD	Z-2145-50	50 µl	77
NRG1		HGL, GGF	ZytoLight SPEC NRG1 Dual Color Break Apart Probe CE IVD ZytoLight SPEC NRG1/CD74 TriCheck™ Probe CE IVD	Z-2181-200 Z-2194-200	200 µl 200 µl	67 66
NTRK1		MTC, TRK	ZytoLight SPEC NTRK1 Dual Color Break Apart Probe CE IVD	Z-2167-200	200 µl	27
PAX3		HUP2	ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	Z-2018-50/-200	50 µl/200 µl	104 f.
PAX7		HUP1	ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	Z-2019-50/-200	50 µl/200 µl	104 f.
PDCD1LG2		PD-L2, PDL2	ZytoLight SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe CE IVD	Z-2179-200	200 µl	74
PDGFB		SIS, SSV	ZytoLight SPEC PDGFB Dual Color Break Apart Probe CE IVD ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	Z-2119-200 Z-2116-50/-200	200 µl 50 µl/200 µl	133 120
PDGFRB		JTK12, PDGFR1	ZytoLight SPEC PDGFRB Dual Color Break Apart Probe CE IVD	Z-2197-200	200 µl	53
PIK3CA		PI3K	ZytoLight SPEC PIK3CA/CEN 3 Dual Color Probe CE IVD	Z-2140-200	200 µl	45
PML		MYL, RNF71	ZytoLight SPEC PML/RARA Dual Color Dual Fusion Probe CE IVD	Z-2113-200	200 µl	109
PTEN		MMAC1, TEP1	ZytoLight SPEC PTEN/CEN 10 Dual Color Probe CE IVD	Z-2078-200	200 µl	82
RARA		NR1B1, RAR	ZytoLight SPEC PML/RARA Dual Color Dual Fusion Probe CE IVD	Z-2113-200	200 µl	109
RB1		PPP1R130	ZytoLight SPEC RB1/13q12 Dual Color Probe CE IVD	Z-2165-200	200 µl	96
RET		HSCR1, CDHF12	ZytoLight SPEC RET Dual Color Break Apart Probe CE IVD	Z-2148-50/-200	50 µl/200 µl	81
ROS1		MCF3, ROS	ZytoLight SPEC ROS1 Dual Color Break Apart Probe CE IVD ZytoLight SPEC ROS1/CEN 6 Dual Color Probe CE IVD	Z-2144-50/-200 Z-2162-200	50 µl/200 µl 200 µl	56 57
RREB1		HNT	ZytoLight SPEC RREB1/MYB/CEN 6 Triple Color Probe CE IVD	Z-2152-200	200 µl	54
RUNX1	AML1	AMLCR1	ZytoLight SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe CE IVD ZytoLight SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe CE IVD	Z-2112-200 Z-2157-200	200 µl 200 µl	70 98
RUNX1T1	ETO	CDR, MTG8	ZytoLight SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe CE IVD	Z-2112-200	200 µl	70
SMARCB1		BAF47	ZytoLight SPEC SMARCB1/22q12 Dual Color Probe CE IVD	Z-2178-50	50 µl	131
SOX2		ANOP3	ZytoLight SPEC SOX2/CEN 3 Dual Color Probe CE IVD	Z-2127-200	200 µl	46
SS18	SYT	SSXT	ZytoLight SPEC SS18 Dual Color Break Apart Probe CE IVD	Z-2097-50	50 µl	122
TERT		EST2, TCS1	ZytoLight SPEC TERT/5q31 Dual Color Probe CE IVD	Z-2091-200	200 µl	51

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
TFE3		TFEA	ZytoLight SPEC TFE3 Dual Color Break Apart Probe CE IVD	Z-2109-200	200 µl	135
TFG		TF6	ZytoLight SPEC TFG Dual Color Break Apart Probe CE IVD	Z-2133-50	50 µl	44
TMPRSS2		PRSS10	ZytoLight SPEC ERG/TMPRSS2 TriCheck™ Probe CE IVD	Z-2135-200	200 µl	130
TOP2A		TOP2	ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	Z-2093-50/-200	50 µl/200 µl	118
TP53		LSF1, TRP53	ZytoLight SPEC TP53/17q22 Dual Color Probe CE IVD ZytoLight SPEC TP53/ATM Dual Color Probe CE IVD ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	Z-2198-200 Z-2159-200 Z-2153-200	200 µl 200 µl 200 µl	111 93 f. 112
TYMS		HsT422, TMS	ZytoLight SPEC TYMS/CEN 18 Dual Color Probe CE IVD	Z-2098-200	200 µl	121
USP6		Tre-2	ZytoLight SPEC USP6 Dual Color Break Apart Probe CE IVD	Z-2151-50	50 µl	113
VEGFA		VEGF, VPF	ZytoLight SPEC VEGFA/CEN 6 Dual Color Probe CE IVD	Z-2195-200	200 µl	55
VHL		VHL1	ZytoLight SPEC VHL/CEN 3 Dual Color Probe CE IVD ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	Z-2084-200 Z-2102-200	200 µl 200 µl	38 39 f.
WT1		AWT1	ZytoLight SPEC WT1 Dual Color Break Apart Probe CE IVD	Z-2142-50	50 µl	86
YWHAE		14-3-3 epsilon	ZytoLight SPEC YWHAE Dual Color Break Apart Probe CE IVD	Z-2175-50	50 µl	114

The *Gene Index* list includes only those probes directed against DNA sequences assigned to known genes. It does not contain probes directed against other genomic sequences as e.g. repetitive satellite DNA sequences. For a complete overview of all ZytoLight® probes, please refer to the *Chromosome Index*.

For cross referencing of previous ZytoVision probe names and new HUGO gene names - please visit the HUGO gene nomenclature committee website at www.genenames.org.

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ILE001-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Solid Tumors				
Bladder Cancer	ZytoLight SPEC CDKN2A/CEN 9 Dual Color Probe CE IVD	Z-2063-200	200 µl	75
	ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	Z-2081-50/-200	50 µl/200 µl	76
Brain and Neural Tumors	ZytoLight SPEC 1p36/1q25 Dual Color Probe CE IVD	Z-2075-50/-200	50 µl/200 µl	24 f.
	ZytoLight SPEC 19q13/19p13 Dual Color Probe CE IVD	Z-2076-50/-200	50 µl/200 µl	24 f.
	ZytoLight SPEC CDKN2A/CEN 9 Dual Color Probe CE IVD	Z-2063-200	200 µl	75
	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	Z-2033-50/-200	50 µl/200 µl	62
	ZytoLight SPEC MET/CEN 7 Dual Color Probe CE IVD	Z-2087-200	200 µl	63
	ZytoLight SPEC MYCN/2q11 Dual Color Probe CE IVD	Z-2074-200	200 µl	30
	ZytoLight SPEC PTEN/CEN 10 Dual Color Probe CE IVD	Z-2078-200	200 µl	82
	ZytoLight SPEC TP53/17q22 Dual Color Probe CE IVD	Z-2198-200	200 µl	111
	ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	Z-2153-200	200 µl	112
Breast Cancer	ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	Z-2033-50/-200	50 µl/200 µl	62
	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD	Z-2015-50/-200	50 µl/200 µl	115
	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD	Z-2020-5/-20	5 Tests/20 Tests	115
	ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD	Z-2077-50/-200	50 µl/200 µl	116
	ZytoLight SPEC ERBB2/D17S122 Dual Color Probe CE IVD	Z-2190-50	50 µl	117
	ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	Z-2093-50/-200	50 µl/200 µl	118
	ZytoLight SPEC ERBB3/CEN 12 Dual Color Probe CE IVD	Z-2056-200	200 µl	36 f.
	ZytoLight SPEC ERBB4/2q11 Dual Color Probe CE IVD	Z-2057-200	200 µl	36 f.
	ZytoLight SPEC ESR1/CEN 6 Dual Color Probe CE IVD	Z-2069-50/-200	50 µl/200 µl	59
	ZytoLight SPEC FGFR1/CEN 8 Dual Color Probe CE IVD	Z-2072-50/-200	50 µl/200 µl	69
	ZytoLight SPEC FGFR2/CEN 10 Dual Color Probe CE IVD	Z-2122-200	200 µl	84
	ZytoLight SPEC MYC/CEN 8 Dual Color Probe CE IVD	Z-2092-200	200 µl	72
	ZytoLight SPEC VEGFA/CEN 6 Dual Color Probe CE IVD	Z-2195-200	200 µl	55
Cervical Cancer	ZytoLight SPEC MYC/CEN 8 Dual Color Probe CE IVD	Z-2092-200	200 µl	72
	ZytoLight SPEC TERT/5q31 Dual Color Probe CE IVD	Z-2091-200	200 µl	51
Lung Cancer	ZytoLight SPEC ALK/EML4 TriCheck™ Probe CE IVD	Z-2117-50/-200	50 µl/200 µl	31
	ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	Z-2124-50/-200	50 µl/200 µl	32
	ZytoLight SPEC ALK/2q11 Dual Color Probe CE IVD	Z-2161-200	200 µl	33
	ZytoLight SPEC BRAF/CEN 7 Dual Color Probe CE IVD	Z-2191-200	200 µl	65
	ZytoLight SPEC CARS Dual Color Break Apart Probe CE IVD	Z-2137-50	50 µl	85
	ZytoLight SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe CE IVD	Z-2179-200	200 µl	74
	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	Z-2033-50/-200	50 µl/200 µl	62
	ZytoLight SPEC EML4 Dual Color Break Apart Probe CE IVD	Z-2136-50	50 µl	34
	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD	Z-2015-50/-200	50 µl/200 µl	115
	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD	Z-2020-5/-20	5 Tests/20 Tests	115
	ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD	Z-2077-50/-200	50 µl/200 µl	116
	ZytoLight SPEC ERBB2/D17S122 Dual Color Probe CE IVD	Z-2190-50	50 µl	117
	ZytoLight SPEC FGFR1/CEN 8 Dual Color Probe CE IVD	Z-2072-50/-200	50 µl/200 µl	69
	ZytoLight SPEC FGFR2 Dual Color Break Apart Probe CE IVD	Z-2169-200	200 µl	83
	ZytoLight SPEC FGFR2/CEN 10 Dual Color Probe CE IVD	Z-2122-200	200 µl	84
	ZytoLight SPEC FGFR3 Dual Color Break Apart Probe CE IVD	Z-2170-200	200 µl	48
	ZytoLight SPEC FGFR3/4p11 Dual Color Probe CE IVD	Z-2082-200	200 µl	49

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Lung Cancer	ZytoLight SPEC KIF5B Dual Color Break Apart Probe CE IVD	Z-2131-50	50 µl	80
	ZytoLight SPEC KRAS/CEN 12 Dual Color Probe CE IVD	Z-2115-200	200 µl	99
	ZytoLight SPEC MET/CEN 7 Dual Color Probe CE IVD	Z-2087-200	200 µl	63
	ZytoLight SPEC NRG1 Dual Color Break Apart Probe CE IVD	Z-2181-200	200 µl	67
	ZytoLight SPEC NRG1/CD74 TriCheck™ Probe CE IVD	Z-2194-200	200 µl	66
	ZytoLight SPEC NTRK1 Dual Color Break Apart Probe CE IVD	Z-2167-200	200 µl	27
	ZytoLight SPEC RET Dual Color Break Apart Probe CE IVD	Z-2148-50/-200	50 µl/200 µl	81
	ZytoLight SPEC ROS1 Dual Color Break Apart Probe CE IVD	Z-2144-50/-200	50 µl/200 µl	56
	ZytoLight SPEC SOX2/CEN 3 Dual Color Probe CE IVD	Z-2127-200	200 µl	46
	ZytoLight SPEC TFG Dual Color Break Apart Probe CE IVD	Z-2133-50	50 µl	44
Other Solid Tumors	ZytoLight CEN 8 Probe CE IVD	Z-2004-200	200 µl	136 ff.
	ZytoLight SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	Z-2095-50/-200	50 µl/200 µl	136 ff.
	ZytoLight SPEC ALK/EML4 TriCheck™ Probe CE IVD	Z-2117-50/-200	50 µl/200 µl	31
	ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	Z-2124-50/-200	50 µl/200 µl	32
	ZytoLight SPEC ALK/2q11 Dual Color Probe CE IVD	Z-2161-200	200 µl	33
	ZytoLight SPEC AXL/19p13 Dual Color Probe CE IVD	Z-2154-200	200 µl	127
	ZytoLight SPEC BCL2L1/CEN 20 Dual Color Probe CE IVD	Z-2171-200	200 µl	128
	ZytoLight SPEC BCL2L2/14q32 Dual Color Probe CE IVD	Z-2172-200	200 µl	107
	ZytoLight SPEC BRAF Dual Color Break Apart Probe CE IVD	Z-2189-200	200 µl	64
	ZytoLight SPEC BRAF/CEN 7 Dual Color Probe CE IVD	Z-2191-200	200 µl	65
	ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	Z-2033-50/-200	50 µl/200 µl	62
	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD	Z-2015-50/-200	50 µl/200 µl	115
	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD	Z-2020-5/-20	5 Tests/20 Tests	115
	ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD	Z-2077-50/-200	50 µl/200 µl	116
	ZytoLight SPEC ETV1/CEN 7 Dual Color Probe CE IVD	Z-2141-200	200 µl	60
	ZytoLight SPEC ETV6 Dual Color Break Apart Probe CE IVD	Z-2176-200	200 µl	97
	ZytoLight SPEC FGF3,4,19/CEN 11 Dual Color Probe CE IVD	Z-2158-200	200 µl	90
	ZytoLight SPEC FGFR2 Dual Color Break Apart Probe CE IVD	Z-2169-200	200 µl	83
	ZytoLight SPEC FGFR3/4p11 Dual Color Probe CE IVD	Z-2082-200	200 µl	49
	ZytoLight SPEC FHIT/CEN 3 Dual Color Probe CE IVD	Z-2062-200	200 µl	43
	ZytoLight SPEC GAS6/13q12 Dual Color Probe CE IVD	Z-2156-200	200 µl	106
	ZytoLight SPEC KRAS/CEN 12 Dual Color Probe CE IVD	Z-2115-200	200 µl	99
	ZytoLight SPEC MAML2 Dual Color Break Apart Probe CE IVD	Z-2014-200	200 µl	91
	ZytoLight SPEC MCL1/1p12 Dual Color Probe CE IVD	Z-2173-200	200 µl	26
	ZytoLight SPEC MDM4/1p12 Dual Color Probe CE IVD	Z-2080-200	200 µl	29
	ZytoLight SPEC MERTK/2q11 Dual Color Probe CE IVD	Z-2155-200	200 µl	35
	ZytoLight SPEC MET/CEN 7 Dual Color Probe CE IVD	Z-2087-200	200 µl	63
	ZytoLight SPEC MYB Dual Color Break Apart Probe CE IVD	Z-2143-200	200 µl	58
	ZytoLight SPEC MYCN/2q11 Dual Color Probe CE IVD	Z-2074-200	200 µl	30
	ZytoLight SPEC NTRK1 Dual Color Break Apart Probe CE IVD	Z-2167-200	200 µl	27
	ZytoLight SPEC PIK3CA/CEN 3 Dual Color Probe CE IVD	Z-2140-200	200 µl	45
	ZytoLight SPEC RB1/13q12 Dual Color Probe CE IVD	Z-2165-200	200 µl	96
	ZytoLight SPEC RREB1/MYB/CEN 6 Triple Color Probe CE IVD	Z-2152-200	200 µl	54
	ZytoLight SPEC TFE3 Dual Color Break Apart Probe CE IVD	Z-2109-200	200 µl	135
	ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	Z-2153-200	200 µl	112
	ZytoLight SPEC TYMS/CEN 18 Dual Color Probe CE IVD	Z-2098-200	200 µl	121
	ZytoLight SPEC VEGFA/CEN 6 Dual Color Probe CE IVD	Z-2195-200	200 µl	55

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Prostate Cancer	ZytoLight SPEC ERG Dual Color Break Apart Probe CE IVD	Z-2138-200	200 µl	129
	ZytoLight SPEC ERG/TMPRSS2 TriCheck™ Probe CE IVD	Z-2135-200	200 µl	130
	ZytoLight SPEC PTEN/CEN 10 Dual Color Probe CE IVD	Z-2078-200	200 µl	82
Renal Cell Carcinoma	ZytoLight SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe CE IVD	Z-2118-200	200 µl	41 f.
	ZytoLight SPEC FHIT/CEN 3 Dual Color Probe CE IVD	Z-2062-200	200 µl	43
	ZytoLight SPEC TFE3 Dual Color Break Apart Probe CE IVD	Z-2109-200	200 µl	135
	ZytoLight SPEC VHL/CEN 3 Dual Color Probe CE IVD	Z-2084-200	200 µl	38
	ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	Z-2102-200	200 µl	39 f.
Sarcomas	ZytoLight SPEC CDK4/CEN 12 Dual Color Probe CE IVD	Z-2103-200	200 µl	101
	ZytoLight SPEC COL1A1 Dual Color Break Apart Probe CE IVD	Z-2121-200	200 µl	119
	ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	Z-2116-50/-200	50 µl/200 µl	120
	ZytoLight SPEC DDIT3 Dual Color Break Apart Probe CE IVD	Z-2100-50	50 µl	100
	ZytoLight SPEC EWSR1 Dual Color Break Apart Probe CE IVD	Z-2096-50	50 µl	132
	ZytoLight SPEC FOXO1 Dual Color Break Apart Probe CE IVD	Z-2139-50	50 µl	103
	ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	Z-2018-50/-200	50 µl/200 µl	104 f.
	ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	Z-2019-50/-200	50 µl/200 µl	104 f.
	ZytoLight SPEC FUS Dual Color Break Apart Probe CE IVD	Z-2130-50	50 µl	110
	ZytoLight SPEC JAZF1 Dual Color Break Apart Probe CE IVD	Z-2132-50	50 µl	61
	ZytoLight SPEC MDM2/CEN 12 Dual Color Probe CE IVD	Z-2013-50/-200	50 µl/200 µl	102
	ZytoLight SPEC MDM4/1p12 Dual Color Probe CE IVD	Z-2080-200	200 µl	29
	ZytoLight SPEC NR4A3 Dual Color Break Apart Probe CE IVD	Z-2145-50	50 µl	77
	ZytoLight SPEC PDGFB Dual Color Break Apart Probe CE IVD	Z-2119-200	200 µl	133
	ZytoLight SPEC SMARCB1/22q12 Dual Color Probe CE IVD	Z-2178-50	50 µl	131
	ZytoLight SPEC SS18 Dual Color Break Apart Probe CE IVD	Z-2097-50	50 µl	122
	ZytoLight SPEC TFE3 Dual Color Break Apart Probe CE IVD	Z-2109-200	200 µl	135
	ZytoLight SPEC USP6 Dual Color Break Apart Probe CE IVD	Z-2151-50	50 µl	113
	ZytoLight SPEC VEGFA/CEN 6 Dual Color Probe CE IVD	Z-2195-200	200 µl	55
	ZytoLight SPEC WT1 Dual Color Break Apart Probe CE IVD	Z-2142-50	50 µl	86
	ZytoLight SPEC YWHAE Dual Color Break Apart Probe CE IVD	Z-2175-50	50 µl	114
Hematology Specific Probes				
Acute Lymphoblastic Leukemia (ALL)	ZytoLight SPEC ABL1 Dual Color Break Apart Probe CE IVD	Z-2199-200	200 µl	78
	ZytoLight SPEC ABL2 Dual Color Break Apart Probe CE IVD	Z-2200-200	200 µl	28
	ZytoLight SPEC CDKN2A/CEN 9 Dual Color Probe CE IVD	Z-2063-200	200 µl	75
	ZytoLight SPEC CRLF2 Dual Color Break Apart Probe CE IVD	Z-2201-200	200 µl	134
	ZytoLight SPEC CSF1R Dual Color Break Apart Probe CE IVD	Z-2202-200	200 µl	52
	ZytoLight SPEC ETV6 Dual Color Break Apart Probe CE IVD	Z-2176-200	200 µl	97
	ZytoLight SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe CE IVD	Z-2157-200	200 µl	98
	ZytoLight SPEC KMT2A Dual Color Break Apart Probe CE IVD	Z-2193-200	200 µl	95
Acute Myelogenous Leukemia (AML)	ZytoLight CEN 8 Probe CE IVD	Z-2004-200	200 µl	136 ff.
	ZytoLight SPEC ABL2 Dual Color Break Apart Probe CE IVD	Z-2200-200	200 µl	28
	ZytoLight SPEC EGR1/5p15 Dual Color Probe CE IVD	Z-2107-200	200 µl	50
	ZytoLight SPEC FGFR1 Dual Color Break Apart Probe CE IVD	Z-2168-200	200 µl	68
	ZytoLight SPEC KMT2A Dual Color Break Apart Probe CE IVD	Z-2193-200	200 µl	95
	ZytoLight SPEC PDGFRB Dual Color Break Apart Probe CE IVD	Z-2197-200	200 µl	53
	ZytoLight SPEC PML/RARA Dual Color Dual Fusion Probe CE IVD	Z-2113-200	200 µl	109
	ZytoLight SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe CE IVD	Z-2112-200	200 µl	70

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Chronic Lymphocytic Leukemia (CLL)	ZytoLight SPEC BCL2 Dual Color Break Apart Probe CE IVD	Z-2192-200	200 µl	123
	ZytoLight SPEC CCND1 Dual Color Break Apart Probe CE IVD	Z-2108-200	200 µl	87
	ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
	ZytoLight SPEC D13S319/13q34/CEN 12 Triple Color Probe CE IVD	Z-2160-200	200 µl	93 f.
	ZytoLight SPEC MYC/CEN 8 Dual Color Probe CE IVD	Z-2092-200	200 µl	72
	ZytoLight SPEC RB1/13q12 Dual Color Probe CE IVD	Z-2165-200	200 µl	96
	ZytoLight SPEC TP53/ATM Dual Color Probe CE IVD	Z-2159-200	200 µl	93 f.
	ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	Z-2153-200	200 µl	112
Chronic Myelogenous Leukemia (CML)	ZytoLight CEN 8 Probe CE IVD	Z-2004-200	200 µl	136 ff.
	ZytoLight SPEC ABL1 Dual Color Break Apart Probe CE IVD	Z-2199-200	200 µl	78
	ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	Z-2111-50/-200	50 µl/200 µl	79
	ZytoLight SPEC PDGFRB Dual Color Break Apart Probe CE IVD	Z-2197-200	200 µl	53
	ZytoLight SPEC TP53/17q22 Dual Color Probe CE IVD	Z-2198-200	200 µl	111
Multiple Myeloma	ZytoLight SPEC CCND1 Dual Color Break Apart Probe CE IVD	Z-2108-200	200 µl	87
	ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
	ZytoLight SPEC FGFR3 Dual Color Break Apart Probe CE IVD	Z-2170-200	200 µl	48
	ZytoLight SPEC IGH Dual Color Break Apart Probe CE IVD	Z-2110-200	200 µl	108
	ZytoLight SPEC RB1/13q12 Dual Color Probe CE IVD	Z-2165-200	200 µl	96
	ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	Z-2153-200	200 µl	112
Myelodysplastic Syndrome (MDS)	ZytoLight CEN 8 Probe CE IVD	Z-2004-200	200 µl	136 ff.
	ZytoLight SPEC EGR1/5p15 Dual Color Probe CE IVD	Z-2107-200	200 µl	50
	ZytoLight SPEC ETV6 Dual Color Break Apart Probe CE IVD	Z-2176-200	200 µl	97
	ZytoLight SPEC PDGFRB Dual Color Break Apart Probe CE IVD	Z-2197-200	200 µl	53
	ZytoLight SPEC TERT/5q31 Dual Color Probe CE IVD	Z-2091-200	200 µl	51
Burkitt Lymphoma	ZytoLight SPEC IGH Dual Color Break Apart Probe CE IVD	Z-2110-200	200 µl	108
	ZytoLight SPEC MYC Dual Color Break Apart Probe CE IVD	Z-2090-200	200 µl	71
	ZytoLight SPEC MYC/IGH Dual Color Dual Fusion Probe CE IVD	Z-2105-200	200 µl	73
Non-Hodgkin Lymphoma, other	ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	Z-2124-50/-200	50 µl/200 µl	32
	ZytoLight SPEC BCL2 Dual Color Break Apart Probe CE IVD	Z-2192-200	200 µl	123
	ZytoLight SPEC BCL2/CEN 18 Dual Color Probe CE IVD	Z-2174-200	200 µl	124
	ZytoLight SPEC BCL2/IGH Dual Color Dual Fusion Probe CE IVD	Z-2114-200	200 µl	125
	ZytoLight SPEC BCL6 Dual Color Break Apart Probe CE IVD	Z-2177-200	200 µl	47
	ZytoLight SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe CE IVD	Z-2146-200	200 µl	92
	ZytoLight SPEC CCND1 Dual Color Break Apart Probe CE IVD	Z-2108-200	200 µl	87
	ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	Z-2071-200	200 µl	88
	ZytoLight SPEC CCND1/IGH Dual Color Dual Fusion Probe CE IVD	Z-2125-200	200 µl	89
	ZytoLight SPEC IGH Dual Color Break Apart Probe CE IVD	Z-2110-200	200 µl	108
	ZytoLight SPEC MALT1 Dual Color Break Apart Probe CE IVD	Z-2196-200	200 µl	126
	ZytoLight SPEC MYC Dual Color Break Apart Probe CE IVD	Z-2090-200	200 µl	71

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Genetics				
Sex Mismatched Bone-Marrow Transplantant Management	ZytoLight CEN X Probe	Z-2008-200	200 µl	136 ff.
	ZytoLight CEN X/Y Dual Color Probe CE IVD	Z-2120-200	200 µl	136 ff.
	ZytoLight CEN X/Yq12 Dual Color Probe CE IVD	Z-2016-50/-200	50 µl/200 µl	136 ff.
	ZytoLight CEN Y (DYZ3) Probe CE IVD	Z-2123-200	200 µl	136 ff.
	ZytoLight CEN Yq12 Probe	Z-2010-200	200 µl	136 ff.
Prenatal, Postnatal, and Preimplantation Genetics	ZytoLight Aneusomy Probe Set CE IVD	Z-2104-10/-40	2x 50 µl/2x 200 µl	136 ff.
	ZytoLight SPEC 13q12 Probe CE IVD	Z-2085-200	200 µl	136 ff.
	ZytoLight SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	Z-2095-50/-200	50 µl/200 µl	136 ff.
	ZytoLight SPEC 13/21 Dual Color Probe CE IVD	Z-2164-200	200 µl	136 ff.
	ZytoLight CEN 18 Probe	Z-2007-200	200 µl	136 ff.
	ZytoLight SPEC 18/CEN X/Y Triple Color Probe CE IVD	Z-2163-200	200 µl	136 ff.
	ZytoLight SPEC 21q22 Probe CE IVD	Z-2086-200	200 µl	136 ff.
	ZytoLight SPEC 21/CEN X/Yq12 Triple Color Probe CE IVD	Z-2180-200	200 µl	136 ff.
	ZytoLight CEN X Probe	Z-2008-200	200 µl	136 ff.
	ZytoLight CEN X/Y Dual Color Probe CE IVD	Z-2120-200	200 µl	136 ff.
	ZytoLight CEN X/Yq12 Dual Color Probe CE IVD	Z-2016-50/-200	50 µl/200 µl	136 ff.
	ZytoLight CEN Y (DYZ3) Probe CE IVD	Z-2123-200	200 µl	136 ff.
	ZytoLight CEN Yq12 Probe	Z-2010-200	200 µl	136 ff.

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC 1p36/1q25 Dual Color Probe
ZytoLight® SPEC 19q13/19p13 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC 1p36/1q25 Dual Color Probe and the SPEC 19q13/19p13 Dual Color Probe are designed for the detection of 1p and 19q deletions, respectively.

Deletions affecting the short arm of chromosome 1 (1p) are frequently found in human gliomas and neuroblastomas, but also in breast, lung, endometrial, ovarian, and colorectal carcinomas. Loss of 1p is a strong prognostic factor in patients with neuroblastoma. Since loss of 1p reliably identifies patients at high risk in stages I, II, and IVS, which are otherwise clinically favorable, more aggressive therapy may be considered in these patients.

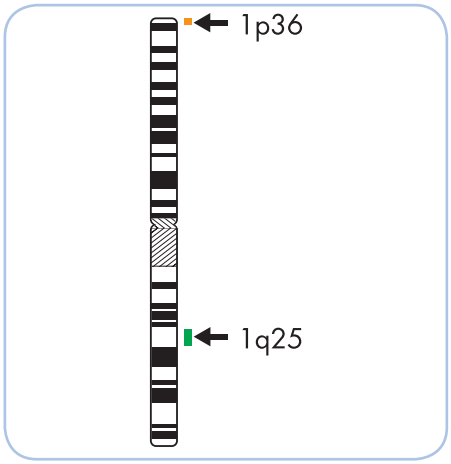
Deletions affecting the long arm of chromosome 19 (19q) are frequently found in human malignant gliomas as well as in neuroblastomas and epithelial ovarian cancers.

Several studies showed correlation of combined allelic losses at 1p36 and 19q13 with oligodendroglioma histology and association with both chemotherapeutic response and survival in patients with anaplastic oligodendrogliomas. Hence, determination of 1p and 19q status may aid in therapeutic decisions and predict outcome in patients with anaplastic oligodendrogliomas.

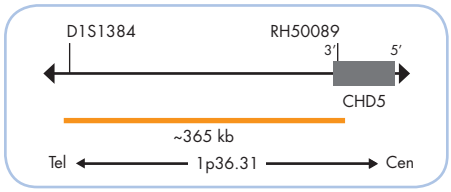
References
Barbashina V, et al. (2005) Clin Cancer Res 11: 1119-28.
Cairncross JG, et al. (1998) J Natl Cancer Inst 90: 1473-9.
Capper D, et al. (2010) Acta Neuropathol 121: 241-52.
Caron H, et al. (1996) N Engl J Med 334: 225-30.
Elsir T, et al. (2011) Br J Cancer 11: 1747-54.
Hoeller S, et al. (2012) Hum Pathol 43: 405-12.
Ragnarsson G, et al. (1999) Br J Cancer 79: 1468-74.
Rosenberg JE, et al. (1996) Oncogene 13: 2483-5.
Smith JS, et al. (1999) Oncogene 18: 4144-52.
Smith JS, et al. (2000) Genes Chromosomes Cancer 29: 16-25.
Smits A, et al. (2012) PLoS One 7: e37041.
White PS, et al. (2005) Oncogene 24: 2684-94.

Probe Description

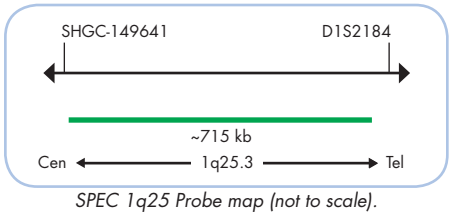
The SPEC 1p36/1q25 Dual Color Probe is a mixture of an orange fluorochrome direct labeled 1p36 probe specific for the smallest region of consistent deletion (SRD) of chromosome 1 defined in neuroblastoma at 1p36.31 and a green fluorochrome direct labeled 1q25 probe specific for 1q25.3.



Ideogram of chromosome 1 indicating the hybridization locations.

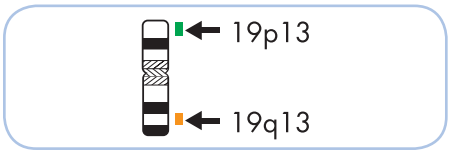


SPEC 1p36 Probe map (not to scale).

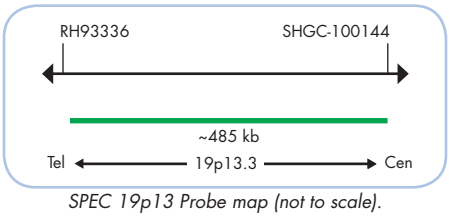


SPEC 1q25 Probe map (not to scale).

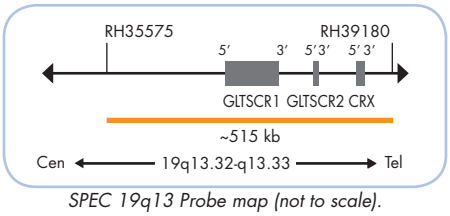
The SPEC 19q13/19p13 Dual Color Probe is a mixture of an orange fluorochrome direct labeled 19q13 probe specific for the region of common deletion in gliomas at 19q13.32-q13.33 and a green fluorochrome direct labeled 19p13 probe specific for 19p13.3.



Ideogram of chromosome 19 indicating the hybridization locations.



SPEC 19p13 Probe map (not to scale).



SPEC 19q13 Probe map (not to scale).

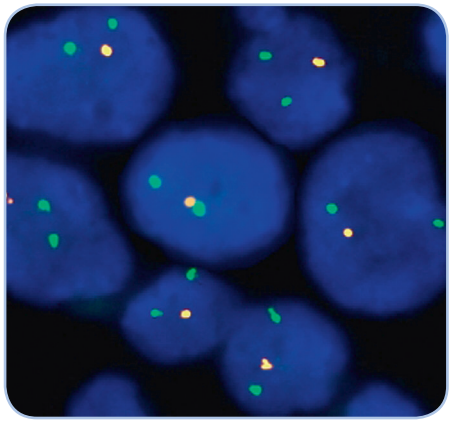
ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

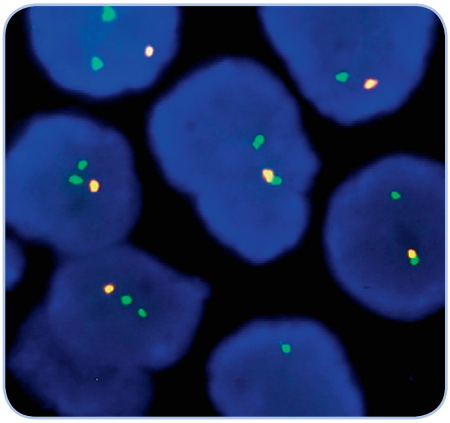
Results

Using the SPEC 1p36/1q25 Dual Color Probe in a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the 1p36 locus, one or no copy of the orange signal will be observed.

Using the SPEC 19q13/19p13 Dual Color Probe in a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the 19q13 locus, one or no copy of the orange signal will be observed.



SPEC 1p36/1q25 Dual Color Probe hybridized to a glioma tissue section with 1p36 deletion as indicated by one orange signal in each nucleus.



SPEC 19q13/19p13 Dual Color Probe hybridized to a glioma tissue section with 19q13 deletion as indicated by one orange signal in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2075-50	ZytoLight SPEC 1p36/1q25 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2075-200	ZytoLight SPEC 1p36/1q25 Dual Color Probe CE IVD	●/●	20 (200 µl)
Z-2076-50	ZytoLight SPEC 19q13/19p13 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2076-200	ZytoLight SPEC 19q13/19p13 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE021-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC MCL1/1p12 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC MCL1/1p12 Dual Color Probe is designed for the detection of MCL1 gene amplifications.

The MCL1 (myeloid cell leukemia 1, a.k.a. BCL2L3) gene is located in the chromosomal region 1q21.3 and encodes for an anti-apoptotic protein that belongs to the BCL2 family. These genes are involved in a wide variety of cellular activities including lymphocyte development and hematopoiesis.

MCL1 amplifications have been reported in several human cancers including bladder, gastric, ovarian, lung, breast, melanoma, and hematologic malignancies.

Overexpression of MCL1 reduces MYC-induced apoptosis in immortalized bronchial epithelial cells.

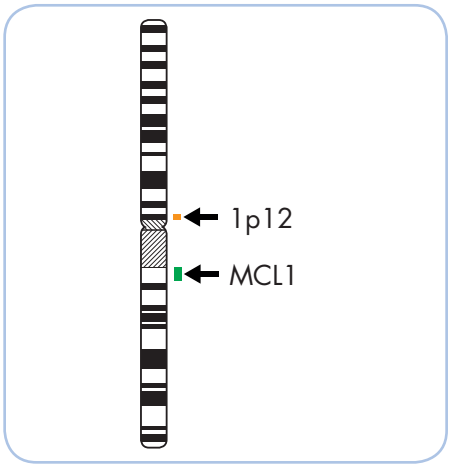
Furthermore, MCL1 amplifications are found in many tumor cell lines with resistance to chemotherapeutic agents. However, many MCL1 amplified cell lines are sensitive to treatment with the cyclin-dependent kinase (CDK) inhibitor dinaciclib. Targeting the BCL2 family proteins with small non-peptidic compounds, so called BH3-mimetics, is currently investigated in clinical trials.

Hence, the identification of MCL1 amplifications by Fluorescence *in situ* Hybridization and the inhibition of MCL1 signaling may be of therapeutic significance in various types of tumors.

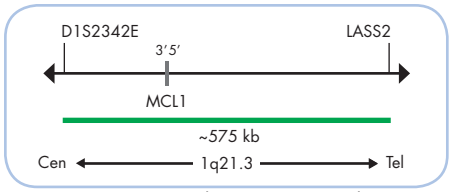
References
Beroukhim R, et al. (2010) Nature 463: 899-905.
Booher RN, et al. (2014) PloS One 9: e108371.
Sochalska M, et al. (2015) FEBS J 282: 834-49.
Yasui K, et al. (2004) Cancer Res 64: 1403-10.

Probe Description

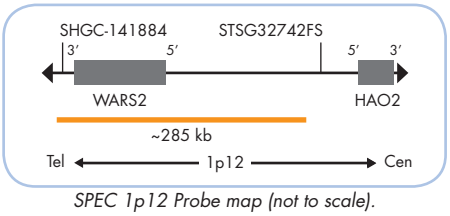
The SPEC MCL1/1p12 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC MCL1 probe hybridizing to the MCL1 gene in the chromosomal region 1q21.3 and an orange fluorochrome direct labeled SPEC 1p12 probe specific for the chromosomal region 1p12. Due to cross-hybridizations of chromosome 1 alpha satellites to other centromeric regions, probes specific for 1p12 are frequently used for chromosome 1 copy number detection.



Ideogram of chromosome 1 indicating the hybridization locations.



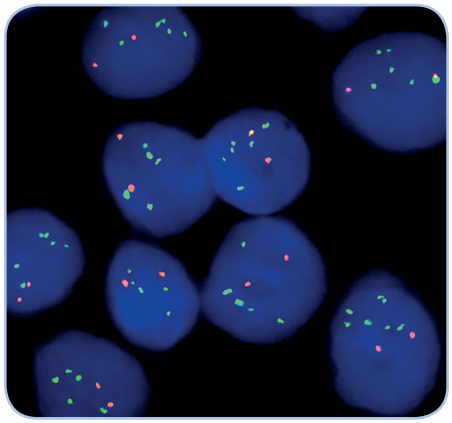
SPEC MCL1 Probe map (not to scale).



SPEC 1p12 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the MCL1 gene locus, multiple copies of the green signal or green signal clusters will be observed.



H2110 cell line with interphase cells showing amplification of the MCL1 gene locus as indicated by multiple green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2173-200	ZytoLight SPEC MCL1/1p12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE108-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

26

ZytoLight® SPEC NTRK1 Dual Color Break Apart Probe

CE IVD

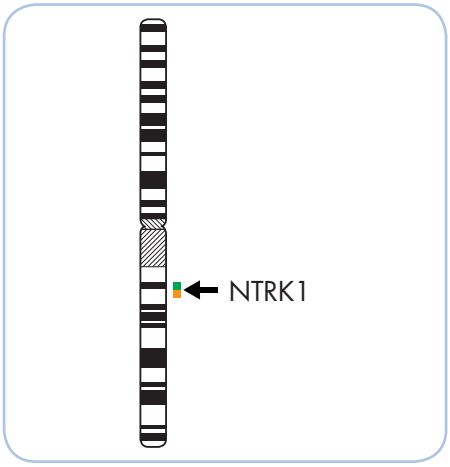
Background

The ZytoLight® SPEC NTRK1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 1q23.1 harboring the NTRK1 (neurotrophic tyrosine kinase receptor type 1, a.k.a. TRKA or TRK) gene. NTRK1 encodes a tyrosine kinase (TK) receptor for the nerve growth factor (NGF). The NTRK1 gene was found to be rearranged in about 12% of papillary thyroid carcinoma (PTC) cases. PTC accounts for about 80% of all thyroid cancers. NTRK1 rearrangements result in the fusion of the 3' end of the NTRK1 gene with the 5' end of different activating genes (TPM3, TPR, or TFG). All these fusion genes encode hybrid proteins comprising the TK domain of NTRK1 and the N-terminus of the partner proteins carrying coiled-coil domains. NTRK1 rearrangements were shown to be involved in thyroid carcinogenesis. Several studies showed that NTRK1 rearrangements may be associated with a worse clinical course when compared with NRTK1 rearrangement-negative PTCs. Recently, NTRK1 rearrangements were also found in lung adenocarcinomas. Various inhibitors targeting the NTRK1-derived fusion proteins were shown *in vitro* to inhibit proliferation of cells expressing the fusion genes. This indicates that these fusion genes are potential therapeutic targets. Hence, detection of NTRK1 rearrangements by Fluorescence *in situ* Hybridization represents a useful tool for studying thyroid carcinogenesis and may be of prognostic and therapeutic significance.

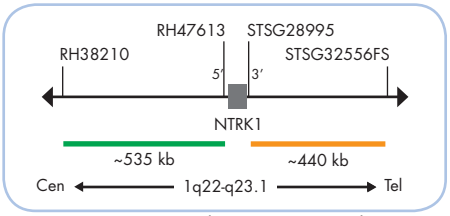
References
Alberti L, et al. (2003) J Cell Physiol 195: 168-86.
Bongarzone I, et al. (1998) Clin Cancer Res 4: 223-8.
Doebele RC, et al. (2013) J Clin Oncol 31 Suppl: Abstr. 8023.
Greco A, et al. (2010) Mol Cell Endocrinol 321: 44-9.
Musholt TJ (2000) Surgery 128: 984-93.
Russell JP, et al. (2000) Oncogene 19: 5729-35.

Probe Description

The SPEC NTRK1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 1q22-q23.1 band. The green fluorochrome direct labeled probe hybridizes proximal and the orange fluorochrome direct labeled probe hybridizes distal to the NTRK1 gene.



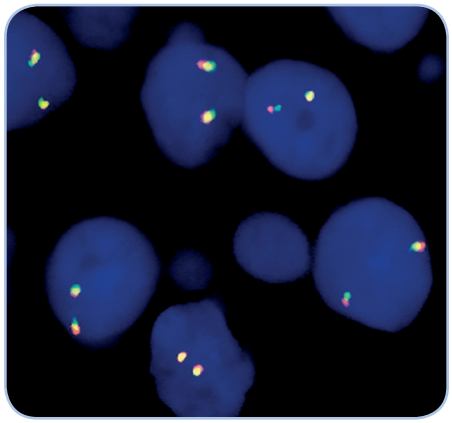
Ideogram of chromosome 1 indicating the hybridization locations.



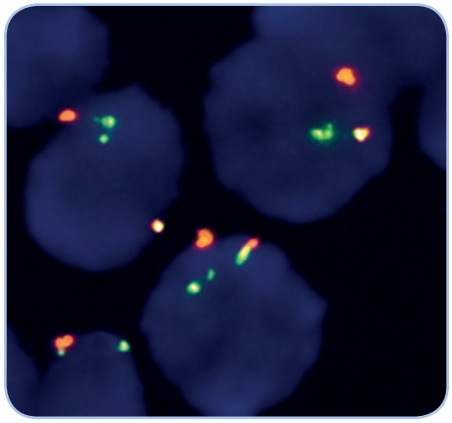
SPEC NTRK1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 1q22-q23.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 1q22-q23.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 1q22-q23.1 locus and one 1q22-q23.1 locus affected by a translocation.



SPEC NTRK1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Lung cancer tissue section with translocation of the NTRK1 gene as indicated by one non-rearranged orange/green fusion signal, one orange and one separate green signal indicating the translocation.

Image kindly provided by Prof. Büttner, Cologne, Germany

Prod. No.	Product	Label	Tests* (Volume)
Z-2167-200	ZytoLight SPEC NTRK1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

27

ZytoLight® SPEC ABL2 Dual Color Break Apart Probe

CE IVD

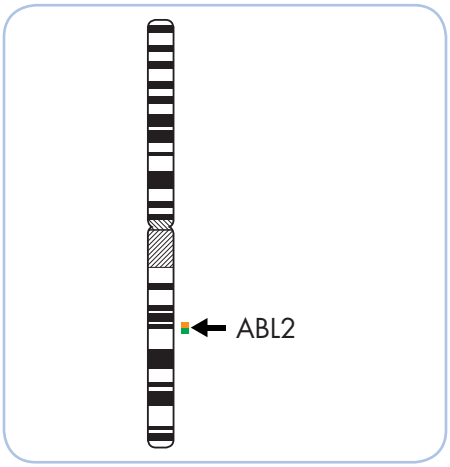
Background

The ZytoLight® SPEC ABL2 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 1q25.2 harboring the ABL2 (ABL proto-oncogene 2, non-receptor tyrosine kinase, a.k.a. ARG) gene.
The ABL2 gene encodes for a non-receptor tyrosine kinase (TK) with high homology to ABL1. ABL1 and ABL2 proteins belong to the Abelson family and link diverse extracellular stimuli to signaling pathways controlling cell growth, survival, invasion, and migration.
The translocation t(1;12)(q25.2;p13.2) involving ABL2 was shown to result in a chimeric protein consisting of the helix-loop-helix (HLH) domain of ETV6 and the TK domain of ABL2. The HLH domain of ETV6 is known to confer oncogenic activity to chimeric tyrosine kinase proteins by forming ligand-independent oligomers.
The ETV6-ABL2 fusion gene has been detected in a patient with AML-M3 and in a T-cell ALL cell line.
Further ABL2 fusion partners have been identified in patients with Philadelphia chromosome-like ALL, including PAG1, RCSD1, and ZC3HAV1. Cell lines expressing ABL2 fusions were shown to respond to tyrosine kinase inhibitors. Moreover, a patient with B-ALL positive for RCSD1-ABL2 fusion was reported to respond to treatment with the ABL1 inhibitor imatinib. Hence, detection of ABL2 rearrangements by FISH may help in selecting patients eligible for therapy with TK inhibitors.

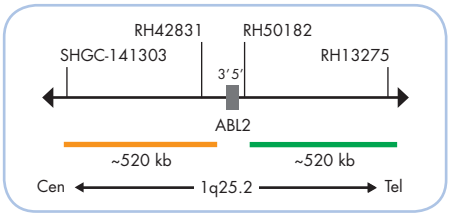
References
Cazzaniga G, et al. (1999) Blood 94: 4370-3.
De Braekeleer E, et al. (2012) Leuk Res 36: 945-61.
Greuber EK, et al. (2013) Nat Rev Cancer 13: 559-71.
Roberts KG, et al. (2014) N Engl J Med 371: 1005-15.

Probe Description

The SPEC ABL2 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 1q25.2 band. The orange fluorochrome direct labeled probe hybridizes proximal to the ABL2 gene at 1q25.2, the green fluorochrome direct labeled probe hybridizes distal to the ABL2 gene at 1q25.2



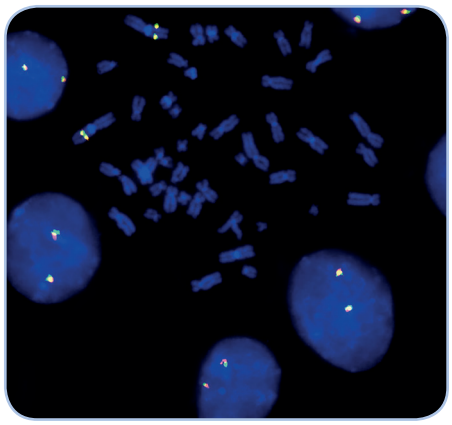
Ideogram of chromosome 1 indicating the hybridization locations.



SPEC ABL2 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 1q25.2 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 1q25.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 1q25.2 locus and one 1q25.2 locus affected by a translocation.



SPEC ABL2 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus and to metaphase chromosomes of a normal cell.

Prod. No.	Product	Label	Tests* (Volume)
Z-2200-200	ZytoLight SPEC ABL2 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

28

ZytoLight® SPEC MDM4/1p12 Dual Color Probe

CE IVD

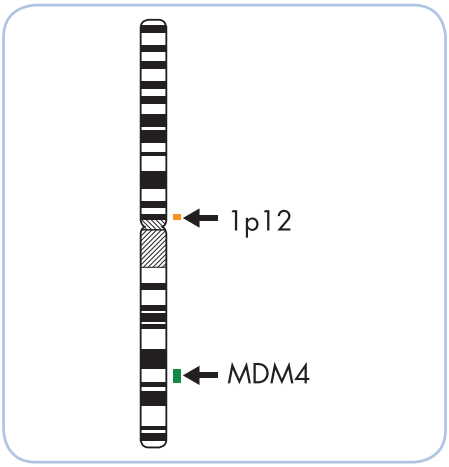
Background

The ZytoLight® SPEC MDM4/1p12 Dual Color Probe is designed for the detection of MDM4 gene amplifications found in 10-20% of various tumors such as lung, colon, stomach, and breast cancers, as well as in 65% of retinoblastomas.
The MDM4 (mouse double minute 4 homolog) gene (a.k.a. HDMX or MDMX) is located in the chromosomal region 1q32.1 and encodes a 490-amino acid protein which shows significant structural similarity to the p53-binding protein MDM2.
Like MDM2, the oncogene MDM4 can bind to p53 thereby inactivating the function of p53 as a transcriptional activator. In addition, MDM4 has been shown to bind to MDM2 resulting in inhibition of MDM2 degradation.
Antitumor strategies employing combined inhibitors of the two oncogenic proteins MDM2 and MDM4 may lead to an effective activation of the tumor suppressor p53.

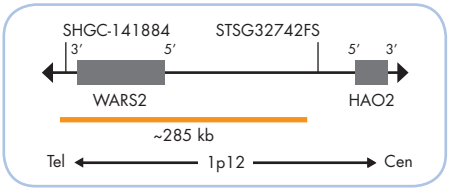
References
Duhamel LA, et al. (2012) Histopathology 60: 357-9.
Laurie NA, et al. (2006) Nature 444: 61-6.
Shvarts A, et al. (1996) EMBO J 15: 5349-57.
Shvarts A, et al. (1997) Genomics 43: 34-42.
Tanimura S et al. (1999) FEBS Lett 447: 5-9.
Toledo F & Wahl GM (2006) Nat Rev Cancer 6: 909-23.
Toledo F & Wahl GM (2007) Int J Biochem Cell Biol 39:1476-82.

Probe Description

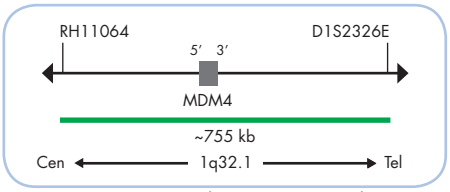
The SPEC MDM4/1p12 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC MDM4 probe hybridizing distal and proximal to the human MDM4 gene in the chromosomal region 1q32.1 and an orange fluorochrome direct labeled SPEC 1p12 probe hybridizing in close proximity to the centromere of chromosome 1 at the chromosomal region 1p12. Due to cross-hybridizations of chromosome 1 alpha satellites to other centromeric regions, probes specific for 1p12 are frequently used for chromosome 1 copy number detection.



Ideogram of chromosome 1 indicating the hybridization locations.



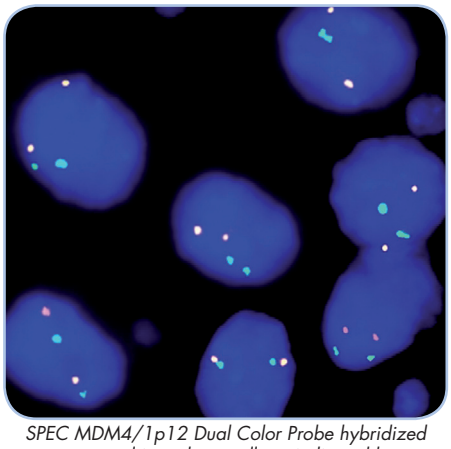
SPEC 1p12 Probe map (not to scale).



SPEC MDM4 Probe map (not to scale).

Results

In a normal interphase nucleus two orange and two green signals are expected. Nuclei with amplification of the MDM4 gene locus or aneuploidy of chromosome 1 will show multiple copies of the green signal or large green signal clusters.



SPEC MDM4/1p12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2080-200	ZytoLight SPEC MDM4/1p12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC MYCN/2q11 Dual Color Probe

Previously: ZytoLight SPEC NMYC/2q11 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC MYCN/2q11 Dual Color Probe is designed for the detection of MYCN amplification which represents the most powerful unfavorable prognostic factor for neuroblastoma. Less frequently amplifications are found in retinoblastoma, small cell lung cancer, astrocytoma and other tumors derived from the neuroectoderm.

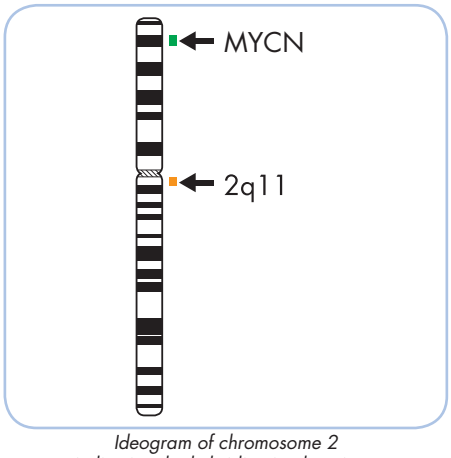
The MYCN (v-myc avian myelocytomatosis viral related oncogene, neuroblastoma derived, a.k.a. NMYC) gene is located in the chromosomal region 2p24.3 and encodes a 62-64 kDa transcription factor mainly expressed in the developing nervous system.

Amplification of the MYCN gene is found in about 25% of primary neuroblastomas and is strongly associated with rapid tumor progression, advanced stages of the disease, and poor prognosis. Hence, amplification status is increasingly being used for stratification of patients to different treatment protocols.

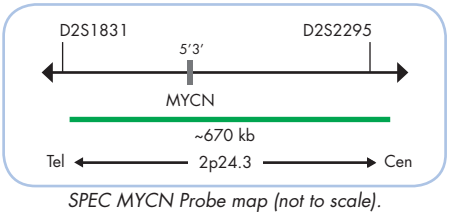
References
Gessi M, et al. (2014) Neuro Oncol 16: 924-32.
Kaneko M, et al. (1998) Med Pediatr Oncol 31: 1-7.
Lee WH, et al. (1984) Nature 309: 458-60.
Slamon DJ, et al. (1986) Science 232: 768-72.
Suita S, et al. (2007) J Pediatr Surg 42: 489-93.

Probe Description

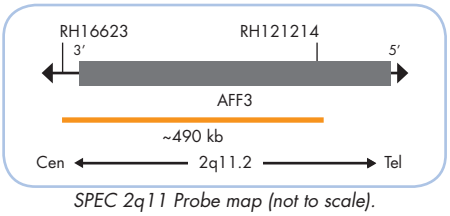
The SPEC MYCN/2q11 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC MYCN probe hybridizing to the human MYCN gene in the chromosomal region 2p24.3 and an orange fluorochrome direct labeled SPEC 2q11 probe specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



Ideogram of chromosome 2 indicating the hybridization locations.



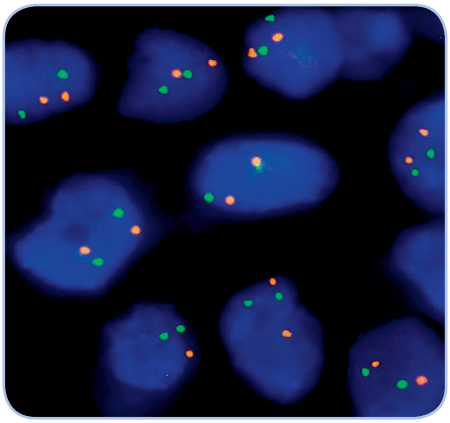
SPEC MYCN Probe map (not to scale).



SPEC 2q11 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the MYCN gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC MYCN/2q11 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2074-200	ZytoLight SPEC MYCN/2q11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

30

ZytoLight® SPEC ALK/EML4 TriCheck™ Probe

CE IVD

Background

The ZytoLight® SPEC ALK/EML4 TriCheck™ Probe is designed to detect inversions involving the chromosomal region 2p23.1-p23.2 harboring the ALK gene and the chromosomal region 2p21 harboring the EML4 gene. Moreover, using this probe it is possible to discriminate between EML4-ALK inversions and translocations affecting ALK, but not EML4, such as ALK-TFG or ALK-KIF5B translocations.

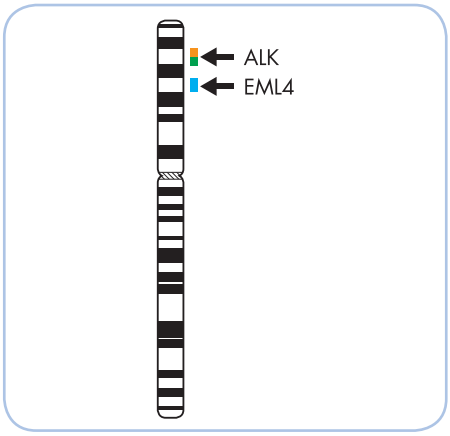
Inversions in the short arm of chromosome 2 [inv(2)(p21p23)] have been frequently detected in non-small cell lung cancer (NSCLC) and lead to the formation of EML4-ALK fusion transcripts. A few reports also identified EML4-ALK fusion transcripts in breast, gastric, and colorectal cancers. Many different breakpoints affecting ALK and EML4 were identified in these respective inversions.

Thus, multiple EML4-ALK transcript variants have been identified, all of which involve the intracellular kinase domain of ALK. ALK kinase targeted therapies may represent a very effective therapeutic strategy in NSCLC patients carrying EML4-ALK rearrangements. For the detection of this subset of NSCLC patients, the specific detection of EML4-ALK rearrangements using Fluorescence *in situ* Hybridization is a helpful tool for diagnosis and for selecting treatment.

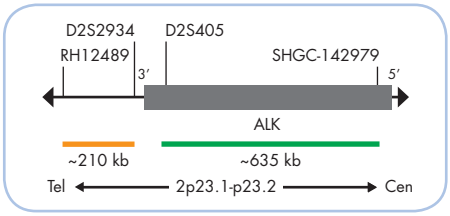
References
Inamura K, et al. (2009) Mod Pathol 22: 508-15.
Koivunen JP, et al. (2008) Clin Cancer Res 14: 4275-83.
Lawce HJ & Olson S (2013) J Assoc Genet Technol 39: 66-71.
Martelli MP, et al. (2009) Am J Pathol 174: 661-70.
Perner S, et al. (2008) Neoplasia 10: 298-302.
Preusser M, et al. (2013) Lung Cancer 80: 278-83.
Rodig SJ, et al. (2009) Clin Cancer Res 15: 5216-23.
Sasaki T, et al. (2010) Eur J Cancer 46: 1773-80.
Schildgen V, et al. (2012) Per Med 9: 801-3.
Schildhaus HU, et al. (2013) Mod Pathol 26: 1468-77.
Schoppmann SF, et al. (2013) Eur J Cancer 49: 1876-81.
Thunnissen E, et al. (2012) Virchows Arch 461: 245-57.
Von Laffert M, et al. (2013) Lung Cancer 81: 200-6.

Probe Description

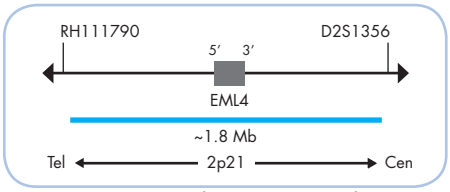
The SPEC ALK/EML4 TriCheck™ Probe is a mixture of three direct labeled probes hybridizing to the short arm of chromosome 2. The orange fluorochrome direct labeled probe hybridizes distal to the ALK gene breakpoint region at 2p23.2, the green fluorochrome direct labeled probe hybridizes proximal to the ALK gene breakpoint region at 2p23.1-p23.2, and the blue fluorochrome direct labeled probe hybridizes to the EML4 gene region at 2p21.



Ideogram of chromosome 2 indicating the hybridization locations.



SPEC ALK Probe map (not to scale).



SPEC EML4 Probe map (not to scale).

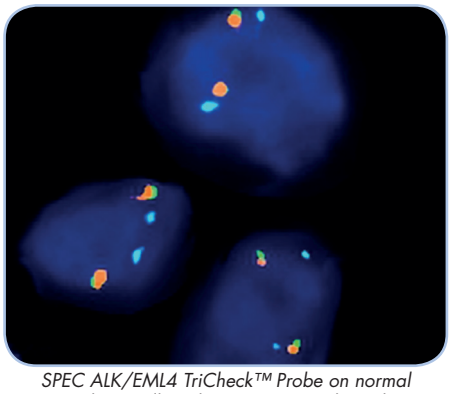
Results

In an interphase nucleus without rearrangement of the EML4-ALK locus, two orange/green fusion signals and two blue signals are expected.

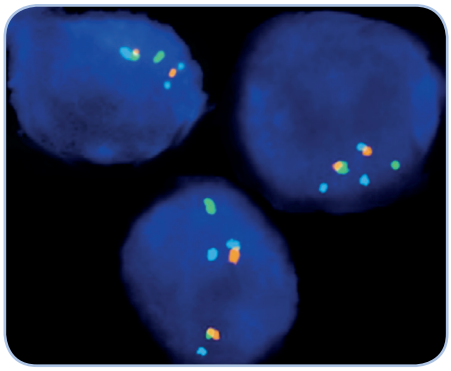
An EML4-ALK inversion is indicated by one separate green signal, one separate orange signal, and an additional blue signal.

An ALK translocation is indicated by separated orange and green signals without an additional blue signal.

EML4-ALK inversion with deletion of 5′-ALK sequences is indicated by loss of one green signal and co-localization of the isolated orange signal with a blue signal.



SPEC ALK/EML4 TriCheck™ Probe on normal interphase cells with non-rearranged ALK loci (two orange/green fusion signals), and non-rearranged EML4 loci (two blue signals).



NSCLC tissue section with an EML4-ALK inversion as indicated by one green, one separated orange, and one additional blue signal.

Prod. No.	Product	Label	Tests* (Volume)
Z-2117-50	ZytoLight SPEC ALK/EML4 TriCheck Probe CE IVD	●/●/●	5 (50 µl)
Z-2117-200	ZytoLight SPEC ALK/EML4 TriCheck Probe CE IVD	●/●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

31

ZytoLight® SPEC ALK Dual Color Break Apart Probe

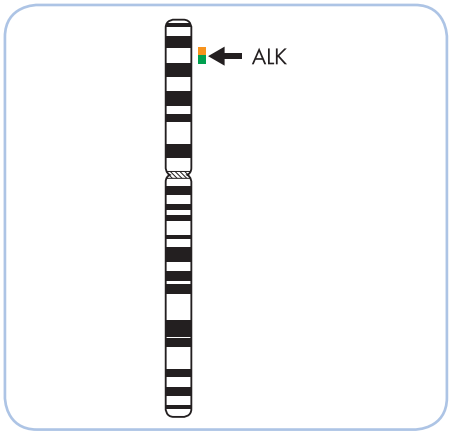
CE IVD

Background

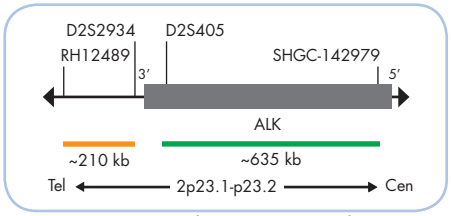
The ZytoLight® SPEC ALK Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 2p23.1-p23.2 harboring the ALK (anaplastic lymphoma receptor tyrosine kinase, a.k.a. CD246) gene.
ALK encodes a transmembrane receptor tyrosine kinase. This gene exerts characteristic oncogenic activities through fusion to several gene partners or mutations both in hemato-poietic and non-hematopoietic solid tumors.
Translocations affecting the ALK gene locus are frequently found in anaplastic large cell lymphoma (ALCL), an aggressive non-Hodgkin lymphoma arising from T-cells. The most frequent translocation t(2;5) results in a fusion with the NPM1 (nucleophosmin a.k.a. nucleolar phosphoprotein B23, numatrin) gene located on chromosome 5q35. This rearrangement results in a NPM1/ALK fusion protein, which is constitutively activated through autophosphorylation, and that in turn mediates malignant cell transformation by activating downstream effectors like e.g. STAT3.
Additionally, inversions affecting the ALK gene located on the short arm of chromosome 2 [inv(2)(p21p23)] have been frequently detected in non-small cell lung cancer (NSCLC) and lead to the formation of EML4-ALK fusion transcripts.
ALK kinase targeted therapies may represent a very effective therapeutic strategy in NSCLC patients carrying EML4-ALK rearrangements.

Probe Description

The SPEC ALK Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 2p23.1-p23.2 band. The orange fluorochrome direct labeled probe hybridizes distal to the ALK gene breakpoint region at 2p23.2, the green fluorochrome direct labeled probe hybridizes proximal to the ALK gene breakpoint region at 2p23.1-p23.2.



Ideogram of chromosome 2 indicating the hybridization locations.

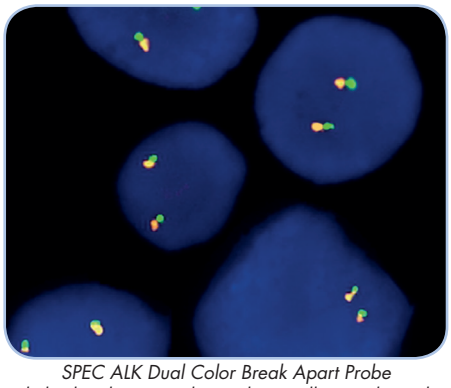


SPEC ALK Probe map (not to scale).

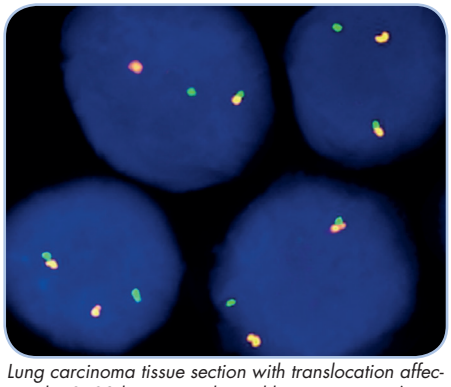
References
Inamura K, et al. (2009) Mod Pathol 22: 508-15.
Koivunen JP, et al. (2008) Clin Cancer Res 14: 4275-83.
Martelli MP, et al. (2009) Am J Pathol 174: 661-70.
Palmer RH, et al. (2009) Biochem J 420: 345-61.
Perner S, et al. (2008) Neoplasia 10: 298-302.
Rodig SJ, et al. (2009) Clin Cancer Res 15: 5216-23.
Sasaki T, et al. (2010) Eur J Cancer 46: 1773-80.
Von Laffert M, et al. (2013) Lung Cancer 81: 200-6.
Zhang Q, et al. (2007) Nat Med 11:1341-8.

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 2p23.1-p23.2 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 2p23.1-p23.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 2p23.1-p23.2 locus and one 2p23.1-p23.2 locus affected by a translocation or inversion.
EML4-ALK inversion with deletion of 5'-ALK sequences is indicated by one or multiple isolated orange signals.



SPEC ALK Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Lung carcinoma tissue section with translocation affecting the 2p23 locus as indicated by one orange/green fusion (non-rearranged) signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2124-50	ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Z-2124-200	ZytoLight SPEC ALK Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE045-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

32

ZytoLight® SPEC ALK/2q11 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC ALK/2q11 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the ALK gene.

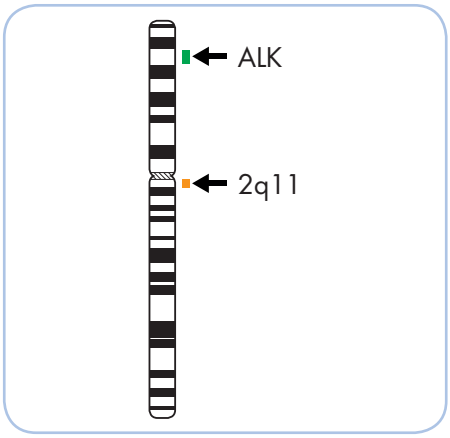
The ALK (anaplastic lymphoma receptor tyrosine kinase, a.k.a. CD246) gene is located on chromosome 2p23.1-p23.2 and encodes a transmembrane receptor tyrosine kinase. ALK was originally identified as a fusion partner of NPM1. This gene fusion is frequently found in anaplastic large cell lymphoma (ALCL), an aggressive non-Hodgkin lymphoma. Rearrangements affecting the ALK gene locus have also been found to play a role in carcinogenesis of a variety of hematopoietic and non-hematopoietic solid tumors, including non-small cell lung cancer (NSCLC). Moreover, ALK amplifications and copy number gains have been reported to occur in a variety of tumors including NSCLC and alveolar rhabdomyosarcoma (ARMS). In colorectal cancer, ALK amplification was correlated with nodal status suggesting that ALK amplified tumors have a more aggressive phenotype. ALK copy number gains and amplifications are also a frequent genetic event in the tumorigenesis of neuroblastomas and were found to result in high ALK expression correlating with an unfavorable neuroblastoma phenotype.

Hence, the identification of ALK gene copy number changes by *in situ* Hybridization might be of prognostic and therapeutic relevance.

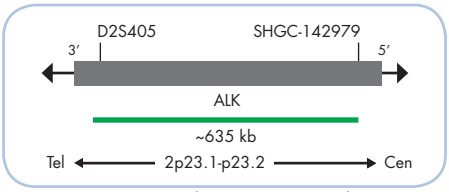
References
Carén H, et al. (2008) Biochem J 416: 153-9.
Corao DA, et al. (2009) Pediatr Dev Pathol 12: 275-83.
Koivunen JP, et al. (2008) Clin Cancer Res 14: 4275-83.
Montagut C, et al. (2010) J Clin Oncol 28: Suppl 10537.
Pelosi G, et al. (2012) Lung Cancer 77: 507-14.
Salido M, et al. (2011) J Thorac Oncol 6: 21-7.
Subramaniam MM, et al. (2009) Hum Pathol 40: 1638-42.

Probe Description

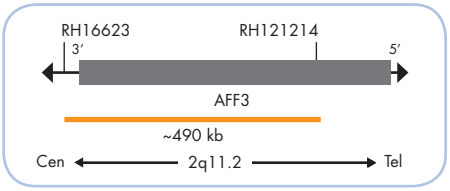
The SPEC ALK/2q11 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC ALK probe hybridizing to the human ALK gene in the chromosomal region 2p23.1-p23.2 and an orange fluorochrome direct labeled SPEC 2q11 probe. The SPEC 2q11 probe is specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



Ideogram of chromosome 2 indicating the hybridization locations.



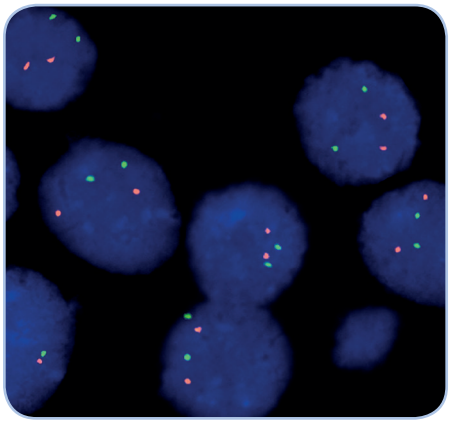
SPEC ALK Probe map (not to scale).



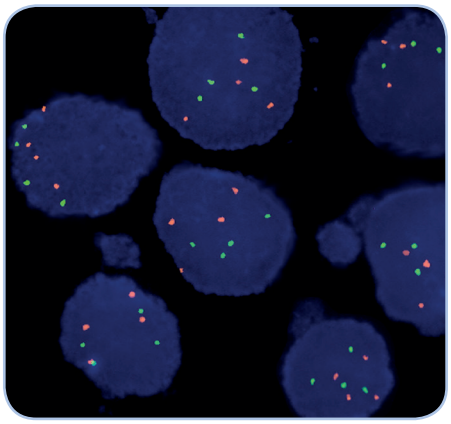
SPEC 2q11 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ALK gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC ALK/2q11 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Neuroblastoma tissue section with tetrasomy of chromosome 2 as indicated by four orange (2q11) and four green (ALK) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2161-200	ZytoLight SPEC ALK/2q11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC EML4 Dual Color Break Apart Probe

CE IVD

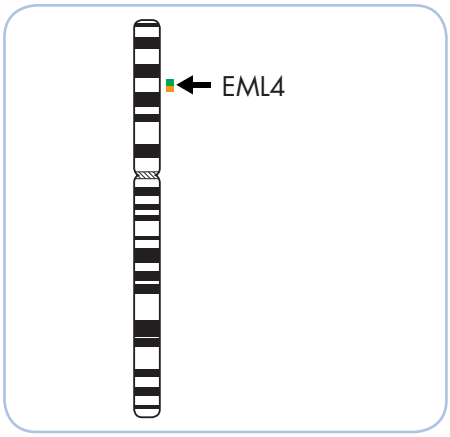
Background

The ZytoLight® SPEC EML4 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 2p21 harboring the EML4 (echinoderm microtubule-associated protein-like 4, a.k.a. ROPP120) gene. Inversions in the short arm of chromosome 2 [inv(2)(p21p23)] have been frequently detected in non-small cell lung cancer (NSCLC) and lead to the formation of EML4-ALK fusion transcripts. A few reports also identified these fusion transcripts in breast, gastric, and colorectal cancers. The fusion genes comprise variably truncated N-terminal portions of the EML4 gene and the intracellular signaling domain of the receptor tyrosine kinase ALK (anaplastic lymphoma receptor tyrosine kinase, a.k.a. CD246). It was found that EML4 mediates ligand-independent dimerization of ALK, resulting in constitutive kinase activity. EML4-ALK was shown to possess transforming activity *in vitro* and *in vivo*. The EML4-ALK fusion transcript is found in about 5% of NSCLC, predominantly adenocarcinomas, and is considered to be mutually exclusive to EGFR or KRAS mutations. The detection of the inversion by Fluorescence *in situ* Hybridization might represent a valuable tool to identify a subpopulation of NSCLC likely to respond to ALK kinase targeting therapies.
The SPEC EML4 Dual Color Break Apart Probe can be used to subsequently confirm EML4-ALK inversion if an ALK Break Apart Probe has been used for initial diagnosis.

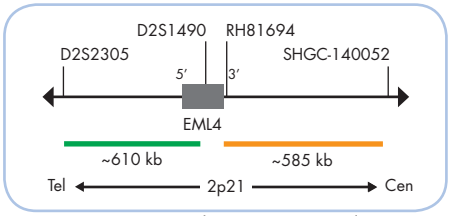
References
Choi YL, et al. (2008) Cancer Res 69: 4971-6.
Inamura K, et al. (2009) Mod Pathol 22: 508-15.
Lin E, et al. (2009) Mol Cancer Res 7: 1466-76.
Perner S, et al. (2008) Neoplasia 10: 298-302.
Rodig SJ, et al. (2009) Clin Cancer Res 15: 5216-23.
Soda M, et al. (2007) Nature 448: 561-6.
Shaw AT, et al. (2009) J Clin Oncol 27: 4247-53.

Probe Description

The SPEC EML4 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 2p21 band. The orange fluorochrome direct labeled probe hybridizes proximal, the green fluorochrome direct labeled probe hybridizes distal to the EML4 gene breakpoint region at 2p21.



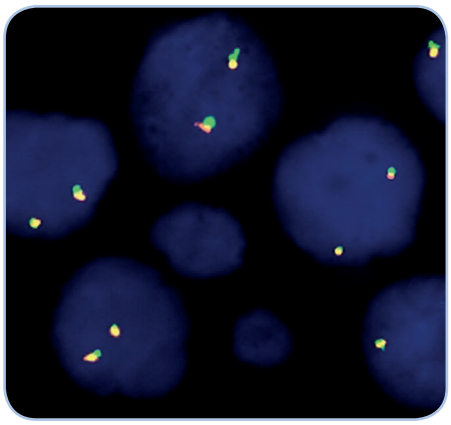
Ideogram of chromosome 2 indicating the hybridization locations.



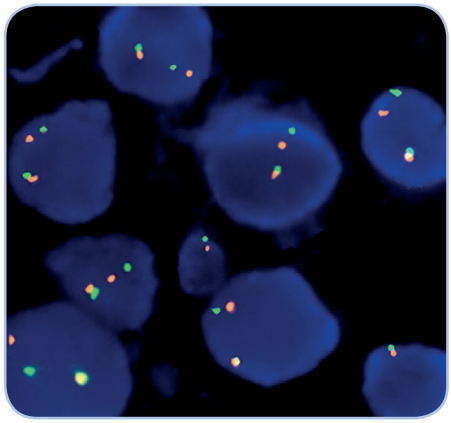
SPEC EML4 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking an inversion involving the 2p21 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 2p21 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 2p21 locus and one 2p21 locus affected by an inversion or translocation.



SPEC EML4 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



NSCLC tissue section with inversion affecting the EML4 locus at 2p21 as indicated by one orange/green fusion (non-rearranged) signal, one green signal, and one separate orange signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2136-50	ZytoLight SPEC EML4 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

34

ZytoLight® SPEC MERTK/2q11 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC MERTK/2q11 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the MERTK gene.

The MERTK (MER proto-oncogene, tyrosine kinase, a.k.a. MER, c-Eyk) gene is located on chromosome 2q13 and encodes a receptor tyrosine kinase which is a member of the TAM (TYRO3/AXL/MERTK) family. Binding of the ligands Protein S or growth arrest-specific 6 (GAS6) to MERTK activates the downstream MAPK and PI3K/Akt antiapoptotic pathways, thereby promoting proliferation and survival of normal and cancer cells. Additional downstream pathways lead to enhanced migration and invasion of tumor cells.

Ectopic expression or overexpression of MERTK has been demonstrated in many human cancers, e.g. ALL, AML, astrocytoma, breast cancer, gastric cancer, mantle cell lymphoma, melanoma, and NSCLC.

In NSCLC, MERTK inhibition was shown to increase apoptosis and to decrease tumor formation in a mouse model.

In melanomas, MERTK expression was shown to correlate with disease progression, with the highest expression in metastatic melanomas. In addition, MERTK inhibition diminished tumor size by 60% in a human melanoma xenograft model.

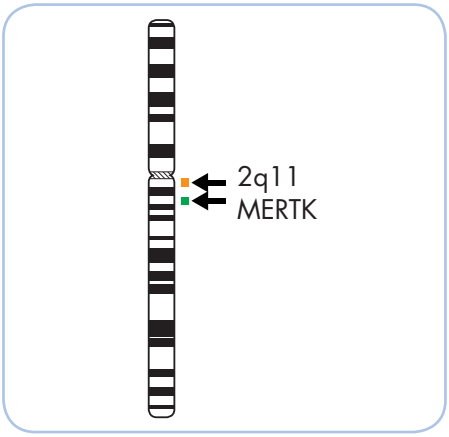
In gastric cancer patients, MERTK expression is associated with a shorter overall survival.

Hence, the identification of MERTK gene copy number changes by Fluorescence *in situ* Hybridization and targeted MERTK signaling inhibition may be of therapeutic significance in various types of tumors.

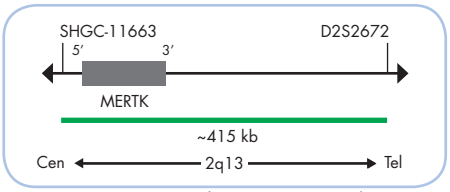
References
Graham DK, et al. (1994) Cell Growth Differ 5: 647-57.
Knubel KH, et al. (2014) Oncotarget 5: 1338- 51.
Linger RM, et al. (2013) Oncogene 32: 3420-31.
Rogers AE, et al. (2012) Oncogene 31: 4171-81.
Schlegel J, et al. (2013) J Clin Invest 123: 2257-67.
Verma A, et al. (2011) Mol Cancer Ther 10: 1763-73.
Yi JH, et al. (2015) Oncotarget [Epub ahead of print].

Probe Description

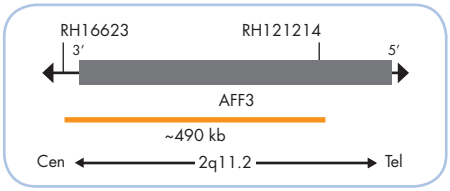
The SPEC MERTK/2q11 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC MERTK probe hybridizing to the MERTK gene in the chromosomal region 2q13 and an orange fluorochrome direct labeled SPEC 2q11 probe. The SPEC 2q11 probe is specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



Ideogram of chromosome 2 indicating the hybridization locations.



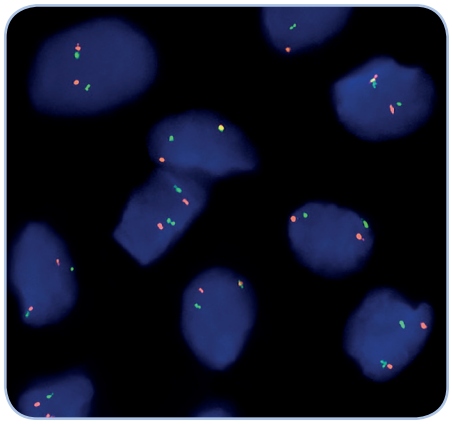
SPEC MERTK Probe map (not to scale).



SPEC 2q11 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the MERTK gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC MERTK/2q11 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2155-200	ZytoLight SPEC MERTK/2q11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC ERBB3/CEN 12 Dual Color Probe

Previously: ZytoLight SPEC HER3/CEN 12 Dual Color Probe

ZytoLight® SPEC ERBB4/2q11 Dual Color Probe

Previously: ZytoLight SPEC HER4/2q11 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC ERBB3/CEN 12 Dual Color Probe and SPEC ERBB4/2q11 Dual Color Probe are designed for the detection of amplifications of the chromosomal regions harboring the genes ERBB3 and ERBB4, respectively.

Genes ERBB3 (a.k.a. HER3) and ERBB4 (a.k.a. HER4) both encode transmembrane glycoproteins acting as cellular growth factor receptors. These proteins belong to the epidermal growth factor receptor subgroup of the receptor tyrosine kinase superfamily also including ERBB1 (EGFR) and ERBB2, known to be affected by gene amplifications in a number of malignant tumors.

Although EGFR and ERBB2 have been shown to represent good predictive markers and appropriate targets for therapeutic approaches, relatively less is known of comparable significance for ERBB3 and ERBB4. However, there is growing evidence that cooperation of all four members of the ERBB gene family contributes to a more aggressive tumor phenotype and influences therapeutic response.

Accordingly, it is assumed that the assessment of the combined amplification status of ERBB1 to ERBB4 may improve the diagnostic value significantly.

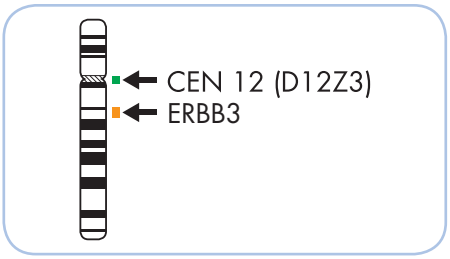
Recently it was shown in a retrospective study that responsiveness to Herceptin™ turned out to be more efficient if tumour cells show ERBB4 gene amplification.

References

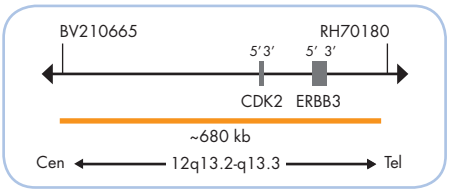
Alimandi M, et al. (1995) Oncogene 10: 1813-21.
Begnami MD, et al. (2011) J Clin Oncol 29: 3030-6.
Berghoff AS, et al. (2014) Breast J 23: 637-43.
Brockhoff G, et al. (2011) Acta Derm Venereol 91: 488-90.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Kraus MH, et al. (1989) Proc Natl Acad Sci USA 86: 9193-7.
Lédel F, et al. (2014) Eur J Cancer 50: 656-62.
Plowman GD, et al. (1993) Proc Natl Acad Sci USA 90: 1746-50.
Sassen A, et al. (2008) Breast Cancer Res 10: R2.
Sassen A, et al. (2009) Breast Cancer Res 11: R50.
Zaczek A, et al. (2005) Histol Histopathol 20: 1005-15.
Zimonjic DB, et al. (1995) Oncogene 10: 1235-7.

Probe Description

The SPEC ERBB3/CEN 12 Dual Color Probe is a mixture of a green fluorochrome direct labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3) and an orange fluorochrome direct labeled SPEC ERBB3 probe hybridizing distal and proximal to the human ERBB3 gene in the chromosomal region 12q13.2-q13.3.

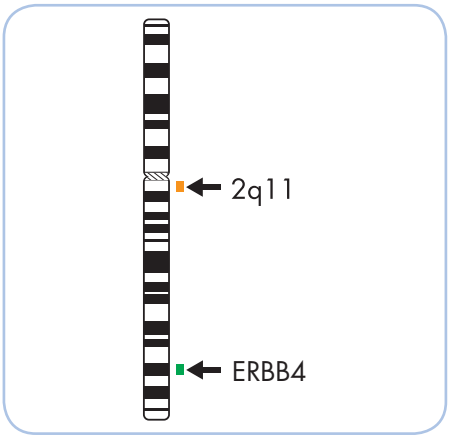


Ideogram of chromosome 12 indicating the hybridization locations.

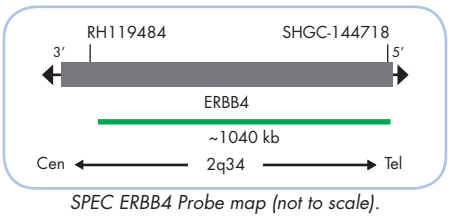


SPEC ERBB3 Probe map (not to scale).

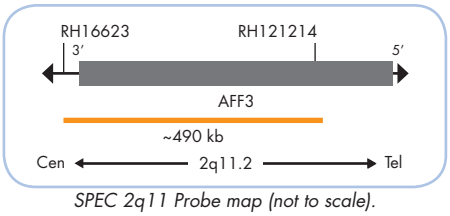
The SPEC ERBB4/2q11 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC ERBB4 probe hybridizing to intronic sequences of the human ERBB4 gene in the chromosomal region 2q34 and an orange fluorochrome direct labeled SPEC 2q11 probe. The SPEC 2q11 probe is specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



Ideogram of chromosome 2 indicating the hybridization locations.



SPEC ERBB4 Probe map (not to scale).



SPEC 2q11 Probe map (not to scale).

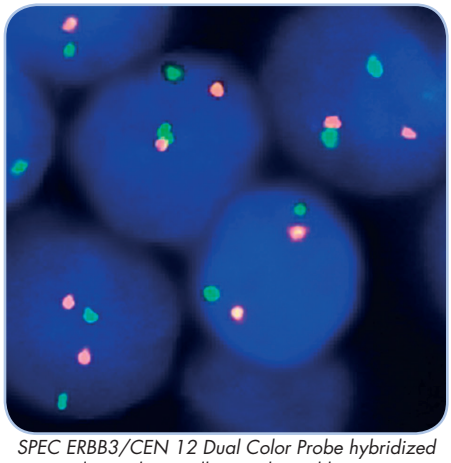
ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

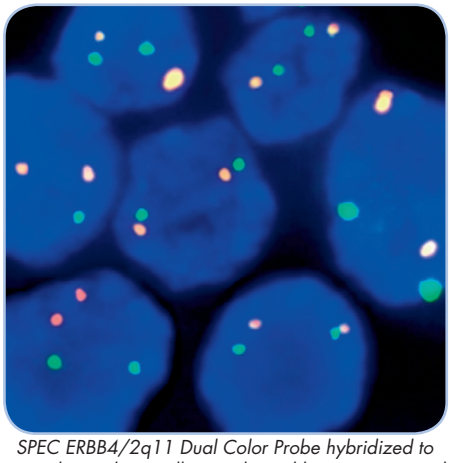
Results

Using the SPEC ERBB3/CEN 12 Dual Color Probe in a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ERBB3 gene locus, multiple copies of the orange signal or orange signal clusters will be observed.

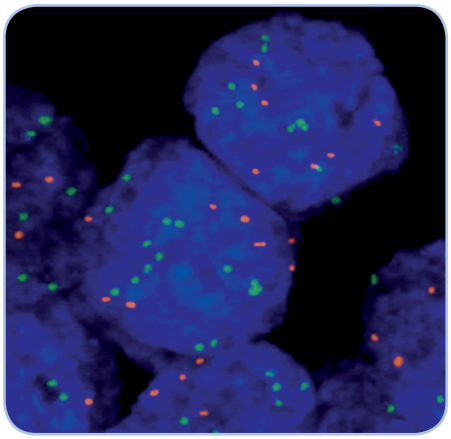
Using the SPEC ERBB4/2q11 Dual Color Probe in a normal interphase nucleus, two green and two orange signals are expected. In a cell with amplification of the ERBB4 gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC ERBB3/CEN 12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



SPEC ERBB4/2q11 Dual Color Probe hybridized to normal interphase cells as indicated by two green and two orange signals in each nucleus.



Breast cancer tissue section with amplification of the ERBB4 gene (green), SPEC 2q11 (orange).

Image kindly provided by Prof. Brockhoff, Regensburg, Germany.

Prod. No.	Product	Label	Tests* (Volume)
Z-2056-200	ZytoLight SPEC ERBB3/CEN 12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Z-2057-200	ZytoLight SPEC ERBB4/2q11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC VHL/CEN 3 Dual Color Probe

CE IVD

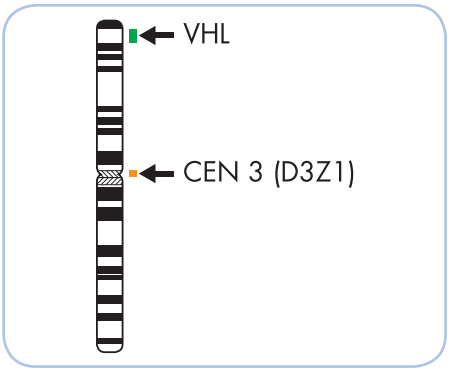
Background

The ZytoLight® SPEC VHL/CEN 3 Dual Color Probe is designed for the detection of deletions affecting the VHL gene.
The tumor suppressor gene VHL (von Hippel-Lindau) is located on 3p25.3 and encodes a 30 kDa protein with ubiquitin ligase E3 activity. The protein is involved in the ubiquitination and degradation of hypoxia-inducible-factor (HIF), which is a transcription factor that plays a critical role in the regulation of gene expression by oxygen.
Loss of heterozygosity (LOH) at chromosome 3p and inactivation of the VHL gene by deletion or mutation is the most frequent genetic change in sporadic as well as VHL disease-associated conventional renal cell carcinomas (RCC) whereas alterations of this region are rarely seen in papillary and chromophobe RCC. Recent studies suggest that the determination of the VHL status by FISH can significantly improve the accuracy of kidney tumor biopsy evaluation, providing prognostic information that can guide management decisions.

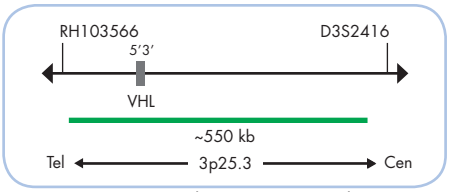
References
Barocas DA, et al. (2006) BJU Int 99: 290-5.
Broom RJ, et al. (2012) Clin Genitourin Cancer 10: 202-6.
Dagher J, et al. (2013) Hum Pathol 44: 2106-15.
Hosoe S, et al. (1990) Genomics 8: 634-40.
Latif F, et al. (1993) Science 260: 1317-20.
Sükösd F, et al. (2003) Cancer Res 63: 455-7.

Probe Description

The SPEC VHL/CEN 3 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 3 probe specific for the alpha satellite centromeric region of chromosome 3 (D3Z1) and a green fluorochrome direct labeled SPEC VHL probe spanning the VHL gene at 3p25.3.



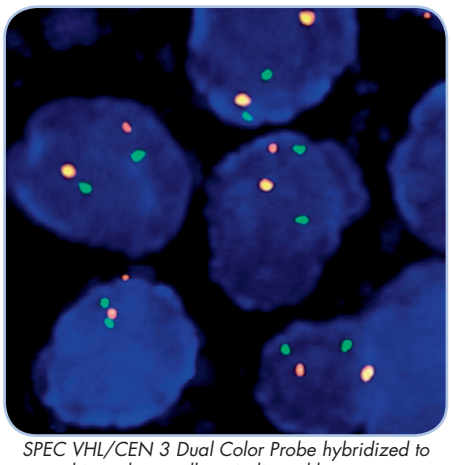
Ideogram of chromosome 3 indicating the hybridization locations.



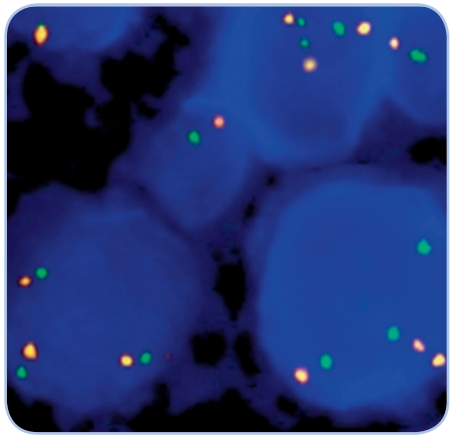
SPEC VHL Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the VHL gene, one or no copy of the green signal will be observed.



SPEC VHL/CEN 3 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Trisomy of chromosome 3 as indicated by three orange (CEN 3) and three green (VHL) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2084-200	ZytoLight SPEC VHL/CEN 3 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe

CE IVD

Background

The ZytoLight® SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe is designed for an accurate identification of renal cell carcinoma (RCC) subtypes by the simultaneous detection of VHL gene status and enumeration of chromosomes 1, 7, and 17 in tumor cells.

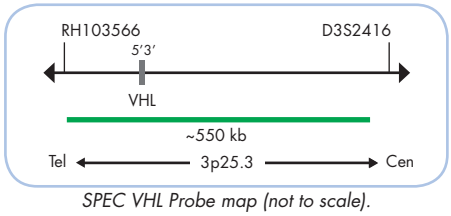
Clear cell RCC (ccRCC), papillary RCC (pRCC), chromophobe RCC (chRCC) and renal oncocytomas (ROs) are the most frequent renal cell tumor subtypes. Patients with ccRCC have a poorer prognosis than patients with pRCC and chRCC. RO is considered to be a benign neoplasm. The differentiation between RCC types may sometimes be difficult on histopathological features alone. However, the different subtypes of kidney tumors are characterized by distinct genetic patterns. Chromosome 3p deletion, including deletion of the tumor suppressor gene VHL (von Hippel-Lindau) in 3p25.3, is the most typical genetic abnormality in ccRCC. pRCC is characterized by trisomy/polysomy of chromosomes 7 and 17. Combined losses of chromosomes 1, 2, 6, 10, 13, 17, and 21 (with 1, 2, 6, and 17 being affected most frequently) are the most common changes in chRCC, whereas ROs often show rearrangements involving 11q13.3 harboring the CCND1 gene or losses of chromosomes 1, 14, and sex chromosomes.

Consequently, the ZytoLight® SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe is designed to differentiate between ccRCC, pRCC, and some chRCC tumors and should be used in combination with the ZytoLight® SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe which helps to especially differentiate between chRCC and ROs.

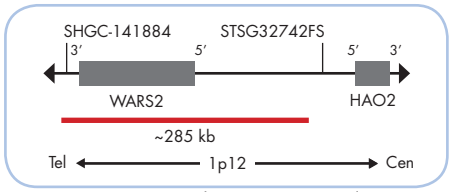
References
Brunelli M, et al. (2005) Modern Pathology 18: 161-9.
Iqbal MA, et al. (2000) Diagn Cytopathol 22: 3-6.
Jhang JS, et al. (2004) Cancer Genet Cytogenet 149: 114-9.
Mertz KD, et al. (2006) Urologe 45: 316-22.
Moch H (2013) Semin Cancer Biol 23: 3-9.
Sanjmyatav J, et al. (2013) Eur Urol 64: 689-91.
Sukov WR, et al. (2009) Hum Pathol 40: 1296-303.

Probe Description

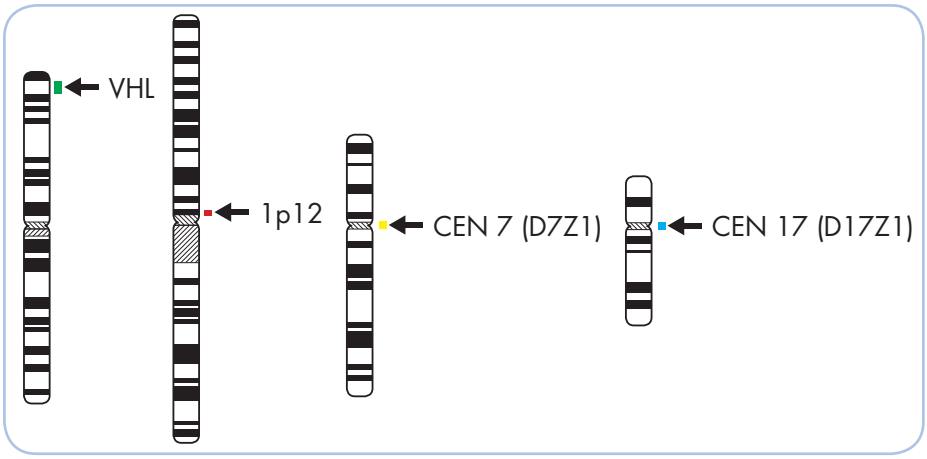
The SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe is a mixture of a green fluorochrome direct labeled SPEC VHL probe spanning the VHL gene at 3p25.3, a gold fluorochrome direct labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1), a blue fluorochrome direct labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1), and a red fluorochrome direct labeled SPEC 1p12 hybridizing in close proximity to the centromere of chromosome 1 at the chromosomal region 1p12. Due to cross-hybridizations of chromosome 1 alpha satellites to other centromeric regions, probes specific for 1p12 are frequently used for chromosome 1 copy number detection.



SPEC VHL Probe map (not to scale).



SPEC 1p12 Probe map (not to scale).



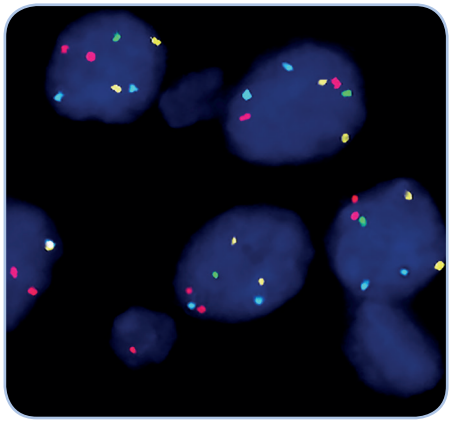
Ideograms of chromosomes 3, 1, 7, and 17 indicating the hybridization locations.

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

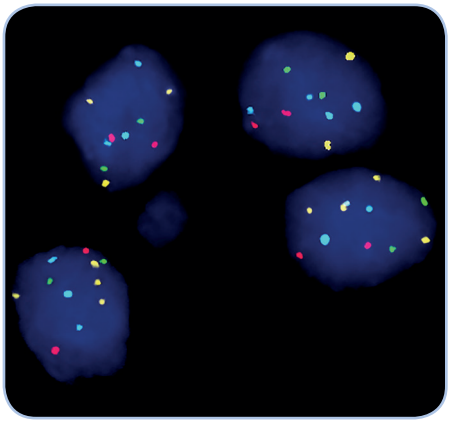
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Results

In a normal interphase nucleus, two green, two red, two gold, and two blue signals are expected. In a cell with deletion affecting the VHL gene, a reduced number of green signals will be observed. In cells with aneusomy of chromosome 1, 7, or 17, more or less signals of the respective color will be visible.



Renal cell carcinoma tissue section with deletion of the VHL gene as indicated by one green signal in each nucleus.



Renal cell carcinoma tissue section with polysomy of the chromosome 7 and 17 as indicated by multiple gold and/or blue signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2102-200	ZytoLight SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe CE IVD	●/●/●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe

CE IVD

Background

The ZytoLight® SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe is designed for an accurate identification of renal cell carcinoma (RCC) subtypes by the simultaneous detection of rearrangements affecting the CCND1 (cyclin D1, a.k.a. PRAD1) gene in 11q13.3 and enumeration of chromosomes 2 and 6 in tumor cells.

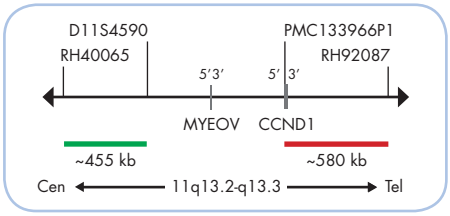
Clear cell RCC (ccRCC), papillary RCC (pRCC), chromophobe RCC (chRCC), and renal oncocytomas (ROs) are the most frequent renal cell tumor subtypes. Patients with ccRCC have a poorer prognosis than patients with pRCC and chRCC. RO is considered to be a benign neoplasm. The differentiation between RCC types may sometimes be difficult on histopathological features alone. However, the different subtypes of kidney tumors are characterized by distinct genetic patterns. Chromosome 3p deletion, including deletion of the tumor suppressor gene VHL (von Hippel-Lindau) in 3p25.3, is the most typical genetic abnormality in ccRCC. pRCC is characterized by trisomy/polysomy of chromosomes 7 and 17. Combined losses of chromosomes 1, 2, 6, 10, 13, 17, and 21 (with 1, 2, 6, and 17 being affected most frequently) are the most common changes in chRCC, whereas ROs often show rearrangements involving 11q13.3 or losses of chromosomes 1, 14, and sex chromosomes.

Consequently, the ZytoLight® SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe is designed to especially differentiate between chRCC and ROs and should be used in combination with the ZytoLight® SPEC VHL/1p12/CEN 7/17 Quadruple Color Probe which is designed for the differentiation between ccRCC, pRCC, and some chRCC tumors.

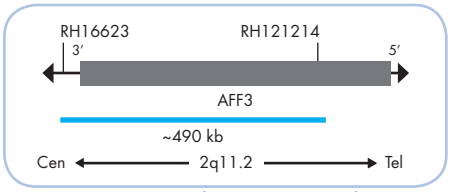
References
Brunelli M, et al. (2005) Modern Pathology 18: 161-9.
Iqbal MA, et al. (2000) Diagn Cytopathol 22: 3-6.
Jhang JS, et al. (2004) Cancer Genet Cytogenet 149: 114-9.
Mertz KD, et al. (2006) Urologe 45: 316-22.
Moch H (2013) Semin Cancer Biol 23: 3-9.
Sanjmyatav J, et al. (2013) Eur Urol 64: 689-91.
Sukov WR, et al. (2009) Hum Pathol 40: 1296-303.

Probe Description

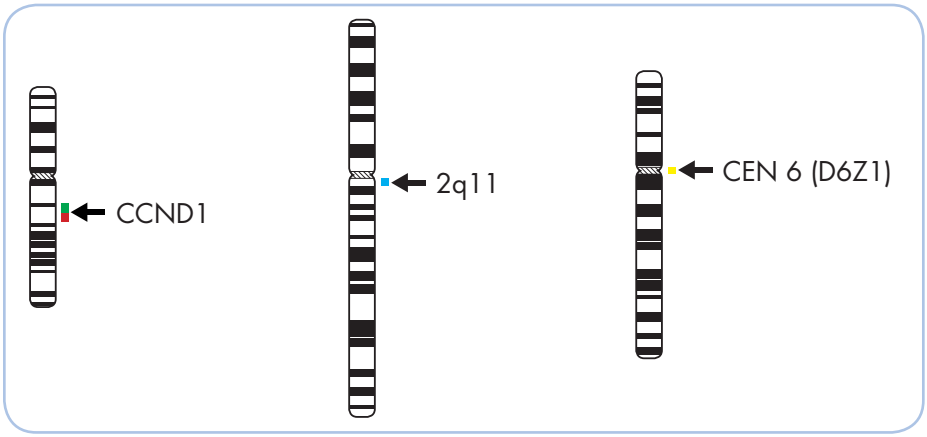
The SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe is a mixture of a green and a red fluorochrome direct labeled probe hybridizing proximal and distal to the breakpoint on 11q13.3, respectively, a gold fluorochrome direct labeled CEN 6 probe specific for the alpha satellite centromeric region of chromosome 6 (D6Z1), and a blue fluorochrome direct labeled SPEC 2q11 probe. The SPEC 2q11 probe is specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



SPEC CCND1 Probe map (not to scale).



SPEC 2q11 Probe map (not to scale).



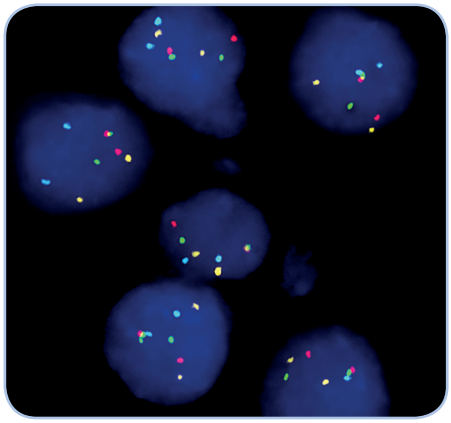
Ideograms of chromosomes 11, 2, and 6 indicating the hybridization locations.

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

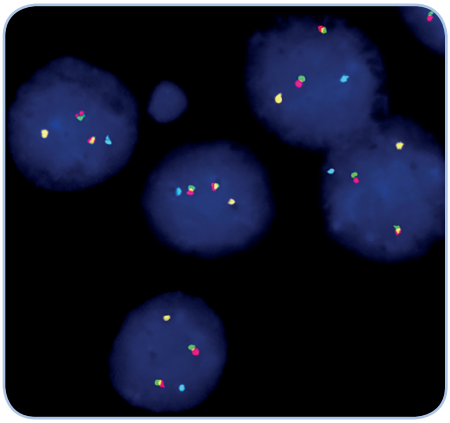
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Results

In a normal interphase nucleus, two red/green fusion signals, two blue, and two gold signals are expected. In a cell with translocation of the CCND1 gene locus, a signal pattern consisting of one red/green fusion signal, one red, and a separate green signal indicates one normal CCND1 locus and one CCND1 locus affected by an 11q13.3 translocation. In cells with aneusomy of chromosome 2 or 6, more or less signals of the respective color will be visible.



Renal cell carcinoma tissue section with translocation affecting the 11q13.3 locus as indicated by one non-rearranged red/green fusion signal, one red signal, and one separate green signal indicating the translocation.



Renal cell carcinoma tissue section with monosomy of chromosome 2 and 6 as indicated by one blue and one gold signal in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2118-200	ZytoLight SPEC CCND1 Break Apart/2q11/CEN 6 Quadruple Color Probe CE IVD	●/●/●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE079-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

42

ZytoLight® SPEC FHIT/CEN 3 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC FHIT/CEN 3 Dual Color Probe is designed for the detection of FHIT gene deletions frequently observed in most of the common epithelial neoplasms.

The FHIT (fragile histidine triad) gene is located in the chromosomal region 3p14.2 and encodes a 16.8 kDa member of the HIT superfamily of nucleoside monophosphate hydrolases and transferases.

The 1.6 Mb FHIT gene encompasses the most carcinogen-sensitive common fragile region FRA3B and the t(3;8) translocation breakpoint associated with hereditary renal carcinoma.

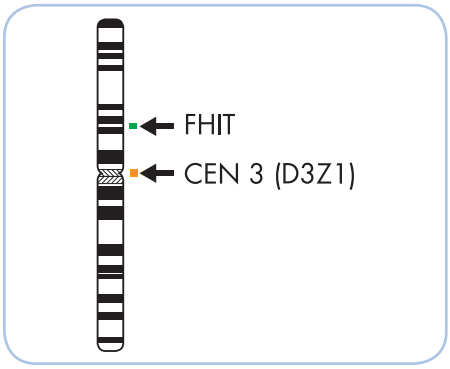
The tumor suppressor gene FHIT is inactivated by deletions in a variety of human tumors e.g. lung, kidney, gastric, breast, pancreatic, and cervical tumors. Since loss of the FHIT locus occurs in a number of preneoplastic lesions, FHIT may represent a potential marker for the detection of tumor precursor cells.

References

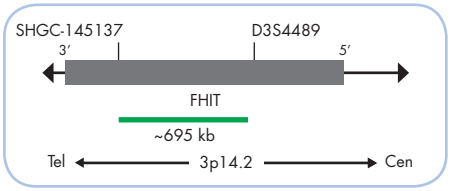
Broom RJ, et al. (2012) Clin Genitourin Cancer 10: 202-6.
Cirombella R, et al. (2010) Cancer Lett 291:230-6.
Huebner K, et al. (1998) Annu Rev Genet 32: 7-31.
Ishii H, et al. (2003) J Exp Ther Oncol 3: 291-6.
Ohta M, et al. (1996) Cell 84: 587-97.
Pekarsky Y, et al. (2002) Lancet Oncol 3: 748-54.
Schwarz S, et al. (2008) Cytometry A 73: 305-11.
Vieira J, et al. (2010) Genes Chromosomes Cancer 49: 935-47.

Probe Description

The SPEC FHIT/CEN 3 Dual Color probe is a mixture of an orange fluorochrome direct labeled CEN 3 probe specific for the alpha satellite centromeric region of chromosome 3 (D3Z1) and a green fluorochrome direct labeled SPEC FHIT probe hybridizing to sequences of introns 4 and 5 of the human FHIT gene at 3p14.2.



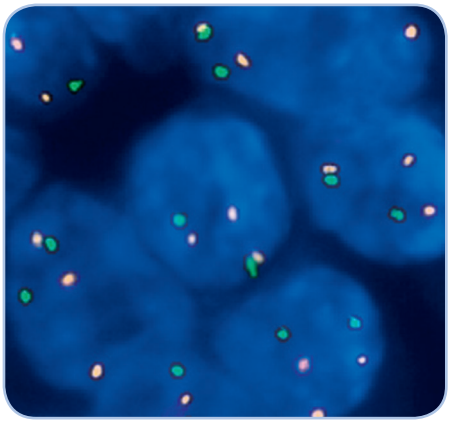
Ideogram of chromosome 3 indicating the hybridization locations.



SPEC FHIT Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletion of the FHIT gene locus, a reduced number of green signals will be observed. Deletions affecting only parts of introns 4 and/or 5 of the FHIT gene might result in a normal signal pattern with green signals of reduced size.



SPEC FHIT/CEN 3 Dual Color Probe hybridized to interphase cells each showing three orange and two green signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2062-200	ZytoLight SPEC FHIT/CEN 3 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC TFG Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC TFG Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 3q12.2 harboring the TFG (TRK-fused gene; a.k.a. TRCK fusion gene) gene.

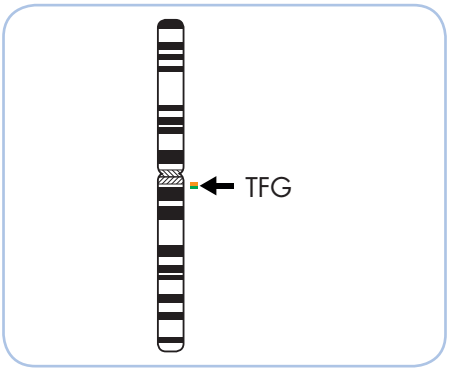
Initially, TFG was identified as a fusion partner of the protein kinases NTRK1 in papillary thyroid carcinoma and NR4A3 (a.k.a. NOR1) in extraskeletal myxoid chondrosarcoma generating the oncogenes TRK-T3 and TFG-NR4A3, respectively. The TFG gene has been found to be a fusion partner of the ALK gene, first identified in anaplastic large cell lymphomas (ALCL). However, the TFG-ALK fusion transcript was also found in non-small cell lung cancer (NSCLC). TFG is a ubiquitously expressed regulator of protein secretion. The translocation t(2;3)(p23;q12) results in the fusion of the first domains of TFG including the coiled-coil domain to the tyrosine kinase domain of ALK. It was shown that the aberrant TFG-ALK fusion transcript has transforming activity.

Fluorescence *in situ* Hybridization could be used to determine the specific translocation partners of the ALK gene e.g. in NSCLC.

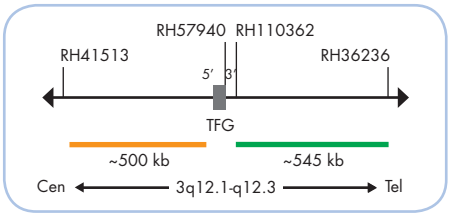
References
Greco A, et al. (1995) Mol Cell Biol 15: 6118-27.
Hernández L, et al. (2002) Am J Pathol 160: 1487-94.
Hisaoka M, et al. (2004) Genes Chromosomes Cancer 40: 325-8.
Rikova K, et al. (2007) Cell 131: 1190-203.
Witte K, et al. (2011) Nat Cell Biol 13: 550-8.

Probe Description

The SPEC TFG Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 3q12.1-q12.3 band. The orange fluorochrome direct labeled probe hybridizes at 3q12.1-q12.2 proximal to the TFG gene and the green fluorochrome direct labeled probe hybridizes at 3q12.2-q12.3 distal to that gene.



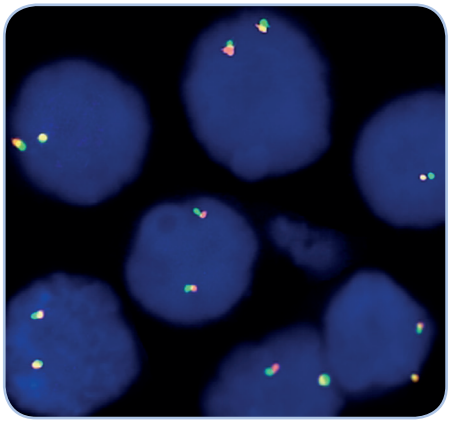
Ideogram of chromosome 3 indicating the hybridization locations.



SPEC TFG Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 3q12.1-q12.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 3q12.1-q12.3 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 3q12.1-q12.3 locus and one 3q12.1-q12.3 locus affected by a translocation.



SPEC TFG Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2133-50	ZytoLight SPEC TFG Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE069-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

44

ZytoLight® SPEC PIK3CA/CEN 3 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC PIK3CA/CEN 3 Dual Color Probe is designed for the detection of PIK3CA gene amplifications frequently found in a variety of human cancers.

The PIK3CA (a.k.a. PI3K-alpha) gene is located on chromosome 3q26.32 and encodes the 110 kDa catalytic subunit of the phosphatidylinositol 3-kinase (PI3K). Amplifications of PIK3CA were found e.g. in cervical, ovarian, endometrial, breast, gastric, and lung cancer.

In ovarian cancer as well as cervical cancer cells increased copy numbers were shown to be associated with increased expression of the gene product and PI3K activity. Furthermore, treatment with a PI3K inhibitor leads to decreased proliferation and increased apoptosis. It was concluded that PIK3CA is an important oncogene in these tumors.

Likewise in endometrial carcinomas detection of PIK3CA amplification is associated with tumor grade and stage.

A significant correlation between PIK3CA amplification and poor survival was found for gastric cancer patients.

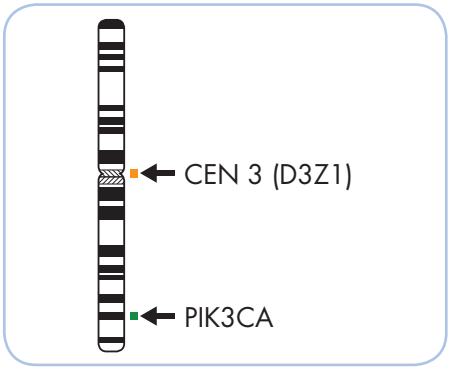
PIK3CA amplification was also frequently found in non-small cell lung cancer (NSCLC) and was shown to be associated with certain clinicopathologic features.

PIK3CA amplification seems to promote tumorigenesis through aberrant activation of the PI3K/Akt signaling pathway. Hence, this pathway might represent an effective therapeutic target in several cancer types.

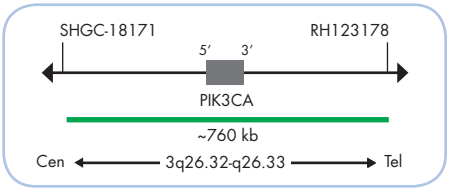
References
Ji M, et al. (2011) BMC Cancer 11: 147.
Ma YY, et al. (2000) Oncogene 19: 2739-44.
Shayesteh L, et al. (1999) Nat Genet 21: 99-102.
Shi J, et al. (2012) BMC Cancer 12: 50.
Volinia S, et al. (1994) Genomics 24: 472-7.

Probe Description

The SPEC PIK3CA/CEN 3 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 3 probe specific for the alpha satellite centromeric region of chromosome 3 (D3Z1) and a green fluorochrome direct labeled SPEC PIK3CA probe specific for the chromosomal region 3q26.32-q26.33 harboring the PIK3CA gene.



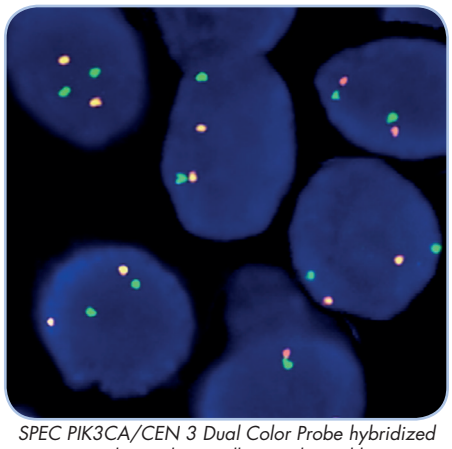
Ideogram of chromosome 3 indicating the hybridization locations.



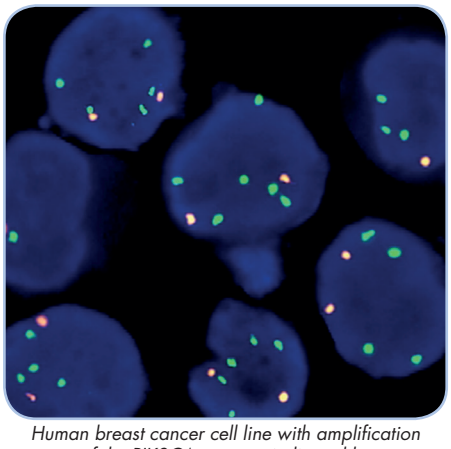
SPEC PIK3CA Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. Nuclei with amplification of the PIK3CA gene locus 3q26.32-q26.33 or aneuploidy of chromosome 3 will show multiple copies of the green signal or large green signal clusters.



SPEC PIK3CA/CEN 3 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Human breast cancer cell line with amplification of the PIK3CA gene as indicated by multiple green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2140-200	ZytoLight SPEC PIK3CA/CEN 3 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC SOX2/CEN 3 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC SOX2/CEN 3 Dual Color Probe is designed for the detection of SOX2 gene amplifications frequently observed in squamous cell carcinoma (SCC) of the lung, the esophagus, the oral cavity, and further organ sites. In addition, amplifications and/or overexpression were found in glioma, breast cancer, and other tumor types.

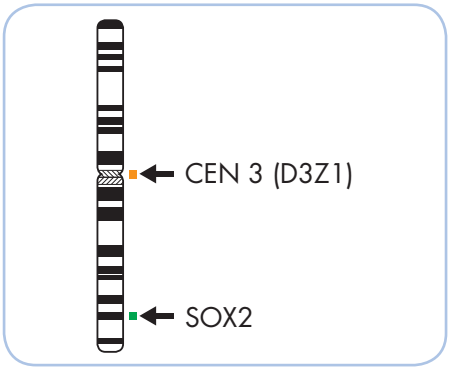
The SOX2 (sex determining region Y-box 2, a.k.a. ANOP3) gene is located on chromosome 3q26.33 and encodes a High Mobility Group domain transcription factor that is a regulator of normal stem cell function in embryonic and neural stem cells. Amplification of the SOX2 gene was found in about 20% of lung SSC and 15% of esophageal SCC and results in oncogenic SOX2 overexpression. In a large series of lung SSC it was shown that amplification of SOX2 was associated with lower tumor grade and hence with favorable prognosis.

However, in glioma and glioma cell lines SOX2 expression seems to show a positive correlation with malignancy grade.

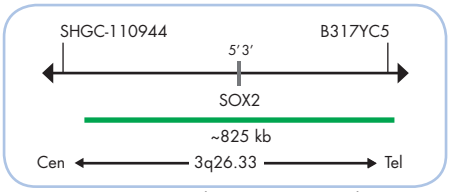
References
Alonso MM, et al. (2011) PLoS One 6: e26740.
Annovazzi L, et al. (2011) Cancer Genomics Proteomics 8: 139-47.
Bass AJ, et al. (2009) Nat Genet 41: 1238-42.
Hussenet T, et al. (2010) PLoS One 5: e8969.
Kokalj Vokac N, et al. (2014) Mol Cytogenet 7: 5.
Maier S, et al. (2011) Hum Pathol 42: 1078-88.
Wilbertz T, et al. (2011) Mod Pathol 24: 944-53.

Probe Description

The SPEC SOX2/CEN 3 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 3 probe specific for the alpha satellite centromeric region of chromosome 3 (D3Z1) and a green fluorochrome direct labeled SPEC SOX2 probe specific for the SOX2 gene at 3q26.33.



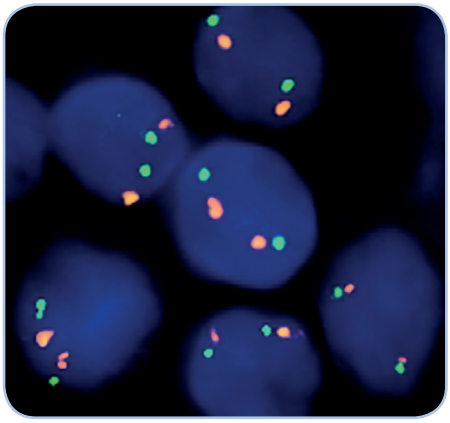
Ideogram of chromosome 3 indicating the hybridization locations.



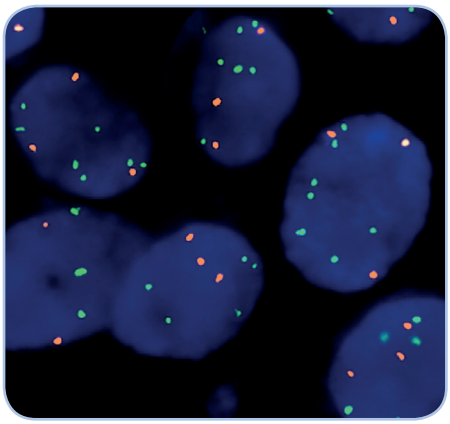
SPEC SOX2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. Nuclei with amplification of the SOX2 gene locus 3q26.33 or aneuploidy of chromosome 3 will show multiple copies of the green signal or large green signal clusters.



SPEC SOX2/CEN 3 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Lung cancer tissue section with amplification of the SOX2 gene (green) and trisomy of chromosome 3 (orange).

Prod. No.	Product	Label	Tests* (Volume)
Z-2127-200	ZytoLight SPEC SOX2/CEN 3 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC BCL6 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC BCL6 Dual Color Break Apart Probe is designed for the detection of translocations involving the chromosomal region 3q27.3 harboring the BCL6 (B-cell CLL/lymphoma 6, a.k.a. ZNF51, LAZ3) gene.

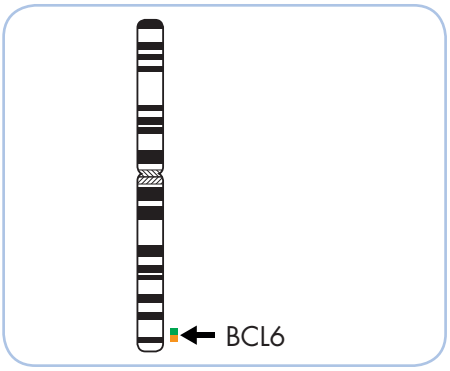
The BCL6 protein acts as a transcriptional repressor that is involved in the regulation of lymphoid development and function. Chromosomal rearrangements of the BCL6 gene region were found to occur in different types of non-Hodgkin lymphoma (NHL), including diffuse large B-cell lymphoma (DLBCL) and follicular lymphoma (FL). The most common BCL6 translocation t(3;14)(q27;q32.3) results in the IGH-BCL6 gene fusion. In addition, more than 20 partner loci have been identified including immunoglobulin (Ig) genes but also a number of non-Ig genes. As a result of these translocations, the rearranged BCL6 gene comes under the control of the promoter of the partner gene leading to deregulated expression of BCL6.

In DLBCL, the most common histologic subtype of NHL, BCL6 translocations represent one of the most frequent cytogenetic abnormality, occurring in 20% to 40% of the cases. Several studies reported a correlation of BCL6 translocation with an inferior overall survival. Moreover, DLBCL which are positive for both BCL6 and MYC rearrangements have been shown to have an extremely poor prognosis. Hence, the detection of BCL6 rearrangements by Fluorescence *in situ* Hybridization may help in predicting the clinical outcome in patients with NHL.

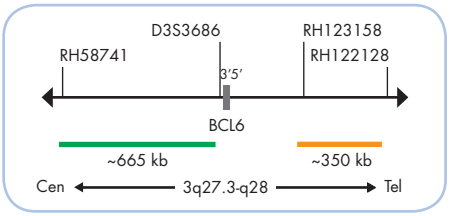
References
Akyurek N, et al. (2012) Cancer 118: 4173-83.
Cady FM, et al. (2008) J Clin Oncol 26: 4814-9.
Ohno H (2004) Histol Histopathol 19: 637-50.
Ohno H (2006) J Clin Exp Hematop 46: 43-53.

Probe Description

The SPEC BCL6 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 3q27.3-q28 band. The green fluorochrome direct labeled probe hybridizes at 3q27.3 proximal to the BCL6 gene, and the orange fluorochrome direct labeled probe hybridizes at 3q27.3-q28 distal to the BCL6 gene.



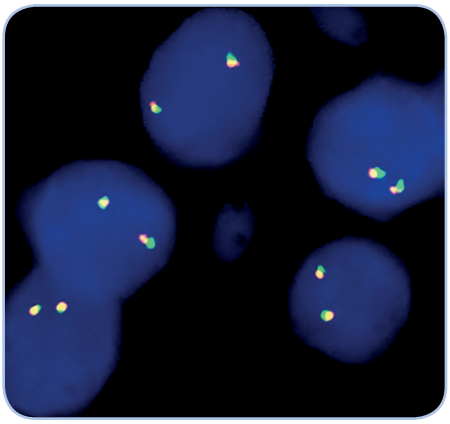
Ideogram of chromosome 3 indicating the hybridization locations.



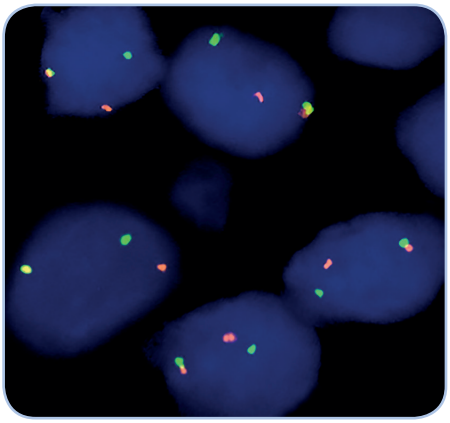
SPEC BCL6 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 3q27.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 3q27.3 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 3q27.3 locus and one 3q27.3 locus affected by a translocation.



SPEC BCL6 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



DLBCL tissue section with translocation of the BCL6 gene as indicated by one non-rearranged orange/green fusion signal, one orange, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2177-200	ZytoLight SPEC BCL6 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

47

ZytoLight® SPEC FGFR3 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC FGFR3 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 4p16.3 harboring the FGFR3 (fibroblast growth factor receptor 3, a.k.a. JTK4) gene.

Rearrangements affecting the FGFR3 gene are frequently found in carcinomas of various types including multiple myeloma (MM), bladder cancer, glioblastoma, peripheral T-cell lymphoma, and lung squamous cell carcinoma.

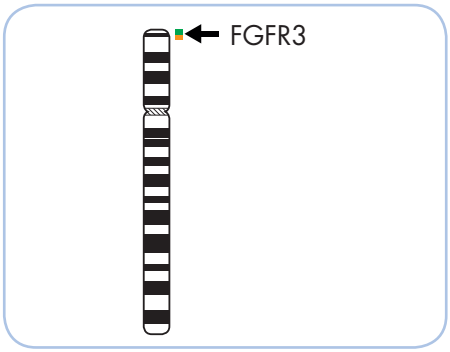
FGFR3 encodes for a transmembrane receptor tyrosine kinase which dimerizes after ligand binding leading to activation of downstream signaling cascades. This gene develops characteristic oncogenic activities after fusion to several gene partners which often leads to ligand-independent activation of the tyrosine kinase of the FGFR3 fusion protein.

Several *in vivo* and *in vitro* studies have demonstrated the therapeutic potential of FGFR inhibitors in cell lines and animal models harboring FGFR3 fusion genes. Hence, the detection of FGFR3 translocations by Fluorescence *in situ* Hybridization may be a useful predictive biomarker in the selection of patients for FGFR-targeted therapy.

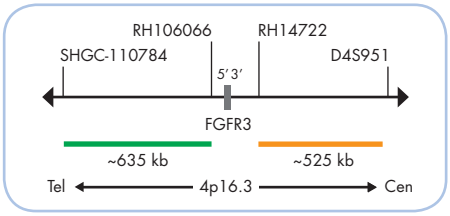
References
Cheng T, et al. (2013) PLoS One 8: e57284.
Fonseca R, et al. (2009) Leukemia 23: 2210-21.
Kang S, et al. (2009) Mol Cell Biol 29: 2105-17.
Knowles MA (2007) World J Urol 25: 581-93.
Parker BC, et al. (2014) J Pathol 232: 4-15.
Williams SV, et al. (2012) Hum Mol Genet 22: 795-803.

Probe Description

The SPEC FGFR3 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 4p16.3 band. The orange fluorochrome direct labeled probe hybridizes proximal, the green fluorochrome direct labeled probe hybridizes distal to the FGFR3 gene at 4p16.3.



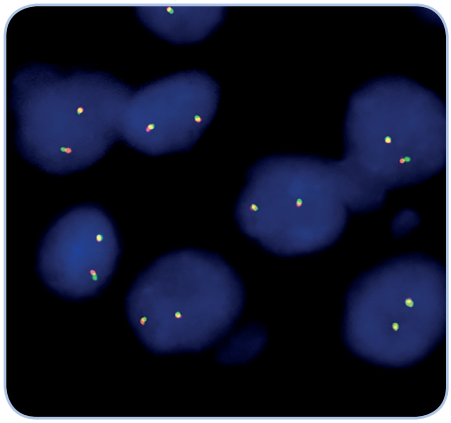
Ideogram of chromosome 4 indicating the hybridization locations.



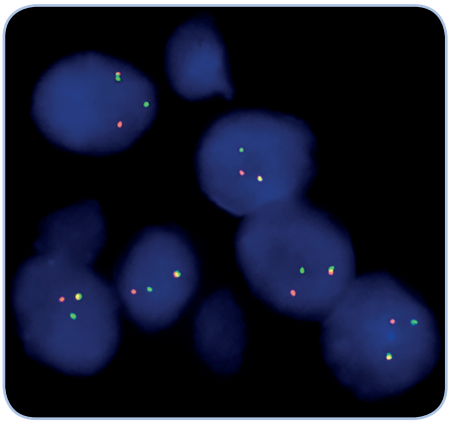
SPEC FGFR3 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 4p16.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 4p16.3 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 4p16.3 locus and one 4p16.3 locus affected by a translocation.



SPEC FGFR3 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Breast cancer tissue section with translocation affecting the FGFR3 gene as indicated by one non-rearranged orange/green fusion signal, one orange, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2170-200	ZytoLight SPEC FGFR3 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

48

ZytoLight® SPEC FGFR3/4p11 Dual Color Probe

Previously: ZytoLight SPEC FGFR3/CEN 4 Dual Color Probe

CE IVD

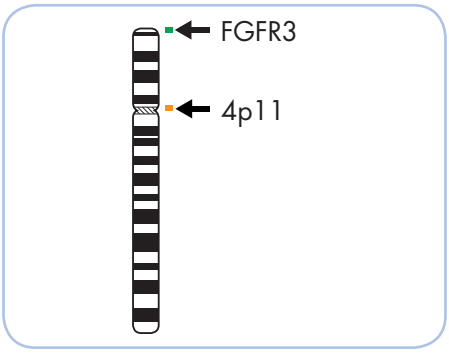
Background

The ZytoLight® SPEC FGFR3/4p11 Dual Color Probe is designed for the detection of FGFR3 gene amplifications.
The FGFR3 (fibroblast growth factor receptor 3) gene is located in the chromosomal region 4p16.3 and encodes a receptor tyrosine kinase.
FGFR family members differ from one another in their ligand affinities and tissue distribution. The extracellular portion of the protein interacts with fibroblast growth factors, setting in motion a cascade of downstream signals, ultimately influencing mitogenesis and differentiation. The FGFR3 protein binds acidic and basic fibroblast growth hormone and plays a role in bone development and maintenance. Activating mutations are associated with multiple myeloma, cervical carcinoma, and carcinoma of the bladder. Additionally, it was found that copy number gains at 4p16.3 occurred significantly more frequently in recurred/metastasized salivary gland adenoid cystic carcinoma (ACC) compared with indolent ACC.

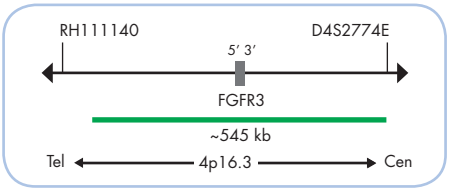
References
Keegan K, et al. (1991) PNAS 88: 1095-9.
L'Hôte CG & Knowles MA (2005) Exp Cell Res 304: 417-31.
Thompson LM, et al. (1991) Genomics 11: 1133-42.
Vékony H, et al. (2007) Clin Cancer Res 13: 3133-9.

Probe Description

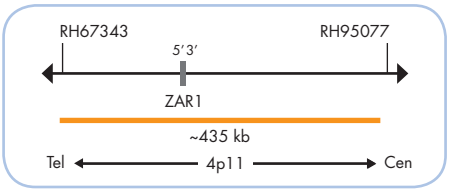
The SPEC FGFR3/4p11 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC FGFR3 probe hybridizing to the FGFR3 gene in the chromosomal region 4p16.3 and an orange fluorochrome direct labeled SPEC 4p11 probe specific for the ZAR1 (zygote arrest 1) gene region in 4p11. For an unambiguous enumeration of chromosome 4 the SPEC 4p11 is found to be more suitable.



Ideogram of chromosome 4 indicating the hybridization locations.



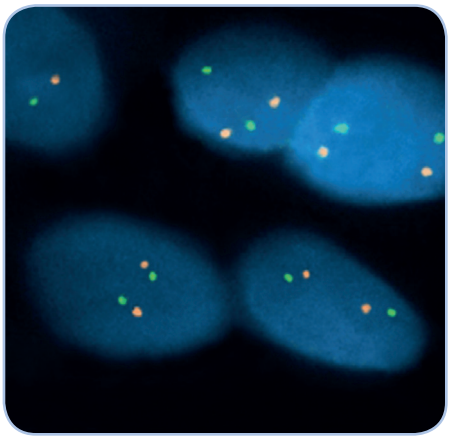
SPEC FGFR3 Probe map (not to scale).



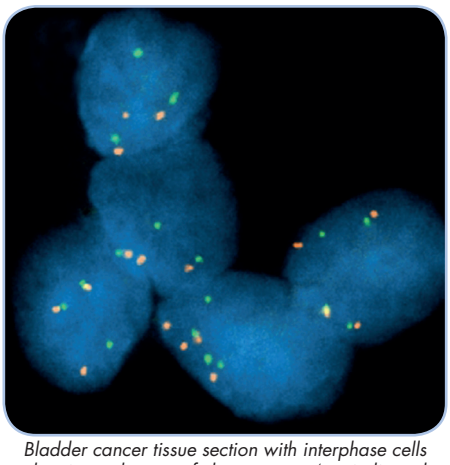
SPEC 4p11 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the FGFR3 gene locus, multiple copies of the green signal or large green signal clusters will be observed.



SPEC FGFR3/4p11 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Bladder cancer tissue section with interphase cells showing polysomy of chromosome 4 as indicated by multiple green and orange signals in the nuclei.

Prod. No.	Product	Label	Tests* (Volume)
Z-2082-200	ZytoLight SPEC FGFR3/4p11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC EGR1/5p15 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC EGR1/5p15 Dual Color Probe is designed for the detection of EGR1 gene deletions.

The EGR1 (early growth response 1) gene is located in the chromosomal region 5q31.2. Deletions spanning the region 5q31.2 are among the most common reoccurring abnormalities detectable in myelodysplastic syndromes (MDS) and acute myeloid leukemia (AML).

The EGR1 protein belongs to the EGR family of C2H2-type zinc-finger proteins. It is a nuclear protein and functions as a transcriptional regulator.

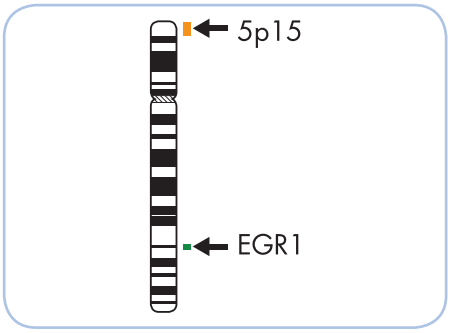
Deletion of EGR1 in estrogen receptor negative (ER-) breast carcinomas is correlated with a higher tumor grade, suggesting that loss of the EGR1 gene (and thereby loss of functioning EGR1 protein) may contribute to the pathogenesis of ER- breast carcinomas.

In patients with therapy-related MDS and AML, dicentric chromosomes have often been observed. In such conditions, many patients show a complex karyotype with several marker chromosomes unidentifiable by conventional cytogenetics. Fluorescence *in situ* Hybridization (FISH) has now made the characterization of these rearrangements much easier.

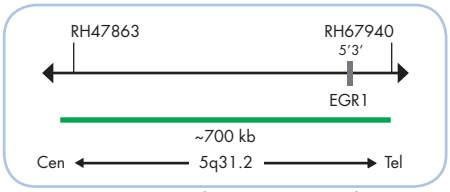
References
Graubert TA, et al. (2009) PLoS One 4: e4583.
Herry A, et al. (2007) Cancer Genet Cytogenet 175: 125-31.
Ronski K, et al. (2005) Cancer 104: 925-30.
Sun Y & Cook JR (2010) Leuk Res 34: 340-3.

Probe Description

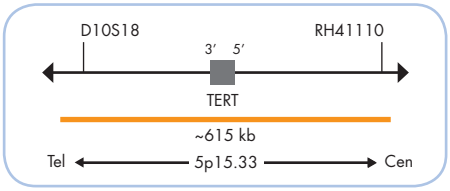
The SPEC EGR1/5p15 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC EGR1 probe hybridizing to the EGR1 gene in the chromosomal region 5q31.2 and an orange fluorochrome direct labeled SPEC 5p15 probe specific for the chromosomal region 5p15.33.



Ideogram of chromosome 5 indicating the hybridization locations.



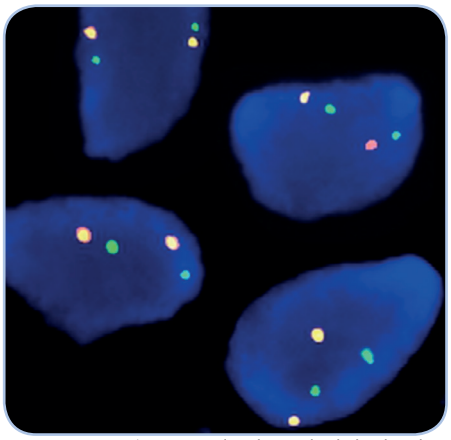
SPEC EGR1 Probe map (not to scale).



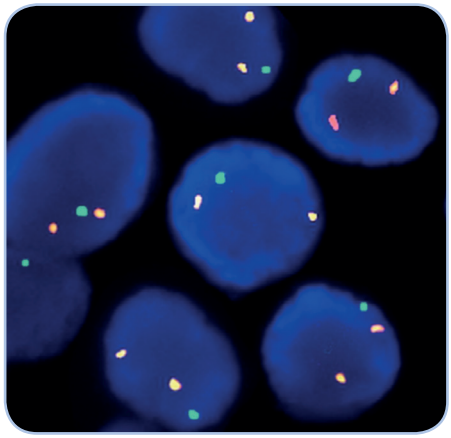
SPEC 5p15 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the EGR1 gene locus, one or no copy of the green signal will be observed.



SPEC EGR1/5p15 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



SPEC EGR1/5p15 Dual Color Probe hybridized to bone marrow biopsy section with deletion of the EGR1 gene as indicated by one green signal and two orange signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2107-200	ZytoLight SPEC EGR1/5p15 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

50

ZytoLight® SPEC TERT/5q31 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC TERT/5q31 Dual Color Probe is designed for the detection of TERT gene amplifications and chromosomal gains found in a variety of human tumors.

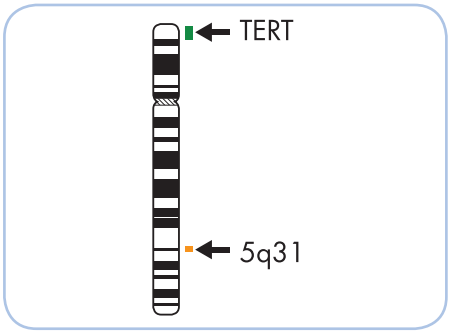
The TERT (telomerase reverse transcriptase) gene is located in the chromosomal region 5p15.33 and encodes the reverse transcriptase component of the human telomerase. Telomerase, the ribonucleoprotein enzyme complex necessary to maintain the ends of chromosomes, is absent from the majority of somatic cells but is present and active in the majority of immortal cell lines and human cancers.

Chromosomal gain or amplification of the TERT gene was found in various human tumors such as lung, cervical, bladder, breast, hepatocellular and colorectal carcinomas as well as in neuroblastoma and melanoma. It was shown that TERT amplification is a poor prognostic factor in non-small cell lung cancer (NSCLC) and is associated with poorly differentiated histopathology of hepatocellular carcinomas. Thus, detection of TERT amplification may have useful applications in cancer diagnosis and prognosis.

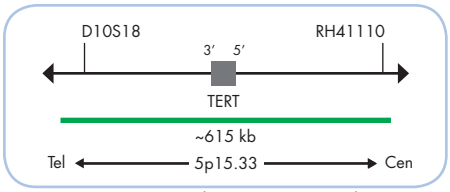
References
Bryce LA, et al. (2000) Neoplasia 2: 197-201.
Cao Y, et al. (2008) Cancer Sci 99: 1092-9.
Morin GB (1989) Nature 353: 454-6.
Takuma Y, et al. (2004) J Gastroenterol Hepatol 19: 1300-4.
Zhu C-Q, et al. (2006) Br J Cancer 94: 1452-9.

Probe Description

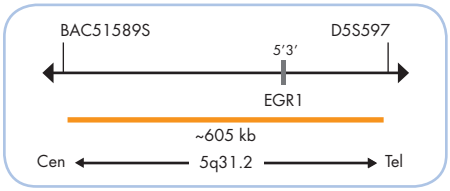
The SPEC TERT/5q31 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC TERT probe hybridizing to the TERT gene in the chromosomal region 5p15.33 and an orange fluorochrome direct labeled SPEC 5q31 probe specific for the chromosomal region 5q31.2 harboring the EGR1 gene. Since chromosomes 1, 5, and 19 share the same repetitive sequences, probes specific for 5q31.2 are commonly used for chromosome 5 copy number detection.



Ideogram of chromosome 5 indicating the hybridization locations.



SPEC 5p15 Probe map (not to scale).

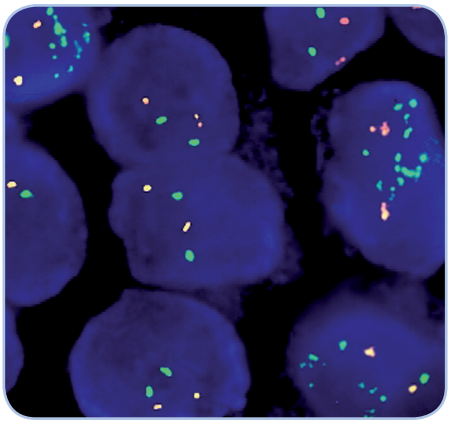


SPEC 5q31 Probe map (not to scale).

Results

In a normal interphase nucleus two orange and two green signals are expected.

In a cell with amplification of the TERT gene locus or aneuploidy of chromosome 5, multiple copies of the green signal or green signal clusters will be observed.



SPEC TERT/5q31 Dual Color Probe hybridized to melanoma tissue section showing normal cell as indicated by two green and two orange signals in each nucleus and cells with TERT gene amplification as indicated by multiple green signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2091-200	ZytoLight SPEC TERT/5q31 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

51

ZytoLight® SPEC CSF1R Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC CSF1R Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 5q32 harboring the CSF1R (colony stimulating factor 1 receptor, a.k.a. FMS) gene.

The CSF1 receptor is activated by dimerization upon binding of its ligand CSF1 and is involved in macrophage development.

Rearrangement of the CSF1R gene was first detected in an acute megakaryoblastic leukemia (AMKL) cell line generating the RBM6-CSF1R fusion gene. A MEF2D-CSF1R fusion gene was described in a patient with primary pre-B cell acute lymphoblastic leukemia (pre-B ALL). Both fusion proteins contain the intact kinase domain of CSF1R.

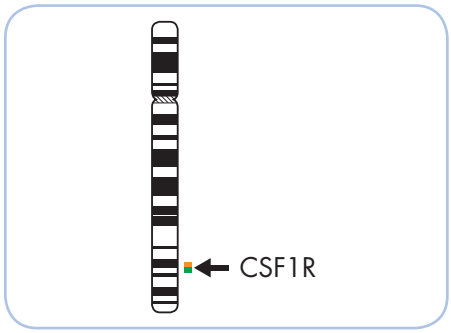
Philadelphia chromosome-like ALL (Ph-like ALL) is a subgroup of B-cell precursor ALL and is associated with a high risk of treatment failure. SSBP2-CSF1R fusions were detected in some patients with Ph-like ALL. They result from either the balanced translocation t(5;5)(q14;q32) or the duplication dup(5)(q14q32). Expression of this fusion gene results in cytokine-independent growth and enhanced STAT5 activation which are inhibited by dasatinib *in vitro*. CSF1R signaling was also shown to be suppressed by the ABL1 kinase inhibitor imatinib.

Hence, the detection of CSF1R rearrangements by FISH may help in selecting ALL patients eligible for treatment with CSF1R inhibitors.

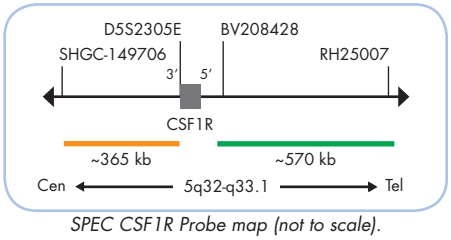
References
Dewar AL, et al. (2005) Blood 105: 3127-32.
Gu TL, et al. (2007) Blood 110: 323-33.
Lilljebjörn H, et al. (2014) Leukemia 28: 977-9.
Roberts KG, et al. (2014) N Engl J Med 371: 1005-15.
Schwab C, et al. (2014) Blood 124: 3773.

Probe Description

The SPEC CSF1R Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 5q32-q33.1 band. The orange fluorochrome direct labeled probe hybridizes proximal to the CSF1R gene at 5q32, the green fluorochrome direct labeled probe hybridizes distal to the CSF1R gene at 5q32-q33.1.



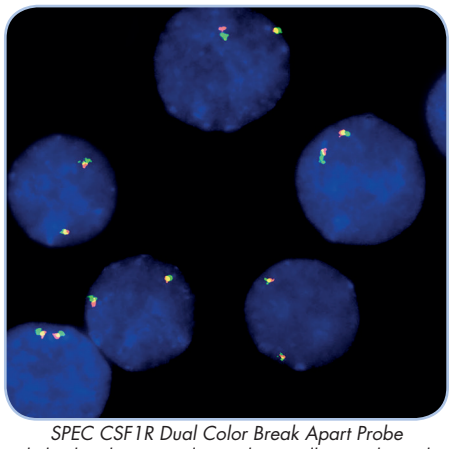
Ideogram of chromosome 5 indicating the hybridization locations.



SPEC CSF1R Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 5q32-q33.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 5q32-q33.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 5q32-q33.1 locus and one 5q32-q33.1 locus affected by a translocation. Duplication of the 5q32 locus will result in additional orange signals.



SPEC CSF1R Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2202-200	ZytoLight SPEC CSF1R Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE109-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

52

ZytoLight® SPEC PDGFRB Dual Color Break Apart Probe

CE IVD

Background

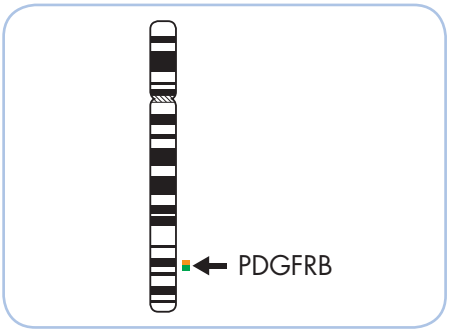
The ZytoLight® SPEC PDGFRB Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 5q32 harboring the PDGFRB gene. The PDGFRB (platelet-derived growth factor receptor-ß) gene encodes a transmembrane glycoprotein that belongs to the type III receptor tyrosine kinase family and has a key role in a variety of cellular processes.

Translocations involving the PDGFRB gene are rare genetic disorders and are identified in myelodysplastic/myeloproliferative neoplasms (MDS/MPNs), chronic myeloproliferative disorders (CMPD), acute myeloid leukemia (AML), and also in atypical (BCR-ABL1-negative) chronic myeloid leukemia/chronic myelomonocytic leukemia (CML/CMML)-like diseases, often with eosinophilia and splenomegaly. The most common translocation involving PDGFRB is the t(5;12)(q32;p13.2). Result of this translocation is the fusion protein ETV6-PDGFRB, in which the pointed domain of ETV6 is juxtaposed next to the transmembrane and entire tyrosine kinase domain of PDGFRB. As a result, the tyrosine kinase is constitutively activated leading to hematopoietic cell proliferation. Patients with PDGFRB translocations respond well to imatinib therapy with excellent hematopoietic and molecular responses. Recent studies revealed that sorafenib is a further potential inhibitor of patients with ETV6-PDGFRB translocation.

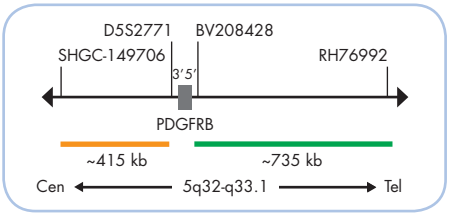
References
Bain BJ (2010) Haematologica 95: 696-8.
Cross NC and Reiter A (2008) Acta Haematol 119: 199-206.
Jones AV and Cross NC (2004) Cell Mol Life Sci 61: 2912-23.
Keene P, et al. (1987) Br J Haematol 67: 25-31.
Lierman E, et al. (2007) Haematologica 92: 27-34.
Savage N, et al. (2013) Int J Lab Hematol 35: 491-500.
Steer EJ and Cross NC (2002) Acta Haematol 107: 113-22.
Vega F, et al. (2015) Am J Clin Pathol 144: 377-92.

Probe Description

The SPEC PDGFRB Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 5q32-q33.1 band. The green fluorochrome direct labeled probe hybridizes distal to the PDGFRB gene, and the orange fluorochrome direct labeled probe hybridizes proximal to the PDGFRB locus.



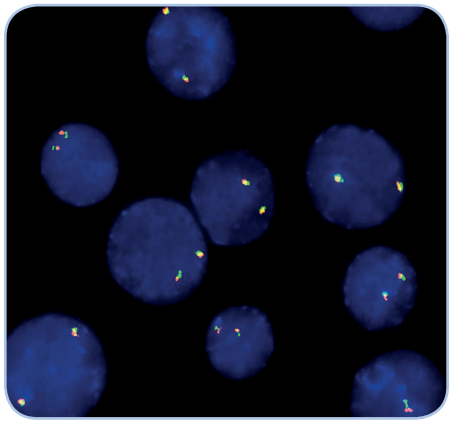
Ideogram of chromosome 5 indicating the hybridization locations.



SPEC PDGFRB Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 5q32-q33.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 5q32-q33.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 5q32-q33.1 locus and one 5q32-q33.1 locus affected by a translocation.



SPEC PDGFRB Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2197-200	ZytoLight SPEC PDGFRB Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE103-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

53

ZytoLight® SPEC RREB1/MYB/CEN 6 Triple Color Probe

CE IVD

Background

The ZytoLight® SPEC RREB1/MYB/CEN 6 Triple Color Probe is designed for the detection of copy number changes of the chromosomal regions harboring the RREB1 and the MYB gene, respectively.

The RREB1 (ras responsive element binding protein 1, a.k.a. HNT) gene is located in 6p24.3 and encodes a zinc finger transcription factor. The MYB (v-myb avian myeloblastosis viral oncogene homolog, a.k.a. c-myb) gene is located in 6q23.3 and encodes a transcription factor that is implicated in proliferation, survival, and differentiation of hematopoietic progenitor cells.

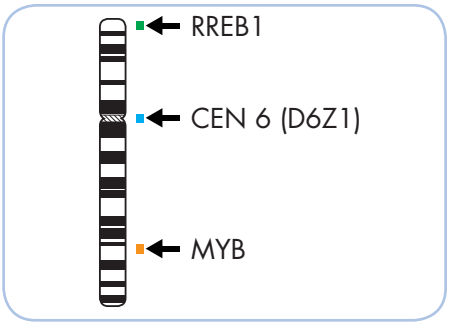
Overexpression of the RREB1 protein was detected in prostate cancer and in a medullary thyroid cancer cell line. RREB1 is suggested to play a role in Ras and Raf signal transduction in medullary thyroid cancer.

MYB has been found to be amplified in a variety of human cancers. In pancreatic cancer, MYB amplification was mainly found in advanced and metastatic tumors. In breast tumors from BRCA1 germ-line mutation carriers, MYB amplification was observed in 29% of the cases and resulted in overexpression of the MYB protein. Moreover, duplication of the MYB gene occurs in 8.4% of individuals with T-cell acute lymphoblastic leukemia (T-ALL).

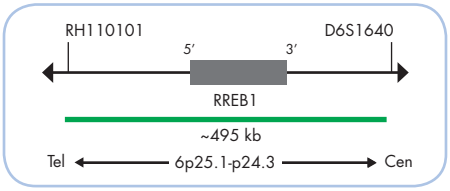
References
Kauraniemi P, et al. (2000) Cancer Res 60: 5323-8.
Lahortiga I, et al. (2007) Nat Genet 39: 593-5.
Thiagalingam A, et al. (1996) Mol Cell Biol 16: 5335-45.
Wallrapp C, et al. (1997) Cancer Res 57: 3135-9.
Zou J, et al. (2011) Prostate 71: 1518-24.

Probe Description

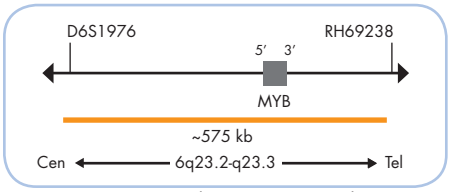
The SPEC RREB1/MYB/CEN 6 Triple Color Probe is a mixture of a green fluorochrome direct labeled SPEC RREB1 probe hybridizing to the RREB1 locus at 6p24.3-p25.1, an orange fluorochrome direct labeled SPEC MYB probe hybridizing to the MYB locus at 6q23.2-q23.3, and a blue fluorochrome direct labeled CEN 6 probe specific for the alpha satellite centromeric region of chromosome 6 (D6Z1).



Ideogram of chromosome 6 indicating the hybridization locations.



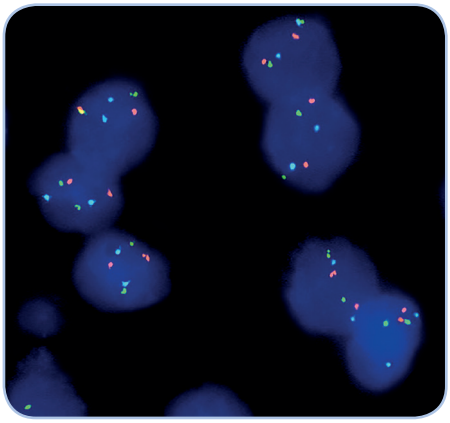
SPEC RREB1 Probe map (not to scale).



SPEC MYB Probe map (not to scale).

Results

In a normal interphase nucleus, two green, two orange, and two blue signals are expected. In a cell with amplification of the RREB1 or the MYB gene locus, multiple copies of the green or orange signal will be observed, respectively. In a cell with deletion of the RREB1 or the MYB gene locus, a reduced number of green or orange signals will be observed, respectively.



SPEC RREB1/MYB/CEN 6 Triple Color Probe hybridized to normal interphase cells as indicated by two green, two orange, and two blue signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2152-200	ZytoLight SPEC RREB1/MYB/CEN 6 Triple Color Probe CE IVD	●/●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC VEGFA/CEN 6 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC VEGFA/CEN 6 Dual Color Probe is designed for the detection of amplifications involving the chromosomal region 6p21.1 harboring the VEGFA gene (vascular endothelial growth factor A, a.k.a. VEGF, VPF).

The VEGFA protein is involved in vascular permeability, angiogenesis, cell migration, and inhibition of apoptosis. In addition, binding of VEGFA to its receptors activates the RAS/MEK/MAPK pathway, thus, leading to mitotic activation.

Amplification of the VEGFA gene locus was found in several types of malignancy, such as osteosarcoma, hepatocellular carcinoma (HCC), and colorectal cancers.

In patients with osteosarcoma, VEGFA gene amplification results in elevated expression of VEGFA and is associated with adverse tumor-free survival.

VEGFA amplifications occur in 3-6 % of colorectal cancers and result in a highly aggressive disease.

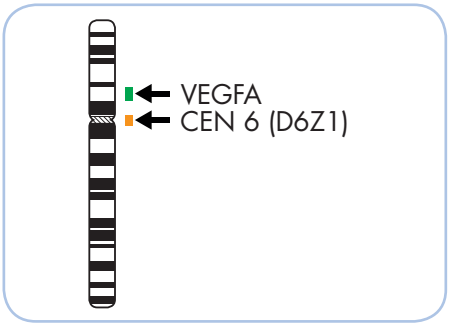
HCC patients with VEGFA gain responded better to sorafenib, a multi-kinase inhibitor that blocks, i.a., receptors of the VEGFA protein, resulting in improved survival of the patients. This suggests that VEGFA is a potential biomarker for response to sorafenib therapy in HCC.

Hence, detection of VEGFA amplifications by Fluorescence *in situ* Hybridization may help in selecting patients eligible for an anti-VEGFA therapy.

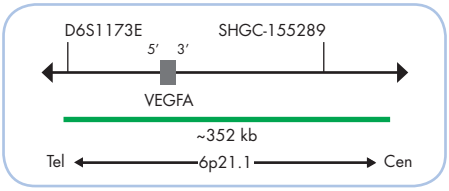
References
Horwitz E, et al. (2014) Cancer Discov 4: 730-43.
Vlajnic T, et al. (2011) Mod Pathol 24: 1404-12.
Yang J, et al. (2011) Cancer 117: 4925-38.

Probe Description

The SPEC VEGFA/CEN 6 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC VEGFA probe specific for the VEGFA gene at 6p21.1 and an orange fluorochrome direct labeled CEN 6 probe specific for the alpha satellite centromeric region of chromosome 6 (D6Z1).



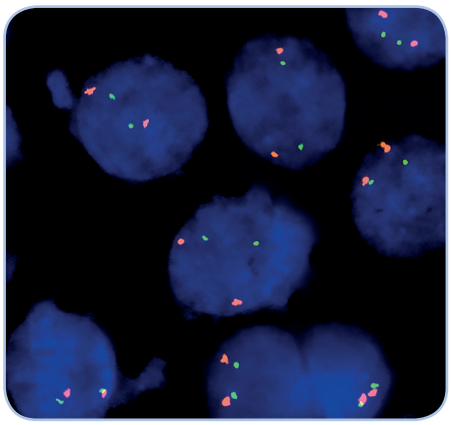
Ideogram of chromosome 6 indicating the hybridization locations.



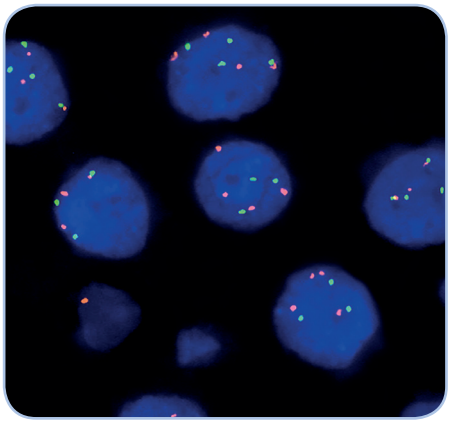
SPEC VEGFA Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the VEGFA gene locus, multiple copies of the green signal or large green signal clusters will be observed.



SPEC VEGFA/CEN 6 Dual Color Probe hybridized to normal interphase calls as indicated by two orange and two green signals in each nucleus.



HCC tissue section with interphase cells showing a polysomy of chromosome 6 as indicated by multiple green (VEGFA) and orange (CEN 6) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2195-200	ZytoLight SPEC VEGFA/CEN 6 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC ROS1 Dual Color Break Apart Probe

CE IVD

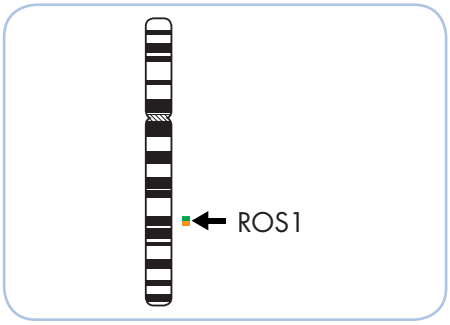
Background

The ZytoLight® SPEC ROS1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 6q22.1 harboring the c-ros oncogene 1 (ROS1, a.k.a. MCF3) gene.
The ROS1 gene is located on 6q22.1 and encodes a receptor tyrosine kinase. Translocations affecting ROS1 have been detected in glioblastoma, cholangiocarcinoma, and non-small cell lung cancer (NSCLC).
In NSCLC several ROS1 translocation partners have been detected all of which result in the fusion of variably truncated forms of e.g. TPM3, SDC4, SLC34A2, CD74, EZR, or LRIG3 to the kinase domain of ROS1. GOPC has also been found to be fused to ROS1 in NSCLC. GOPC-ROS1 fusions result from interstitial deletion of approx. 240 kb on 6q22.1. ROS1 rearrangements have been exclusively detected in adenocarcinoma of the lung and are thought to define a molecular subset of NSCLC with distinct clinical characteristics that are similar to those observed in patients with ALK rearranged NSCLC. First evidence suggests that administration of ROS1 kinase inhibitors may represent a very effective therapeutic strategy in NSCLC patients harboring activating ROS1 rearrangements. Accordingly, detection of ROS1 rearrangements using Fluorescence *in situ* Hybridization might be a helpful tool for the identification of patients likely to respond to ROS1 kinase targeting therapies.

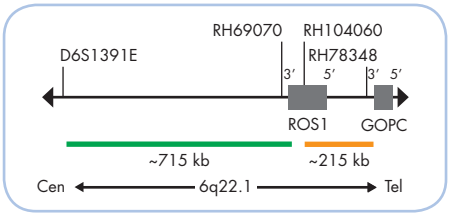
References
Bergethon K, et al. (2012) J Clin Oncol 30: 863-70.
Bos M, et al. (2013) Lung Cancer 81: 142-3.
Lee SE, et al. (2015) Mod Pathol 28: 468-79.
Rikova K, et al. (2007) Cell 131: 1190-203.
Rimkunas VM, et al. (2012) Clin Cancer Res 18: 4449-57.
Suehara Y, et al. (2012) Clin Cancer Res 18: 6599-608.
Takeuchi K, et al. (2012) Nat Med 18: 378-81.

Probe Description

The SPEC ROS1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 6q22.1 band. The orange fluorochrome direct labeled probe hybridizes distal, the green fluorochrome direct labeled probe hybridizes proximal to the ROS1 breakpoint region at 6q22.1.



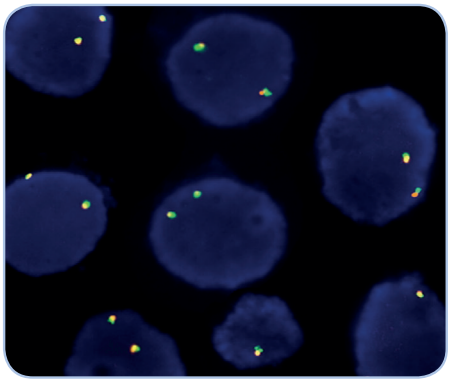
Ideogram of chromosome 6 indicating the hybridization locations.



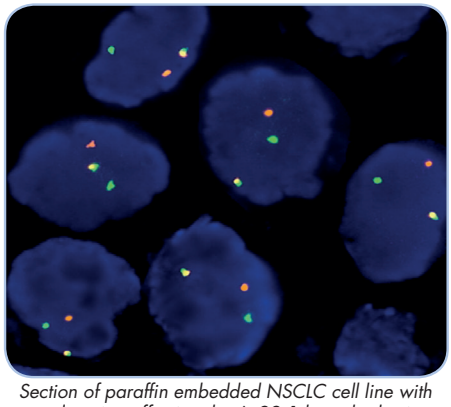
SPEC ROS1 Probe map (not to scale).

Results

In an interphase nucleus lacking an aberration involving the 6q22.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 6q22.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 6q22.1 locus and one 6q22.1 locus affected by a translocation. Isolated green signals are the result of deletions distal to the ROS1 breakpoint region or are due to unbalanced translocations affecting this chromosomal region.



SPEC ROS1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Section of paraffin embedded NSCLC cell line with translocation affecting the 6q22.1 locus harboring ROS1 as indicated by one orange/green fusion signal (non-rearranged), one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2144-50	ZytoLight SPEC ROS1 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Z-2144-200	ZytoLight SPEC ROS1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE061-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

56

ZytoLight® SPEC ROS1/CEN 6 Dual Color Probe

CE IVD

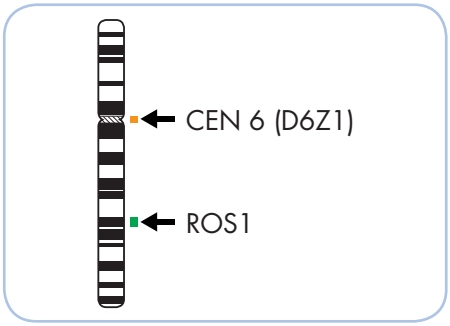
Background

The ZytoLight® SPEC ROS1/CEN 6 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the ROS1 gene.
The ROS1 (c-ros oncogene 1, a.k.a. MCF3) gene is located on 6q22.1 and encodes a receptor tyrosine kinase of the insulin receptor family. ROS1 has been found to undergo genetic rearrangements in a variety of human cancers including glioblastoma, cholangiocarcinoma, and non-small cell lung cancer (NSCLC).
ROS1 rearrangements, detected in adenocarcinoma of the lung, are thought to define a molecular subset of NSCLC with distinct clinical characteristics that are similar to those observed in patients with ALK rearranged NSCLC. Targeting ROS1 fusion proteins with the kinase inhibitor crizotinib was shown to be a promising and effective therapy in NSCLC patients whose tumors are positive for this genetic aberration.
Recently, copy number gain of the ROS1 gene was reported to occur in NSCLC patients and to be associated with poor prognosis.
Hence, detection of ROS1 amplification by FISH could help to identify patients who might be selected for further clinical examinations with regard to potential ROS1 targeting treatments.

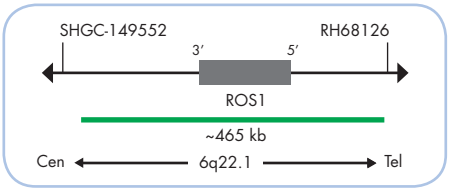
References
Bergethon K, et al. (2012) J Clin Oncol 30: 863-70.
Bos M, et al. (2013) Lung Cancer 81: 142-3.
Jin Y, et al. (2015) Virchows Arch 466: 45-52.
Mazières J, et al. (2015) J Clin Oncol 33: 992-9.
Takeuchi K, et al. (2012) Nat Med 18: 378-81.

Probe Description

The SPEC ROS1/CEN 6 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 6 probe specific for the alpha satellite centromeric region of chromosome 6 (D6Z1) and a green fluorochrome direct labeled SPEC ROS1 probe specific for the ROS1 gene at 6q22.1.



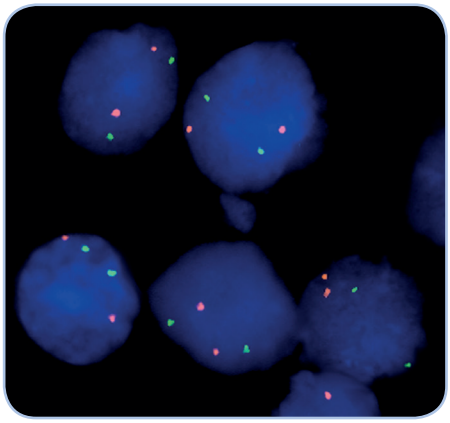
Ideogram of chromosome 6 indicating the hybridization locations.



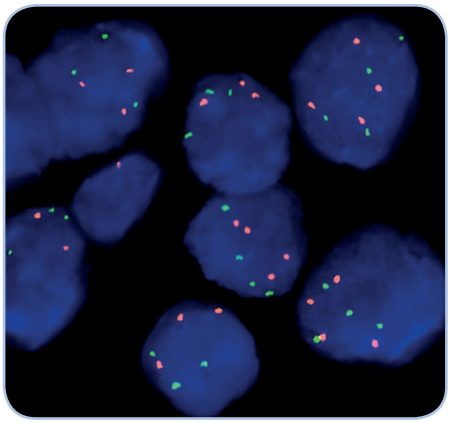
SPEC ROS1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ROS1 gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC ROS1/CEN 6 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Lung cancer tissue section with interphase cells showing a polysomy of chromosome 6 as indicated by multiple orange (CEN 6) and green (ROS1) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2162-200	ZytoLight SPEC ROS1/CEN 6 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC MYB Dual Color Break Apart Probe

CE IVD

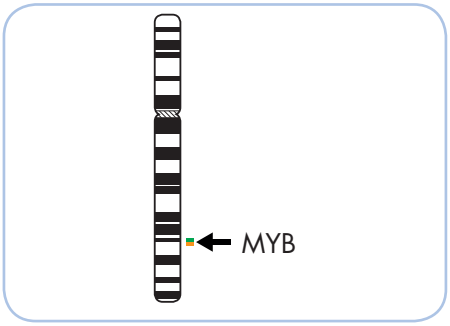
Background

The ZytoLight® SPEC MYB Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 6q23.3 harboring the MYB (v-myb avian myeloblastosis viral oncogene homolog, a.k.a. c-Myb) gene.
The MYB gene is expressed predominantly in immature progenitor cells of all hematopoietic lineages and is highly expressed in most leukemias and in some solid tumors. Translocations affecting MYB have been detected in T-cell acute lymphoblastic leukemia (T-ALL) and adenoid cystic carcinoma (ACC).
Recent studies have identified a subgroup of T-ALL with reciprocal translocation t(6;7)(q23.3;q34) that juxtaposes MYB and TCRB (T-cell receptor beta) leading to the activation of MYB expression. Since the translocation breakpoints in 6q23 map to two clusters located 5 kb and more than 50 kb telomeric of MYB, no true MYB fusion gene is generated. It is assumed that the abnormal MYB expression could confer oncogenic properties and that MYB might represent a potential target for therapeutic intervention in T-ALL.
In ACC a recurrent translocation t(6;9)(q22-23;p23-24) is found in about one third of karyotypically abnormal cases. The translocation results in the fusion of the two transcription factor genes MYB and NFIB (nuclear factor I/B) which leads to enhanced expression of the MYB-NFIB fusion protein. The detection of MYB rearrangements using FISH might represent a powerful adjunctive diagnostic tool useful in the differential diagnosis of ACC.

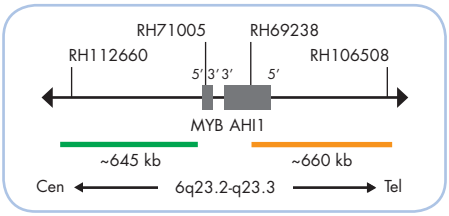
References
Clappier E, et al. (2007) Blood 110: 1251-61.
Persson M, et al. (2009) Pro Natl Acad Sci USA 106: 18740-4.
Stenman G, et al. (2010) Cell Cycle 9: 2986-95.

Probe Description

The SPEC MYB Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 6q23.2-q23.3 band. The orange fluorochrome direct labeled probe hybridizes distal and the green fluorochrome direct labeled probe hybridizes proximal to the MYB breakpoint cluster region.



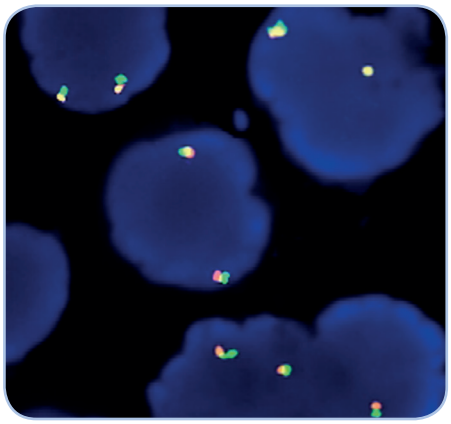
Ideogram of chromosome 6 indicating the hybridization locations.



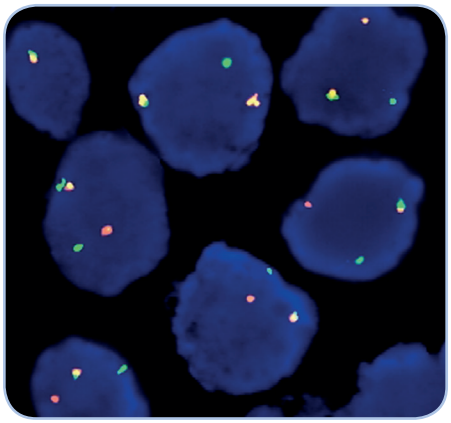
SPEC MYB Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 6q23.2-q23.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 6q23.2-q23.3 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 6q23.2-q23.3 locus and one 6q23.2-q23.3 locus affected by a translocation.



SPEC MYB Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Adenoid cystic carcinoma tissue section with translocation affecting the 6q23.3 locus as indicated by one orange/green fusion (non-rearranged) signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2143-200	ZytoLight SPEC MYB Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

58

ZytoLight® SPEC ESR1/CEN 6 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC ESR1/CEN 6 Dual Color Probe is designed for the detection of ESR1 gene amplification frequently observed in breast cancer.

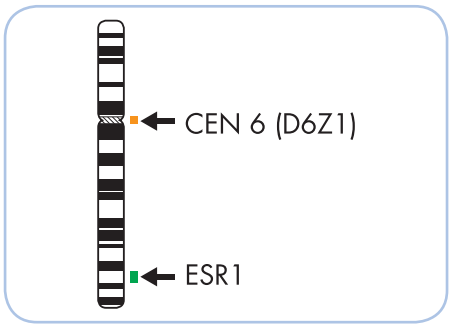
The ESR1 (estrogen receptor 1) gene is located in the chromosomal region 6q25.1 and encodes estrogen receptor alpha (ER). ER expression is one of the most important known factors in the development of breast cancer, and assessing its status by immunohistochemistry is important for determining the use of anti-estrogen receptor therapies.

ESR1 gene amplification has been found frequently in ER-positive breast tumors. Additionally, it has been shown very recently for breast cancer patients receiving adjuvant tamoxifen monotherapy that survival is significantly longer in cases of ESR1 gene amplification as determined by FISH compared to immunohistochemically ER-positive cases without gene amplification. Additionally, it has been shown that response to tamoxifen is dependent on the absolute ESR1 copy number. Thus, determination of ESR1 amplification may identify a subgroup of breast cancer patients particularly likely to respond to anti-estrogen therapy.

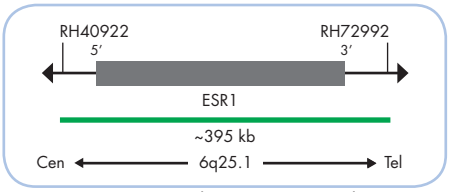
References
Burkhardt L, et al. (2010) Breast Cancer Res Treat 123: 757-65.
Holst F, et al. (2007) Nature Genet 39: 655-60.
Lacroix M (2006) Endocr Relat Cancer 13: 1033-67.
Moelans CB, et al. (2010) Anal Cell Pathol 33: 13-8.
Nembrot M, et al. (1990) Biochem Biophys Res Comm 166: 601-7.
Nessling M, et al. (2005) Cancer Res 65: 439-47.
Pentheroudakis G, et al. (2013) PLoS One 8: e70634.
Rahman MT, et al. (2013) Anticancer Res 33: 3775-81.
Sassen A, et al. (2009) Breast Cancer Res 11: R50.
Tomita S, et al. (2009) Cancer Sci 100: 1012-7.

Probe Description

The SPEC ESR1/CEN 6 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 6 probe specific for the alpha satellite centromeric region of chromosome 6 (D6Z1) and a green fluorochrome direct labeled SPEC ESR1 probe hybridizing to the ESR1 locus at 6q25.1.



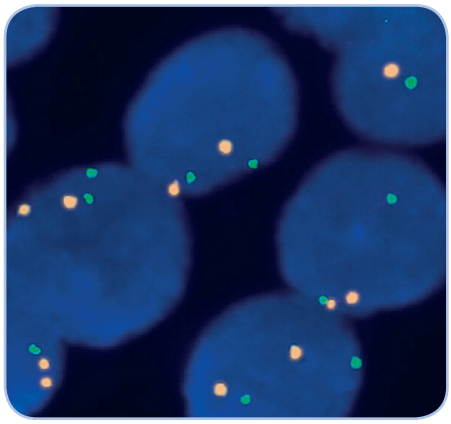
Ideogram of chromosome 6 indicating the hybridization locations.



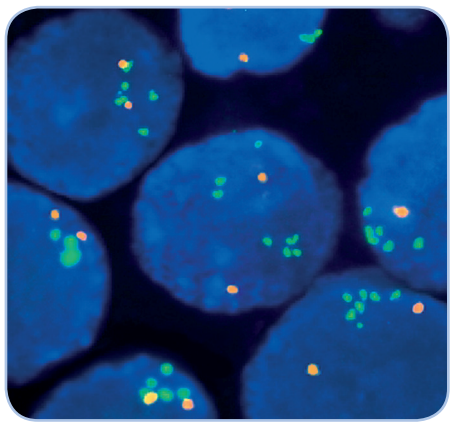
SPEC ESR1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ESR1 gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC ESR1/CEN 6 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



ESR1 gene amplification as indicated by mutiple green ESR1 specific signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2069-50	ZytoLight SPEC ESR1/CEN 6 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2069-200	ZytoLight SPEC ESR1/CEN 6 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

59

ZytoLight® SPEC ETV1/CEN 7 Dual Color Probe

CE IVD

Background

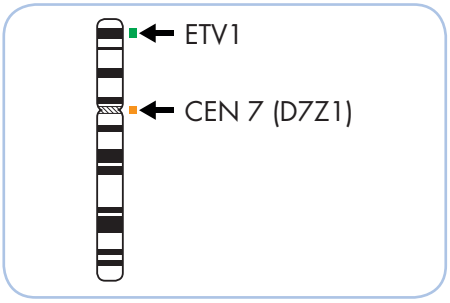
The ZytoLight® SPEC ETV1/CEN 7 Dual Color Probe is designed for the detection of ETV1 gene amplifications observed e.g. in melanoma.

The ETV1 (ETS translocation variant 1, a.k.a. ER81) gene is located on chromosome 7p21.2 and encodes an ETS (E26 transformation-specific) transcription factor. The gene was first identified as a fusion partner of the EWS gene in Ewing's sarcoma. Moreover, it was frequently found to be fused to TMPRSS2 (transmembrane protease, serine 2) in prostate cancer. ETV1 amplification or copy number gain of chromosome 7p was detected in melanoma, lung adenocarcinoma of never smokers, and pleomorphic liposarcoma. In melanoma, more than 40% of the cases show amplification or copy number gain of the ETV1 locus. As ectopic ETV1 overexpression in the context of aberrant MAP kinase pathway activation was found to transform immortalized human melanocytes, it was suggested that ETV1 acts as a melanoma oncogene.

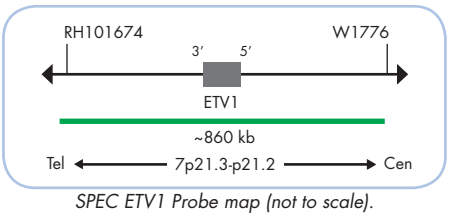
References
Jané-Valbuena J, et al. (2010) Cancer Res 70: 2075-84.
Jeon IS, et al. (1995) Oncogene 10: 1229-34.
Job B, et al. (2010) PLoS One 5: e15145.
Taylor BS, et al. (2008) PLoS One 3: e3179.

Probe Description

The SPEC ETV1/CEN 7 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC ETV1 probe specific for the chromosomal region 7p21.2-p21.3 harboring the ETV1 gene and an orange fluorochrome direct labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1).



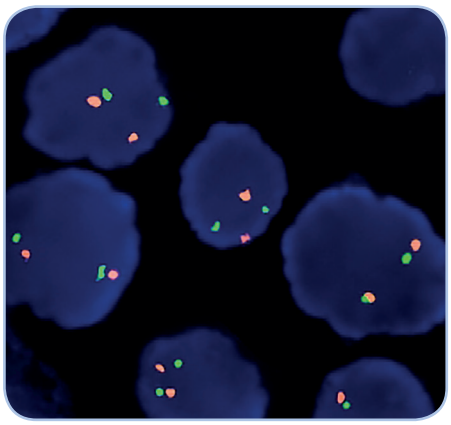
Ideogram of chromosome 7 indicating the hybridization locations.



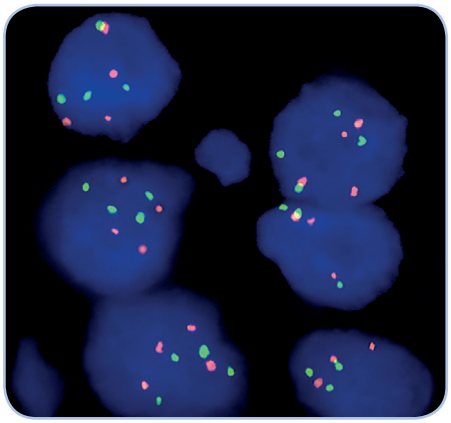
SPEC ETV1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. Nuclei with amplification of the ETV1 gene locus 7p21.2 or polysomy of chromosome 7 will show multiple copies of the green signal or large green signal clusters.



SPEC ETV1/CEN 7 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Lung cancer tissue section with interphase cells showing polysomy of chromosome 7 as indicated by multiple green and orange signals in the nuclei.

Prod. No.	Product	Label	Tests* (Volume)
Z-2141-200	ZytoLight SPEC ETV1/CEN 7 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE084-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC JAZF1 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC JAZF1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 7p15.1-p15.2 harboring the JAZF1 (Juxtaposed with Another Zinc Finger) gene.

Translocations involving the region 7p15.1-p15.2 are frequently found in endometrial stromal sarcoma (ESS). The most common cytogenetic abnormality detected in 33-80% of ESS is t(7;17)(p15.1-p15.2;q11.2) which results in the fusion of the JAZF1 gene at 7p15.1-p15.2 to the JJAZ1 (Joined to JAZF1; a.k.a. SUZ12) gene at 17q11.2. Both genes involved contain zinc finger domains characteristic for DNA binding proteins. It was shown that the fusion protein JAZF1-JJAZ1 can promote cell proliferation when the wild-type JJAZ1 is silenced as it is in ESS harboring the t(7;17).

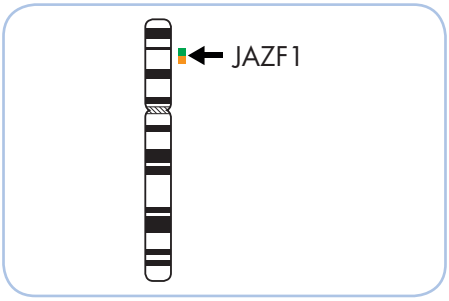
In 25-30% of ESS the JAZF1 gene is disrupted by another translocation t(6;7) where the first zinc finger domain of JAZF1 is fused to both zinc finger domains of the PHF1 (PHD finger protein 1) gene at 6p21.32. As a result the entire coding region of PHF1 is regulated by the JAZF1 promoter.

Since the diagnosis of ESS is often difficult in cases showing diverse histological differentiation or in undifferentiated endometrial sarcoma (UES), the detection of the JAZF1 translocations can serve as a diagnostic tool to confirm the diagnosis of ESS.

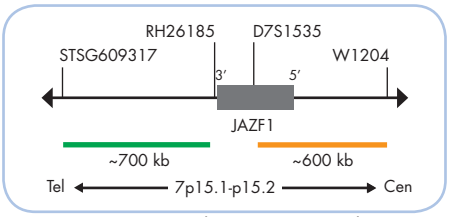
References
Hrzenjak A, et al. (2005) J Mol Diagn 7: 388-95.
Koontz JI, et al. (2001) PNAS 98: 6348-53.
Li H, et al. (2007) PNAS 104: 20001-6.
Micci F, et al. (2003) Cancer Genet Cytogenet 144: 119-24.

Probe Description

The SPEC JAZF1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 7p15.1-p15.2 band. The orange fluorochrome direct labeled probe hybridizes proximal, the green fluorochrome direct labeled probe hybridizes distal to the JAZF1 breakpoint region.



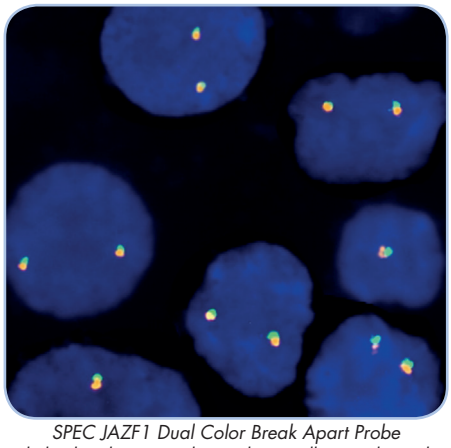
Ideogram of chromosome 7 indicating the hybridization locations.



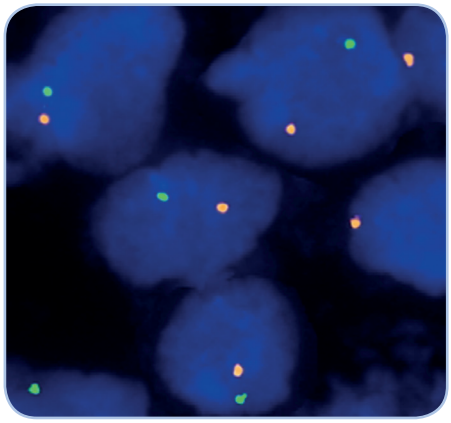
SPEC JAZF1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 7p15.1-p15.2 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 7p15.1-p15.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 7p15.1-p15.2 locus and one 7p15.1-p15.2 locus affected by a translocation.



SPEC JAZF1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Endometrial stromal sarcoma with translocation affecting JAZF1 at 7p15.1-p15.2 as well as monosomy of chromosome 7 as indicated by one orange and one separate green signal.

Prod. No.	Product	Label	Tests* (Volume)
Z-2132-50	ZytoLight SPEC JAZF1 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

61

ZytoLight® SPEC EGFR/CEN 7 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC EGFR/CEN 7 Dual Color Probe is designed for the detection of EGFR gene amplification frequently observed in solid neoplasms including non-small-cell lung cancer (NSCLC) and glioblastoma.

The EGFR gene (a.k.a. ERBB1 and HER1) is located in the chromosomal region 7p11.2 and encodes a transmembrane glycoprotein acting as a cellular growth factor receptor. The protein belongs to the EGFR (epidermal growth factor receptor) subgroup of the RTK (receptor tyrosine kinase) superfamily also including ERBB2 (ERBB2), ERBB3 (HER3), and ERBB4 (HER4).

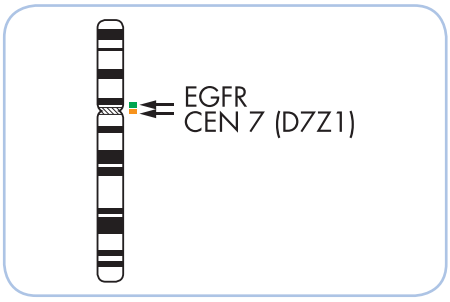
Overexpression of EGFR has been shown in a number of tumor entities and is associated with poor prognosis. EGFR copy number identified by FISH is thought to be a molecular predictor in neoplasms.

References

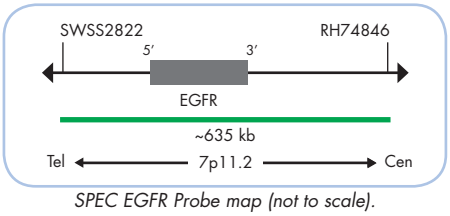
Ach T, et al. (2013) Virchows Arch 462: 65-72.
Balla P, et al. (2011) Histopathology 59: 376-89.
Bernardes VM, et al. (2013) BMJ Open 3: e002077.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Cappuzzo F, et al. (2005) J Natl Cancer Inst 97: 643-55.
Ettl T, et al. (2012) Br J Cancer 106: 719-26.
Ettl T, et al. (2014) Head Neck 36: 517-23.
Gogas H, et al. (2010) Clin Breast Cancer 10: 230-7.
Gonçalves A, et al. (2008) BMC Cancer 8: 169ff.
Kondo I & Shimizu N (1983) Cytogenet Cell Genet 35: 9-14.
Lavand C, et al. (2013) Cancer Cell Int 13: 38.
Libermann TA, et al. (1985) J Cell Sci Suppl 3: 161-72.
Merlino GT, et al. (1985) J Clin Invest 75: 1077-9.
Murray S, et al. (2012) J Exp Clin Cancer Res 31: 77.
Projetti F, et al. (2013) Human Pathology 44: 2116-25.
Sassen A, et al. (2008) Breast Cancer Res 10: R2.
Sassen A, et al. (2009) Breast Cancer Res 11: R50.
Tovey SM, et al. (2004) Breast Cancer Res 6: 246-51.

Probe Description

The SPEC EGFR/CEN 7 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1) and a green fluorochrome direct labeled SPEC EGFR probe specific for the EGFR gene at 7p11.2



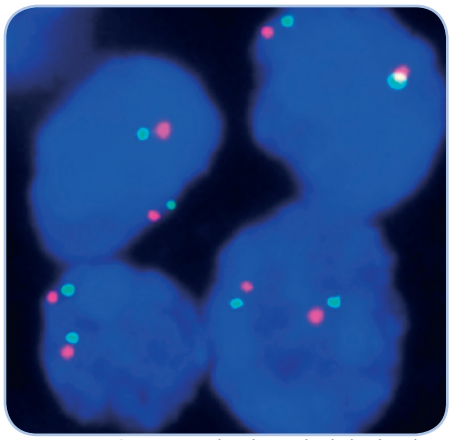
Ideogram of chromosome 7 indicating the hybridization locations.



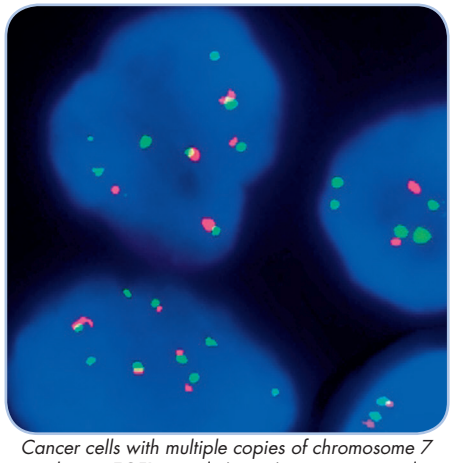
SPEC EGFR Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the EGFR gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC EGFR/CEN 7 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Cancer cells with multiple copies of chromosome 7 and extra EGFR signals (green) in sputum sample from an NSCLC patient.

Prod. No.	Product	Label	Tests* (Volume)
Z-2033-50	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2033-200	ZytoLight SPEC EGFR/CEN 7 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE010-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

62

ZytoLight® SPEC MET/CEN 7 Dual Color Probe

CE IVD

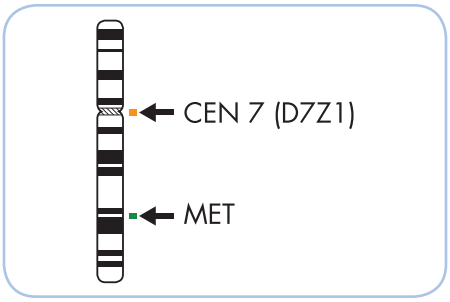
Background

The ZytoLight® SPEC MET/CEN 7 Dual Color Probe is designed for the detection of MET gene amplifications found in a variety of human tumors.
The MET gene (a.k.a. c-Met) is located in the chromosomal region 7q31.2 and encodes a transmembrane tyrosine kinase receptor for the hepathocyte growth factor (HGF). HGF and MET play an important role in angiogenesis and tumor growth. Activation or upregulation of MET was found in a number of carcinomas including lung, breast, colorectal, prostate, and gastric carcinomas as well as in gliomas, melanomas and some sarcomas. MET overexpression is known as a negative prognostic indicator in patients with various carcinomas, multiple myeloma, or glioma. Therefore, several inhibitors of the HGF/MET signaling pathway are being studied and developed as potent therapies to inhibit angiogenesis and tumor growth. Recently, it was shown that MET amplification leads to resistance to gefitinib or erlotinib in lung cancer by driving ERBB3-dependent activation of the PI3K pathway.

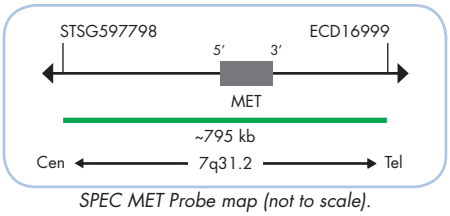
References
Ach T, et al. (2013) Virchows Arch 462: 65-72.
Cooper CS, et al. (1984) Nature 311: 29-32.
Engelman JA, et al. (2007) Science 316: 1039-43.
Ettl T, et al. (2014) Head Neck 36: 517-23.
Garcia S, et al. (2007) Int J Oncol 31: 49-58.
Hara T, et al. (1998) Lab Invest 78: 1143-53.
Lacroix L, et al. (2014) PLoS One 1: e84319.
Lee D, et al. (2015) Cancer Res Treat 47: 120-5.
Preusser M, et al. (2014) Histopathology 65: 684-92.
Schildhaus HU, et al. (2015) Clin Cancer Res 21: 907-15.

Probe Description

The SPEC MET/CEN 7 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1) and a green fluorochrome direct labeled SPEC MET probe specific for the MET gene located at 7q31.2.



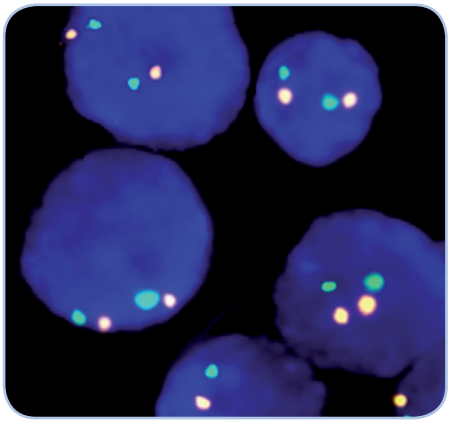
Ideogram of chromosome 7 indicating the hybridization locations.



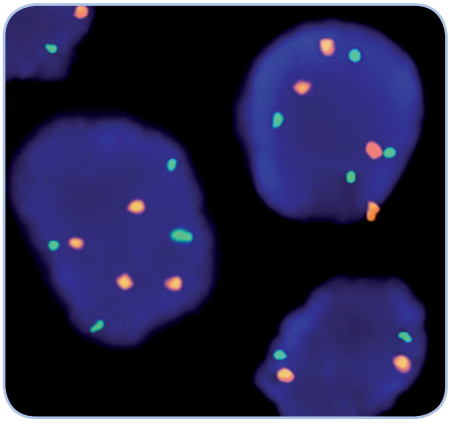
SPEC MET Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the MET gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC MET/CEN 7 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Lung cancer cells with polysomy of chromosome 7 as indicated by four orange (CEN 7) and four green (MET) signals in the nuclei.

Prod. No.	Product	Label	Tests* (Volume)
Z-2087-200	ZytoLight SPEC MET/CEN 7 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC BRAF Dual Color Break Apart Probe

CE IVD

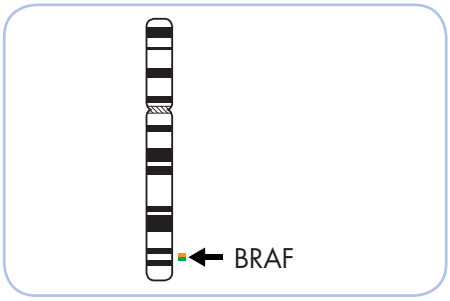
Background

The ZytoLight® SPEC BRAF Dual Color Break Apart Probe is designed for the detection of rearrangements involving the chromosomal region 7q34 harboring the BRAF (B-Raf proto-oncogene, serine/threonine kinase, a.k.a. BRAF1, NS7) gene.
The BRAF gene encodes a protein-serine/threonine kinase that participates in the MAPK cascade, which regulates a large variety of cell processes.
Various BRAF translocations were observed in melanocytic nevi, pilocytic astrocytomas, malignant melanoma, prostate and gastric cancer. The AKAP9-BRAF fusion resulting from paracentric inversion of chromosome 7q was found in radiation-induced papillary thyroid carcinomas. The fusion proteins contain the protein kinase domain but lack the autoinhibitory N-terminal portion of BRAF resulting in constitutive kinase activity.
In addition, in pilocytic astrocytoma the FAM131B-BRAF fusion has been described resulting from interstitial deletion which removes the BRAF N-terminal inhibitory domain. Moreover, pancreatic acinar cell carcinoma - a rare subtype of pancreatic cancer with poor prognosis - shows a recurrent SND1-BRAF rearrangement. SND1-BRAF-transformed cells were shown to be sensitive to treatment with a MEK inhibitor.
Hence, the detection of BRAF rearrangements by Fluorescence *in situ* Hybridization may represent a novel therapeutic target in various diseases.

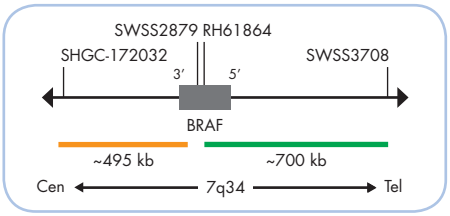
References
Chmielecki J, et al. (2014) Cancer Discov 4: 1398-405.
Ciampi R, et al. (2005) J Clin Invest 115: 94-101.
Cin H, et al. (2011) Acta Neuropathol 121: 763-74.
Dessars B, et al. (2007) J Invest Dermatol 127: 1468-70.
Dougherty MJ, et al. (2010) Neuro Oncol 12: 621-30.
Hutchinson KE, et al. (2013) Clin Cancer Res 19: 6696-702.
Jones DT, et al. (2013) Nat Genet 45: 927-32.
Miller VA, et al. (2014) J Clin Oncol 32 Suppl: Abstr. 11029.
Palanisamy N, et al. (2010) Nat Med 16: 793-8.

Probe Description

The SPEC BRAF Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 7q34 band. The orange fluorochrome direct labeled probe hybridizes proximal, and the green fluorochrome direct labeled probe hybridizes distal to the BRAF gene breakpoint region.



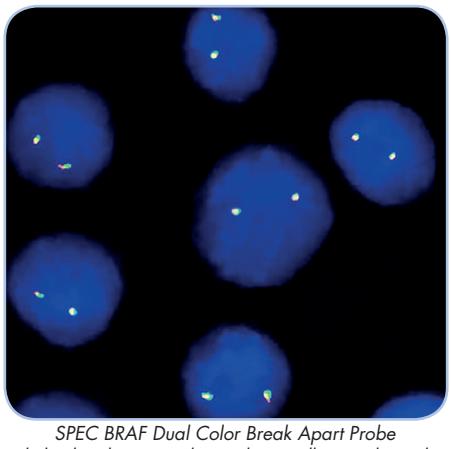
Ideogram of chromosome 7 indicating the hybridization locations.



SPEC BRAF Probe map (not to scale).

Results

In an interphase nucleus lacking a rearrangement involving the 7q34 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 7q34 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 7q34 locus and one 7q34 locus affected by a translocation or inversion. Isolated orange signals are the result of deletions distal to the BRAF breakpoint region.



SPEC BRAF Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2189-200	ZytoLight SPEC BRAF Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC BRAF/CEN 7 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC BRAF/CEN 7 Dual Color Probe is designed for the detection of amplifications involving the chromosomal region 7q34 harboring the BRAF gene (B-Raf proto-oncogene, serine/threonine kinase). The BRAF gene encodes a protein-serine/threonine kinase that participates in the MAPK cascade, which regulates a large variety of cell processes. Activating mutations in BRAF are found in many tumor types, including malignant melanoma, thyroid, colorectal, and ovarian carcinomas, lung adenocarcinoma, as well as in some sarcomas and gliomas. These mutations lead to constitutive activation of BRAF thereby promoting tumorigenesis.

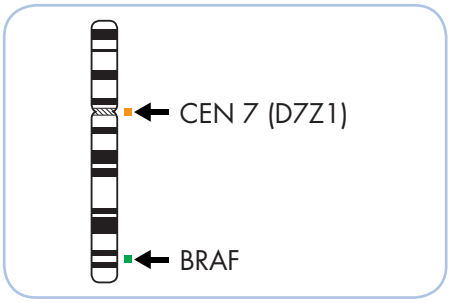
Copy number gains of mutated and non-mutated BRAF have been identified in malignant melanoma (MM), follicular thyroid tumors, astrocytoma, colorectal, and prostate cancer due to amplification of the gene or polysomy of chromosome 7. These amplifications lead to an overexpression of BRAF and to constitutive activation of the MAPK signaling pathway. Follicular carcinomas with BRAF copy number gain were observed to be more often invasive. Colorectal carcinoma or melanoma patients with BRAF V600E mutation were found to acquire resistance to MEK and BRAF inhibitors through amplification of the mutated BRAF gene.

Hence, detection of BRAF amplifications by Fluorescence *in situ* Hybridization may be of therapeutic relevance for these cancer patients.

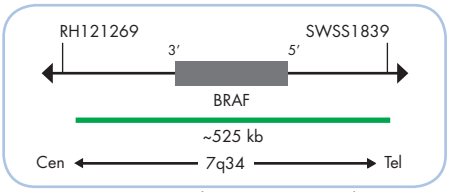
References
Ciampi R, et al. (2005) Endocr Pathol 16: 99-105.
Corcoran RB, et al. (2010) Sci Signal 3: ra84.
Dougherty MJ, et al. (2010) Neuro Oncol 12: 621-30.
Little AS, et al. (2011) Sci Signal 4: ra17.
Pfister S, et al. (2008) J Clin Invest 118: 1739-49.
Ren G, et al. (2012) Genes Chromosomes Cancer 51: 1014-23.
Roskoski R Jr. (2010) Biochem Biophys Res Commun 399: 313-7.
Spittle C, et al. (2007) J Mol Diagn 9: 464-71.
Tanami H, et al. (2004) Oncogene 23: 8796-804.
Villanueva J, et al. (2013) Cell Rep 4: 1090-9.
Willmore-Payne C, et al. (2006) Hum Pathol 37: 520-7.

Probe Description

The SPEC BRAF/CEN 7 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC BRAF probe specific for the BRAF gene at 7q34 and an orange fluorochrome direct labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1).



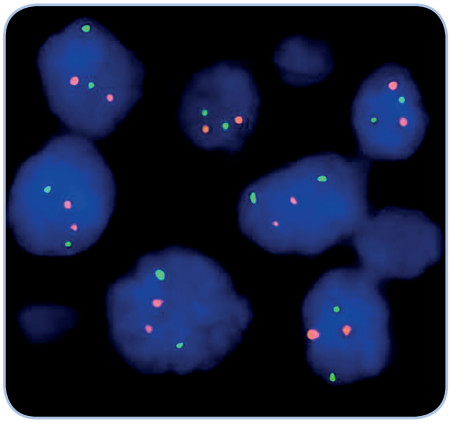
Ideogram of chromosome 7 indicating the hybridization locations.



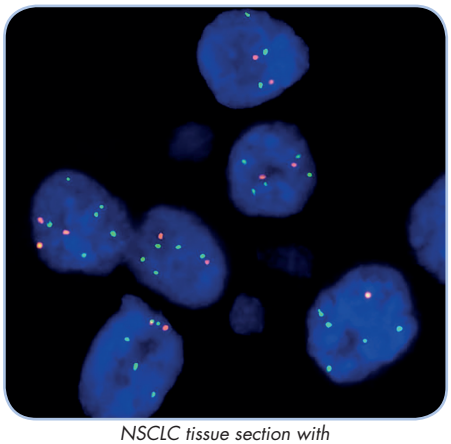
SPEC BRAF Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the BRAF gene locus or polysomy of chromosome 7, multiple copies of the green signal or large green signal clusters will be observed.



Normal interphase cells, BRAF (green), CEN 7 (orange).



NSCLC tissue section with amplification of the BRAF gene (green).

Prod. No.	Product	Label	Tests* (Volume)
Z-2191-200	ZytoLight SPEC BRAF/CEN 7 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC NRG1/CD74 TriCheck™ Probe

CE IVD

Background

The ZytoLight® SPEC NRG1/CD74 TriCheck™ Probe is designed to detect translocations involving the chromosomal region 8p12 harboring the NRG1 (neuregulin 1, a.k.a. HGL or GGF) gene and the chromosomal region 5q32 harboring the CD74 gene.

Using this probe it is possible to discriminate between CD74-NRG1 fusions and translocations affecting NRG1, but not CD74, such as SLC3A2-NRG1 or VAMP2-NRG1 fusions.

NRG1 encodes a variety of growth factors that are ligands for tyrosine kinase receptors of the ERBB family. Rearrangements of the NRG1 gene have been detected in various tumors, including breast cancer, lung cancer, and ovarian adenocarcinoma.

NRG1 translocation-positive breast tumors show a more advanced pathological stage compared with translocation-negative tumors.

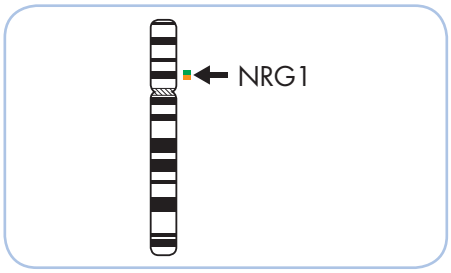
NRG1 rearrangements in lung adenocarcinoma of never smokers were found to result in, e.g., the fusion of CD74 to the EGF-like domain of NRG1and to be associated with a shorter overall and disease-free survival. Due to the involvement of NRG1 fusion proteins in oncogenesis and their association with ERBB receptors, NRG1 constitutes a good candidate for potential therapeutic applications, e.g., in relation to lung tumor subtypes with so far no effective treatment.

Hence, detection of NRG1 rearrangements and CD74-NRG1 fusions by FISH may be of prognostic and therapeutic significance.

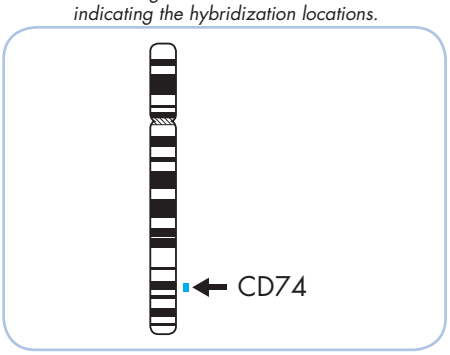
References
Adélaïde J, et al. (2003) Genes Chromosomes Cancer 37: 333-45.
Fernandez-Cuesta L, et al. (2014) Cancer Discov 4: 415-22.
Han JY, et al. (2015) Cancer Res 75: 614.
Huang HE, et al. (2004) Cancer Res 64: 6840-4.
Jung Y, et al. (2015) J Thorac Oncol 10: 1107-11.
Pole JC, et al. (2006) Oncogene 25: 5693-706.

Probe Description

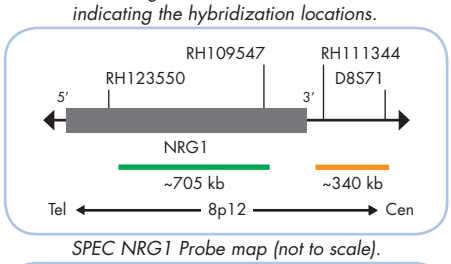
The SPEC NRG1/CD74 TriCheck™ Probe is a mixture of three direct labeled probes hybridizing to the 8p12 and 5q32-q33.1 bands. The green fluorochrome direct labeled probe hybridizes distal and the orange fluorochrome direct labeled probe hybridizes proximal to the NRG1 breakpoint region at 8p12. The blue fluorochrome direct labeled probe hybridizes to the CD74 gene region at 5q32-q33.1.



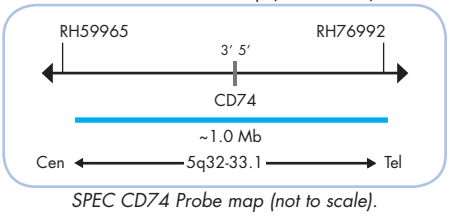
Ideogram of chromosome 8 indicating the hybridization locations.



Ideogram of chromosome 5 indicating the hybridization locations.



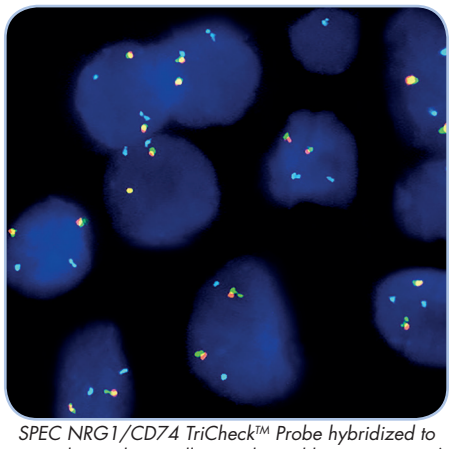
SPEC NRG1 Probe map (not to scale).



SPEC CD74 Probe map (not to scale).

Results

In an interphase nucleus lacking a rearrangement involving the 8p12 and 5q32-q33.1 bands, two orange/green fusion signals and two blue signals are expected. A CD74-NRG1 fusion is indicated by one separate green signal, one separate orange signal, and an additional blue signal which colocalizes with the separated orange signal. An NRG1 rearrangement not involving CD74 is indicated by separated orange and green signals without an additional blue signal.



SPEC NRG1/CD74 TriCheck™ Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals and two blue signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2194-200	ZytoLight SPEC NRG1/CD74 TriCheck Probe CE IVD	●/●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE110-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

66

ZytoLight® SPEC NRG1 Dual Color Break Apart Probe

CE IVD

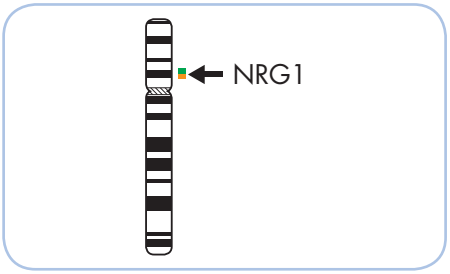
Background

The ZytoLight® SPEC NRG1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 8p12 harboring the NRG1 (neuregulin 1, a.k.a. HGL or GGF) gene.
NRG1 encodes a variety of growth factors that are ligands for tyrosine kinase receptors of the ERBB family. Rearrangements of the NRG1 gene have been detected in various tumors, including breast cancer, lung cancer, and ovarian adenocarcinoma. NRG1 translocation-positive breast tumors show a more advanced pathological stage compared with translocation-negative tumors.
NRG1 rearrangements in lung adenocarcinomas of never smokers were found to result in the fusion of CD74 to the EGF-like domain of NRG1. Several *in vitro* studies indicate that NRG1 fusion proteins lead to an increased activation of ERBB receptors and are hence involved in tumor development.
Due to the involvement of NRG1 isoforms in oncogenesis and their association with ERBB receptors, NRG1 constitutes a good candidate for potential therapeutic applications, e.g., in relation to lung tumor subtypes with so far no effective treatment. Hence, detection of NRG1 rearrangements by Fluorescence *in situ* Hybridization represents a useful tool for studying carcinogenesis of various solid tumors and may be of prognostic and therapeutic significance.

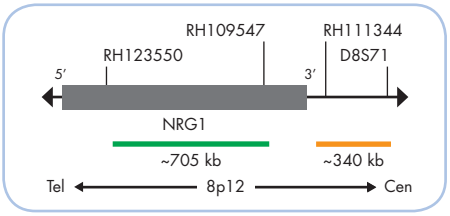
References
Adélaïde J, et al. (2003) Genes Chromosomes Cancer 37: 333-45.
Fernandez-Cuesta L, et al. (2014) Cancer Discov 4: 415-22.
Huang HE, et al. (2004) Cancer Res 64: 6840-4.
Pole JC, et al. (2006) Oncogene 25: 5693-706.

Probe Description

The SPEC NRG1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 8p12 band. The green fluorochrome direct labeled probe hybridizes distal and the orange fluorochrome direct labeled probe hybridizes proximal to the NRG1 breakpoint region.



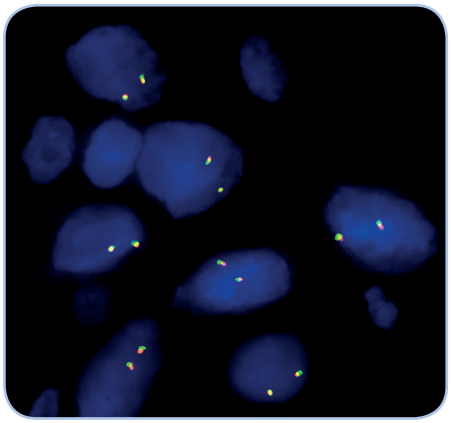
Ideogram of chromosome 8 indicating the hybridization locations.



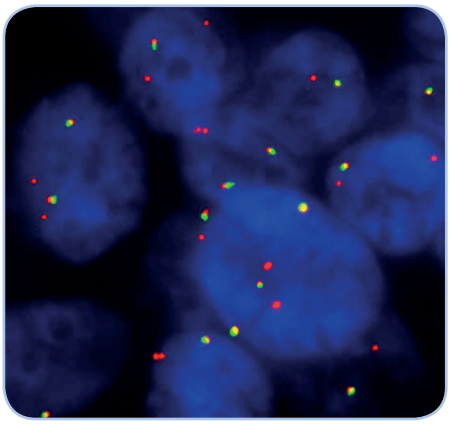
SPEC NRG1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 8p12 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 8p12 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal in lung adenocarcinoma specimens indicates one normal 8p12 locus and one 8p12 locus affected by a translocation.



SPEC NRG1 Dual Color Break Apart Probe hybridized on normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Lung cancer tissue section with rearrangement of the NRG1 gene as indicated by extra orange signals.

Image kindly provided by Mc Leer A, Duruisseaux M, Wislez M and colleagues, Grenoble and Paris, France.

Prod. No.	Product	Label	Tests* (Volume)
Z-2181-200	ZytoLight SPEC NRG1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

67

ZytoLight® SPEC FGFR1 Dual Color Break Apart Probe

CE IVD

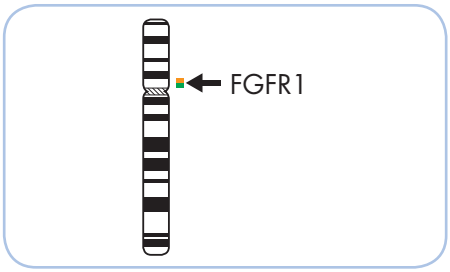
Background

The ZytoLight® SPEC FGFR1 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 8p11.23-p11.22 harboring the FGFR1 (fibroblast growth factor receptor 1, a.k.a. FLT2 and FLG) gene.
Translocations affecting FGFR1 are hallmarks of the 8p11 myeloproliferative syndrome (EMS), also known as stem cell leukemia/lymphoma syndrome, an aggressive stem cell myeloproliferative neoplasm that is associated with eosinophilia, poor prognosis, T-cell lymphoma, and frequent progression to acute myeloid leukemia.
The most common translocation detected in EMS is t(8;13)(p11.2;q12.1) fusing FGFR1 to ZMYM2 (a.k.a. ZNF198). Several other rearrangements affecting the FGFR1 locus are also common in EMS, all of which result in fusion proteins comprising the tyrosine kinase domain of FGFR1 and a dimerization domain of a partner protein. Due to dimerization these fusion proteins show constitutive kinase activity.
Currently, bone marrow or stem cell transplantation is the only curative treatment for patients with EMS. *In vitro* studies suggest that certain receptor tyrosine kinase inhibitors may provide a new therapeutic option.
Detection of FGFR1 rearrangements using FISH may assist in the diagnosis of patients with this aggressive stem cell disorder.

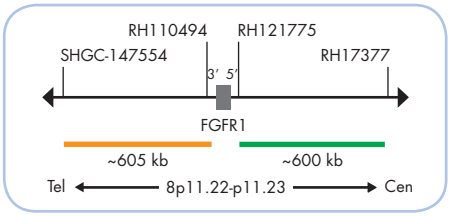
References
Chase A, et al. (2007) Blood 110: 3729-34.
Chase A, et al. (2013) Haematologica 98: 103-6.
Jackson CC, et al. (2010) Hum Pathol 41: 461-76.
Sohal J, et al. (2001) Genes Chromosomes Cancer 32: 155-63.

Probe Description

The SPEC FGFR1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 8p11.23-p11.22 band. The orange fluorochrome direct labeled probe hybridizes distal, the green fluorochrome direct labeled probe hybridizes proximal to the FGFR1 gene breakpoint region at 8p11.23-p11.22.



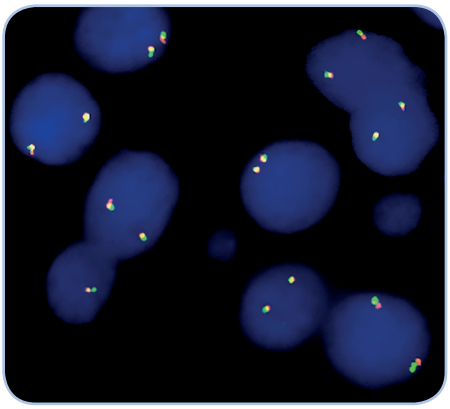
Ideogram of chromosome 8 indicating the hybridization locations.



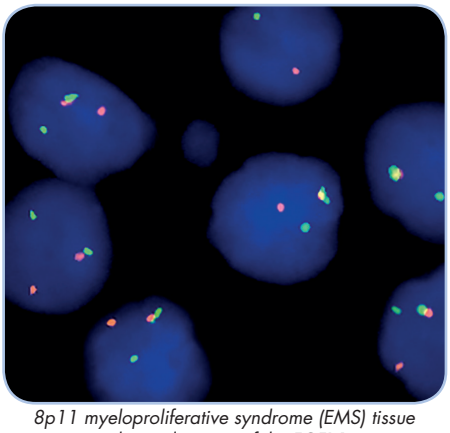
SPEC FGFR1 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 8p11.23-p11.22 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 8p11.23-p11.22 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 8p11.23-p11.22 locus and one 8p11.23-p11.22 locus affected by a translocation.



SPEC FGFR1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



8p11 myeloproliferative syndrome (EMS) tissue section with translocation of the FGFR1 gene as indicated by one non-rearranged orange/green fusion signal, one orange, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2168-200	ZytoLight SPEC FGFR1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE082-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

68

ZytoLight® SPEC FGFR1/CEN 8 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC FGFR1/CEN 8 Dual Color Probe is designed for the detection of FGFR1 gene amplification frequently observed in malignant tumors e.g. breast and prostate cancer and oral squamous cell carcinoma (OSCC).

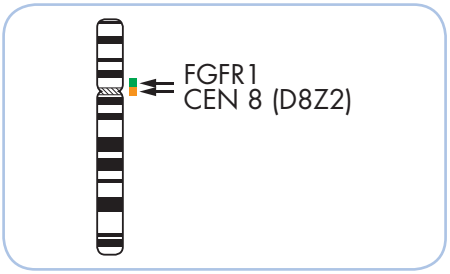
The FGFR1 (fibroblast growth factor receptor 1) gene is located in the chromosomal region 8p11.23-p11.22 and encodes a transmembrane receptor tyrosine kinase. Amplification of the FGFR1 gene, observed in approximately 10% of all breast cancer samples, has revealed to be an independent prognostic factor for overall survival. FGFR1 is believed to emerge as a potential therapeutic target for lobular breast carcinomas.

In prostate cancer, FGFR1 gene amplification seems to be an important step during the transmission to hormone resistance. In OSCC, FGFR1 gene amplification, observed in nearly 20% of all cases, is indicated to contribute to oral carcinogenesis at an early stage of development.

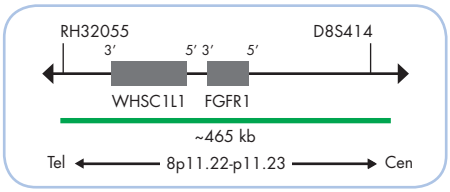
References
Balko JM, et al. (2012) Mol Cancer Ther 11: 2301-5.
Broom RJ, et al. (2012) Clin Genitourin Cancer 10: 202-6.
Cihoric N, et al. (2014) Br J Cancer 110: 2914-22.
Edwards J, et al. (2003) Clin Cancer Res 9: 5271-81.
Elbauomy Elsheikh S, et al. (2007) Breast Cancer Res 9: R23.
Fernanda Amary M, et al. (2014) Cancer Med 3: 980-7.
Freier K, et al. (2007) Oral Oncology 43: 60-6.
Kohler LH, et al. (2012) Virchows Arch 461: 49-57.
Lacroix-Triki M, et al. (2010) J Pathol 222: 282-98.
Lantuejoul S, et al. (2012) Oncologie 14: 530-7.
Lee PL, et al. (1989) Science 245: 57-60.
Lehnen NC, et al. (2013) Histopathology 63: 157-66.
Pfeiffer M, et al. (2012) Nat Genet 44: 1104-10.
Preusser M, et al. (2014) Lung Cancer 83: 83-9.
Reis-Filho JS, et al. (2006) Clin Cancer Res 12: 6652-62.
Schildhaus HU, et al. (2012) Mod Pathol 25: 1473-80.
Schultheis AM, et al. (2014) Mod Pathol 27: 214-21.
Seo AN, et al. (2014) Virchows Arch 465: 547-58.
Turner N, et al. (2010) Cancer Res 70: 2085-94.
Wetterskog D, et al. (2012) J Pathol 226: 84-96.

Probe Description

The SPEC FGFR1/CEN 8 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 8 probe specific for the alpha satellite centromeric region of chromosome 8 (D8Z2) and a green fluorochrome direct labeled SPEC FGFR1 probe specific for the FGFR1 gene at 8p11.23-p11.22.



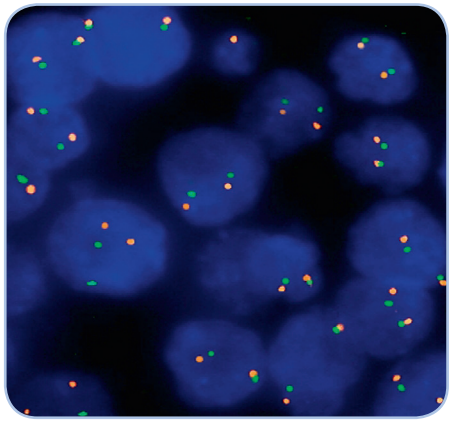
Ideogram of chromosome 8 indicating the hybridization locations.



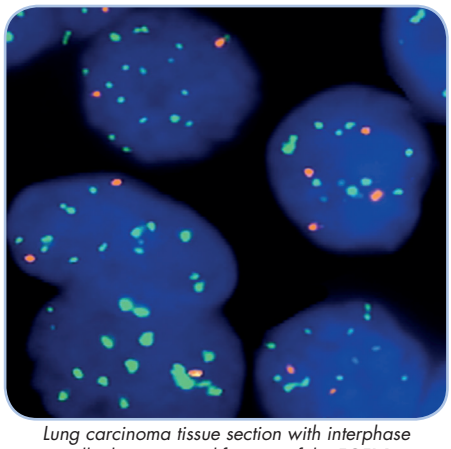
SPEC FGFR1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the FGFR1 gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC FGFR1/CEN 8 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Lung carcinoma tissue section with interphase cells showing amplification of the FGFR1 gene (green) and partly polysomy 8 (orange).

Prod. No.	Product	Label	Tests* (Volume)
Z-2072-50	ZytoLight SPEC FGFR1/CEN 8 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2072-200	ZytoLight SPEC FGFR1/CEN 8 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE020-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® Direct Label System II providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® Repeat Subtraction Technique.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

69

ZytoLight® SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe

CE IVD

Previously: ZytoLight SPEC AML1/ETO Dual Color Dual Fusion Probe

Background

The ZytoLight® SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe is designed to detect the specific translocation involving the chromosomal region 21q22.12 harboring the RUNX1 (a.k.a. AML1) gene and the chromosomal region 8q21.3 harboring the RUNX1T1 (a.k.a. ETO, CBF2T1) gene.

The balanced chromosomal translocation t(8;21) is found in about 90% of acute myeloid leukemia (AML) patients. AML is a heterogeneous clonal disorder of hematopoietic progenitor cells and one of the most common malignant myeloid disorders in adults.

The runt-related transcription factor 1 gene (RUNX1) and the runt-related transcription factor 1; translocated to, 1 (RUNX1T1) gene are both involved in the transcriptional regulation of genes during normal hematopoiesis.

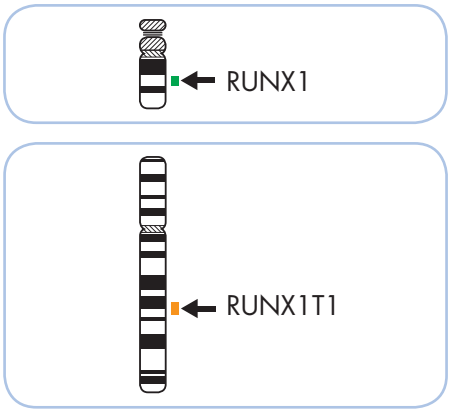
The non-random translocation t(8;21)(q21.3;q22.1) is strongly associated with the French-American-British (FAB) phenotype M2 (AML-M2) and produces a chimeric gene consisting of the 5′-region of the RUNX1 gene fused to the 3′-region of the RUNX1T1 gene. The chimeric protein is thought to be associated with the nuclear corepressor/histone deacetylase complex to block hematopoietic differentiation.

Fluorescence *in situ* Hybridization (FISH) can provide important information for the management of patients with hematologic disorders.

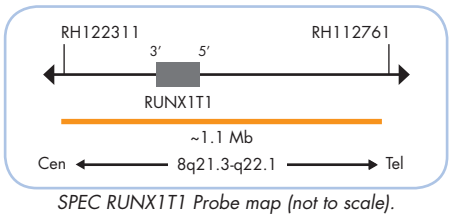
References
Dayyani F, et al. (2008) Blood 111: 4338-47.
Estey E & Döhner H (2006) Lancet 368: 1894-907.
Gmidène A, et al. (2010) Med Oncol: 28 Suppl 1: 509-12.
Licht D (2001) Oncogene 20: 5560-79.
Vangala RK, et al. (2003) Blood 101: 270-7.

Probe Description

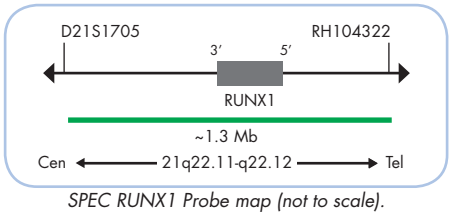
The SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe is a mixture of a green fluorochrome direct labeled RUNX1 probe covering the breakpoint region of the RUNX1 gene and an orange fluorochrome direct labeled RUNX1T1 probe covering the breakpoint region of the RUNX1T1 gene.



Ideograms of chromosomes 21 (above) and 8 (below) indicating the hybridization locations.



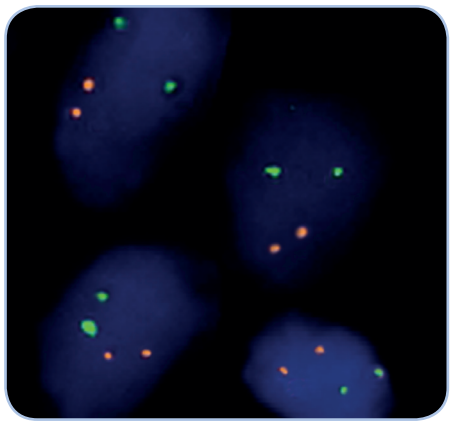
SPEC RUNX1T1 Probe map (not to scale).



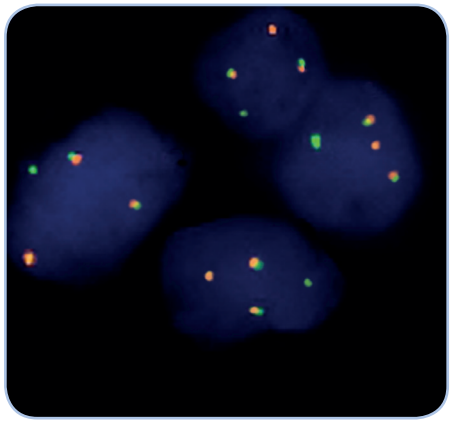
SPEC RUNX1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange and green signal, respectively.



SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Bone marrow biopsy section with translocation affecting the RUNX1/RUNX1T1 locus as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2112-200	ZytoLight SPEC RUNX1/RUNX1T1 Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

70

ZytoLight® SPEC MYC Dual Color Break Apart Probe

Previously: ZytoLight SPEC CMYC Dual Color Break Apart Probe

CE IVD

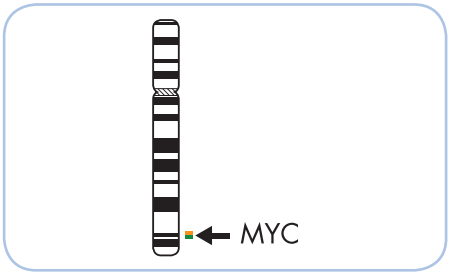
Background

The ZytoLight® SPEC MYC Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 8q24.21 harboring the MYC gene. The MYC proto-oncogene (v-myc avian myelocytomatosis viral oncogene homolog, a.k.a. CMYC) encodes a transcription factor essential for cell growth and proliferation and is broadly implicated in tumorigenesis. Translocations involving the MYC gene are considered to be cytogenetic hallmarks for Burkitt Lymphoma but are also found in other types of lymphomas. The most frequent translocation involving the MYC gene region is t(8;14)(q24.21;q32.3) juxtaposing the MYC gene in 8q24.21 next to the IgH (immunoglobulin heavy chain) locus in 14q32.33. Further translocations affecting the MYC gene are t(8;22)(q24.21;q11.2) and t(2;8)(p11.2;q24.21), both of which involve one of the two immunoglobulin light chain loci. All three translocations bring the MYC gene under the control of a regulatory element from one of the immunoglobulin loci resulting in constitutive overexpression of MYC.

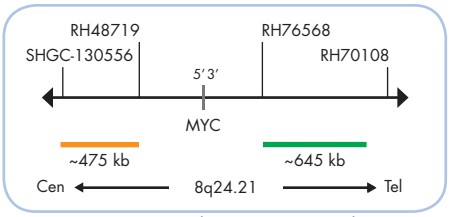
References
Boerma EG, et al. (2009) Leukemia 23: 225-34.
Dalla-Favera R, et al. (1982) PNAS 79: 6497-501.
Haralambieva E, et al. (2004) Genes Chromosomes Cancer 40: 10-8.
Veronese ML, et al. (1995) Blood 85: 2132-8.

Probe Description

The SPEC MYC Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 8q24.21 band. The orange fluorochrome direct labeled probe hybridizes proximal to the MYC gene, the green fluorochrome direct labeled probe hybridizes distal to that gene.



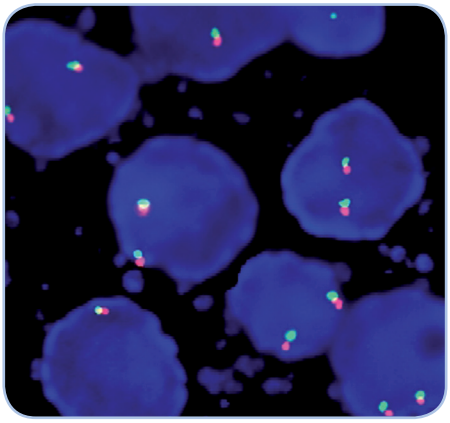
Ideogram of chromosome 8 indicating the hybridization locations.



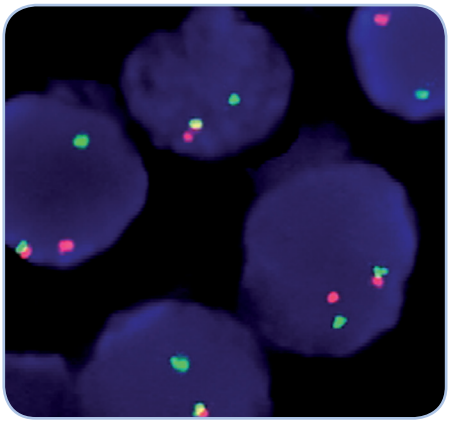
SPEC MYC Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 8q24.21 band two orange/green fusion signals are expected representing two normal (non-rearranged) 8q24.21 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 8q24.21 locus and one 8q24.21 locus affected by an 8q24.21 translocation. Alternative break points particularly observed in variant MYC translocations t(8;22) and t(2;8) might result in different signal patterns.



SPEC MYC Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Burkitt Lymphoma tissue section with translocation affecting the 8q24.21 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2090-200	ZytoLight SPEC MYC Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE028-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

71

ZytoLight® SPEC MYC/CEN 8 Dual Color Probe

Previously: ZytoLight SPEC CMYC/CEN 8 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC MYC/CEN 8 Dual Color Probe is designed for the detection of MYC gene amplifications found in a variety of human tumors.

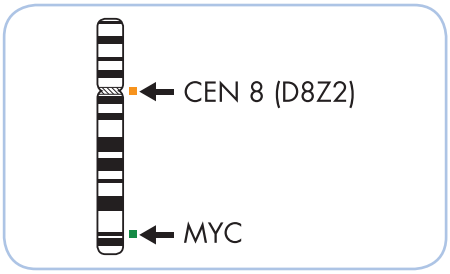
The MYC proto-oncogene (v-myc avian myelocytomatosis viral oncogene homolog, a.k.a. CMYC) is located in the chromosomal region 8q24.21 and encodes a transcription factor that can activate and repress transcription thereby regulating expression of numerous target genes that are essential for cell growth and proliferation. Deregulation of MYC is a common denominator in cancer. MYC amplification was found e.g. in breast, colon, kidney, lung, ovary, bladder, head and neck, and endometrial cancer. Several studies showed a correlation between gene amplification and disease progression or recurrence in breast cancer and other malignancies. Malignant cutaneous angiosarcomas, for example, but not benign and atypical vascular lesions occurring after radiotherapy of breast cancer are characterized by amplification of the MYC gene. The presence of MYC amplification is thus of considerable diagnostic importance for the distinction of malignant from atypical postradiation vascular neoplasms of the skin.

Since inactivation of MYC appears to be effective in the treatment of neoplasia MYC targeting therapies have been developed some of which have entered clinical trials.

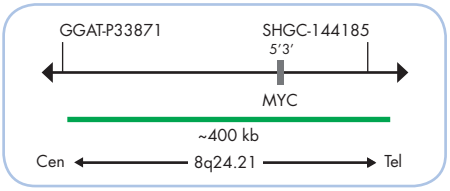
References
Dalla-Favera R, et al. (1982) PNAS 79: 6497-501.
Fromont G, et al. (2013) Hum Pathol 44: 1617-23.
Mannuci S, et al. (2012) Adv Hematol 2012: 149780.
Mentzel T, et al. (2012) Mod Pathol 25: 75-95.
Nesbit CE, et al. (1999) Oncogene 18: 3004-16.
Schraml P, et al. (1999) Clin Cancer Res 5: 1966-75.
Taub R, et al. (1982) PNAS 79: 7837-41.

Probe Description

The SPEC MYC/CEN 8 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 8 probe specific for the alpha satellite centromeric region of chromosome 8 (D8Z2) and a green fluorochrome direct labeled SPEC MYC probe specific for the MYC gene at 8q24.21.



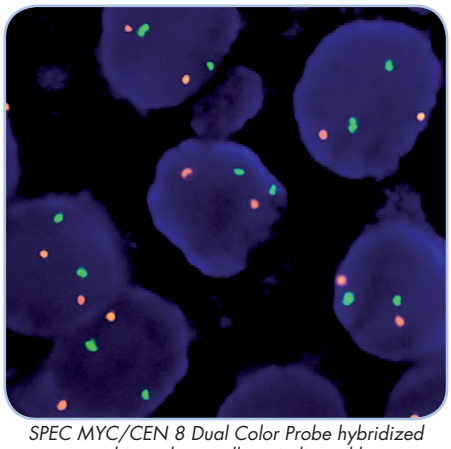
Ideogram of chromosome 8 indicating the hybridization locations.



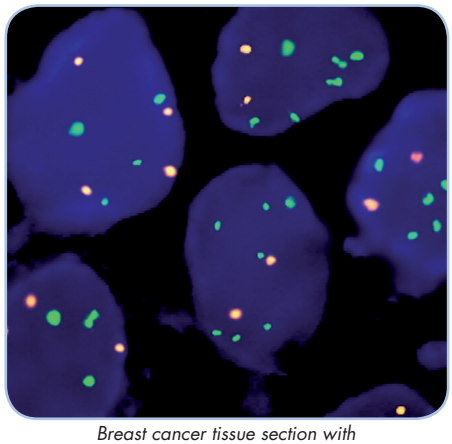
SPEC MYC Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the MYC gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC MYC/CEN 8 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Breast cancer tissue section with interphase cells showing partly polysomy 8 and partly amplification of the MYC gene locus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2092-200	ZytoLight SPEC MYC/CEN 8 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC MYC/IGH Dual Color Dual Fusion Probe

Previously: ZytoLight SPEC CMYC/IGH Dual Color Dual Fusion Probe

CE IVD

Background

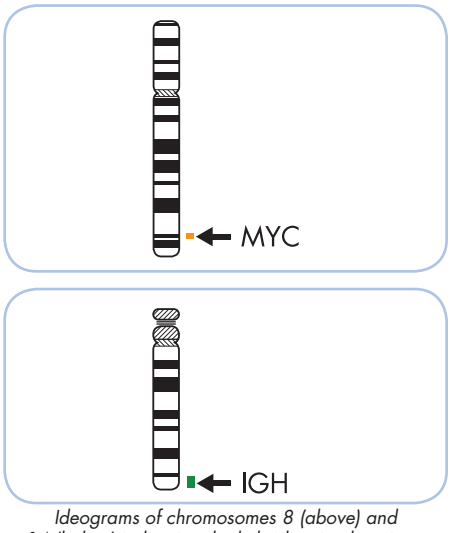
The ZytoLight® SPEC MYC/IGH Dual Color Dual Fusion Probe is designed to detect the translocation t(8;14)(q24;q32) affecting the MYC gene in the chromosomal region 8q24.21 and the IGH locus in 14q32.33. The MYC proto-oncogene (v-myc avian myelocytomatosis viral oncogene homolog, a.k.a. CMYC) encodes a transcription factor essential for cell growth and proliferation and is broadly implicated in tumorigenesis. Translocations involving the MYC gene are considered to be cytogenetic hallmarks for Burkitt Lymphoma (BL) but are also found in other types of lymphomas.

The most frequent translocation involving the MYC gene region t(8;14)(q24.21;q32.3) can be found in approx. 80% of the BL cases and juxtaposes the MYC gene next to the IgH (immunoglobulin heavy chain) locus. Further translocations affecting the MYC gene are t(8;22)(q24.21;q11.2) and t(2;8)(p11.2;q24.21), both of which involve one of the two immunoglobulin light chain loci. All three translocations bring the MYC gene under the control of a regulatory element from one of the immunoglobulin loci resulting in constitutive overexpression of MYC.

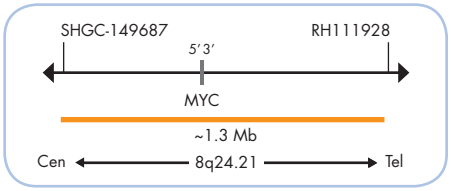
The identification of MYC specific rearrangements is a critical part of the diagnostic work-up and management of patients, identifying those who will benefit from the intensive therapeutic regimens used to treat BL. Fluorescence *in situ* Hybridization (FISH) which allows the correlation with immunochemistry can be critical to patient management and is an approach commonly used.

Probe Description

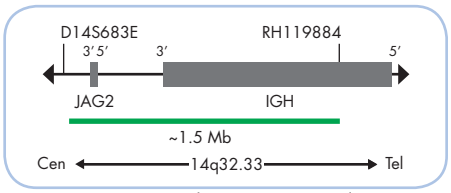
The SPEC MYC/IGH Dual Color Dual Fusion Probe is a mixture of an orange fluorochrome direct labeled MYC probe spanning the known MYC breakpoints, and a green fluorochrome direct labeled IGH probe spanning the known breakpoints of IGH.



Ideograms of chromosomes 8 (above) and 14 (below) indicating the hybridization locations.



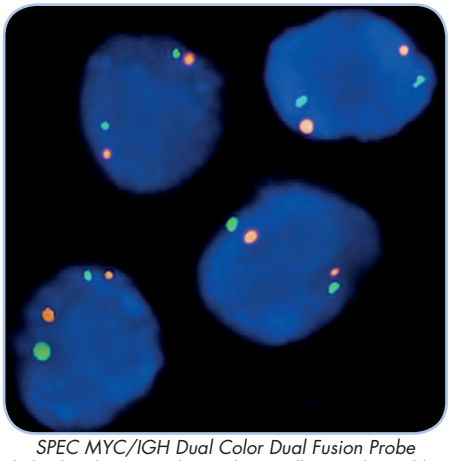
SPEC MYC Probe map (not to scale).



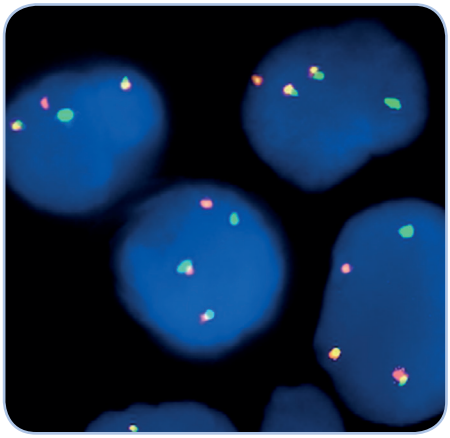
SPEC IGH Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange respectively green signal.



SPEC MYC/IGH Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Burkitt Lymphoma tissue section with t(8;14) as indicated by one separate orange signal, one separate green signal and two orange/green fusion signals indicating the MYC/IGH translocation.

References
May P, et al. (2010) Cancer Genet Cytogenet 198: 71-5.
Perkins A & Friedberg J (2008) Hematology Am Soc Hematol Educ Program 2008: 341-8.
Veronese ML, et al. (1995) Blood 85: 2132-8.

Prod. No.	Product	Label	Tests* (Volume)
Z-2105-200	ZytoLight SPEC MYC/IGH Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

73

ZytoLight® SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe is designed for the detection of CD274,PDCD1LG2 gene cluster amplifications observed in various carcinomas, e.g. classical non-Hodgkin lymphoma and mediastinal large B-cell lymphoma.

The CD274 (cluster of differentiation 274, a.k.a. PDCD1LG1, PDL1) and PDCD1LG2 (programmed cell death 1 ligand 2, a.k.a. PDL2, CD273) genes, which are separated by 42 kilobases, are located on chromosome 9p24.1.

The genes encode ligands for the PD-1 receptor of T-cells. CD274 is expressed by cancer cells of various tumor types, including melanoma, non-small cell lung cancer (NSCLC), breast cancer, and renal cell carcinomas. It is believed that interactions between the T-cell PD-1 receptor and its ligands CD274 or PDCD1LG2 expressed by tumor cells prevent the immune system from attacking the tumor cells.

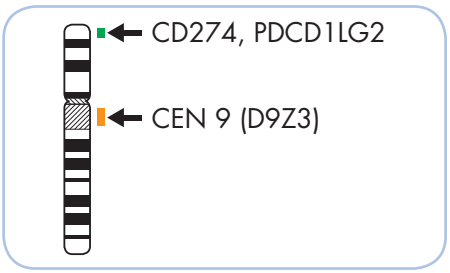
The blockade of the PD-1/CD274, PDCD1LG2 pathway has yielded promising results in clinical trials conducted on tumors that express the PD-1 receptor. In early phase clinical trials compounds blocking PD-1 and CD274 have shown to be especially effective in advanced-stage NSCLC patients positive for CD274. Hence, targeting PD-1 or CD274,PDCD1LG2 represents a promising new treatment for this cancer entity.

Consequently, the identification of CD274,PDCD1LG2 gene copy number detected by Fluorescence *in situ* Hybridization might be of prognostic and predictive relevance in diverse cancers.

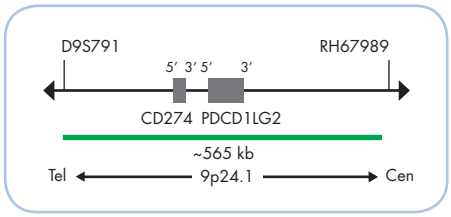
References
Green MR, et al. (2012) Clin Cancer Res 18: 1611-8.
Hao Y, et al. (2014) Clin Cancer Res 20: 2674-83.
Mamalis A, et al. (2014) Arch Dermatol Res 306: 511-9.
Schalper KA, at al. (2014) Clin Cancer Res 20: 2773-82.
Velcheti V, et al. (2014) Lab Invest 94: 107-16.

Probe Description

The SPEC CD274, PDCD1LG2/CEN 9 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC CD274, PDCD1LG2 probe specific for the CD274 and PDCD1LG2 genes at 9p24.1 and an orange fluorochrome direct labeled CEN 9 probe specific for the classical satellite III region of chromosome 9 (D9Z3) at 9q12.



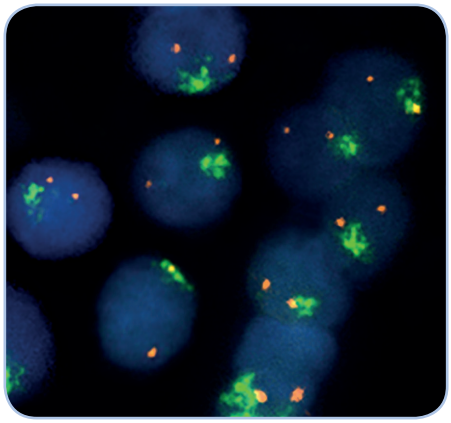
Ideogram of chromosome 9 indicating the hybridization locations.



SPEC CD274, PDCD1LG2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the CD274,PDCD1LG2 gene cluster, multiple copies of the green signal or large green signal clusters will be observed.



Primary mediastinal large B-cell lymphoma tissue section with amplification of the CD274,PDCD1LG2 gene region as indicated by green signal clusters in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2179-200	ZytoLight SPEC CD274,PDCD1LG2/CEN 9 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC CDKN2A/CEN 9 Dual Color Probe

Previously: ZytoLight SPEC p16/CEN 9 Dual Color Probe

CE IVD

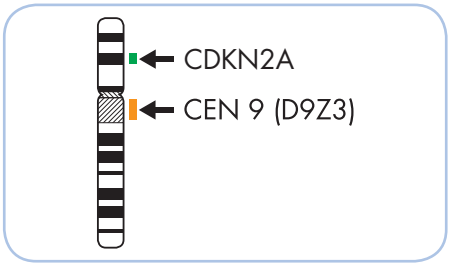
Background

The ZytoLight® SPEC CDKN2A/CEN 9 Dual Color Probe is designed for the detection of CDKN2A deletions frequently observed in most tumor cell lines as well as in primary human malignancies.
The CDKN2A gene, often referred to as p16 or INK4a/ARF, is located in the chromosomal region 9p21.3. Using alternative first exons and an alternative reading frame, the gene encodes for two distinct tumor suppressor proteins p16INK4a and p14ARF, both involved in cell cycle regulation. CDKN2A has been identified as a major susceptibility gene for melanoma. The tumor suppressor gene CDKN2A is inactivated by homozygous deletions with high frequency in a variety of human primary tumors e.g. bladder and renal cell carcinoma, prostate and ovarian adenocarcinoma, non-small cell lung cancer, sarcoma, glioma, mesothelioma, and melanoma. Furthermore, deletion of the CDKN2A gene is found in up to 80% of T-cell acute lymphoblastic leukemia cases and is associated with poor prognosis and relapse of the disease.

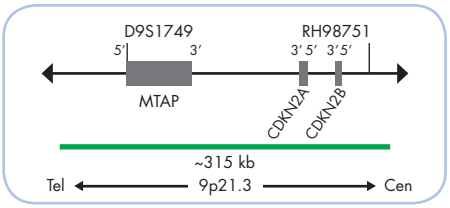
References
Cowan JM et al. (1988) J Natl Cancer Inst 80: 1159-64.
Holley T, et al. (2012) PLoS One 7: e50586.
Hussussian CJ, et al. (1994) Nat Genet 8: 15-21.
Kamb A, et al. (1994) Science 264: 436-40.
Nobori T, et al. (1994) Nature 368: 753-6.
Quelle DE, et al. (1995) Cell 83: 993-1000.
Rocco JW & Sidransky D (2001) Exp Cell Res 264: 42-55.
Schoppmeyer K, et al. (1999) Neoplasia 1: 128-37.
Schwarz S, et al. (2008) Cytometry A 73: 305-11.
Sharpless NE (2005) Mutat Res 576: 22-38.

Probe Description

The SPEC CDKN2A/CEN 9 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 9 probe specific for the classical satellite III region of chromosome 9 (D9Z3) at 9q12 and a green fluorochrome direct labeled SPEC CDKN2A probe specific for the CDKN2A gene at 9p21.3.



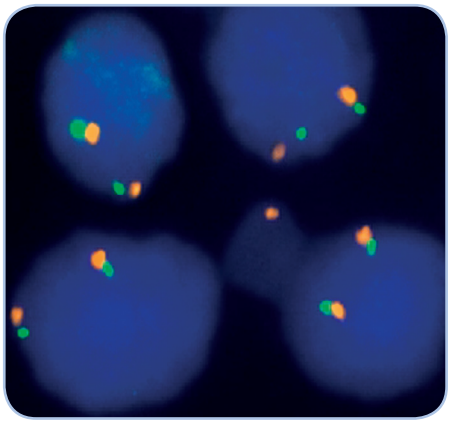
Ideogram of chromosome 9 indicating the hybridization locations.



SPEC CDKN2A Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletion of the CDKN2A gene locus, a reduced number of green signals will be observed. Deletions affecting only parts of the CDKN2A gene might result in a normal signal pattern with green signals of reduced size.



SPEC CDKN2A/CEN 9 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2063-200	ZytoLight SPEC CDKN2A/CEN 9 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe

Previously: ZytoLight SPEC p16/CEN 3/7/17 Quadruple Color Probe

CE IVD

Background

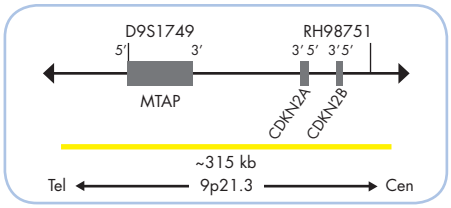
The ZytoLight® SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe is designed for the simultaneous detection of CDKN2A gene status and enumeration of chromosomes 3, 7, and 17 in tumor cells. The tumor suppressor gene CDKN2A (a.k.a. p16 or p16INK4a) is located in the chromosomal region 9p21.3 and is inactivated by homozygous deletions with high frequency in a variety of human primary tumors e.g. renal cell and bladder carcinoma, prostate and ovarian adenocarcinoma, non-small cell lung cancer, sarcoma, glioma, mesothelioma, and melanoma.
Additionally, non-random numerical chromosome aberrations are frequently observed in a variety of solid tumors.

Hence, detection of these specific chromosome aberrations in tumor cells can serve as a valuable diagnostic aid in tumor classification and staging. For example, in bladder cancer monosomy 3, 7, and 17 is significantly associated with T3-4 stages. In papillary renal cell carcinoma trisomy 7 or 17 is frequently found, while chromophobic RCC is characterized by widespread chromosomal losses.

References
Barocas DA, et al. (2006) BJU Int 99: 290-5.
Gallucci M, et al. (2005) J Clin Pathol 58: 367-71.
Kamb A, et al. (1994) Science 264: 436-40.
Sharpless NE (2005) Mutat Res 576: 22-38.

Probe Description

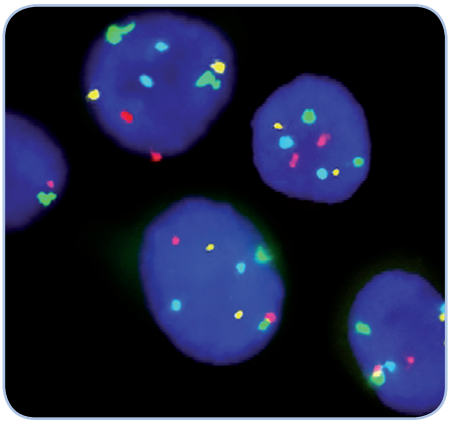
The SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe is a mixture of a gold fluorochrome direct labeled SPEC CDKN2A probe specific for the CDKN2A gene at 9p21.3, a red fluorochrome direct labeled CEN 3 probe specific for the alpha satellite centromeric region of chromosome 3 (D3Z1), a green fluorochrome direct labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1), and a blue fluorochrome direct labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1).



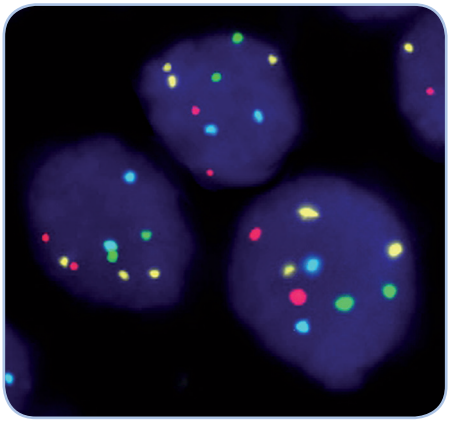
SPEC CDKN2A Probe map (not to scale).

Results

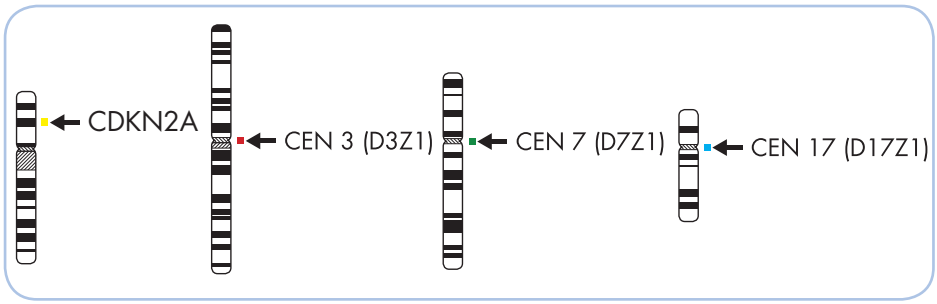
In a normal interphase nucleus, two gold, two red, two green, and two blue signals are expected. In a cell with deletion of the CDKN2A gene locus, a reduced number of gold signals will be observed. In cells with aneusomy of chromosomes 3, 7, or 17 more or less signals of the respective color will be visible.



Normal cytological specimen hybridized with SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe as indicated by two gold (CDKN2A), two red (CEN 3), two green (CEN 7), and two blue (CEN 17) signals.



SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe hybridized to tumor cells showing a trisomy 9 as indicated by three CDKN2A signals (gold) in each nucleus.



Ideograms of chromosomes 9, 3, 7, and 17 indicating the hybridization locations.

Prod. No.	Product	Label	Tests* (Volume)
Z-2081-50	ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	●/●/●/●	5 (50 µl)
Z-2081-200	ZytoLight SPEC CDKN2A/CEN 3/7/17 Quadruple Color Probe CE IVD	●/●/●/●	20 (200 µl)

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC NR4A3 Dual Color Break Apart Probe

CE IVD

Background

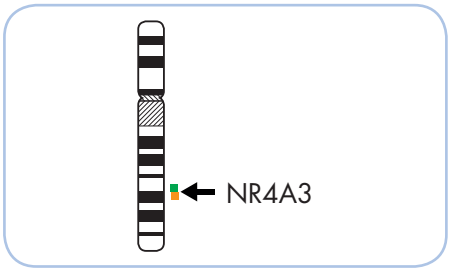
The ZytoLight® SPEC NR4A3 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 9q22.33-q31.1 harboring the nuclear receptor subfamily 4, group A, member 3 (NR4A3; a.k.a. TEC, NOR1, CHN) gene.Extraskeletal myxoid chondrosarcoma (EMC) is a rare soft-tissue sarcoma of chondroblastic origin that occurs primarily in adults. The tumor is characterized by recurrent chromosomal translocations resulting in fusions of the NR4A3 gene to various N-terminal partners including EWSR1, RBP56, TCF12, and TFG. NR4A3 is a member of the steroid/thyroid receptor superfamily and acts as a transcriptional activator. The resulting chimeric proteins contain N-terminal parts of the various partners fused to the entire coding sequence of NR4A3. The most frequent reciprocal translocation is t(9;22)(q22.3-q31;q12.2) found in about 70% of EMC generating a EWSR1-NR4A3 fusion gene in which the 3'-terminal part of EWSR1 is replaced by the entire NR4A3 gene.

EMC is histologically characterized by a mixture of cellular and myxoid stromal components, making it difficult to distinguish it from other benign or malignant mesenchymal tumors. Since chromosomal translocations of EWSR1 are found in several different neoplasias while NR4A3 rearrangements have been exclusively detected in EMC, assessment of NR4A3 rearrangements by Fluorescence *in situ* Hybridization might represent a helpful tool for the differential diagnosis of EMC.

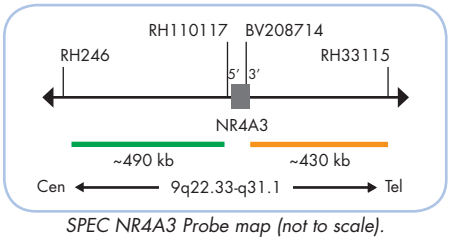
References
Benini S, et al. (2014) J Mol Diagn 16: 314-23.
Labelle Y, et al. (1995) Hum Mol Genet 4: 2219-26.
Nogushi H, et al. (2010) Hum Pathol 41: 336-42.
Ohkura N, et al. (1994) Biochem Biophys Res Commun 205: 1959-65.
Panagopoulos I, et al. (2002) Genes Chromosomes Cancer 35: 340-52.

Probe Description

The SPEC NR4A3 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 9q22.33-q31.1 band. The orange fluorochrome direct labeled probe hybridizes distal to the NR4A3 gene and the green fluorochrome direct labeled probe hybridizes proximal to that gene.



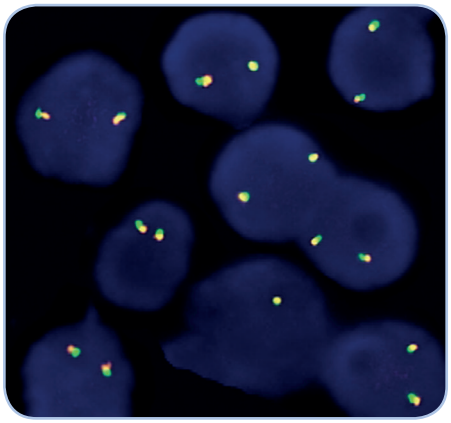
Ideogram of chromosome 9 indicating the hybridization locations.



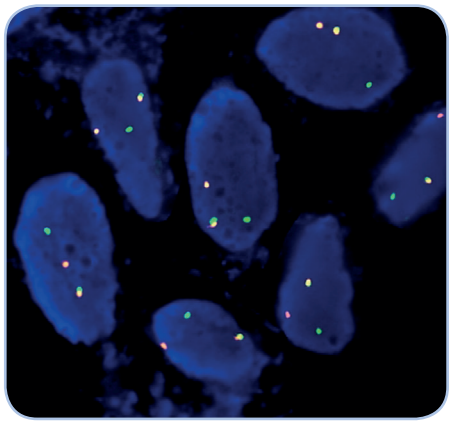
SPEC NR4A3 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 9q22.33-q31.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 9q22.33-q31.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 9q22.33-q31.1 locus and one 9q22.33-q31.1 locus affected by a translocation.



SPEC NR3A3 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signal per nucleus.



Extraskeletal myxoid chondrosarcoma tissue section with translocation affecting the 9q22.33-q31.1 locus as indicated by one orange/green fusion (non-rearranged) signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2145-50	ZytoLight SPEC NR4A3 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

77

ZytoLight® SPEC ABL1 Dual Color Break Apart Probe

CE IVD

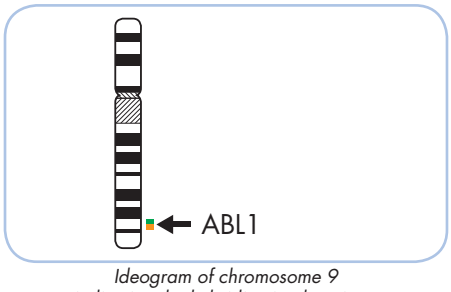
Background

The ZytoLight® SPEC ABL1 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 9q34.12 harboring the ABL1 (ABL proto-oncogene 1, non-receptor tyrosine kinase, a.k.a. ABL) gene.
Chromosomal rearrangements involving ABL1 occur in various hematological malignancies leading to fusions of the ABL1 gene to different fusion partners.
The translocation t(9;22)(q34.1;q11.2) results in BCR/ABL1 fusion and is observed in approx. 90% of patients with chronic myeloid leukemia (CML) and in approx. 25% of adults with acute lymphoblastic leukemia (ALL). The rearrangements are cytogenetically characterized by the presence of the Philadelphia (Ph) chromosome.
Other ABL1 fusion partners include, e.g., ETV6 and NUP214. The kinase domain of ABL1 is retained in all chimeric proteins.
The NUP214-ABL1 is the second most prevalent ABL1 fusion gene in malignant hemopathies, with a frequency of 5% in T-cell ALL. NUP214-ABL1 fusion genes are often found amplified on episomes.
Tyrosine kinase inhibitors, such as imatinib, suppress the constitutive kinase activity of ABL1 fusion proteins. Therefore, these drugs may have potential in the treatment of patients with ABL1 fusions.

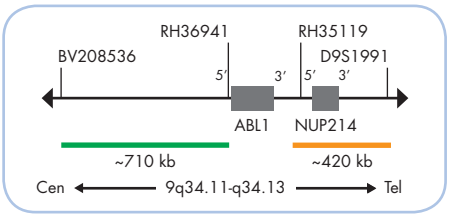
References
De Braekeleer E, et al. (2011) Eur J Haematol 86: 361-71.
De Klein A, et al. (1982) Nature 300: 765-7.
Graux C, et al. (2009) Leukemia 23: 125-33.
Lim TH, et al. (2005) Ann Acad Med Singapore 34: 533-8.
Primo D, et al. (2003) Leukemia 17: 1124-9.
Rieder H, et al. (1998) Leukemia 12: 1473-81.
Sessarego M, et al. (2000) Haematologica 85: 35-9.
Zheng X, et al. (2009) PLoS One 4: e7661.

Probe Description

The SPEC ABL1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 9q34.11-q34.13 band. The green fluorochrome direct labeled probe hybridizes proximal to the ABL1 gene at 9q34.11-q34.12, the orange fluorochrome direct labeled probe hybridizes distal to the ABL1 gene at 9q34.12-q34.13.



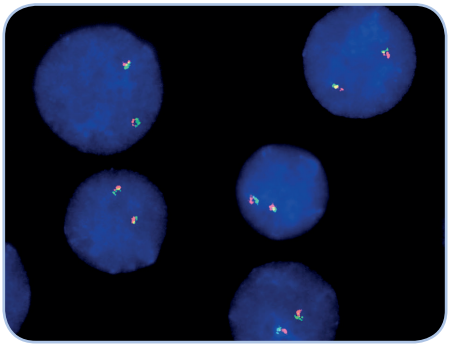
Ideogram of chromosome 9 indicating the hybridization locations.



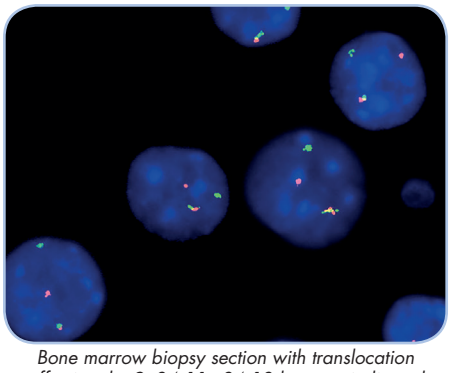
SPEC ABL1 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 9q34.11-q34.13 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 9q34.11-q34.13 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 9q34.11-q34.13 locus and one 9q34.11-q34.13 locus affected by a translocation. Amplifications of the NUP214-ABL1 fusion genes will result in multiple orange signals or orange signal clusters.



SPEC ABL1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Bone marrow biopsy section with translocation affecting the 9q34.11-q34.13 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2199-200	ZytoLight SPEC ABL1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

78

ZytoLight® SPEC BCR/ABL1 Dual Color Dual Fusion Probe

Previously: ZytoLight SPEC BCR/ABL Dual Color Dual Fusion Probe

CE IVD

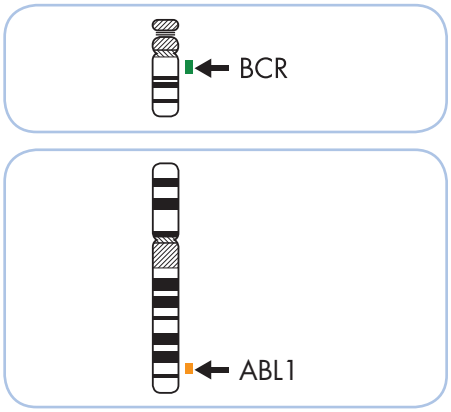
Background

The ZytoLight® SPEC BCR/ABL1 Dual Color Dual Fusion Probe is designed for the detection of the specific translocations involving the chromosomal region 9q34.12 harboring the ABL1 (a.k.a ABL) gene, and the chromosomal region 22q11.23, harboring the BCR (a.k.a. BCR1) gene. Rearrangements involving t(9;22)(q34.1;q11.2) are observed in approx. 90% of patients with chronic myeloid leukemia (CML) and in approx. 25% of adults with acute lymphoblastic leukemia (ALL). The rearrangements are cytogenetically characterized by the presence of the Philadelphia (Ph) chromosome.
The translocation frequently results in the formation of a chimeric BCR/ABL1 fusion gene on the derivative chromosome 22. The gene product is a BCR/ABL1 protein with abnormal tyrosine kinase activity. In normal cells, ABL1 kinase activity is finely regulated in response to growth factors and other stimuli. The BCR/ABL1 fusion protein leads to constitutive activation of down-stream signaling pathways, including Ras, Jak/Stat and PI-3 kinase. In rare cases the BCR/ABL1 fusion gene is located on chromosomal sites other than the Ph chromosome.
Fluorescence *in situ* Hybridization (FISH) allows for the identification of rearrangements that could otherwise not be detected by conventional karyotyping.

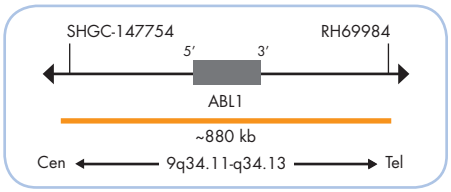
References
Hehne S, et al. (2012) Pathol Res Pract 208: 510-7.
Lim TH, et al. (2005) Ann Acad Med Singapore 34: 533-8.
Primo D, et al. (2003) Leukemia 17: 1124-9.
Rieder H, et al. (1998) Leukemia12: 1473-81.
Sessargeo M, et al. (2000) Haematologica 85: 35-9.
Zheng X, et al. (2009) PLoS One 4: e7661.

Probe Description

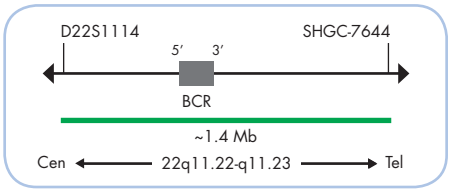
The SPEC BCR/ABL1 Dual Color Dual Fusion Probe is a mixture of a green fluorochrome direct labeled BCR probe spanning the minor and major breakpoint cluster of the BCR gene and an orange fluorochrome direct labeled ABL1 probe spanning the breakpoint region of the ABL1 gene.



Ideograms of chromosomes 22 (above) and 9 (below) indicating the hybridization locations.



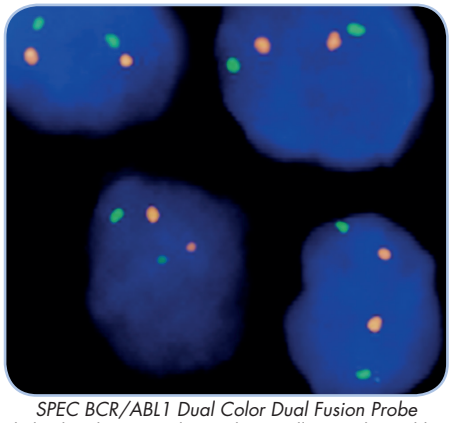
SPEC ABL1 Probe map (not to scale).



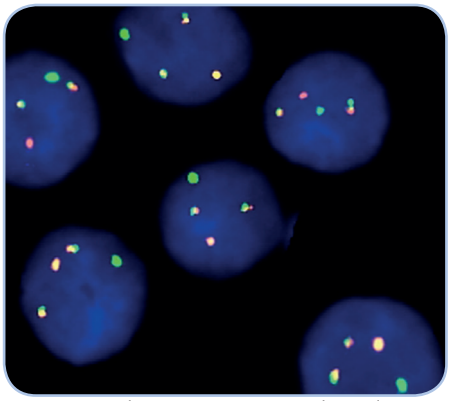
SPEC BCR Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange respectively green signal.



SPEC BCR/ABL1 Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Bone marrow biopsy tissue section with translocation affecting the BCR/ABL1 loci as indicated by one separate orange signal, one separate green signal and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2111-50	ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	●/●	5 (50 µl)
Z-2111-200	ZytoLight SPEC BCR/ABL1 Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

79

ZytoLight® SPEC KIF5B Dual Color Break Apart Probe

CE IVD

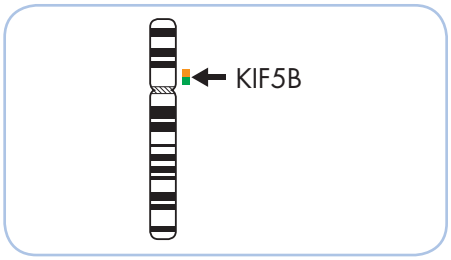
Background

The ZytoLight® SPEC KIF5B Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 10p11.22 harboring the KIF5B (kinesin family member 5B) gene.
About 5% of all non-small cell lung cancer cases are positive for the ALK-EML4 fusion as a result of an inversion in chromosome 2. However, not in all cases showing an aberration of the ALK gene the EML4-ALK fusion transcript could be detected. KIF5B was identified as a novel fusion partner for ALK in ALK-positive lung cancer. KIF5B is a ubiquitously expressed microtubule-based motor protein involved in organelle transport. The translocation t(2;10)(p23;p11.2) results in the fusion of the first domains of KIF5B including the motor domain and the coiled-coil domain with the tyrosine kinase domain of ALK. Overexpression of the aberrant KIF5B/ALK fusion transcript can lead to enhanced cell proliferation, migration, and invasion.
A further aberration affecting the KIF5B gene is inv(10)(p11.2q11.2). This inversion was detected in adenocarcinomas of the lung and results in the fusion of KIF5B with the ret proto-oncogene (RET). The fusion transcript again comprises the coiled-coil domain of KIF5B and the tyrosine kinase domain of RET. In accordance with the EML4-ALK fusion the development of specific agents targeting KIF5B-RET might provide a new therapeutic strategy for lung adenocarcinomas.

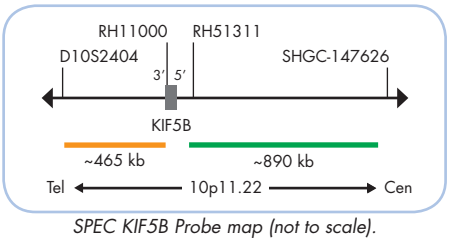
References
Gautschi O, et al. (2013) J Thorac Oncol 8: e43-4.
Ju YS, et al. (2012) Genome Res 22: 436-45.
Kohno T, et al. (2012) Nat Med 18: 375-7.
Takeuchi K, et al. (2009) Clin Cancer Res 15: 3143-9.
Takeuchi K, et al. (2012) Nat Med 18: 378-81.
Wong DW, et al. (2011) Cancer 117: 2709-18.

Probe Description

The SPEC KIF5B Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 10p11.22 band. The orange fluorochrome direct labeled probe hybridizes distal, the green fluorochrome direct labeled probe hybridizes proximal to the KIF5B gene.



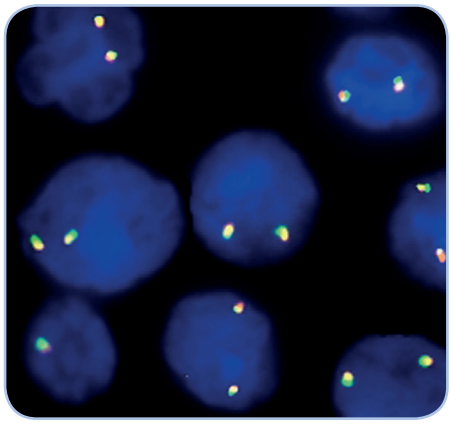
Ideogram of chromosome 10 indicating the hybridization locations.



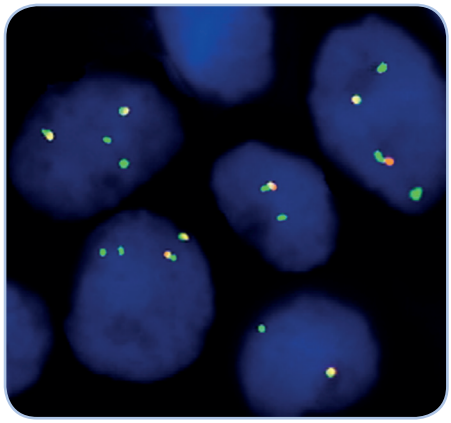
SPEC KIF5B Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 10p11.22 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 10p11.22 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 10p11.22 locus and one 10p11.22 locus affected by a translocation.



SPEC KIF5B Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



NSCLC tissue section with tetrasomy of chromosome 10 in some cells and an unbalanced translocation affecting KIF5B as indicated by one or two extra green signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2131-50	ZytoLight SPEC KIF5B Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® Direct Label System II providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® Repeat Subtraction Technique.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

80

ZytoLight® SPEC RET Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC RET Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 10q11.21 harboring the RET (rearranged during transfection proto-oncogene) gene. RET encodes a tyrosine kinase (TK) receptor. Translocations involving RET were first described in papillary thyroid carcinoma (PTC) where somatic rearrangements result in the fusion of its TK catalytic domain with an N-terminal dimerization domain encoded by various fusion partner genes. More recently, recurrent inversions [inv (10)(p11.2q11.2)] fusing the coiled-coil domains of the kinesin family member 5B (KIF5B) gene to the RET kinase domain have been detected in lung adenocarcinoma. The resulting KIF5B-RET fusion protein can form homodimers through the coiled-coil domains of KIF5B, causing an aberrant activation of the TK of RET, a mechanism known from KIF5B-ALK fusions which is also found in lung adenocarcinoma.

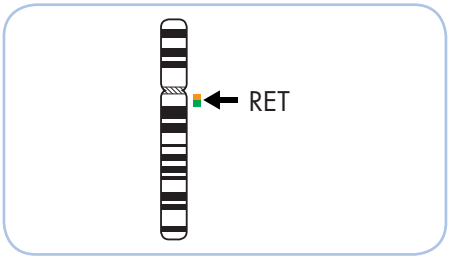
Since *in vitro* studies showed transforming activity of KIF5B-RET which could be suppressed by a TK inhibitor, it was assumed that the chimeric oncogene might be a promising molecular target for the treatment of lung cancer.

The same holds true for the very recently discovered BCR-RET and FGFR1OP-RET fusion genes in chronic myelomonocytic leukemia (CMML) generated by two balanced translocations t(10;22)(q11.2;q11.2) and t(6;10)(q27;q11.2), respectively.

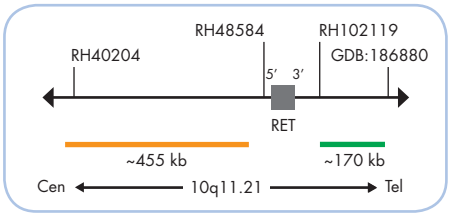
References
Ballerini P, et al. (2012) Leukemia 26: 2384-9.
Gautschi O, et al. (2013) J Thorac Oncol 8: e43-4.
Ju YS, et al. (2012) Genome Res 22: 436-45.
Kohno T, et al. (2012) Nat Med 18: 375-7.
Lee SE, et al. (2015) Mod Pathol 28: 468-79.
Nikiforov YE (2002) Endocr Pathol 13: 3-16.
Takahashi M, et al. (1985) Cell 42: 581-8.
Takeuchi K, et al. (2012) Nat Med 18: 378-81.

Probe Description

The SPEC RET Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 10q11.21 band. The orange fluorochrome direct labeled probe hybridizes proximal to the RET gene, the green fluorochrome direct labeled probe hybridizes distal to that gene.



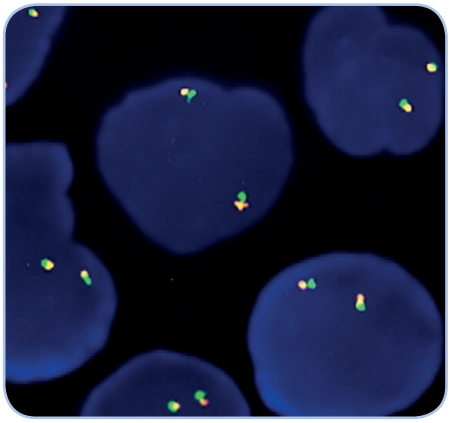
Ideogram of chromosome 10 indicating the hybridization locations.



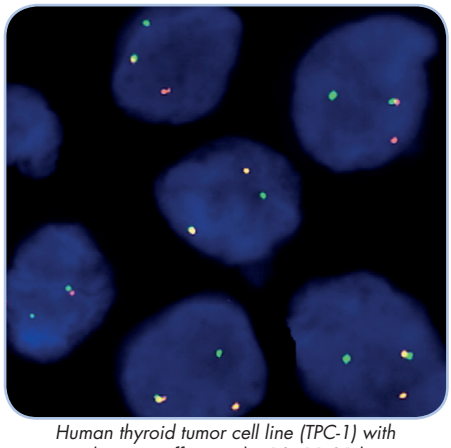
SPEC RET Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 10q11.21 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 10q11.21 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 10q11.21 locus and one 10q11.21 locus affected by a translocation or inversion.



SPEC RET Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Human thyroid tumor cell line (TPC-1) with translocation affecting the 10q11.21 locus as indicated by one orange/green fusion (non-rearranged) signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2148-50	ZytoLight SPEC RET Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Z-2148-200	ZytoLight SPEC RET Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE065-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

81

ZytoLight® SPEC PTEN/CEN 10 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC PTEN/CEN 10 Dual Color Probe is designed for the detection of PTEN deletions frequently observed in many tumor types, including renal, melanoma, endometrial, breast, prostate, lung, bladder, and thyroid cancer but also in hematological neoplasms.

The tumor suppressor gene PTEN (phosphatase and tensin homolog deleted on chromosome ten), often referred to as MMAC1 (mutated in multiple advanced cancers 1), is located on 10q23.31 and encodes a 47 kDa dual-specificity phosphatase that has both lipid and protein phosphatase activity. Its inactivation results in constitutive activation of the PI3K/AKT pathway and in subsequent increase in protein synthesis, cell cycle progression, migration, and survival.

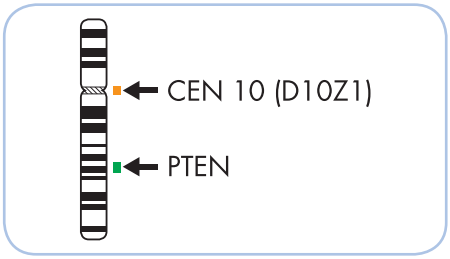
Deletions affecting the long arm of chromosome 10 have been detected in 30 to 50% of early and advanced stage sporadic melanomas and about 40 to 70% of prostate cancers. In both tumor entities loss of PTEN has been associated with poor clinical outcome. Currently, several drugs targeting the PI3K/AKT pathway for the therapy of solid tumors have entered clinical trials.

References

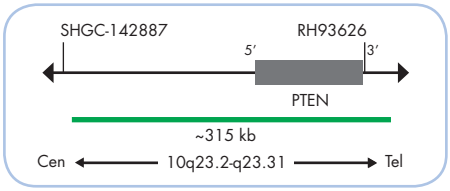
Ach T, et al. (2013) Virchows Arch 462: 65-72.
Dahia PLM, et al. (1999) Hum Mol Genet 8: 185-93.
Ettl T, et al. (2012) Br J Cancer 106: 719-26.
Ettl T, et al. (2014) Head Neck 36: 517-23.
Healy E, et al. (1998) Oncogene 16: 2213-8.
Li J, et al. (1997) Science 275: 1943-7.
Swoboda A, et al. (2011) Genes Chromosomes Cancer 50: 680-8.
Weng LP, et al. (2001) Hum Mol Genet 10: 599-604.
Yoshimoto M, et al. (2006) Cancer Genet Cytogenet 169: 128-37.
Yoshimoto M, et al. (2007) Br J Cancer 97: 678-85.

Probe Description

The SPEC PTEN/CEN 10 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 10 probe specific for the alpha satellite centromeric region of chromosome 10 (D10Z1) and a green fluorochrome direct labeled SPEC PTEN probe specific for the chromosomal region 10q23.2-q23.31 harboring the PTEN gene.



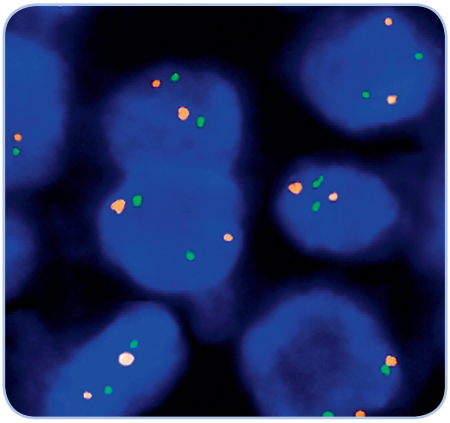
Ideogram of chromosome 10 indicating the hybridization locations.



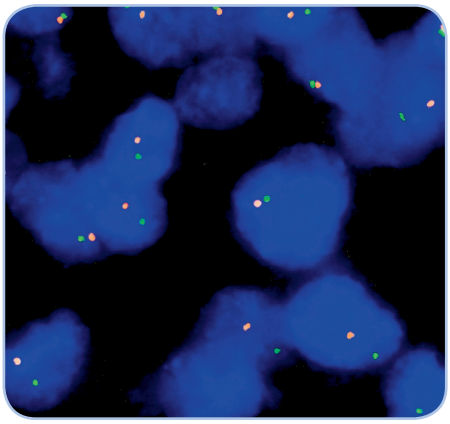
SPEC PTEN Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions of the PTEN gene locus, a reduced number of green signals will be observed. Deletions affecting only parts of the PTEN gene might result in normal signal pattern with green signals of reduced size.



SPEC PTEN/CEN 10 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Melanoma tissue section with chromosome 10 monosomy as indicated by one orange and one green signal in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2078-200	ZytoLight SPEC PTEN/CEN 10 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

82

ZytoLight® SPEC FGFR2 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC FGFR2 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 10q26.13 harboring the FGFR2 (fibroblast growth factor receptor 2, a.k.a. BEK) gene.

Translocations and inversions affecting FGFR2 have been detected in several solid tumors, including e.g. breast cancer, lung cancer, and the intrahepatic subtype of cholangiocarcinoma.

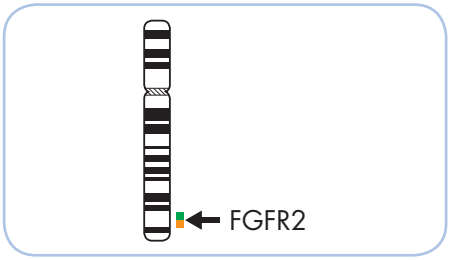
Several partner genes have been described to be fused to FGFR2 after rearrangement. The resulting fusion genes are predicted to encode chimeric proteins carrying the kinase domain of FGFR2. Most of the currently known FGFR2 fusion products are likely to exhibit oligomerization capability resulting in kinase activation.

In prostate cancer FGFR2 was found to be fused to the promoter region of SLC45A3 predicted to result in signal activation by overexpression of the FGFR2 protein. Recent studies indicate the involvement of FGFR2 fusion proteins in tumorigenesis. Moreover, *in vitro* studies suggest that certain FGFR tyrosine kinase inhibitors may provide a new therapeutic option for patients showing FGFR2 rearrangement. Hence, detection of FGFR2 rearrangements using FISH may help to identify patients which might respond to FGFR2 kinase targeting therapies.

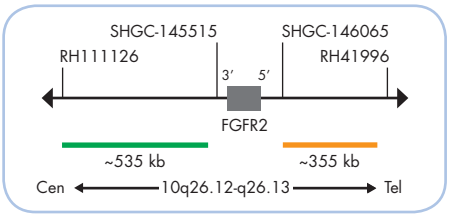
References
Arai Y, et al. (2014) Hepatology 59: 1427-34.
Seo JS, et al. (2012) Genome Res 22: 2109-19.
Wu YM, et al. (2013) Cancer Discov 3: 636-47.

Probe Description

The SPEC FGFR2 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 10q26.12-q26.13 band. The orange fluorochrome direct labeled probe hybridizes distal to the FGFR2 gene at 10q26.13, the green fluorochrome direct labeled probe hybridizes proximal to the FGFR2 gene at 10q26.12-q26.13.



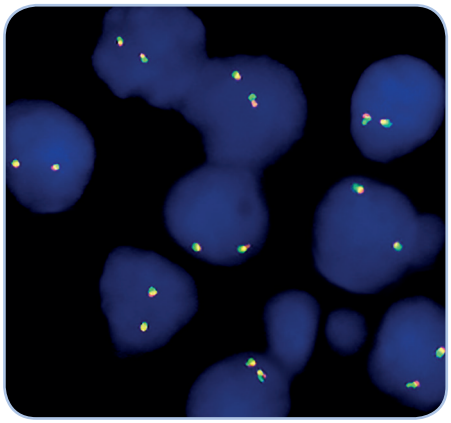
Ideogram of chromosome 10 indicating the hybridization locations.



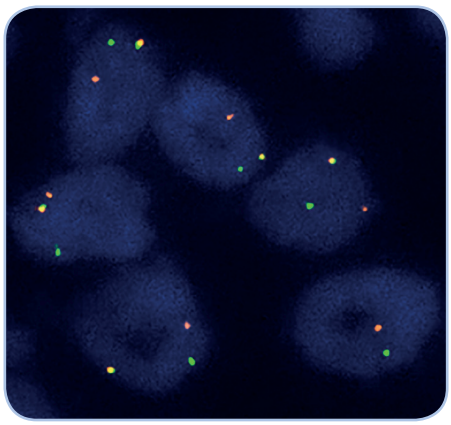
SPEC FGFR2 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 10q26.13 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 10q26.13 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 10q26.13 locus and one 10q26.13 locus affected by a translocation.



SPEC FGFR2 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Cholangiocellular adenocarcinoma tissue section with translocation of the FGFR2 gene as indicated by one non-rearranged orange/green fusion signal, one orange, and one separate green signal indicating the translocation.

Kindly provided by Prof. Dr. Büttner, Cologne, Germany.

Prod. No.	Product	Label	Tests* (Volume)
Z-2169-200	ZytoLight SPEC FGFR2 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

83

ZytoLight® SPEC FGFR2/CEN 10 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC FGFR2/CEN 10 Dual Color Probe is designed for the detection of FGFR2 gene amplifications frequently observed in breast cancer as well as in gastric cancer.

The FGFR2 (fibroblast growth factor gene 2, a.k.a. BEK) gene is located on chromosome 10q26.13 and encodes splice variants of the receptor tyrosine kinases FGFR2b and FGFR2c.

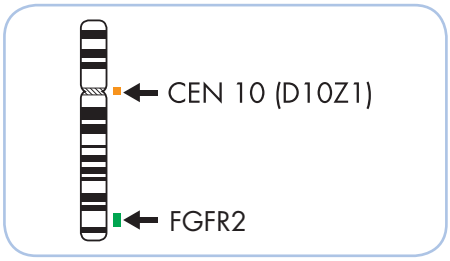
Amplification of the FGFR2 gene leads to overexpression of the FGFR2 protein and subsequently to signal activation. Additionally, during the amplification process the C-terminal deletion of FGFR2 can occur due to exclusion of the last exon from the FGFR2 amplicon. Both, overexpression and deletion of the last exon result in FGFR2 signaling activation based on constitutive phosphorylation of the FRS2 adaptor molecule.

The process of ligand independent FGFR2 signaling leads to a more severe malignant phenotype of these tumors. Moreover, high FGFR2 expression is correlated with poor overall survival (OS) and poor disease-free survival (DFS) rates in breast cancer patients. Consequently, FGFR2 gene amplification detected by Fluorescence *in situ* Hybridization might be used as a prognostic marker e.g. in breast cancer.

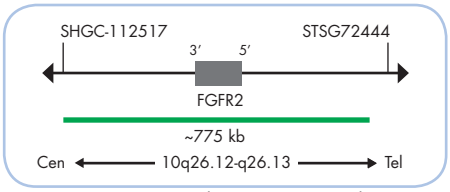
References
Azuma K, et al. (2011) Biochem Biophys Res Commun 407: 219-24.
Chang J, et al. (2015) Oncotarget 6: 2009-22.
Katoh M (2010) Expert Rev Anticancer Ther 10: 1375-9.
Katoh Y & Katoh M (2009) Int J Mol Med 23: 307-11.
Moffa AB, et al. (2004) Mol Cancer Res 2: 643-52.
Sun S, et al. (2012) J Surg Oncol 105: 773-9.

Probe Description

The SPEC FGFR2/CEN 10 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 10 probe specific for the alpha satellite centromeric region of chromosome 10 (D10Z1) and a green fluorochrome direct labeled SPEC FGFR2 probe specific for the chromosomal region 10q26.12-q26.13 harboring the FGFR2 gene.



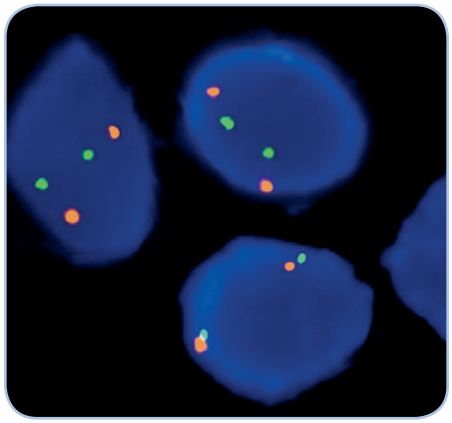
Ideogram of chromosome 10 indicating the hybridization locations.



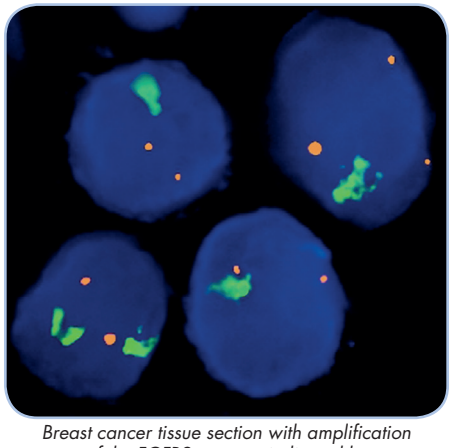
SPEC FGFR2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. Nuclei with amplification of the FGFR2 gene locus 10q26.12-q26.13, or aneuploidy of chromosome 10 will show multiple copies of the green signal or large green signal clusters.



SPEC FGFR2/CEN 10 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Breast cancer tissue section with amplification of the FGFR2 gene as indicated by green signal cluster in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2122-200	ZytoLight SPEC FGFR2/CEN 10 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC CARS Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC CARS Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 11p15.4 harboring the CARS (cysteinyl-tRNA-synthetase) gene detected in inflammatory myofibroblastic tumors (IMT).

IMT are neoplastic mesenchymal proliferations that occur predominantly in children and young adults. Cytogentic studies of IMT show various complex karyotypic abnormalities, frequently involving the short arm of chromosome 2 harboring the ALK gene locus in 2p23.1-p23.2. The ALK (anaplastic lymphoma receptor tyrosine kinase, a.k.a. CD246) gene encodes a receptor tyrosine kinase and was frequently identified as a fusion partner of various hybrid genes predominantly in anaplastic large cell lymphoma, and more recently, in non-small cell lung cancer. However, also in IMT several different ALK fusion genes have been identified including CARS-ALK.

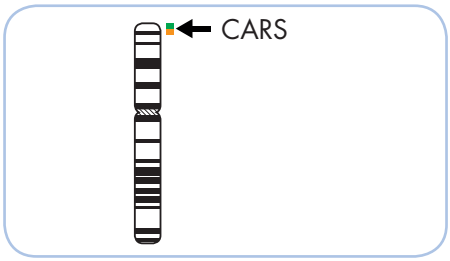
CARS encodes a class 1 aminoacyl-tRNA synthetase and is ubiquitously expressed. The translocation results in the fusion of the active promoter as well as the first domains of CARS to the receptor tyrosine kinase domain of ALK. Thus, CARS is predicted to mediate homodimerization of the chimeric product resulting in constitutive ALK kinase activation.

The detection of translocations affecting CARS and ALK by Fluorescence *in situ* Hybridization might represent a valuable tool to identify a subpopulation of IMT likely to respond to ALK kinase targeting therapies.

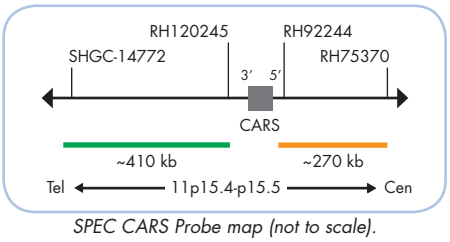
References
Butrynski JE, et al. (2010) N Engl J Med 363: 1727-33.
Cools J, et al. (2002) Genes Chromosomes Cancer 34: 354-62.
Cruzen ME, et al. (1993) Genomics 15: 692-3.
Debelenko LV, et al. (2003) Lab Invest 83: 1255-65.

Probe Description

The SPEC CARS Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 11p15.4-p15.5 band. The orange fluorochrome direct labeled probe hybridizes proximal to the CARS gene and the green fluorochrome direct labeled probe hybridizes distal to that gene.



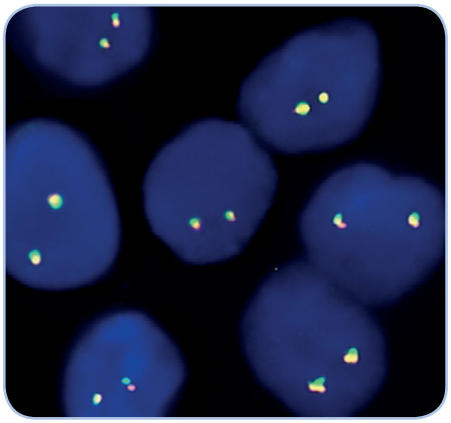
Ideogram of chromosome 11 indicating the hybridization locations.



SPEC CARS Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 11p15.4-p15.5 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 11p15.4-p15.5 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 11p15.4-p15.5 locus and one 11p15.4-p15.5 locus affected by a translocation.



SPEC CARS Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2137-50	ZytoLight SPEC CARS Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE057-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

85

ZytoLight® SPEC WT1 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC WT1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 11p13 harboring the WT1 (Wilms tumor 1) gene.

The WT1 gene is located on 11p13 and encodes a zinc finger DNA-binding protein that acts as a transcriptional activator or repressor depending on the cellular or chromosomal context. Inactivating mutations in the tumor suppressor gene WT1 have been identified in patients with Wilms' tumor and in a subset of sporadic cancers.

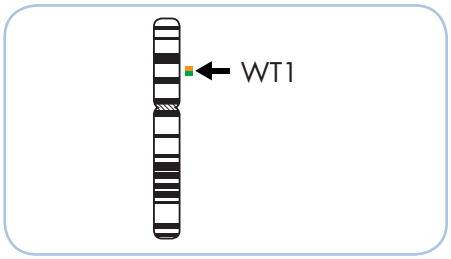
However, in desmoblastic small round cell tumors (DSRCT) recurrent translocations affecting the WT1 gene have been found. DSRCT is a highly aggressive mesenchymal tumor that primarily affects male adolescents and young adults. The translocation t(11;22)(p13;q12.2) is detectable in virtually all DSRCT tested and results in the fusion of the potent transcriptional activator domain of the EWSR1 gene and the DNA-binding zinc-finger domains of the WT1 gene. The EWSR1-WT1 chimeric protein acts as an oncogenic transcription factor as evidenced by its ability to transform cells *in vitro*.

While EWSR1 rearrangements are present in about 90% of DSRCT but are also frequently found in other small round blue cell neoplasms as e.g. Ewing sarcoma, WT1 translocations are exclusively found in DSRCT. Hence, detection of the t(11;22) by Fluorescence *in situ* Hybridization represents a valuable tool for the differential diagnosis of DSRCT.

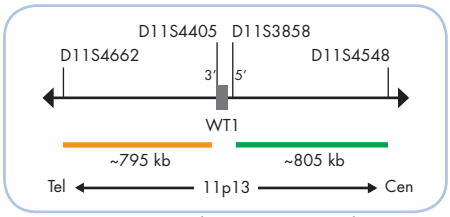
References
Gerald WL, et al. (1995) Pro Natl Acad Sci USA 92: 1028-32.
Kim J, et al. (1998) Oncogene 16: 1973-9.
Ladanyi M & Gerald W (1994) Cancer Res 54: 2837-40.
Wang ZY, et al. (1993) J Biol Chem 268: 9172-5.

Probe Description

The SPEC WT1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 11p13 band. The orange fluorochrome direct labeled probe hybridizes distal and the green fluorochrome direct labeled probe hybridizes proximal to the WT1 gene.



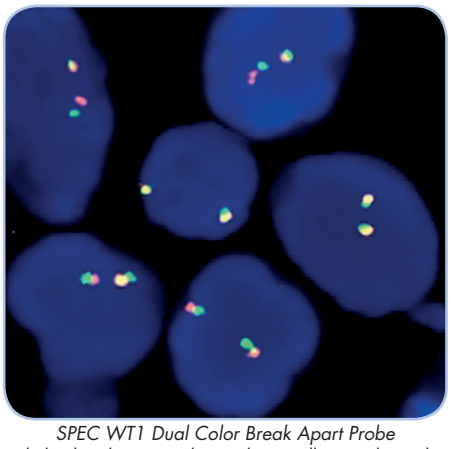
Ideogram of chromosome 11 indicating the hybridization locations.



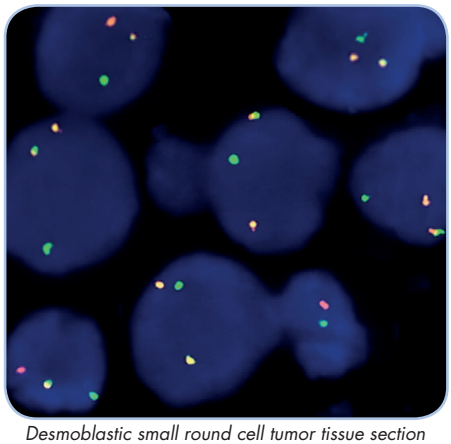
SPEC WT1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 11p13 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 11p13 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 11p13 locus and one 11p13 locus affected by a translocation.



SPEC WT1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Desmoblastic small round cell tumor tissue section with translocation affecting the 11p13 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2142-50	ZytoLight SPEC WT1 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

86

ZytoLight® SPEC CCND1 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC CCND1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 11q13.3 harboring the CCND1 gene. The CCND1 gene (cyclin D1, a.k.a. PRAD1) encodes a regulatory subunit of cyclin-dependent kinases.

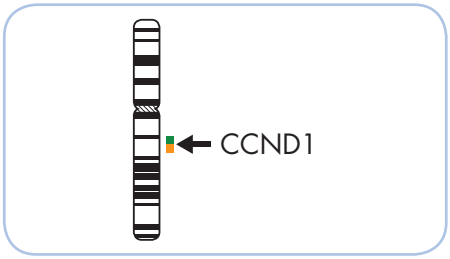
Translocations involving the chromosomal region t(11;14) (q13.3;q32.3) are considered to be characteristic for mantle cell lymphomas (MCL) but have also been identified in other lymphoproliferative disorders (LPDs), such as B-prolymphocytic leukemia, and, less frequently, in plasma cell myelomas, B-cell chronic lymphocytic leukemia, and in splenic lymphomas with villous lymphocytes (SLVL).

The t(11;14) rearrangement often leads to overexpression of the CCND1 protein. Determination of translocations involving the chromosomal region 11q13.3 can also help to distinguish MCL from other chronic lymphoproliferative disorders. Since the course of MCL is aggressive, and its response to chemotherapy is poor, differential diagnosis is clinically important. Additionally, it was also shown that a renal oncocytoma (RO) specific breakpoint is located in band 11q13.3, involving the CCND1 locus. The histologic features of RO may overlap with those of chromophobe renal cell carcinoma (ChRCC). Fluorescence *in situ* Hybridization (FISH) can be used as a diagnostic tool for differentiation of RO from ChRCC.

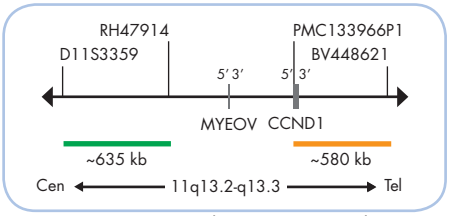
References
Bentz JS, et al. (2004) Cancer 102: 124-31.
Bosch F, et al. (1997) Cancer 82: 567-75.
Sinke RJ, et al. (1997) Cancer Genet Cytogenet 96: 95-101.
Sukov WR, et al. (2007) Hum Pathol 40: 1296-303.
Tarsitano M, et al. (2009) Cancer Genet Cytogenet 195: 164-7.
Vaandrager JW, et al. (1996) Blood 4: 1177-82.

Probe Description

The SPEC CCND1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 11q13.2-q13.3 band. The orange fluorochrome direct labeled probe hybridizes distal to and covers the CCDN1 gene, while the green fluorochrome direct labeled probe hybridizes proximal to that gene.



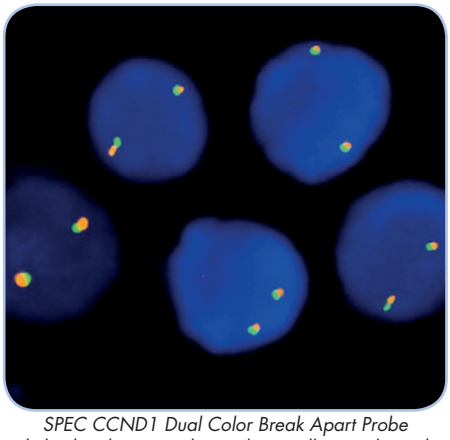
Ideogram of chromosome 11 indicating the hybridization locations.



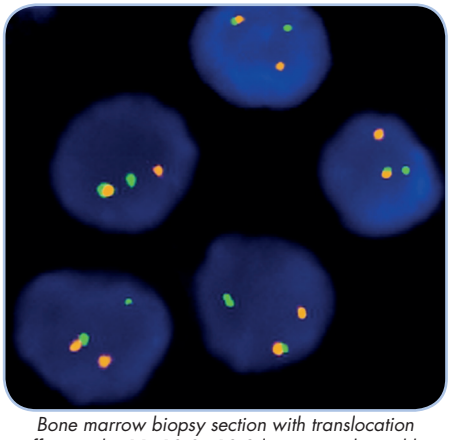
SPEC CCND1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 11q13.2-q13.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) CCND1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal CCND1 locus and one CCND1 locus affected by an 11q13.2-q13.3 translocation.



SPEC CCND1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Bone marrow biopsy section with translocation affecting the 11q13.2-q13.3 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2108-200	ZytoLight SPEC CCND1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE041-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

87

ZytoLight® SPEC CCND1/CEN 11 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC CCND1/CEN 11 Dual Color Probe is designed for the detection of CCND1 gene amplification frequently observed in breast cancer and other human tumors.

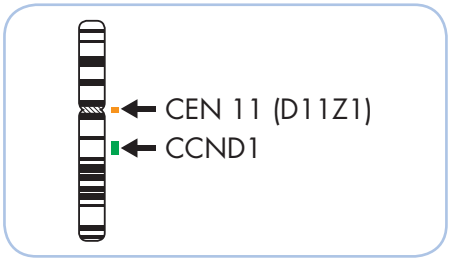
The cyclin D1 gene (a.k.a. CCND1 or PRAD1) is located in the chromosomal region 11q13.3 and encodes a regulatory subunit of cyclin-dependent kinases that promote progression through the cell cycle.

The proto-oncogene CCND1 is amplified in a number of solid tumors including approx. 20% of all human breast cancer cases and about 30% of squamous cell carcinomas of the esophagus and the head and neck region. Amplification of chromosomal material from 11q13.3 harboring the CCND1 gene is discussed as a prognostic marker in terms of metastasis, tumor recurrence, and survival for several tumor entities. In gastrointestinal stromal tumors (GIST), CCND1 amplification was found in 16% of high-risk tumors and was absent in low- or intermediate-risk tumors indicating the prognostic relevance of this genetic alteration in GIST.

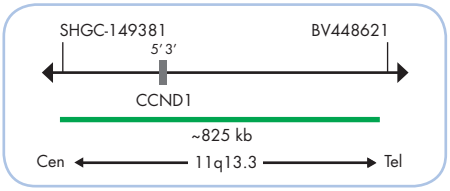
References
Al-Kuraya K, et al. (2004) Cancer Res 64: 8534-40.
Courjal F, et al. (1997) Cancer Res 57: 4360-7.
Motokura T, et al. (1991) Nature 350: 512-5.
Ormandy CJ, et al. (2003) Breast Cancer Res Treat 78: 323-35.
Schuuring E (1995) Gene 159: 83-96.
Tornillo L, et al. (2005) Lab Invest 85: 921-31.
Xiong Y, et al. (1991) Cell 65: 691-9.

Probe Description

The SPEC CCND1/CEN 11 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 11 probe specific for the alpha satellite centromeric region of chromosome 11 (D11Z1) and a green fluorochrome direct labeled SPEC CCND1 probe specific for the CCND1 gene at 11q13.3.



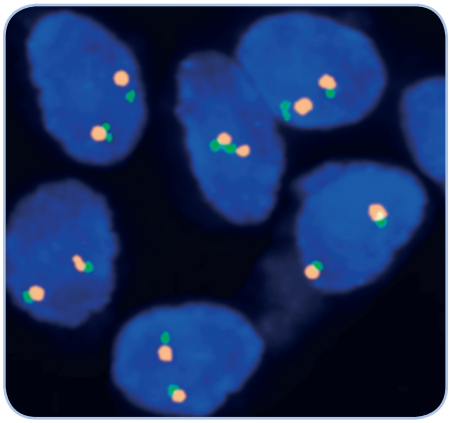
Ideogram of chromosome 11 indicating the hybridization locations.



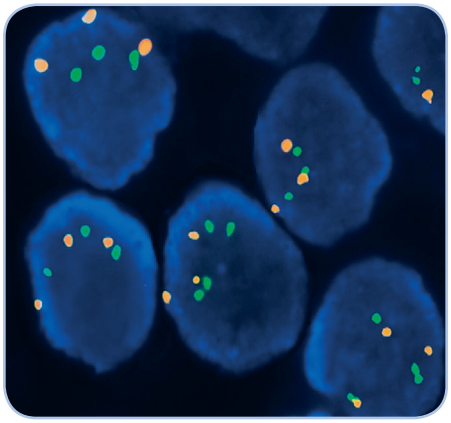
SPEC CCND1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the CCND1 gene locus, multiple copies of the green signal or large green signal clusters will be observed.



SPEC CCND1/CEN 11 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Polysomy of chromosome 11 as indicated by three orange (CEN 11) and three green (CCND1) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2071-200	ZytoLight SPEC CCND1/CEN 11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

88

ZytoLight® SPEC CCND1/IGH Dual Color Dual Fusion Probe

CE IVD

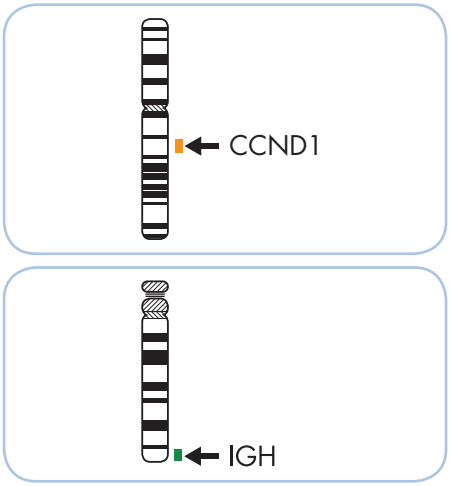
Background

The ZytoLight® SPEC CCND1/IGH Dual Color Dual Fusion Probe is designed to detect translocation t(11;14)(q13.3;q32.3) frequently found in mantle cell lymphomas. The translocation juxtaposes the CCND1 gene (cyclin D1, a.k.a. PRAD1 and BCL1) next to the IGH (immunoglobulin heavy locus, a.k.a. IGH@) locus and results in constitutive overexpression of CCND1.
The translocation t(11;14)(q13.3;q32.3) that involves the CCND1 and IGH gene regions is detected in up to 95% of patients with mantle cell lymphomas (MCL) and are considered to be the genetic hallmark of this subtype of low-grade peripheral B-cell neoplasms. However, the t(11;14) has also been identified in other lymphoproliferative disorders (LPDs), such as B-prolymphocytic leukemia (PLL), and, less frequently, in plasma cell myelomas, B-cell chronic lymphocytic leukemia, and in splenic lymphomas with villous lymphocytes (SLVL).
Since the course of MCL is aggressive, and its response to standard chemotherapy is poor, differential diagnosis from other chronic lymphoproliferative disorders via detection of the t(11;14) translocation might be of great clinical importance.

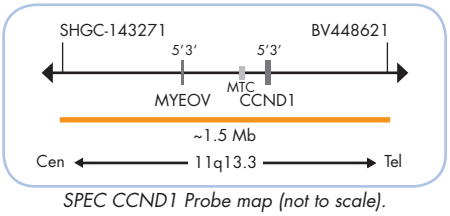
References
Bentz JS, et al. (2004) Cancer 102: 124-31.
Li JY, et al. (1999) Am J Pathol 154: 1449-52.
Siebert R, et al. (1998) Ann of Oncol 9: 519-26.
Vaandrager JW, et al. (1996) Blood 88: 1177-82.

Probe Description

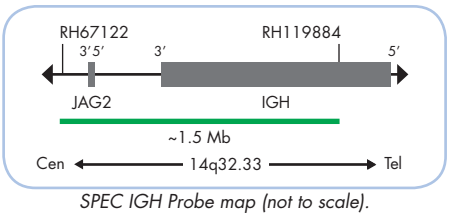
The SPEC CCND1/IGH Dual Color Dual Fusion Probe is a mixture of an orange fluorochrome direct labeled CCND1 probe spanning the major translocation cluster (MTC) region comprising about 120 kb upstream of CCND1 and a green fluorochrome direct labeled IGH probe spanning the breakpoint cluster region of IGH.



Ideograms of chromosomes 11 (above) and 14 (below) indicating the hybridization locations.



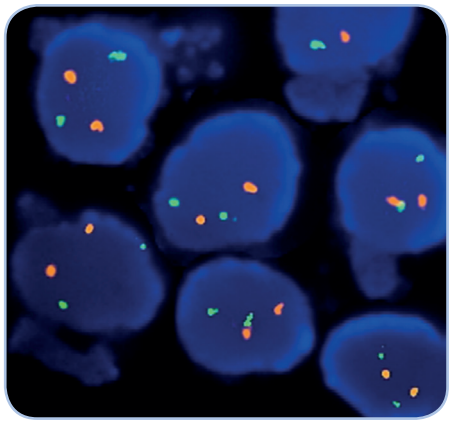
SPEC CCND1 Probe map (not to scale).



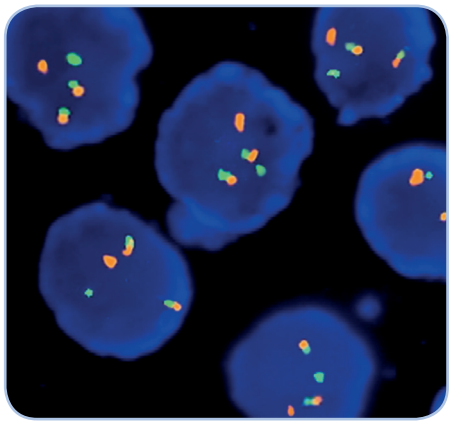
SPEC IGH Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal CCND1/IGH translocation leads to two orange/green fusion signals indicating both rearranged chromosomes. Additionally, the non-rearranged chromosomes are indicated by one orange signal and a separate green signal, respectively.



SPEC CCND1/IGH Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Section of an iliac crest biopsy with translocation affecting the CCND1/IGH loci as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2125-200	ZytoLight SPEC CCND1/IGH Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

89

ZytoLight® SPEC FGF3,4,19/CEN 11 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC FGF3,4,19/CEN 11 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the genes FGF3, FGF4, and FGF19.

The fibroblast growth factor encoding genes FGF3 (a.k.a. INT2), FGF4 (a.k.a. HSTF1, HST-1), and FGF19 are located in a cluster on 11q13.3, a locus that is amplified in multiple tumor types. Fibroblast growth factors and their receptors (FGFRs) regulate the growth, differentiation, and regeneration of a variety of tissues.

The genes FGF3, FGF4, and/or FGF19 were found to be amplified in some hepatocellular carcinoma (HCC). FGF3/FGF4 amplification is associated with HCC metastasis and recurrence as well as with sensitivity to treatment with sorafenib. Amplification of FGF19 in HCC results in an increased expression of this gene which is correlated with a worse prognosis. Moreover, *in vitro* studies have demonstrated that patients positive for 11q13.3 amplification are likely to respond to anti-FGF19 therapy.

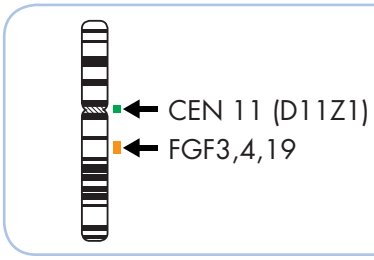
Amplifications of the chromosomal region 11q13.3 have also been detected in non-small cell lung cancer (NSCLC), adenoid cystic carcinoma (ACC), and bladder cancer.

Hence, the detection of amplifications of the FGF3, FGF4, and FGF19 genes by Fluorescence *in situ* Hybridization may be of prognostic significance and may aid in therapeutic decision making in HCC.

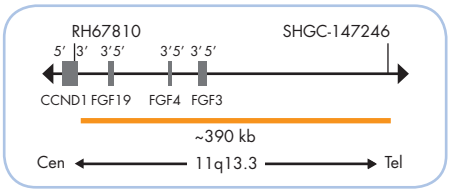
References
Arao T, et al. (2013) Hepatology 57: 1407-15.
Chaffer CL, et al. (2007) Differentiation 75: 831-42.
Hu L, et al. (2007) Cancer Lett 252: 36-42.
Miura S, et al. (2012) BMC Cancer 12: 56.
Sawey ET, et al. (2011) Cancer Cell 19: 347-58.
Tai AL, et al. (2005) Cancer 106: 146-55.
Vékony H, et al. (2007) Clin Cancer Res 13: 3133-9.
Zaharieva BM, et al. (2003) J Pathol 201: 603-8.

Probe Description

The SPEC FGF3,4,19/CEN 11 Dual Color Probe is a mixture of an orange fluorochrome direct labeled SPEC FGF3,4,19 probe hybridizing to the human FGF3, FGF4, and FGF19 genes in the chromosomal region 11q13.3 and a green fluorochrome direct labeled CEN 11 probe specific for the alpha satellite centromeric region of chromosome 11 (D11Z1).



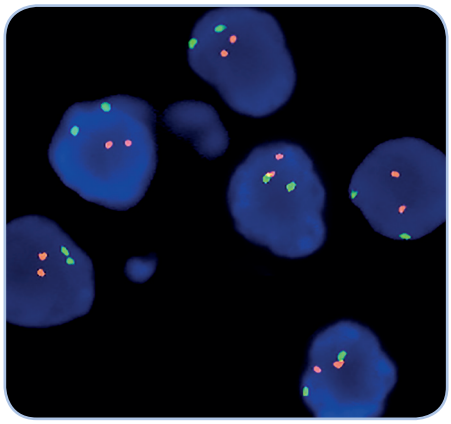
Ideogram of chromosome 11 indicating the hybridization locations.



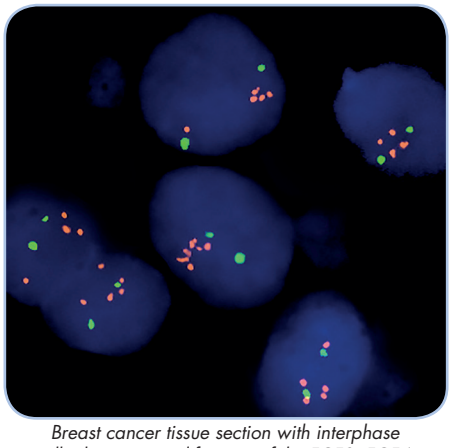
SPEC FGF3,4,19 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the FGF3, FGF4, and/or FGF19 gene locus, multiple copies of the orange signal or orange signal clusters will be observed.



SPEC FGF3,4,19/CEN 11 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Breast cancer tissue section with interphase cells showing amplification of the FGF3, FGF4, and/or FGF19 gene locus as indicated by multiple orange signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2158-200	ZytoLight SPEC FGF3,4,19/CEN 11 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE088-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

90

ZytoLight® SPEC MAML2 Dual Color Break Apart Probe

Previously: ZytoLight MEC I Probe SPEC t(11;19) Dual Color Break Apart Probe

CE IVD

Background

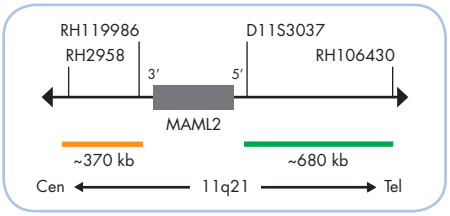
The ZytoLight® SPEC MAML2 Dual Color Break Apart Probe is designed to detect the translocation t(11;19)(q21;p13.1) specific for mucoepidermoid carcinomas. The mucoepidermoid carcinoma is the most common malignant tumor of the salivary gland. With about 30-50% of all cases, the translocation t(11;19)(q21;p13.1) is the most frequent chromosomal aberration in mucoepidermoid carcinomas. In some cases the t(11;19) is the sole chromosomal anomaly and in other cases the t(11;19) was found either as a more complex translocation involving other chromosomes or together with other abnormalities.

References
Bishop JA, et al. (2014) Head Neck Pathol 8: 287-90.
Camelo-Piragua SI, et al. (2009) Hum Pathol 40: 887-92.
Chiosea SI, et al. (2012) Laryngoscope 122: 1690-4.
El-Naggar A, et al. (1996) Cancer Genet Cytogenet 87: 29-33.
Jee KJ, et al. (2013) Mod Pathol 26: 213-22.
Lei Y & Chiosea SI (2012) Head Neck Pathol 6: 166-70.
Noda H, et al. (2013) Cancer Sci 104: 85-92.
Nordkvist A, et al. (1994) Cancer Genet Cytogenet 74: 77-83.
Rotellini M, et al. (2012) J Oral Pathol Med 41: 615-20.
Schwarz S, et al. (2011) Histopathology 58: 557-70.
Schwarz S, et al. (2011) Int J Clin Exp Pathol 4: 336-48.
Winnes M, et al. (2007) Genes Chromosomes Cancer 46: 559-63.
Zhu F, et al. (2014) PLoS One 9: e94399.

Probe Description

The SPEC MAML2 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 11q21 band. The green fluorochrome direct labeled probe hybridizes distal to the MAML2 gene, the orange fluorochrome direct labeled probe hybridizes proximal to that gene.

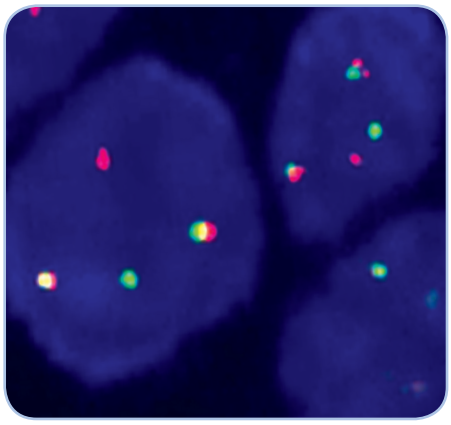
Ideogram of chromosome 11 indicating the hybridization locations.



SPEC MAML2 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 11q21 band two orange/green fusion signals are expected representing two normal (non-rearranged) 11q21 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 11q21 locus and one 11q21 locus affected by the translocation specific for mucoepidermoid carcinomas.



SPEC MAML2 Dual Color Break Apart Probe hybridized to abnormal nuclei containing two normal chromosomes 11 as indicated by two orange/green signal pairs and a derivative chromosome 11 with a translocation involving the 11q21 band as indicated by one orange and one separate green signal.

Prod. No.	Product	Label	Tests* (Volume)
Z-2014-200	ZytoLight SPEC MAML2 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE002-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

91

ZytoLight® SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe

CE IVD

Background

The ZytoLight® SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe is designed to detect translocations involving the chromosomal region 11q22.2 harboring the BIRC3 (baculoviral IAP repeat containing 3, a.k.a. API2) gene and the chromosomal region 18q21.32 harboring the MALT1 (mucosa associated lymphoid tissue lymphoma translocation gene 1, a.k.a. MLT) gene.

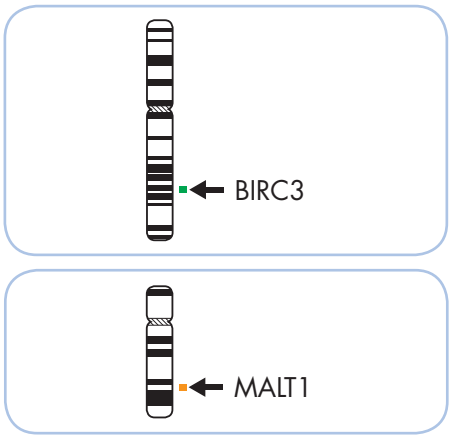
The recurrent translocation t(11;18)(q22.2;q21.3) is frequently found in mucosa-associated lymphoid tissue (MALT) lymphoma which represents the most common extranodal B-cell tumor and accounts for 5-10% of all non-Hodgkin lymphoma. The translocation results in the expression of chimeric fusion transcripts comprising the N-terminal end of the apoptosis inhibitor BIRC3 which is highly expressed in adult lymphoid tissue and C-terminal parts of the MALT1 protease.

The BIRC3/MALT1 fusion protein was shown to induce proteolytic cleavage of NF-kappa-B-inducing kinase (NIK) ultimately resulting in constitutive non-canonical NF-kappa-B signaling, enhanced B-cell adhesion, and apoptosis resistance. It is assumed that disruption of the BIRC3-NIK interaction and/or blocking of MALT1 protease or NIK kinase activity could represent new treatment approaches for refractory t(11;18)-positive MALT lymphoma.

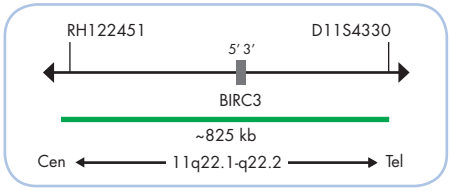
References
Dierlamm J, et al. (1999) Blood 93: 3601-9.
Dierlamm J, et al. (2000) Blood 96: 2215-8.
Morgan JA, et al. (1999) Cancer Res 59: 6205-13.
Rosebeck S, et al. (2011) Science 331: 468-72.

Probe Description

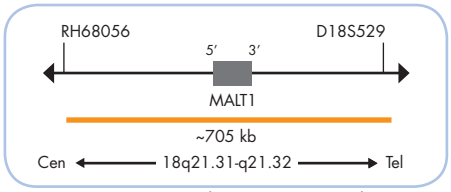
The SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe is a mixture of a green direct labeled BIRC3 probe spanning the BIRC3 gene region at 11q22.1-q22.2 and an orange direct labeled MALT1 probe spanning the MALT1 gene region at 18q21.31-q21.32.



Ideograms of chromosomes 11 (above) and 18 (below) indicating the hybridization locations.



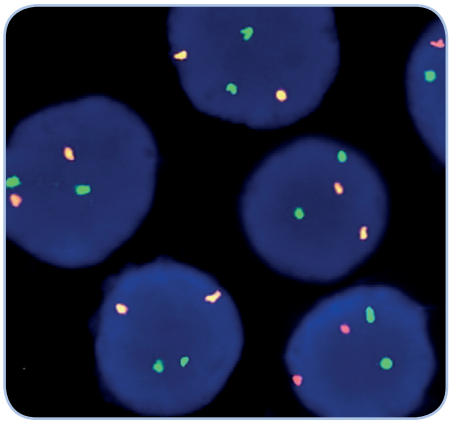
SPEC BIRC3 Probe map (not to scale).



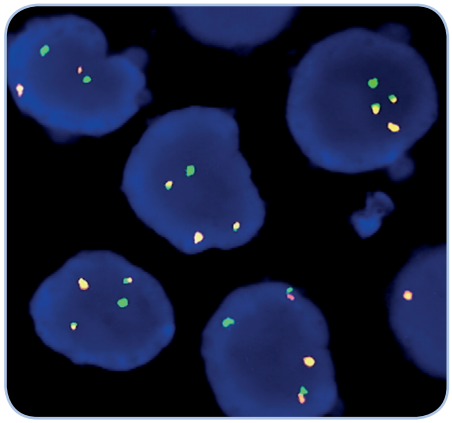
SPEC MALT1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange and green signal, respectively.



SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



MALT lymphoma tissue section with translocation affecting the BIRC3/MALT1 loci as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2146-200	ZytoLight SPEC BIRC3/MALT1 Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE064-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

92

ZytoLight® SPEC TP53/ATM Dual Color Probe
ZytoLight® SPEC D13S319/13q34/CEN 12 Triple Color Probe

CE IVD

Background

The ZytoLight® SPEC TP53/ATM Dual Color Probe is designed for the detection of deletions affecting the genes TP53 and ATM, and the ZytoLight® SPEC D13S319/13q34/CEN 12 Triple Color Probe is designed for the detection of D13S319 deletions as well as for the enumeration of chromosome 12.

CLL (chronic lymphocytic leukemia) is the most common form of leukemia in Western population.

TP53 (tumor protein 53, a.k.a. p53) gene deletions have been detected in patients with CLL, multiple myeloma (MM), and acute myeloid leukemia (AML). In CLL patients, allelic loss of the short arm of chromosome 17 is associated with treatment failure with alkylating agents and short survival times.

The ATM (ataxia telangiectasia mutated) gene is located on 11q22.3 and encodes a protein kinase which is involved in cell cycle regulation, including TP53 activation. CLL patients with 11q deletion exhibit rapid disease progression and inferior survival.

The most frequent aberration in CLL is the deletion of 13q14 which involves the D13S319 locus and which is associated with a favorable prognosis if occurring as the sole genetic aberration. Deletions of the long arm of chromosome 13 are also frequently detected in patients with aggressive non-Hodgkin lymphoma (NHL) and have been found to represent an adverse prognostic factor in MM.

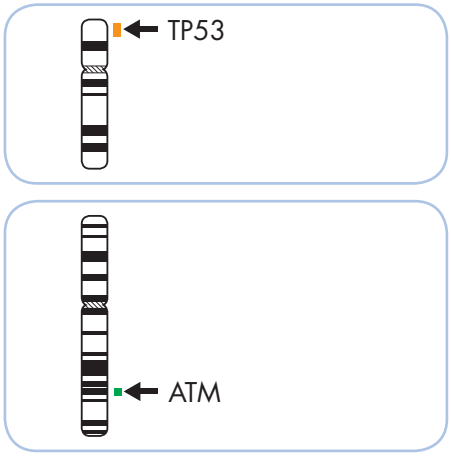
Trisomy 12 represents another frequent chromosomal aberration in CLL, detected in about 20% of CLL cases. Trisomy 12 as single aberration is associated with an intermediate prognostic outcome.

Hence, in combination with further biological markers, morphology and clinical information FISH is a valuable tool to predict disease progression and overall survival.

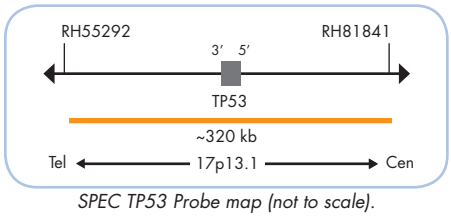
References
Chang H, et al. (1999) Leukemia 13: 105-9.
Dal Bo M, et al. (2011) Genes Chromosomes Cancer 50: 633-43.
Ouillette P, et al. (2011) Clin Cancer Res 21: 6778-90.
Pettitt AR, et al. (2001) Blood 98: 814-22.
Ripollés L, et al. (2006) Cancer Genet Cytogenet 171: 57-64.
Shanafelt TD, et al. (2006) Ann Intern Med 145: 435-47.
Stilgenbauer S, et al. (2002) Leukemia 16: 993-1007.

Probe Description

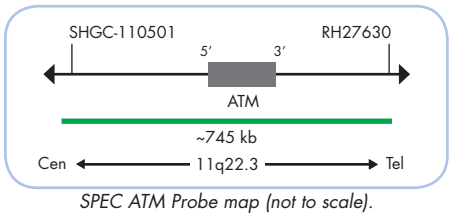
The SPEC TP53/ATM Dual Color Probe is a mixture of an orange fluorochrome direct labeled SPEC TP53 probe hybridizing to the TP53 gene in the chromosomal region 17p13.1 and a green fluorochrome direct labeled SPEC ATM probe specific for the ATM gene at 11q22.3.



Ideograms of chromosomes 17 (above) and 11 (below) indicating the hybridization locations.

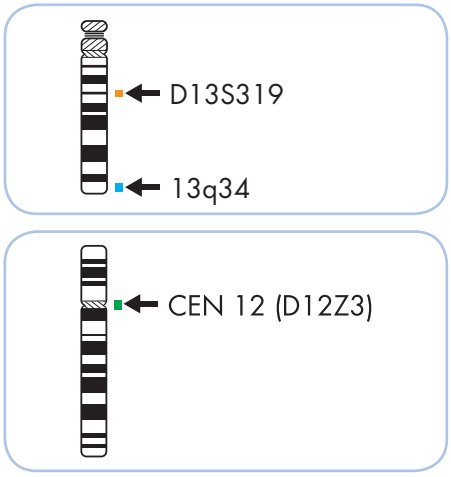


SPEC TP53 Probe map (not to scale).

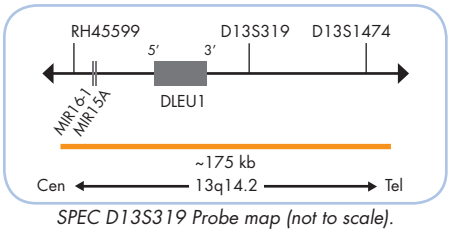


SPEC ATM Probe map (not to scale).

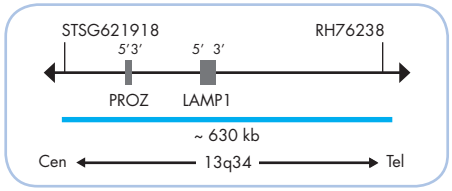
The SPEC D13S319/13q34/CEN 12 Triple Color Probe is a mixture of an orange fluorochrome direct labeled SPEC D13S319 probe specific for the D13S319 locus at 13q14.2, a blue fluorochrome direct labeled SPEC 13q34 probe specific for the chromosomal region 13q34 and a green fluorochrome direct labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3). The SPEC 13q34 probe is specific for the LAMP1 (lysosome-associated membrane protein 1) gene region in 13q34. Due to cross-hybridizations of chromosome 13 alpha satellites to other centromeric regions, probes specific for 13q34 are frequently used for chromosome 13 copy number detection.



Ideograms of chromosomes 13 (above) and 12 (below) indicating the hybridization locations.



SPEC D13S319 Probe map (not to scale).



SPEC 13q34 Probe map (not to scale).

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

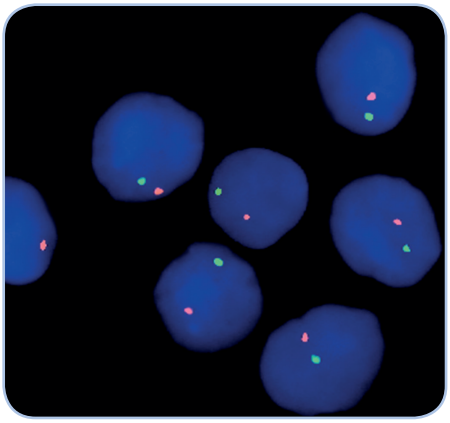
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

93

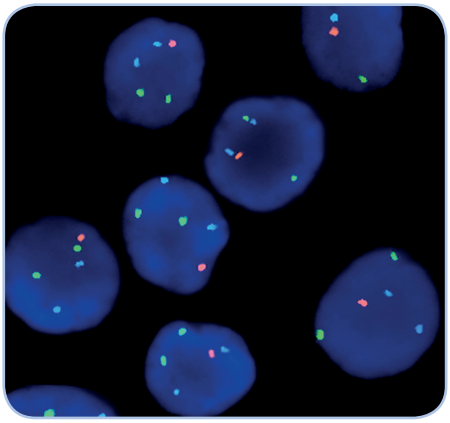
Results

Using the SPEC TP53/ATM Dual Color Probe in a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the TP53 gene locus, a reduced number of orange signals will be observed. Deletions affecting only parts of the TP53 locus might result in a normal signal pattern with orange signals of reduced size. In a cell with ATM gene deletions, a reduced number of green signals will be observed. Deletions affecting only parts of the ATM locus might result in a normal signal pattern with green signals of reduced size.

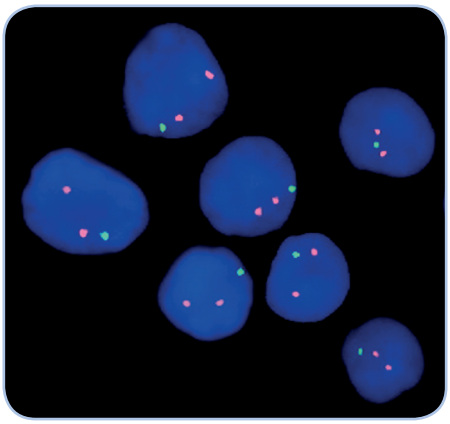
Using the SPEC D13S319/13q34/CEN 12 Triple Color Probe in a normal interphase nucleus, two orange, two green, and two blue signals are expected. In a cell with deletions affecting the D13S319 locus, a reduced number of orange signals will be observed. Deletions affecting only parts of the D13S319 locus might result in a normal signal pattern with orange signals of reduced size. In a cell with trisomy or polysomy 12, three or more copies of the green signal will be observed, respectively.



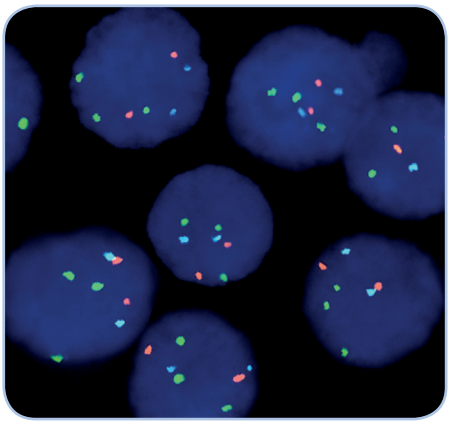
SPEC TP53/ATM Dual Color Probe hybridized to bone marrow biopsy section with deletions of the ATM and the TP53 genes as indicated by one green and one orange signal in each nucleus.



SPEC D13S319/13q34/CEN 12 Triple Color Probe hybridized to bone marrow biopsy section with deletion of the D13S319 locus as indicated by one orange signal and two blue signals in each nucleus.



SPEC TP53/ATM Dual Color Probe hybridized to bone marrow biopsy section with deletion of the ATM gene as indicated by one green signal in each nucleus.



SPEC D13S319/13q34/CEN 12 Triple Color Probe hybridized to bone marrow biopsy section with trisomy of chromosome 12 as indicated by three green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2159-200	ZytoLight SPEC TP53/ATM Dual Color Probe CE IVD	●/●	20 (200 µl)
Z-2160-200	ZytoLight SPEC D13S319/13q34/CEN 12 Triple Color Probe CE IVD	●/●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

94

ZytoLight® SPEC KMT2A Dual Color Break Apart Probe

CE IVD

Background

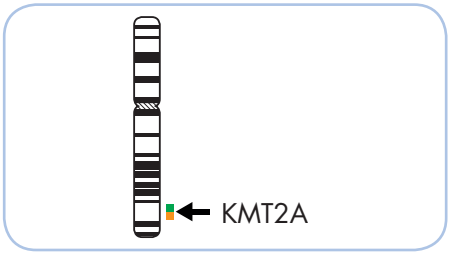
The ZytoLight® SPEC KMT2A Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 11q23.3 harboring the KMT2A gene. The KMT2A (a.k.a. MLL: mixed-lineage leukemia or myeloid-lymphoid leukemia) gene encodes a histone lysine N-methyltransferase and is involved in a variety of cellular processes, including hematopoiesis, DNA damage response, and cell cycle control.

Translocations involving the KMT2A gene are identified in 5-6% of all acute myeloid leukemias (AML) and 5-10% of all acute lymphoblastic leukemias (ALL). The frequency of translocations involving the KMT2A gene is significantly higher in infants with AML (50%) as well as with ALL (80%). More than 30 fusion partners are documented for KMT2A, the most common translocations are t(4;11) and t(11;19) in ALL, and t(6;11), t(9;11), and t(11;19) in AML patients.

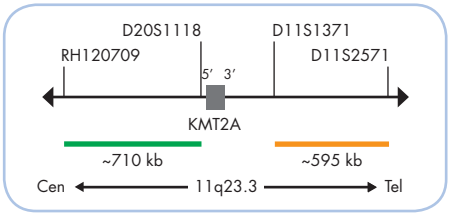
Between 1-15% of cancer patients treated with DNA topoisomerase II inhibitor develop therapy-related leukemia (t-AML) associated with KMT2A translocations. Generally, the presence of KMT2A rearrangements in patients with acute leukemia indicates a less favorable prognosis. However, recent studies suggest that the specific KMT2A translocation partner may influence response to therapy and overall prognosis depending on the clinical context. Hence, detection of KMT2A translocations by Fluorescence *in situ* Hybridization may be of diagnostic and prognostic relevance.

Probe Description

The SPEC KMT2A Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 11q23.3 band. The green fluorochrome direct labeled probe hybridizes proximal to the KMT2A gene, and the orange fluorochrome direct labeled probe hybridizes distal to the KMT2A gene region.



Ideogram of chromosome 11 indicating the hybridization locations.

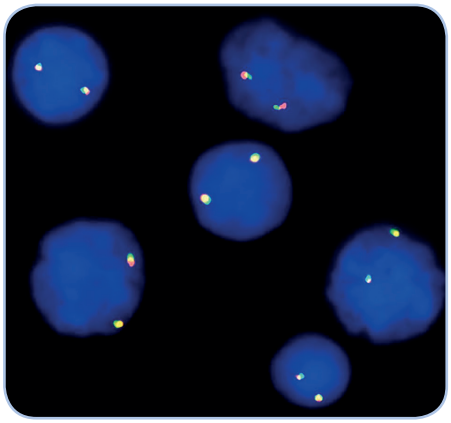


SPEC KMT2A Probe map (not to scale).

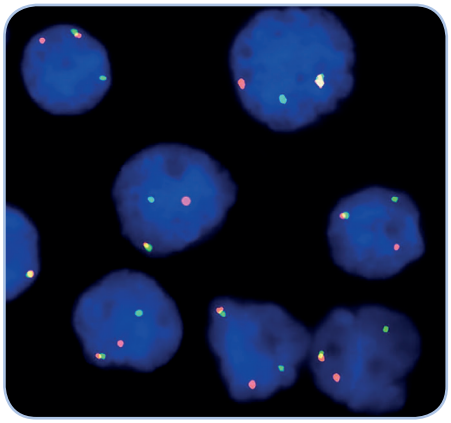
References
Broeker PL, et al. (1996) Blood 87: 1912-22.
De Braekeleer M, et al. (2005) Anticancer Res 25: 1931-44.
Ford DJ & Dingwall AK (2015) Cancer Genet 208: 178-91.
Gindin T, et al. (2014) Hematol Oncol [Epub ahead of print].
Keefe JG, et al. (2010) J Mol Diagn 12: 441-52.
Langer T, et al. (2003) Genes Chromosomes Cancer 36: 393-401.
Wechsler DS, et al. (2003) Genes Chromosomes Cancer 36: 26-36.

Results

In an interphase nucleus lacking a translocation involving the 11q23.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 11q23.3 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 11q23.3 locus and one 11q23.3 locus affected by a translocation.



SPEC KMT2A Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Bone marrow tissue section with translocation of the KMT2A gene as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2193-200	ZytoLight SPEC KMT2A Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC RB1/13q12 Dual Color Probe

CE IVD

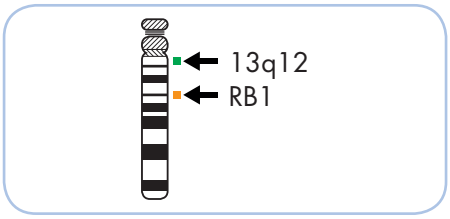
Background

The ZytoLight® SPEC RB1/13q12 Dual Color Probe is designed for the detection of deletions affecting the RB1 gene.
The RB1 (retinoblastoma 1, a.k.a. pRb) gene is located on 13q14.2 and encodes a protein which acts as a tumor suppressor playing a crucial role in cell cycle regulation and genome stability. Deletions of RB1 are frequently found in retinoblastoma.
However, either monoallelic or biallelic deletions of RB1 are also common in a wide variety of solid tumors and hematologic malignancies such as multiple myeloma (MM) and chronic lymphocytic leukemia (CLL).
While 13q14 deletions exclusive of RB1 confer a more favorable prognosis in CLL patients, 13q14 deletions that encompass the RB1 locus (present in approx. 20% of all CLL cases) are associated with shortened survival.
Hence, Fluorescence *in situ* Hybridization is a valuable tool for the detection of RB1 gene deletions and can be used in combination with further biological markers, morphology and clinical information for the prediction of disease progression and overall survival.

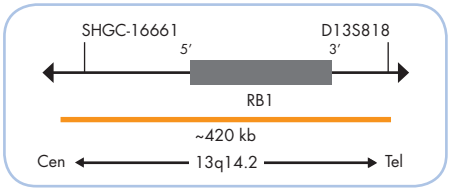
References
Dal Bo M, et al. (2011) Genes Chromosomes Cancer 50: 633-43.
Dao DD, et al. (1994) Leukemia 8: 1280-4.
Di Fiore R, et al. (2013) J Cell Physiol 228: 1676-87.
Juge-Morineau N, et al. (1997) Leuk Lymphoma 24: 229-37.
Orlandi EM, et al. (2013) Hematol Oncol 31: 136-42.
Ouillette P, et al. (2011) Clin Cancer Res 17: 6778-90.

Probe Description

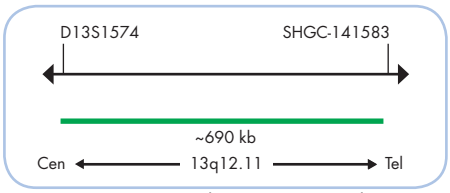
The SPEC RB1/13q12 Dual Color Probe is a mixture of an orange fluorochrome direct labeled SPEC RB1 probe specific for the RB1 gene in the chromosomal region 13q14.2 and a green fluorochrome direct labeled SPEC 13q12 probe specific for the chromosomal region 13q12.11. The SPEC 13q12 Probe is designed to hybridize in close proximity of centromere 13 at 13q12.11. Since chromosomes 13 and 21 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



Ideogram of chromosome 13 indicating the hybridization locations.



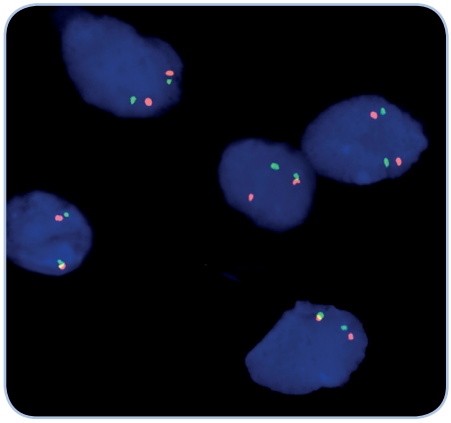
SPEC RB1 Probe map (not to scale).



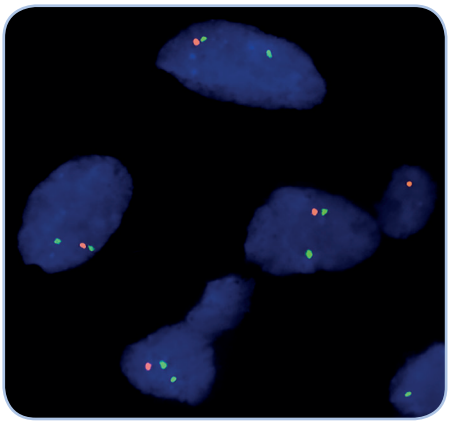
SPEC 13q12 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the RB1 gene locus, one or no copy of the orange signal will be observed.



SPEC RB1/13q12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



SPEC RB1/13q12 Dual Color Probe hybridized to benign spindle cell lipoma tissue section with deletion of the RB1 gene as indicated by one orange signal and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2165-200	ZytoLight SPEC RB1/13q12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

96

ZytoLight® SPEC ETV6 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC ETV6 Dual Color Break Apart Probe is designed for the detection of translocations involving the chromosomal region 12p13.2 harboring the ETV6 (ETS variant gene 6, a.k.a. TEL) gene.

ETV6 is a member of the ETS family of transcription factors. More than 40 translocations with ETV6 involvement have been reported in diverse types of hematological and non-hematological malignancies.

The balanced chromosomal translocation t(12;21)(p13.2;q22.1), which leads to ETV6-RUNX1 fusion, represents the most frequent genetic rearrangement (19-27%) in initial childhood B-cell precursor (BCP) acute lymphoblastic leukemia (ALL) and has been associated with good prognosis.

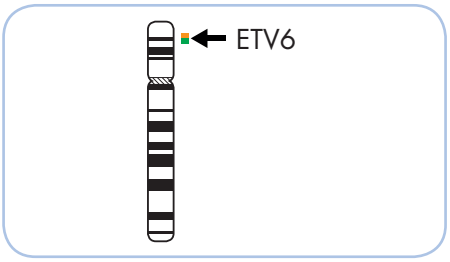
The ETV6-NTRK3 gene fusion resulting from the t(12;15)(p13.2;q25) translocation was found to be characteristic for mammary analogue secretory carcinoma (MASC) of the salivary glands. Since MASC morphologically mimics other neoplasms, the detection of ETV6 rearrangements may be helpful for the differential diagnosis of MASC.

In a subgroup of myeloproliferative disorders, the t(5;12)(q32;p13.2) translocation is a recurrent chromosome abnormality resulting in the fusion of ETV6 to the receptor tyrosine kinase PDGFRB. Patients carrying the t(5;12) translocation can be successfully treated with tyrosine kinase inhibitors.

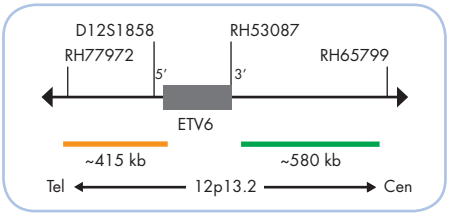
Hence, the detection of ETV6 rearrangements by Fluorescence *in situ* Hybridization may facilitate therapeutic decision making in regards to a variety of hematologic malignancies and some solid tumors.

Probe Description

The SPEC ETV6 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 12p13.2 band. The green fluorochrome direct labeled probe hybridizes proximal and the orange fluorochrome direct labeled probe hybridizes distal to the ETV6 gene.



Ideogram of chromosome 12 indicating the hybridization locations.

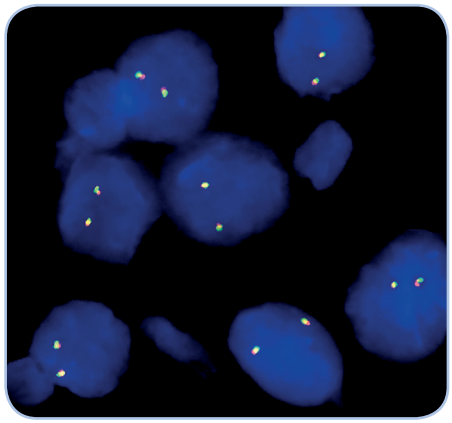


SPEC ETV6 Probe map (not to scale).

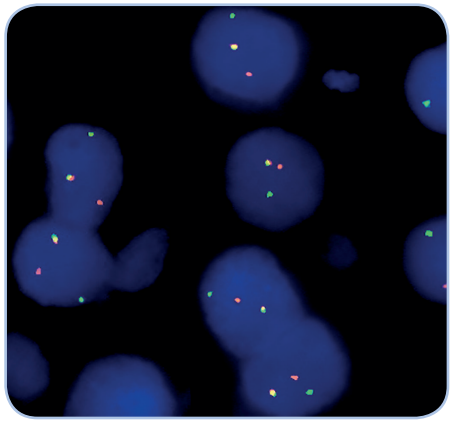
References
Bohlander SK (2005) Semin Cancer Biol 15: 162-74.
De Braekeleer E, et al. (2012) Leuk Res 36: 945-61.
Peter A, et al. (2009) Eur J Haematol 83: 420-32.
Pinto A, et al. (2014) Mod Pathol 27: 30-7.

Results

In an interphase nucleus lacking a translocation involving the 12p13.2 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 12p13.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 12p13.2 locus and one 12p13.2 locus affected by a translocation.



SPEC ETV6 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



MASC tissue section of the salivary glands with translocation of the ETV6 gene as indicated by one non-rearranged orange/green fusion signal, one orange and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2176-200	ZytoLight SPEC ETV6 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE085-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

97

ZytoLight® SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe

CE IVD

Background

The ZytoLight® SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe is designed for the detection of the specific translocation involving the chromosomal region 12p13.2 harboring the ETV6 (ETS variant gene 6, a.k.a. TEL) gene and the chromosomal region 21q22.12 harboring the RUNX1 (runt-related transcription factor 1, a.k.a. AML1) gene.

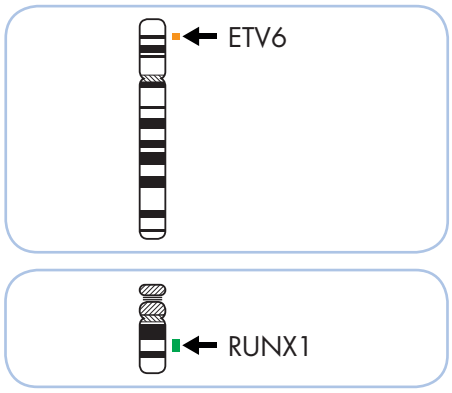
The balanced chromosomal translocation t(12;21)(p13.2;q22.1), which leads to ETV6/RUNX1 fusion, represents the most frequent genetic rearrangement in initial childhood B-cell precursor (BCP) acute lymphoblastic leukemia (ALL) (19-27%) and has been associated with good prognosis. The ETV6/RUNX1 fusion protein, comprising a putative repressor domain of ETV6, a member of the ETS family of transcription factors, fused to RUNX1, the DNA-binding subunit of the RUNX1/CBF beta transcription factor complex, acts as a trans-dominant repressor of RUNX1 regulated target genes involved in hematopoiesis.

Three secondary aberrations in ETV6/RUNX1 positive ALL have been found to negatively influence the clinical course: deletion of the second non-translocated ETV6 allele, gains of the RUNX1 gene, and duplication of the derivative chromosome 21.

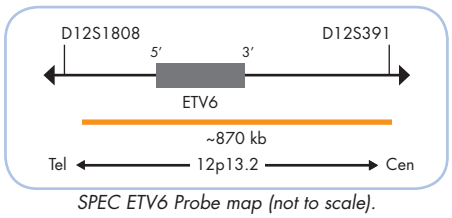
Detection of t(12;21) by Fluorescence *in situ* Hybridization enables the simultaneous identification of the most common secondary changes and thus provides additional information about the possible outcome of the disease in patients with ALL.

Probe Description

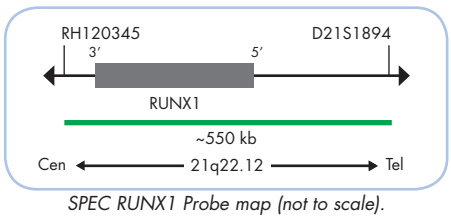
The SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe is a mixture of an orange fluorochrome direct labeled ETV6 probe spanning the known breakpoint region of the ETV6 gene and a green fluorochrome direct labeled RUNX1 probe covering the known breakpoint region of the RUNX1 gene.



Ideograms of chromosomes 12 (above) and 21 (below) indicating the hybridization locations.



SPEC ETV6 Probe map (not to scale).

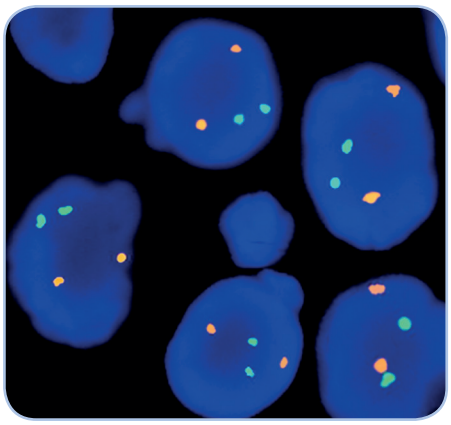


SPEC RUNX1 Probe map (not to scale).

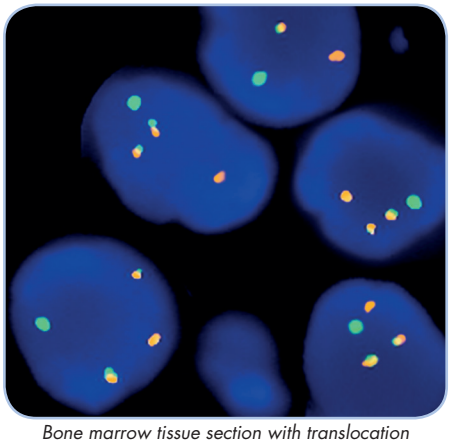
References
Fenrick R, et al. (1999) Mol Cell Biol 19: 6566-74.
Martínez-Ramírez A, et al. (2001) Haematologica 86: 1245-53.
Morrow M, et al. (2007) Oncogene 26: 4404-14.
Peter A, et al. (2009) Eur J Haematol 83: 420-32.
Shurtleff SA, et al. (1995) Leukemia 9: 1985-9.

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange and green signal, respectively.



SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Bone marrow tissue section with translocation affecting the ETV6/RUNX1 loci as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2157-200	ZytoLight SPEC ETV6/RUNX1 Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE072-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

98

ZytoLight® SPEC KRAS/CEN 12 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC KRAS/CEN 12 Dual Color Probe is designed for the detection of KRAS gene amplifications found e.g. in lung cancer.

The KRAS (v-Ki-ras2 Kirsten rat sarcoma viral oncogene homolog) gene located on chromosome 12p12.1 is a member of the RAS gene family comprising HRAS, KRAS, and NRAS, all of which encode a 21 kDa protein. The wildtype proteins play a pivotal role in cell proliferation, differentiation, and senescence. Mutations of KRAS are frequently found in epithelial malignancies and lead to activation of the downstream mitogen-activated protein kinase (MAPK) resulting in unchecked cellular proliferation and tumor progression.

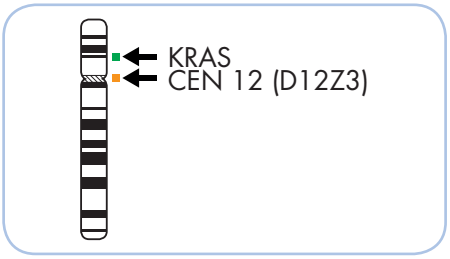
Amplifications of KRAS and the implications in tumorigenesis are not as well characterized as KRAS mutations. However, recent studies using different methods found amplification of KRAS or copy number gain of the 12p12.1 region including KRAS in various primary tumors, as e.g. in lung, colorectal, pancreatic, and gastric cancers.

For non-small cell lung cancer (NSCLC) patients KRAS amplification as assessed by Fluorescence *in situ* Hybridization (FISH) was detected in about 15% of the tumors. Amplification of KRAS was found to be correlated with poor prognosis and may act synergistically with KRAS mutations to promote tumor progression.

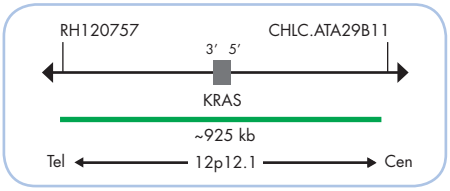
References
Little AS, et al. (2011) Sci Signal 4: er2.
Mita H, et al. (2009) BMC Cancer 9: 198.
Sasaki H, et al. (2011) J Thorac Oncol 6: 15-20.
Wagner PL, et al. (2011) Lung Cancer 74: 118-23.

Probe Description

The SPEC KRAS/CEN 12 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3) and a green fluorochrome direct labeled SPEC KRAS probe specific for the KRAS gene at 12p12.1.



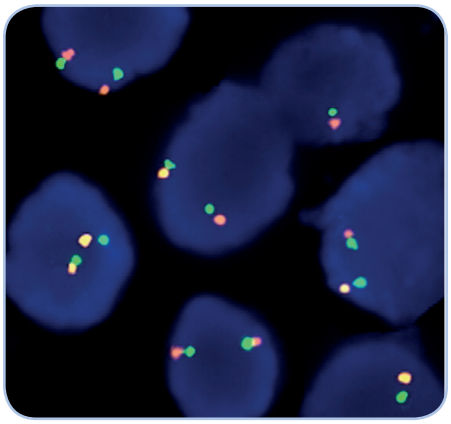
Ideogram of chromosome 12 indicating the hybridization locations.



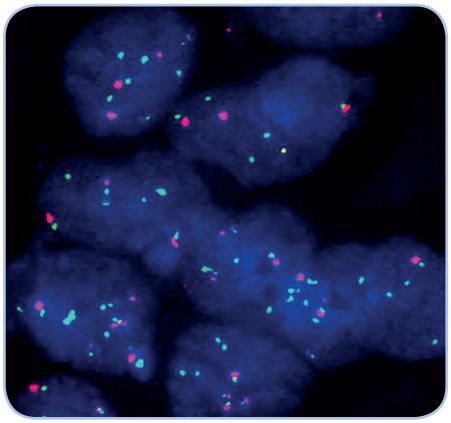
SPEC KRAS Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. Nuclei with amplification of the KRAS gene locus 12p12.1 or aneuploidy of chromosome 12 will show multiple copies of the green signal or large green signal clusters.



SPEC KRAS/CEN 12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Lung cancer tissue section with amplification of the KRAS gene (green).

Image kindly provided by Prof. Diebold, Lucerne, Switzerland.

Prod. No.	Product	Label	Tests* (Volume)
Z-2115-200	ZytoLight SPEC KRAS/CEN 12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE056-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

99

ZytoLight® SPEC DDIT3 Dual Color Break Apart Probe

Previously: ZytoLight SPEC CHOP Dual Color Break Apart Probe

CE IVD

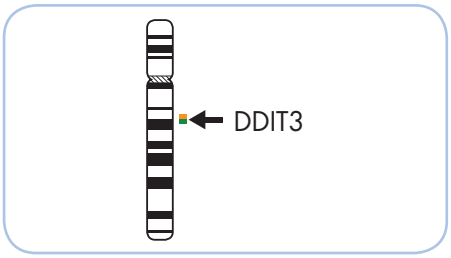
Background

The ZytoLight® SPEC DDIT3 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 12q13.3 harboring the DDIT3 (C/EBP-homologous protein) gene (a.k.a. CHOP, GADD153).
The DDIT3 gene encodes for a stress-induced dominant-negative inhibitor of the transcription factors C/EBP and LAP. DDIT3 is consistently rearranged in myxoid liposarcomas (MLS). The most frequent translocation involving the DDIT3 gene region is t(12;16)(q13.3;p11.2) and occurs in about 90% of patients with MLS. The rearrangement results in a fusion gene comprising the 5´part of the FUS (fused in sarcoma) gene, located in 16p11.2, and the complete coding region of the DDIT3 gene. The FUS-DDIT3 fusion protein acts as an abnormal transcription factor and development of myxoid liposarcomas is thus regarded as a consequence of deregulated FUS-DDIT3 target genes.
Differential diagnosis of liposarcomas and accurate classification, the latter being especially important with regard to appropriate treatment and prognosis, are often problematic. Therefore, detection of DDIT3 rearrangements via FISH analysis is a valuable tool to confirm the histopathological diagnosis of myxoid liposacrcoma.

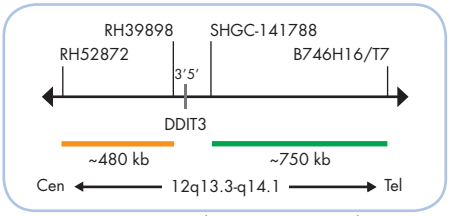
References
Åman P, et al. (1992) Genes Chromosomes Cancer 5: 278-85.
Andersson M, et al. (2010) BMC Cancer 10: 249-58.
Germano G, et al. (2010) Cancer Res 70: 2235-44.
Meis-Kindblom JM, et al. (2001) Virchows Arch 439: 141-51.
Panagopoulos I, et al. (1994) Cancer Res 54: 6500-3.
Ron D & Habener JF (1992) Genes Dev 6: 439-53.

Probe Description

The SPEC DDIT3 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 12q13.3-q14.1 band. The orange fluorochrome direct labeled probe hybridizes proximal to the DDIT3 gene and the green fluorochrome direct labeled probe hybridizes distal to that gene.



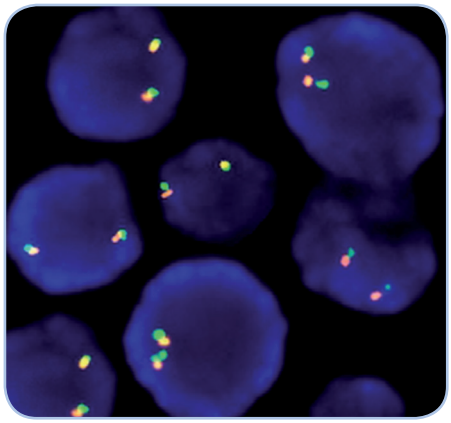
Ideogram of chromosome 12 indicating the hybridization locations.



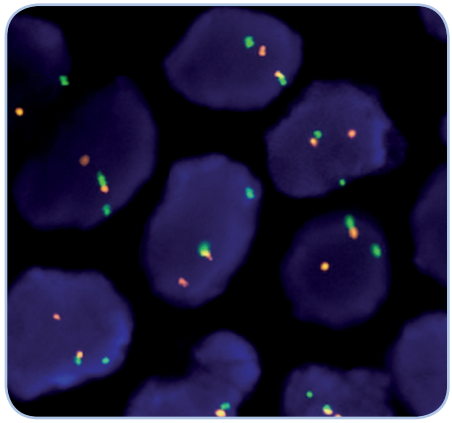
SPEC DDIT3 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 12q13.3-q14.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 12q13.3-q14.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 12q13.3-q14.1 locus and one 12q13.3-q14.1 locus affected by a 12q13.3-q14.1 translocation.



SPEC DDIT3 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Myxoid liposarcoma tissue section with translocation affecting the 12q13.3-q14.1 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2100-50	ZytoLight SPEC DDIT3 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC CDK4/CEN 12 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC CDK4/CEN 12 Dual Color Probe is designed for the detection of CDK4 gene amplifications. The cyclin-dependent kinase 4 (CDK4) gene is located in the chromosomal region 12q14.1, ~10 Mb centromeric to the murine double minute (MDM2) gene and is frequently coamplified with MDM2 in different malignancies.

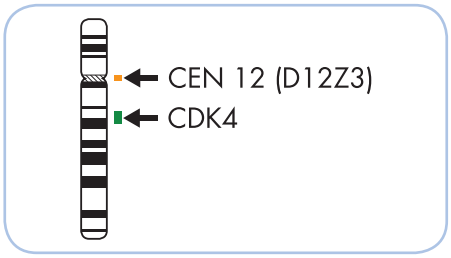
In a complex with cyclin D1 (CCND1), the CDK4 encoded serine/threonine kinase phosphorylates the retinoblastoma protein 1 (RB1) which in turn leads to the release of the EF2 transcription factor and subsequently to an upregulation of genes which are required for progression through the S-, G2-, and M-phases of the cell cycle. Due to amplification of the respective chromosomal region, CDK4 is overexpressed in many human tumors such as soft tissue sarcomas, osteosarcomas (OS), and gliomas. In glioblastomas, the lack of amplification of several genes like CDK4 was recognized to be associated with a longer survival time. In OS, coamplification of MDM2 and CDK4, located in two discontinuous regions, occurs frequently in parosteal OS and less often in classical high-grade OS.

Although MDM2/CDK4 coamplification is not restricted to atypical lipomatous tumors/well-differentiated liposarcomas (ALT/WDLPS) and dedifferentiated liposarcomas (DDLPS), its detection is a strong criterion for distinguishing these tumor types from other undifferentiated sarcomas and even from carcinomas and lymphomas.

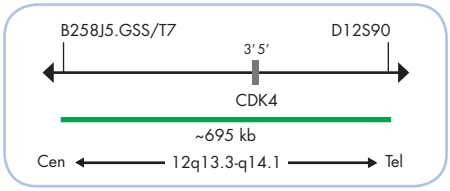
References
Binh MB, et al. (2005) Am J Surg Pathol 29: 1340-7.
Fischer U, et al. (2010) Int J Cancer 126: 2594-602.
Lopes MA, et al. (2001) Oral Oncol 37: 566-71.
Mejia-Guerrero S, et al. (2010) Genes Chromosomes Cancer 49: 518-25.
Sirvent N, et al. (2007) Am J Surg Pathol 31: 1476-89.
Wunder JS, et al. (1999) Oncogene 18: 783-8.

Probe Description

The SPEC CDK4/CEN 12 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3) and a green fluorochrome direct labeled SPEC CDK4 probe specific for the chromosomal region 12q13.3-q14.1 harboring the CDK4 gene.



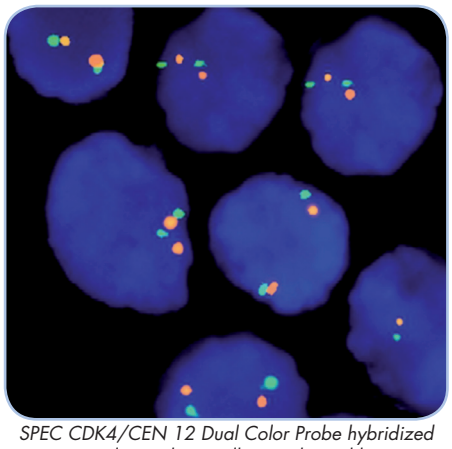
Ideogram of chromosome 12 indicating the hybridization locations.



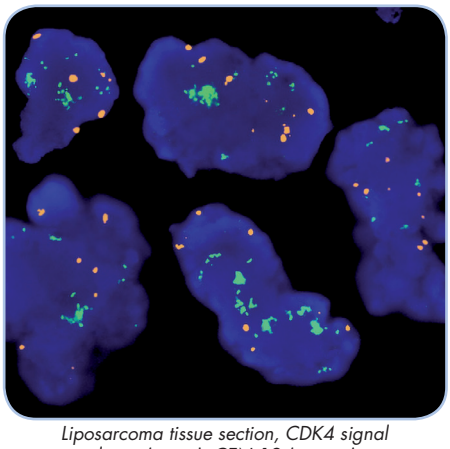
SPEC CDK4 Probe map (not to scale).

Results

In a normal interphase nucleus two orange and two green signals are expected. Nuclei with amplification of the CDK4 gene locus 12q13.3-q14.1, or polysomy of chromosome 12 will show multiple copies of the green signal or large green signal clusters.



SPEC CDK4/CEN 12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Liposarcoma tissue section, CDK4 signal cluster (green), CEN 12 (orange).

Prod. No.	Product	Label	Tests* (Volume)
Z-2103-200	ZytoLight SPEC CDK4/CEN 12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE034-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

101

ZytoLight® SPEC MDM2/CEN 12 Dual Color Probe

CE IVD

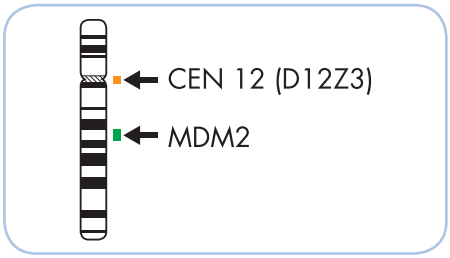
Background

The ZytoLight® SPEC MDM2/CEN 12 Dual Color Probe is designed for the detection of MDM2 gene amplifications found in more than 10% of human tumors. The MDM2 (mouse double minute 2) gene is located in the chromosomal region 12q15 and encodes for an E3 ubiquitin ligase which acts as a major negative regulator of the tumor suppressor p53. Due to amplification of the respective chromosomal region, MDM2 is overexpressed in many human tumors such as soft tissue sarcomas, osteosarcomas, gliomas, NSCLC, gastric and breast carcinomas. Well-differentiated liposarcomas (WDLPS), the most common soft tissue tumors in adults, are characterized by the amplification of 12q-derived chromosomal material, harboring the MDM2 oncogene while lipomas show balanced translocations involving 12q13-15. Accordingly, detection of the 12q14-15 amplification is regarded as a valuable tool for the differential diagnosis between WDLPS and lipomas. Furthermore, detection of MDM2 amplification might have prognostic relevance in gastrointestinal stromal tumors (GIST), the most common primary mesenchymal tumor of the gastrointestinal tract.

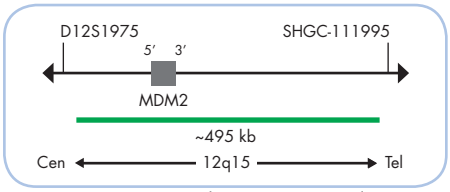
References
Brisson M, et al. (2013) Skeletal Radiol 42: 635-47.
Duhamel LA, et al. (2012) Histopathology 60: 357-9.
Flanagan AM, et al. (2010) Skeletal Radiol 39: 213-24.
Kashima T, et al. (2012) Mod Pathol 25: 1384-96.
Kikuchi K, et al. (2013) Sarcoma 2013: 520858.
Korcheva VB, et al. (2011) Appl Immunhistochem Mol Morphol 19: 119-25.
Larousserie F, et al. (2013) Eur J Radiol 82: 2149-53.
Lokka S, et al. (2014) BMC Clin Pathol 14: 36.
Luan SL, et al. (2010) J Pathol 222: 166-79.
Momand J, et al. (1992) Cell 69: 1237-45.
Oliner JD, et al. (1992) Nature 358: 80-3.
Pedeutour F, et al. (1994) Genes Chromosomes Cancer 10: 85-94.
Pedeutour F, et al. (2004) Bull Cancer 91: 317-23.
Pedeutour F, et al. (2012) Virchows Arch 461: 67-78.
Poaty H, et al. (2012) PLoS One 7: e29426.
Toledo F & Wahl GM (2006) Nat Rev Cancer 6: 909-23.
Tornillo L, et al. (2005) Lab Invest 85: 921-31.
Vassilev LT (2007) Trends Mol Med 13: 23-31.

Probe Description

The SPEC MDM2/CEN 12 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3) and a green fluorochrome direct labeled SPEC MDM2 probe specific for the MDM2 gene at 12q15.



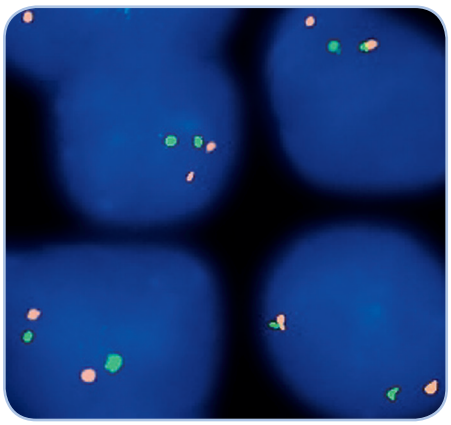
Ideogram of chromosome 12 indicating the hybridization locations.



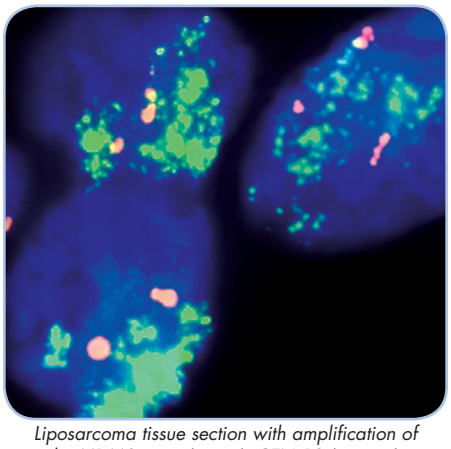
SPEC MDM2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the MDM2 gene locus, multiple copies of the green signal or green signal clusters will be observed.



Normal interphase cells, MDM2 (green), CEN 12 (orange).



Liposarcoma tissue section with amplification of the MDM2 gene (green), CEN 12 (orange).

Prod. No.	Product	Label	Tests* (Volume)
Z-2013-50	ZytoLight SPEC MDM2/CEN 12 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2013-200	ZytoLight SPEC MDM2/CEN 12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE003-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

102

ZytoLight® SPEC FOXO1 Dual Color Break Apart Probe

Previously: ZytoLight SPEC FKHR Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC FOXO1 Dual Color Break Apart Probe is designed for the detection of specific translocations involving the chromosomal region 13q14.11 harboring the FOXO1 (forkhead box O1, a.k.a. FKHR) gene characteristic for alveolar rhabdomyosarcoma.

Among solid tumors of the childhood, rhabdomyosarcoma (RMS) is the most common soft tissue sarcoma. RMS are classified in two main categories: embryonal rhabdomyosarcoma (ERMS) and alveolar rhabdomyosarcoma (ARMS). The alveolar histology is associated with a poorer prognosis. ARMS is characterized by two tumor-specific reciprocal translocations t(2;13)(q36;q14.1) and t(1;13)(p36.1;q14.1) detectable in more than 80% of all ARMS. These translocations fuse the FOXO1 locus on 13q14.11 to either PAX3 on chromosome 2 or to PAX7 on chromosome 1. The resulting fusion transcripts encode for the chimeric proteins PAX3-FOXO1 and PAX7-FOXO1 that combine transcriptional domains from the corresponding wild-type proteins and thereby acquire oncogenic activity.

The translocations and their fusion genes represent highly specific genetic markers useful in the diagnosis of ARMS.

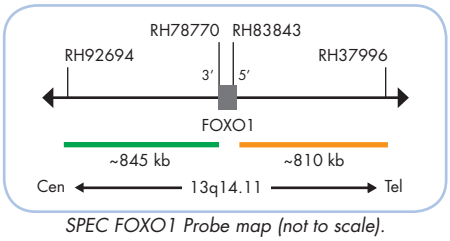
References

Dal Cin P, et al. (1991) Cancer Genet Cytogenet 55: 191-5.
Douglass EC, et al. (1991) Genes Chromosomes Cancer 3: 480-2.
Gunawan B, et al. (1999) Pathol Oncol Res 5: 211-3.
Seidal T, et al. (1982) Acta Pathol Microbiol Immunol Scand A 90: 345-54.
Sorensen PH, et al. (2002) J Clin Oncol 20: 2672-9.

Probe Description

The SPEC FOXO1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 13q14.11 band. The orange fluorochrome direct labeled probe hybridizes distal, the green fluorochrome direct labeled probe hybridizes proximal to the breakpoint region of the FOXO1 gene.

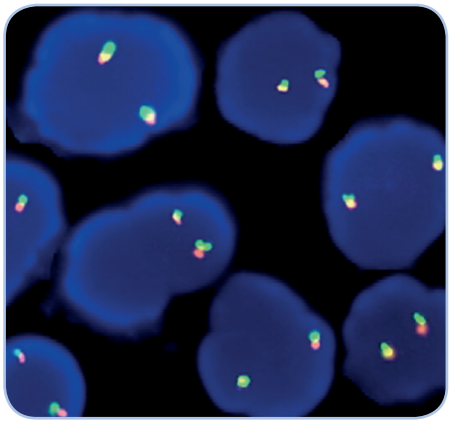
Ideogram of chromosome 13 indicating the hybridization locations.



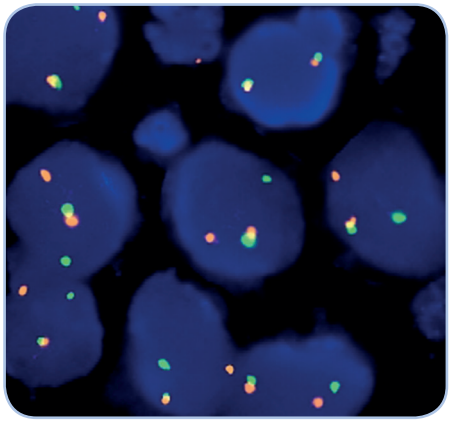
SPEC FOXO1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 13q14.11 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 13q14.11 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 13q14.11 locus and one 13q14.11 locus affected by a translocation.



SPEC FOXO1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Rhabdomyosarcoma tissue section with translocation affecting the 13q14.11 locus harboring FOXO1 as indicated by one orange/green fusion signal (non-rearranged), one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2139-50	ZytoLight SPEC FOXO1 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE059-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

103

ZytoLight® SPEC FOXO1/PAX3 Dual Color Single Fusion Probe

Previously: ZytoLight RMS I Probe SPEC t(2;13) Dual Color Fusion Probe

ZytoLight® SPEC FOXO1/PAX7 Dual Color Single Fusion Probe

Previously: ZytoLight RMS II Probe SPEC t(1;13) Dual Color Fusion Probe

CE IVD

Background

The ZytoLight® SPEC FOXO1/PAX3 Dual Color Single Fusion Probe and SPEC FOXO1/PAX7 Dual Color Single Fusion Probe are designed to detect translocations t(2;13)(q36;q14.1) and t(1;13)(p36.1;q14.1) in alveolar rhabdomyosarcomas. Among solid tumors of the childhood, rhabdomyosarcoma is the most common soft tissue sarcoma. Rhabdomyosarcomas are classified in two main categories: embryonal and alveolar rhabdomyosarcoma. The alveolar histology is associated with a poorer prognosis. Alveolar rhabdomyosarcoma is characterized by two tumor-specific translocations, i.e., t(2;13)(q36;q14.1) and t(1;13)(p36.1;q14.1) which are detectable in most cases of alveolar rhabdomyosarcomas.

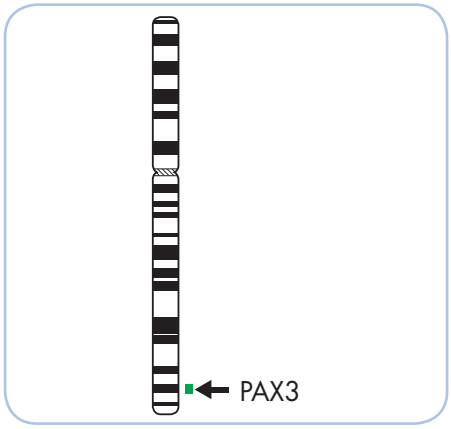
The translocations and their fusion genes represent highly specific genetic markers useful in the diagnosis of alveolar rhabdomyosarcomas.

Correlations between the type of translocation and clinical features as e.g. longer disease-free survival have been identified.

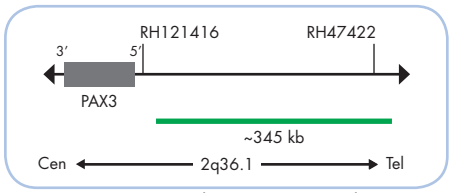
References
Dal Cin P, et al. (1991) Cancer Genet Cytogenet 55: 191-5.
Douglass EC, et al. (1991) Genes Chromosomes Cancer 3: 480-2.
Gunawan B, et al. (1999) Pathol Oncol Res 5: 211-3.
Rekhi B, et al. (2014) Pathol Res Pract 210: 328-33.
Seidal T, et al. (1982) Acta Pathol Microbiol Immunol Scand [A]: 345-54.

Probe Description

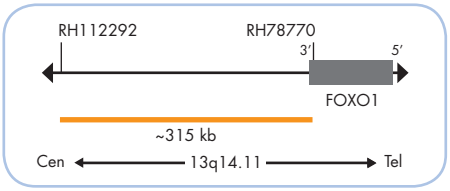
The SPEC FOXO1/PAX3 Dual Color Single Fusion Probe is a mixture of two direct labeled probes hybridizing to the 2q36.1 and 13q14.11 band. The green fluorochrome direct labeled probe hybridizes distal to the PAX3 gene at 2q36.1, the orange fluorochrome direct labeled probe hybridizes proximal to the FOXO1 gene at 13q14.11.



Ideograms of chromosomes 2 (above) and 13 (below) indicating the hybridization locations.

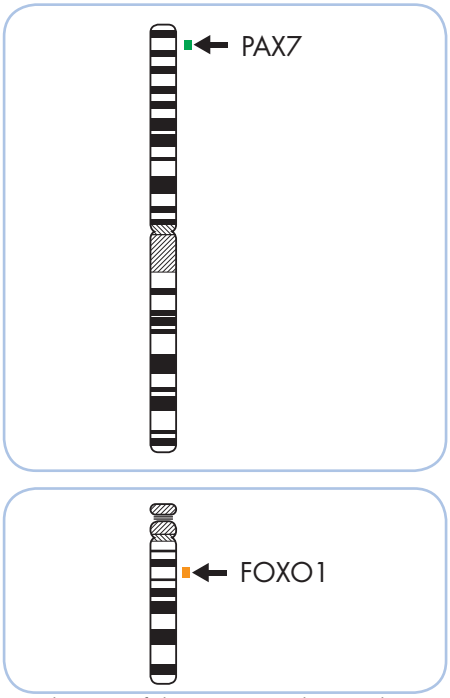


SPEC PAX3 Probe map (not to scale).

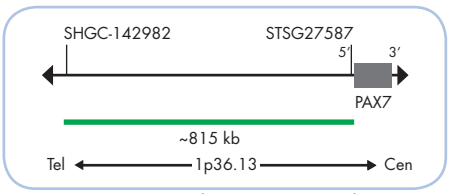


SPEC FOXO1 Probe map (not to scale).

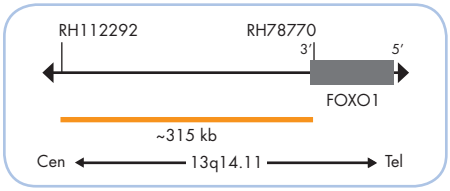
The SPEC FOXO1/PAX7 Dual Color Single Fusion Probe is a mixture of two direct labeled probes hybridizing to the 1p36.13 and 13q14.11 band. The green fluorochrome direct labeled probe hybridizes distal to the PAX7 gene at 1p36.13, the orange fluorochrome direct labeled probe hybridizes proximal to the FOXO1 gene at 13q14.11.



Ideograms of chromosomes 1 (above) and 13 (below) indicating the hybridization locations.



SPEC PAX7 Probe map (not to scale).



SPEC FOXO1 Probe map (not to scale).

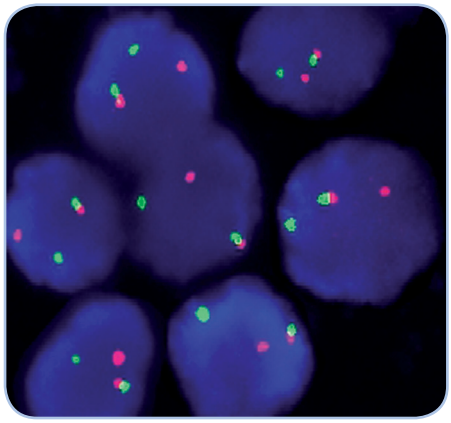
FE007-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

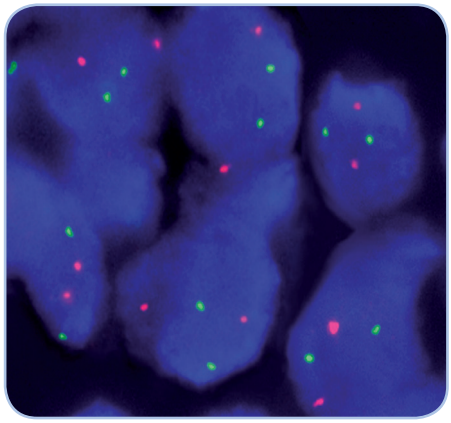
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Results

In an interphase nucleus lacking the t(1;13) or t(2;13), respectively, two orange and two green signals are expected. In a cell harboring the t(1;13) or t(2;13), respectively, one orange signal, one green signal, and one orange/green fusion signal will be observed.



SPEC FOXO1/PAX3 Dual Color Single Fusion Probe hybridized to abnormal nuclei harboring a t(2;13)(q35;q14) as indicated by one orange, one green, and one orange/green fusion signal.



SPEC FOXO1/PAX7 Dual Color Single Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2018-50	ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	●/●	5 (50 µl)
Z-2018-200	ZytoLight SPEC FOXO1/PAX3 Dual Color Single Fusion Probe CE IVD	●/●	20 (200 µl)
Z-2019-50	ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	●/●	5 (50 µl)
Z-2019-200	ZytoLight SPEC FOXO1/PAX7 Dual Color Single Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

105

ZytoLight® SPEC GAS6/13q12 Dual Color Probe

CE IVD

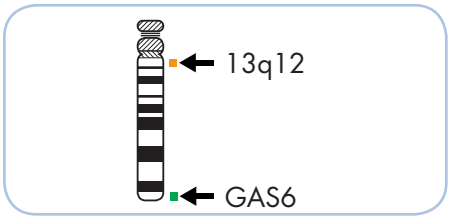
Background

The ZytoLight® SPEC GAS6/13q12 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the GAS6 gene.
The GAS6 (growth arrest-specific 6, a.k.a. AXSF, AXLLG) gene is located on chromosome 13q34 and encodes a ligand for the receptor tyrosine kinase family TAM which includes the proteins TYRO3, AXL, and MERTK. GAS6 has the highest affinity for AXL, followed by TYRO3, and MERTK. Binding of GAS6 to TAM receptors has been shown to promote proliferation and survival of cancer cells *in vitro*.
GAS6 overexpression and its association with poorer prognosis has been reported in several human cancers including glioblastoma, pancreatic ductal adenocarcinoma, ovarian cancer, and cytogenetically normal acute myeloid leukemia.
In patients with gastric cancer, high expression of GAS6 was shown to be associated with lymph node metastasis. GAS6 has been shown to be a target for overexpression and amplification in breast cancer positively correlating with a number of favorable prognostic markers including smaller tumor size.
Hence, the identification of GAS6 gene copy number changes by Fluorescence *in situ* Hybridization may be of prognostic significance in various types of tumors. Moreover, interventions which inhibit GAS6 pathways could have therapeutic potential.

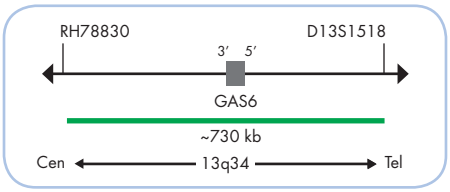
References
Abba MC, et al. (2007) Cancer Res 67: 4104-12.
Buehler M, et al. (2013) Biomed Res Int 2013: 238284.
Hutterer M, et al. (2008) Clin Cancer Res 14: 130-8.
Mc Cormack O, et al. (2008) Br J Cancer 98: 1141-6.
Nagata K, et al. (1996) J Biol Chem 271: 30022-7.
Song X, et al. (2011) Cancer 117: 734-43.
Verma A, et al. (2011) Mol Cancer Ther 10: 1763-73.
Whitman SP, et al. (2014) Leukemia 28: 1252-8.

Probe Description

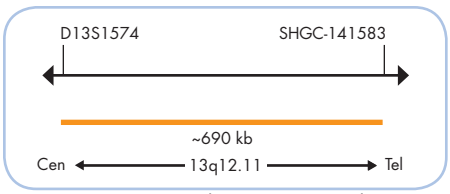
The SPEC GAS6/13q12 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC GAS6 probe hybridizing to the human GAS6 gene in the chromosomal region 13q34 and an orange fluorochrome direct labeled SPEC 13q12 probe specific for 13q12.11. The SPEC 13q12 Probe is designed to hybridize in close proximity of centromere 13 at 13q12.11. Since chromosomes 13 and 21 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



Ideogram of chromosome 13 indicating the hybridization locations.



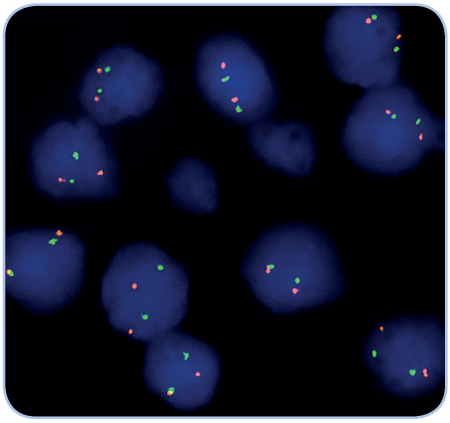
SPEC GAS6 Probe map (not to scale).



SPEC 13q12 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the GAS6 gene locus, multiple copies of the green signal or green signal clusters will be observed.


SPEC GAS6/13q12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2156-200	ZytoLight SPEC GAS6/13q12 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC BCL2L2/14q32 Dual Color Probe

CE IVD

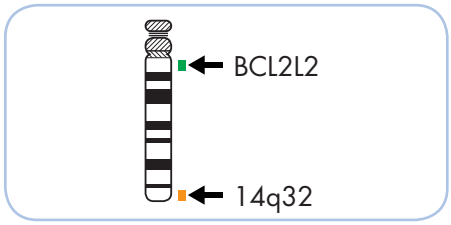
Background

The ZytoLight® SPEC BCL2L2/14q32 Dual Color Probe is designed for the detection of BCL2L2 gene amplifications.
The BCL2L2 (BCL2-like 2, a.k.a. BCL-W) gene is located in the chromosomal region 14q11.2 and encodes for an anti-apoptotic protein that belongs to the BCL2 family. These genes are involved in a wide variety of cellular activities including lymphocyte development and hematopoiesis. BCL2L2 amplifications have been reported in several human cancers including lung, ovarian, breast, and hematologic malignancies.
BCL2L2 amplifications are found in many tumor cell lines with resistance to chemotherapeutic agents. Targeting the BCL2 family proteins with small non-peptidic compounds, so called BH3-mimetics, is currently investigated in clinical trials. Hence, the identification of BCL2L2 amplifications by Fluorescence *in situ* Hybridization and the inhibition of BCL2L2 signaling may be of therapeutic significance in various types of tumors.

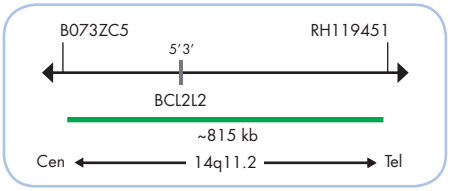
References
Beroukhim R, et al. (2010) Nature 463: 899-905.
Booher RN, et al. (2014) PloS One 9: e108371.
Sochalska M, et al. (2015) FEBS J 282: 834-49.
Yasui K, et al. (2004) Cancer Res 64: 1403-10.

Probe Description

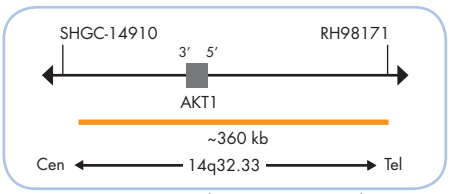
The SPEC BCL2L2/14q32 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC BCL2L2 probe hybridizing to the BCL2L2 gene in the chromosomal region 14q11.2 and an orange fluorochrome direct labeled SPEC 14q32 probe specific for the chromosomal region 14q32.33. Due to cross-hybridizations of chromosome 14 alpha satellites to other centromeric regions, probes specific for 14q32 are frequently used for chromosome 14 copy number detection.



Ideogram of chromosome 14 indicating the hybridization locations.



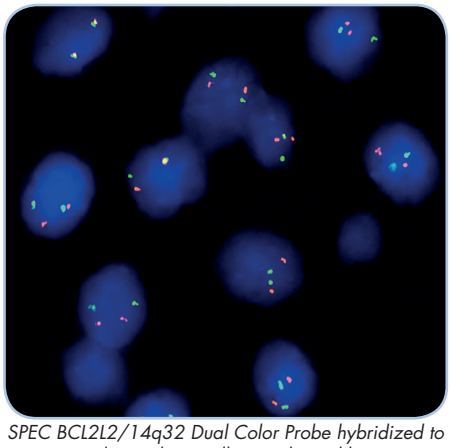
SPEC BCL2L2 Probe map (not to scale).



SPEC 14q32 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the BCL2L2 gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC BCL2L2/14q32 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2172-200	ZytoLight SPEC BCL2L2/14q32 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE107-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC IGH Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC IGH Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 14q32.33 harboring the IGH gene.

Rearrangements involving the IGH (immunoglobulin heavy locus, a.k.a. IGH@) gene are considered to be cytogenetic hallmarks for non-Hodgkin lymphoma (NHL). NHLs represent 50% of all hematological malignancies.

IGH gene rearrangements have been identified in about 50% of NHLs and are associated with specific subtypes of NHLs. Translocation t(11;14)(q13.3;q32.3) can be found in about in 95% of mantle cell lymphoma (MCL), t(14;18)(q32.3;q21.3) in 80% of follicular lymphoma (FL), t(3;14)(q27;q32.3) in diffuse large B-cell lymphoma (DLBCL), and t(8;14)(q24.21;q32.3) in Burkitt's lymphoma. In all of these translocations an oncogene located near the breakpoint of the translocation partner is activated by juxtaposing to IGH regulatory sequences.

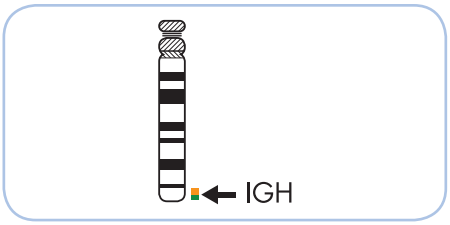
Rearrangements involving 14q32.33 have unique biological characteristics and correlate with clinical, morphological, and immunophenotypic features. Fluorescence *in situ* Hybridization is a helpful tool for the diagnosis, selecting treatment, and giving prognostic information.

References

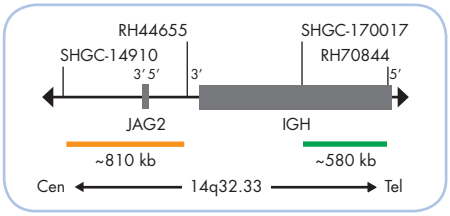
Bernicot I, et al. (2007) Cytogenet Genome Res 118: 345-52.
Hehne S, et al. (2012) Pathol Res Pract 208: 510-7.
Kazuhiro N, et al. (1997) Blood 90: 526-34.
Lu S, et al. (2004) Cancer Genet and Cytogenet 152: 141-5.
Quintero-Rivera F, et al. (2009) Cancer Genet and Cytogenet 190: 33-9.

Probe Description

The SPEC IGH Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 14q32.33 band. The orange fluorochrome direct labeled probe hybridizes proximal, and the green fluorochrome direct labeled probe hybridizes distal to the constant regions of the IGH locus.



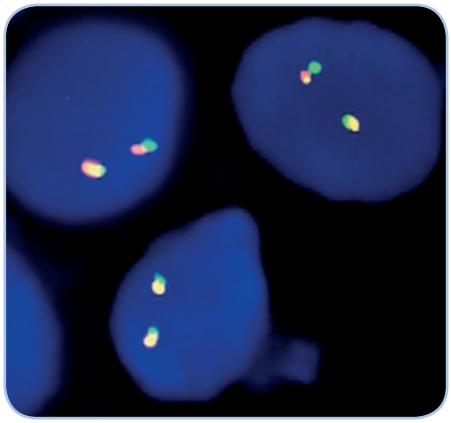
Ideogram of chromosome 14 indicating the hybridization locations.



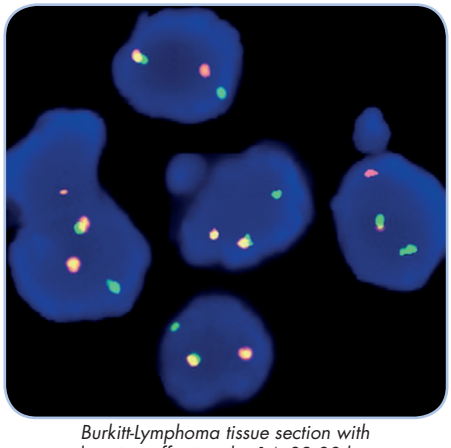
SPEC IGH Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 14q32.33 band two orange/green fusion signals are expected representing two normal (non-rearranged) 14q32.33 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 14q32.33 locus and one 14q32.33 locus affected by a translocation.



SPEC IGH Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Burkitt-Lymphoma tissue section with translocation affecting the 14q32.33 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2110-200	ZytoLight SPEC IGH Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

108

ZytoLight® SPEC PML/RARA Dual Color Dual Fusion Probe

CE IVD

Background

The ZytoLight® SPEC PML/RARA Dual Color Dual Fusion Probe is designed to detect the translocation t(15;17)(q24;q21.2) affecting the PML gene in the chromosomal region 15q24.1 and the RARA locus in 17q21.2.

Translocations involving the PML (promyelocytic leukemia, a.k.a. MYL) gene and the RARA (retinoic acid receptor alpha, a.k.a. RARα) gene are considered to be characteristic for acute promyelocytic leukemia (APL), a subtype of acute myeloid leukemia.

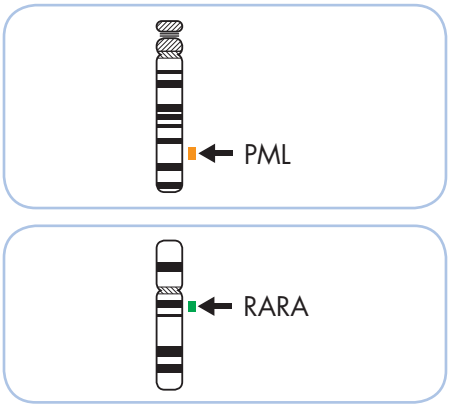
Various fusion partners of RARA have been identified, however, in 95% of all APL cases, rearrangements involving the PML gene are detectable. This translocation t(15;17)(q24;q21) leads to a gene fusion of the PML and the RARA gene. The fusion is supposed to play a fundamental role in induction, development, and progression of APL.

Since the PML/RARA fusion accounts for the response of these neoplasms to all-trans retinoic acid (ATRA) therapy and other conventional chemotherapy it is important to accurately distinguish between t(15;17) translocations and translocations involving other partners of RARA.

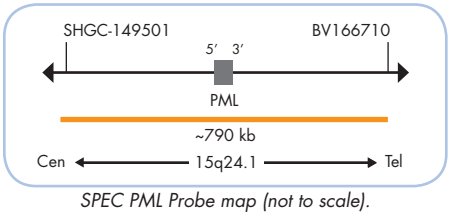
References
Abe S, et al. (2008) Cancer Genet and Cytogenet 184: 44-7.
Brockmann SR, et al. (2003) Cancer Genet and Cytogenet 145: 144-51.
Reiter A, et al. (2004) Acta Hematol 112: 55-67.
Sanz MA, et al. (2009) Blood 113: 1875-91.

Probe Description

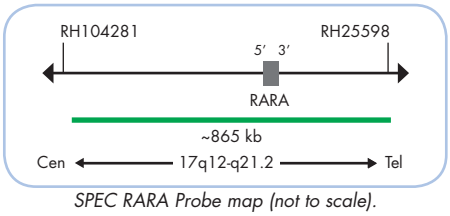
The SPEC PML/RARA Dual Color Dual Fusion Probe is a mixture of an orange fluorochrome direct labeled PML probe spanning the known PML breakpoints, and a green fluorochrome direct labeled RARA probe spanning the known breakpoints of RARA.



Ideograms of chromosomes 15 (above) and 17 (below) indicating the hybridization locations.



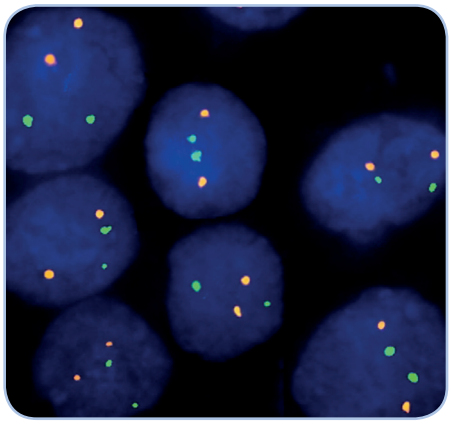
SPEC PML Probe map (not to scale).



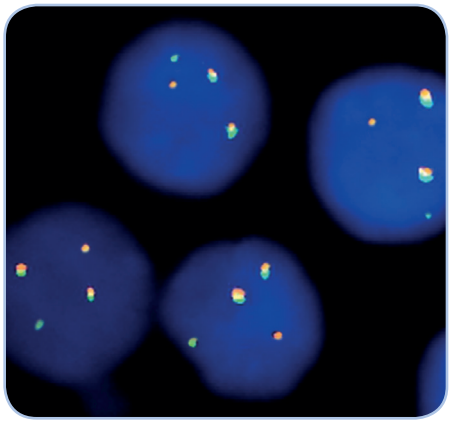
SPEC RARA Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal PML/RARA translocation leads to two orange/green fusion signals indicating both rearranged chromosomes. Additionally, the non-rearranged chromosomes are indicated by one orange signal and a separate green signal, respectively.



SPEC PML/RARA Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Bone marrow biopsy section with translocation affecting the PML/RARA loci as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2113-200	ZytoLight SPEC PML/RARA Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

109

ZytoLight® SPEC FUS Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC FUS Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 16p11.2 harboring the FUS (fused in sarcoma) gene (a.k.a. TLS, FUS/TLS, hnRNP P2).

The FUS gene encodes an RNA-binding protein, the C-terminal end of which is involved in protein and RNA binding and which appears to be involved in transcriptional activation with its N-terminal end. It shares distinct characteristics with EWSR1 and TAF15 which together with FUS are frequently referred to as the FET family of proteins.

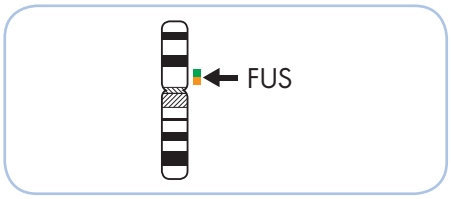
FUS gene rearrangements have been shown to be involved in both solid tumors and leukemias fusing the N-terminal end of FUS to various fusion partners. The most frequent translocation involving the FUS gene region is t(12;16)(q13.3;p11.2). Occurring in over 90% of myxoid liposarcomas, the FUS-DDIT3 fusion protein is regarded as being consequential for the development of myxoid liposarcomas by acting as an abnormal transcription factor and thus deregulating FUS-DDIT3 target genes.

Differential diagnosis of liposarcomas and accurate classification, the latter being especially important with regard to appropriate treatment and prognosis, are often problematic. Therefore, detection of FUS rearrangements via *in situ* Hybridization analysis is a valuable tool to confirm the histopathological diagnosis of myxoid liposarcoma.

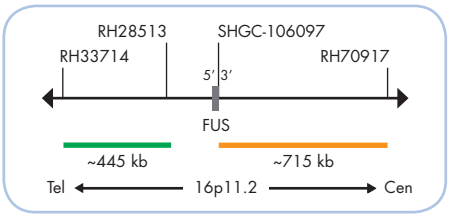
References
Andersson M, et al. (2010) BMC Cancer 10: 249-58.
Antonescu C, et al. (2000) J Mol Diagn 2: 132-8.
Germano G, et al. (2010) Cancer Res 70: 2235-44.
Kuroda M, et al. (1995) Am J Pathol 147: 1221-7.
Meis-Kindblom JM, et al. (2001) Virchows Arch 439: 141-51.
Panagopoulos I, et al. (1994) Cancer Res 54: 6500-3.
Panagopoulos I, et al. (1997) Oncogene 15: 1357-62.

Probe Description

The SPEC FUS Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 16p11.2 band. The orange fluorochrome direct labeled probe hybridizes proximal to the FUS gene, the green fluorochrome direct labeled probe hybridizes distal to that gene.



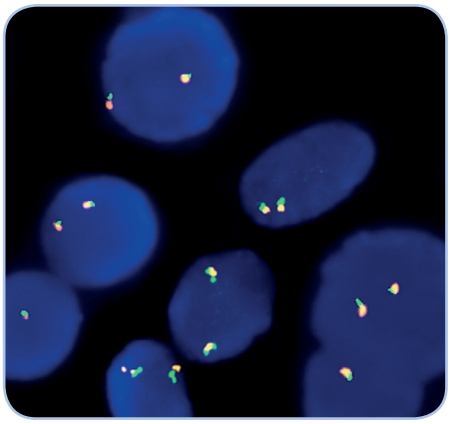
Ideogram of chromosome 16 indicating the hybridization locations.



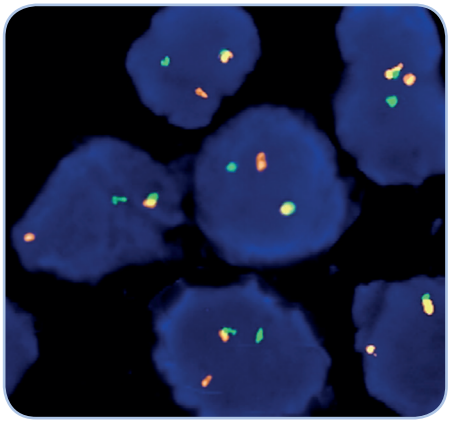
SPEC FUS Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 16p11.2 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 16p11.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 16p11.2 locus and one 16p11.2 locus affected by a 16p11.2 translocation.



SPEC FUS Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Myxoid liposarcoma tissue section with translocation affecting the 16p11.2 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2130-50	ZytoLight SPEC FUS Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE053-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

110

ZytoLight® SPEC TP53/17q22 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC TP53/17q22 Dual Color Probe is designed for the detection of TP53 deletions as well as for the determination of copy number changes of the chromosomal region 17q22, harboring the MPO (myeloperoxidase) gene. TP53 loss in combination with signal gain of the 17q22 chromosomal region serve as a marker for the detection of isochromosomes often found in hematologic malignancies as well as in neuroblastoma.

The TP53 gene (tumor protein 53, a.k.a. p53, BCC7, LFS1, TRP53) is located in the chromosomal region 17p13.1 and encodes a 53 kDa transcription factor. TP53 gene deletions have been detected in patients with chronic lymphocytic leukemia (CLL), multiple myeloma (MM), and acute myeloid leukemia (AML). In CLL patients, allelic loss of the short arm of chromosome 17 is associated with treatment failure with alkylating agents and short survival times.

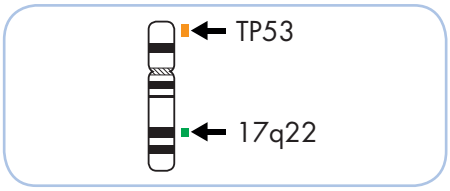
Isochromosome 17q is a frequent cytogenetic abnormality seen in hematologic malignancies including blast phase of chronic myelogenous leukemia (CML), AML, Hodgkin and non-Hodgkin lymphomas. In neuroblastoma, gain of the 17q21-qter is associated with stronger tumor progression.

Thus, the combined detection of both targets by Fluorescence *in situ* Hybridization allows for a sensitive determination of isochromosomes and may be a helpful tool for diagnosis and selecting treatment.

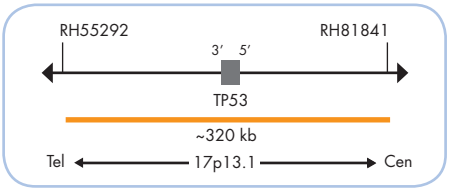
References
Becher R, et al. (1990) Blood 8: 1679-83.
Bown N, et al. (1999) N Engl J Med 340: 1954-61.
Fioretos T, et al. (1999) Blood 94: 225-32.
Pettitt AR, et al. (2001) Blood 98: 814-22.
Ripollés L, et al. (2006) Cancer Genet Cytogenet 171: 57-64.
Shanafelt TD, et al. (2006) Ann Intern Med 145: 435-47.

Probe Description

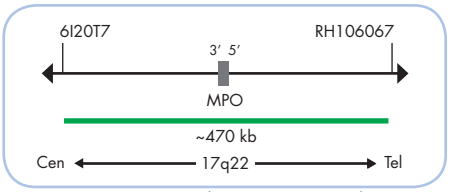
The SPEC TP53/17q22 Dual Color Probe is a mixture of an orange fluorochrome direct labeled SPEC TP53 probe hybridizing to the TP53 gene in the chromosomal region 17p13.1 and a green fluorochrome direct labeled SPEC 17q22 probe specific for the chromosomal region 17q22 harboring the MPO gene.



Ideogram of chromosome 17 indicating the hybridization locations.



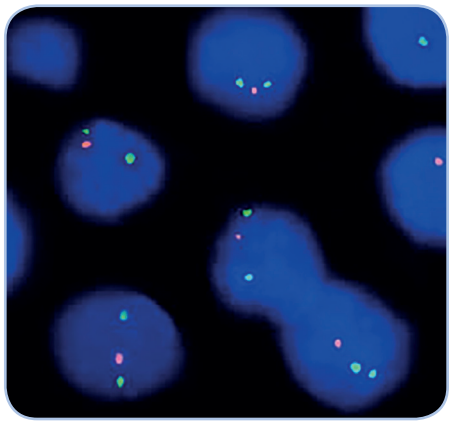
SPEC TP53 Probe map (not to scale).



SPEC 17q22 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletion of the TP53 gene locus, one orange signal and two green signals can be detected. A gain of 17q involving the 17q22 region will result in three or more green signals and two orange signals. Isochromosome 17q is indicated by three green signals and one orange signal.



SPEC TP53/17q22 Dual Color Probe hybridized to bone marrow tissue section with deletion of the TP53 gene as indicated by one orange signal and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2198-200	ZytoLight SPEC TP53/17q22 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

111

ZytoLight® SPEC TP53/CEN 17 Dual Color Probe

CE IVD

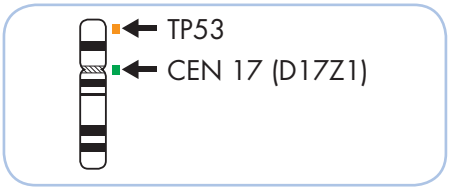
Background

The ZytoLight® SPEC TP53/CEN 17 Dual Color Probe is designed for the detection of TP53 gene deletions observed e.g. in chronic lymphocytic leukemia (CLL).
The TP53 gene (tumor protein 53, a.k.a. p53, BCC7, LFS1, TRP53) is located in the chromosomal region 17p13.1 and encodes a 53 kDa transcription factor which regulates cell proliferation, differentiation, and apoptosis and which functions as a tumor suppressor by activating the expression of genes that inhibit cell growth. Deletions affecting the short arm of chromosome 17 (17p), the site of the TP53 gene, are often accompanied by mutations in the remaining allele, and thus result in the loss of TP53 tumor suppressor activity.
TP53 gene deletions have been detected in patients with chronic lymphocytic leukemia (CLL), multiple myeloma (MM), acute myeloid leukemia (AML), and are also very frequent in primary solid tumors of different histological origin. The presence of TP53 deletion has been shown to correlate with more aggressive disease, shortened survival, and poor response to standard treatment. CLL patients with deletion of 17p are more likely to respond to treatment with the monoclonal anti-CD52 antibody alemtuzumab than to conventional chemotherapy. FISH is an effective method to screen for deletions affecting the TP53 gene locus in order to identify patients who are candidates for alternative treatment and to avoid administration of otherwise ineffective therapy.

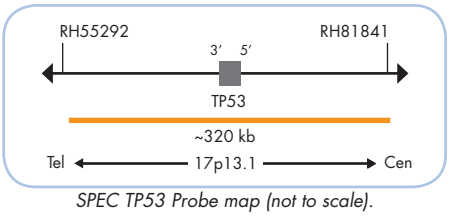
References
Amiel A, et al. (1997) Cancer Genet Cytogenet 97: 97-100.
Chang H, et al. (2005) Blood 105: 358-60.
Chang H, et al. (2010) Am J Clin Pathol 133: 70-4.
Herrera JC, et al. (2010) Biomedica 30: 390-400.
Lozanski G, et al. (2004) Blood 103: 3278-81.
Tavor S, et al. (2011) Leuk Lymphoma 52: 642-7.

Probe Description

The SPEC TP53/CEN 17 Dual Color Probe is a mixture of a green fluorochrome direct labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1) and an orange fluorochrome direct labeled SPEC TP53 probe specific for the TP53 gene at 17p13.1.



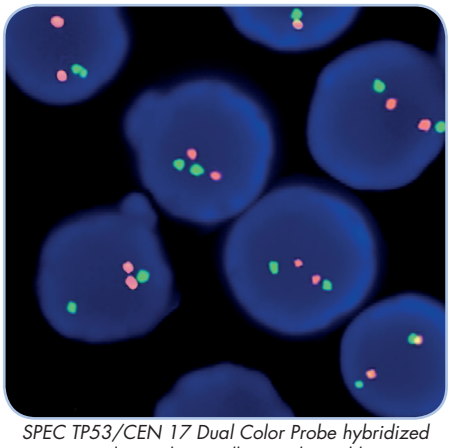
Ideogram of chromosome 17 indicating the hybridization locations.



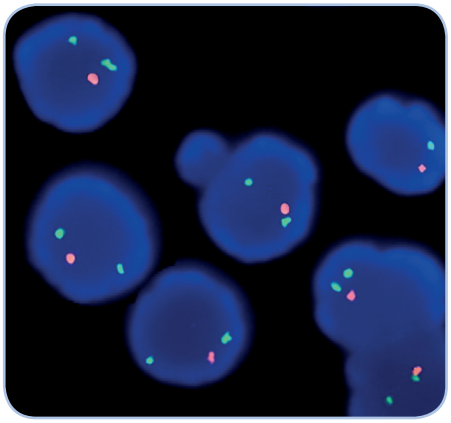
SPEC TP53 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletions affecting the TP53 gene locus, one or no copy of the orange signal will be observed.



SPEC TP53/CEN 17 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



SPEC TP53/CEN 17 Dual Color Probe hybridized to bone marrow tissue section with deletion of the TP53 gene as indicated by one orange signal and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2153-200	ZytoLight SPEC TP53/CEN 17 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC USP6 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC USP6 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 17p13.2 harboring the USP6 (Ubiquitin-specific peptidase 6, a.k.a. TRE2 or TRE17) gene.

Translocations affecting USP6 have been initially found in primary aneurysmal bone cysts (ABC), a benign, but locally aggressive bone lesion that occurs predominantly during the first two decades of life. USP6 rearrangements are restricted to spindle cells in primary ABC, indistinguishable from surrounding normal spindle cells.

The resulting fusion genes detected are formed by juxtaposition of the USP6 coding sequences to the highly active promoter sequences of several partner genes, as e.g. CDH11, COL1A1, OMD, TRAP150, and ZNF9, leading to the transcriptional upregulation of USP6. No true fusion genes are formed.

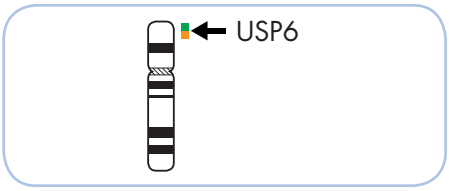
More recently, nodular fasciitis (NF), another mesenchymal lesion, has been tested positive for USP6 rearrangements. NF is a subcutaneous pseudosarcomatous myofibroblastic proliferation of unknown pathogenesis that regresses spontaneously when not surgically resected. The translocation results in the fusion of the promoter region of MYH9 located on 22q12.3 to the entire coding sequence of USP6 and subsequently in upregulated USP6 expression.

For both lesions it is assumed that the detection of USP6 rearrangements by Fluorescence *in situ* Hybridization might represent a valuable diagnostic tool.

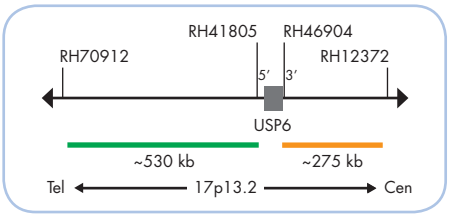
References
Erickson-Johnson MR, et al. (2011) Lab Invest 91: 1427-33.
Nakamura T, et al. (1988) Oncogene Res 2: 357-70.
Oliveira AM, et al. (2004) Cancer Res 64: 1920-3.
Oliveira AM, et al. (2005) Oncogene 24: 3419-26.

Probe Description

The SPEC USP6 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 17p13.2 band. The orange fluorochrome direct labeled probe hybridizes proximal to the USP6 gene and the green fluorochrome direct labeled probe hybridizes distal to that gene.



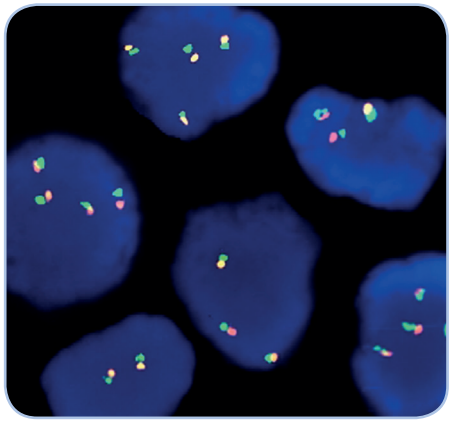
Ideogram of chromosome 17 indicating the hybridization locations.



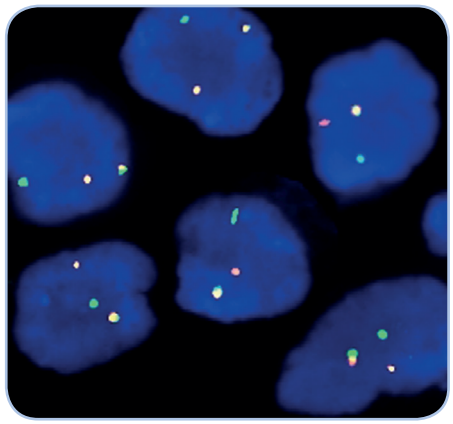
SPEC USP6 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 17p13.2 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 17p13.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 17p13.2 locus and one 17p13.2 locus affected by a translocation.



SPEC USP6 Break Apart Probe hybridized to aneurysmal bone cyst tissue section with polysomy of chromosome 17 but without translocation affecting the 17p13.2 locus as indicated by multiple orange/green fusion signals per nucleus.



Aneurysmal bone cyst tissue section with translocation affecting the 17p13.2 locus as indicated by one orange/green fusion (non-rearranged) signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2151-50	ZytoLight SPEC USP6 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

113

ZytoLight® SPEC YWHAE Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC YWHAE Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal region 17p13.3 harboring the YWHAE (tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, epsilon a.k.a. 14-3-3 epsilon) gene.

YWHAE encodes a protein of the 14-3-3 family which is involved in regulation of cellular proliferation, metabolism, and differentiation. However, altered expression of 14-3-3 family proteins is associated with development and progression of cancer.

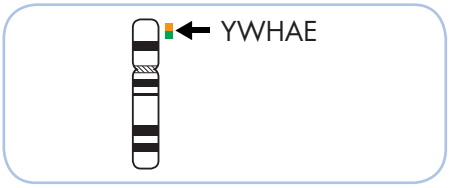
The fusion between YWHAE and one of the FAM22 family members (FAM22A or FAM22B) caused by a t(10;17)(q22;p13) has been identified in the clinically aggressive, high-grade endometrial stromal sarcoma (ESS) as well as in clear cell sarcoma of the kidney (CCSK).

In contrast to the classic low-grade form of ESS harboring JAZF1 gene fusions, YWHAE-FAM22 ESS display high-grade histologic features and an aggressive clinical course. Moreover, due to the lack of estrogen and progesterone receptor expression in YWHAE-FAM22 ESS, the hormonal therapy used to treat low-grade ESS is likely to be ineffective. Consequently, differentiation between YWHAE-FAM22 and JAZF1 ESS by FISH is clinically relevant to support the diagnosis and may aid in therapeutic decision making.

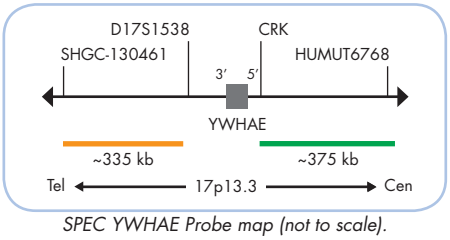
References
Isphording A, et al. (2013) Hum Pathol 44: 837-43.
Lee CH, et al. (2012) PNAS 109: 929-34.
O'Meara E, et al. (2012) J Pathol 227: 72-80.
Stewart JC, et al. (2014) Histopathology 65: 473-82.

Probe Description

The SPEC YWHAE Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 17p13.3 band. The orange fluorochrome direct labeled probe hybridizes distal to the YWHAE gene breakpoint region at 17p13.3, the green fluorochrome direct labeled probe hybridizes proximal to the YWHAE gene breakpoint region at 17p13.3.



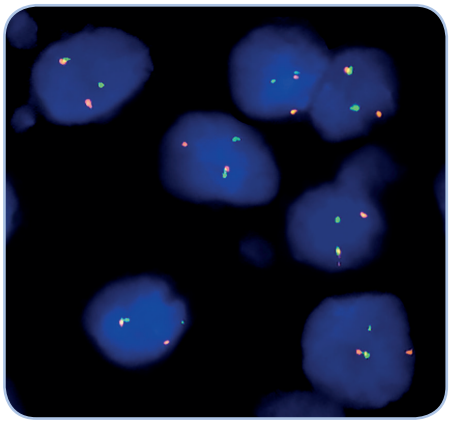
Ideogram of chromosome 17 indicating the hybridization locations.



SPEC YWHAE Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 17p13.3 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 17p13.3 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 17p13.3 locus and one 17p13.3 locus affected by a translocation.



Endometrial stromal sarcoma tissue section with translocation affecting the YWHAE gene as indicated by one non-rearranged orange/green fusion signal, one orange, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2175-50	ZytoLight SPEC YWHAE Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

114

ZytoLight® SPEC ERBB2/CEN 17 Dual Color Probe

Previously: ZytoLight SPEC HER2/CEN 17 Dual Color Probe

CE IVD

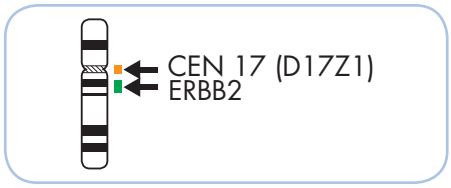
Background

The ZytoLight® SPEC ERBB2/CEN 17 Dual Color Probe is designed for the detection of ERBB2 gene amplification frequently observed in solid malignant neoplasms e.g. breast cancer samples. The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes a 185-190 kDa transmembrane glycoprotein, p185, acting as a cellular growth factor receptor. The p185 protein belongs to the EGFR (epidermal growth factor receptor) subgroup of the RTK (receptor tyrosine kinase) superfamily also including ERBB1 (HER1), ERBB3 (HER3), and ERBB4 (HER4).
Amplification of the proto-oncogene ERBB2, observed in approximately 20% of all breast cancer samples, has been correlated with a poor prognosis of the disease. Similar results have been obtained for a variety of other malignant neoplasms e.g. ovarian cancer, stomach cancer, and carcinomas of the salivary gland.

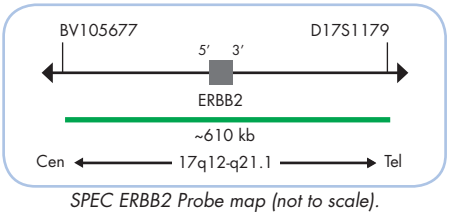
References
Baselga J, et al. (1999) Semin Oncol 26: 78-83.
Brunello E, et al. (2012) Histopathology 60: 482-8.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Cochet A, et al. (2012) J Nucl Med 53: 512-20.
Coussens L, et al. (1985) Science 230: 1132-9.
Ettl T, et al. (2012) Hum Pathol 43: 921-31.
Ettl T, et al. (2012) Br J Cancer 106: 719-26.
Fasching P, et al. (2011) BMC Cancer 11: 486.
Haas M, et al. (2011) Virchows Arch 458: 403-11.
Hillig T, et al. (2012) APMIS 120: 1000-7.
Humbert O, et al. (2012) Ann Oncol 23: 2572-7.
Hwang CC, et al. (2011) Histopathology 59: 984-92.
Hynes NE & Stern DF (1994) Biochim Biophys Acta 1198: 165-84.
Jäger M, et al. (2009) Cancer Res 69: 4270-6.
Lang D, et al. (2008) Diagn Pathol 3: 49ff.
Lehmann-Che L, et al. (2011) Br J Cancer 104: 1739-46.
Ly M, et al. (2012) Oncology 83: 257-63.
Moelans CB, et al. (2011) Crit Rev Oncol Hematol 80: 380-92.
Oliveira-Costa JP, et al. (2011) Diagn Pathol 6: 73.
Park JB, et al. (1989) Cancer Res 49: 6605-9.
Parris TZ, et al. (2010) Clin Cancer Res 16: 3860-74.
Perrone G, et al. (2012) PLoS One 7: e43110.
Popescu NC, et al. (1989) Genomics 4: 362-6.
Sassen A, et al. (2008) Breast Cancer Res 10: R2.
Sassen A, et al. (2009) Breast Cancer Res 11: R50.
Schindlbeck C, et al. (2010) J Cancer Res Clin Oncol 136: 1029-37.
Slamon DJ, et al. (1987) Science 235: 177-82.
Vollmann-Zwerenz A, et al. (2010) Cytometry Part A 77: 387-99.
Voutsas IF, et al. (2013) Int J Radiat Biol 89: 319-25.

Probe Description

The SPEC ERBB2/CEN 17 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1) and a green fluorochrome direct labeled SPEC ERBB2 probe specific for the chromosomal region 17q12-q21.1 harboring the ERBB2 gene.



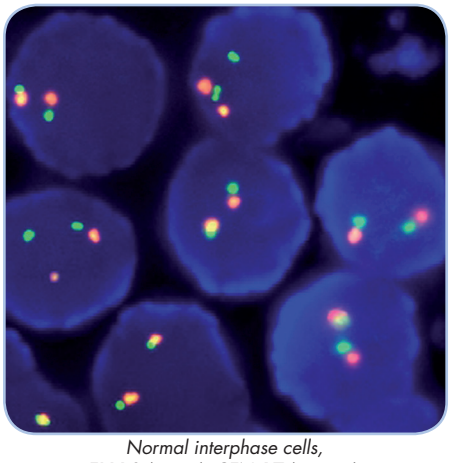
Ideogram of chromosome 17 indicating the hybridization locations.



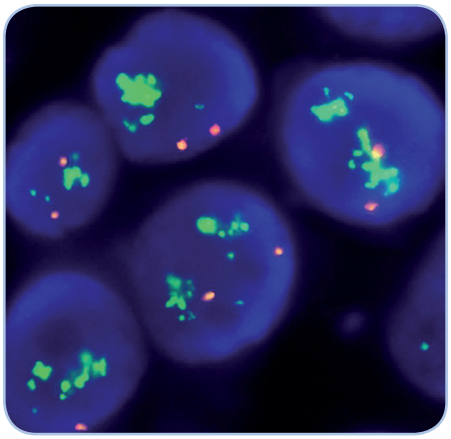
SPEC ERBB2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ERBB2 gene locus, multiple copies of the green signal or green signal clusters will be observed.



Normal interphase cells, ERBB2 (green), CEN 17 (orange).



Breast carcinoma tissue section, ERBB2 gene cluster (green), CEN 17 (orange).

Prod. No.	Product	Label	Tests* (Volume)
Z-2015-50	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2015-200	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe CE IVD	●/●	20 (200 µl)
Z-2020-5	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; Probe, 0.05 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml	●/●	5
Z-2020-20	ZytoLight SPEC ERBB2/CEN 17 Dual Color Probe Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; Probe, 0.2 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml	●/●	20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

115

ZytoLight® CEN 17/SPEC ERBB2 Dual Color Probe

CE IVD

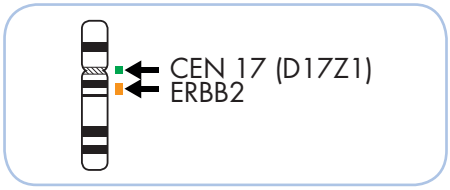
Background

The ZytoLight® CEN 17/SPEC ERBB2 Dual Color Probe is designed for the detection of ERBB2 gene amplification frequently observed in solid malignant neoplasms e.g. breast cancer samples.
The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes a 185-190 kDa transmembrane glycoprotein, p185, acting as a cellular growth factor receptor. The p185 protein belongs to the EGFR (epidermal growth factor receptor) subgroup of the RTK (receptor tyrosine kinase) superfamily also including ERBB1 (HER1), ERBB3 (HER3), and ERBB4 (HER4).
Amplification of the proto-oncogene ERBB2, observed in approximately 20% of all breast cancer samples, has been correlated with a poor prognosis of the disease.
Similar results have been obtained for a variety of other malignant neoplasms e.g. ovarian cancer, stomach cancer, and carcinomas of the salivary gland.

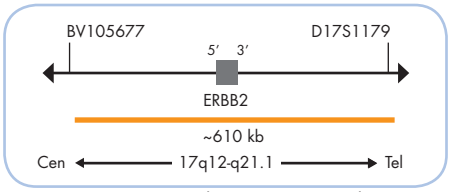
References
Baselga J, et al. (1999) Semin Oncol 26: 78-83.
Brunello E, et al. (2012) Histopathology 60: 482-8.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Coussens L, et al. (1985) Science 230: 1132-9.
Ettl T, et al. (2012) Br J Cancer 106: 719-26.
Hwang CC, et al. (2011) Histopathology 59: 984-92.
Hynes NE & Stern DF (1994) Biochim Biophys Acta 1198: 165-84.
Moelans CB, et al. (2011) Crit Rev Oncol Hematol 80: 380-92.
Park JB, et al. (1989) Cancer Res 49: 6605-9.
Popescu NC, et al. (1989) Genomics 4: 362-6.
Sassen A, et al. (2008) Breast Cancer Res 10: R2.
Slamon DJ, et al. (1987) Science 235: 177-82.
Voutsas IF, et al. (2013) Int J Radiat Biol 89: 319-25.
Wolff AC, et al. (2013) J Clin Oncol 31: 3997-4013.

Probe Description

The CEN 17/SPEC ERBB2 Dual Color Probe is a mixture of a green fluorochrome direct labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1) and an orange fluorochrome direct labeled SPEC ERBB2 probe specific for the chromosomal region 17q12-q21.1 harboring the ERBB2 gene.



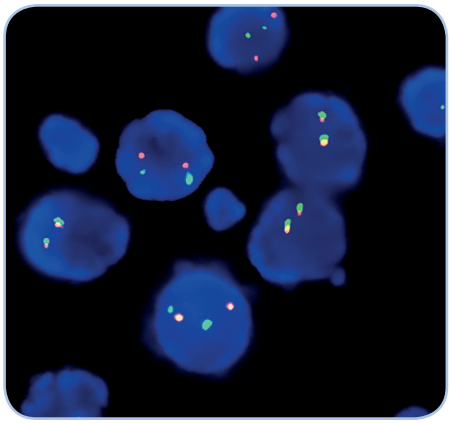
Ideogram of chromosome 17 indicating the hybridization locations.



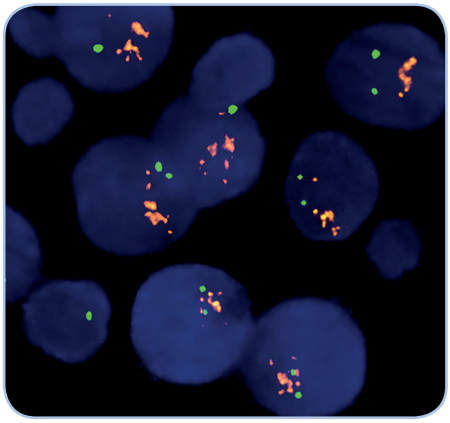
SPEC ERBB2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ERBB2 gene locus, multiple copies of the orange signal or orange signal clusters will be observed.



Normal interphase cells, ERBB2 (orange), CEN 17 (green).



Breast carcinoma tissue section, ERBB2 gene cluster (orange), CEN 17 (green).

Prod. No.	Product	Label	Tests* (Volume)
Z-2077-50	ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD	●/●	5 (50 µl)
Z-2077-200	ZytoLight CEN 17/SPEC ERBB2 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC ERBB2/D17S122 Dual Color Probe

CE IVD

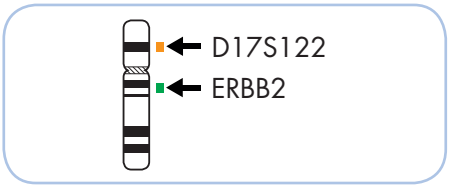
Background

The ZytoLight® SPEC ERBB2/D17S122 Dual Color Probe is designed for the detection of ERBB2 gene amplification frequently observed in solid malignant neoplasms e.g. breast cancer samples.
The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes a 185-190 kDa transmembrane glycoprotein, p185, acting as a cellular growth factor receptor. The p185 protein belongs to the EGFR (epidermal growth factor receptor) subgroup of the RTK (receptor tyrosine kinase) superfamily also including ERBB1 (HER1), ERBB3 (HER3), and ERBB4 (HER4).
Amplification of the proto-oncogene ERBB2, observed in approximately 20% of all breast cancer samples, has been correlated with a poor prognosis of the disease.
Similar results have been obtained for a variety of other malignant neoplasms e.g. ovarian cancer, stomach cancer, and carcinomas of the salivary gland.
Fluorescence *in situ* Hybridization targeting the alpha satellite centromeric regions of chromosome 17 may be misleading in some cases due to possible gains or losses of this region. For these cases, judged as equivocal according to the ASCO guidelines, reflex testing is recommended using the SPEC ERBB2/D17S122 Dual Color Probe.

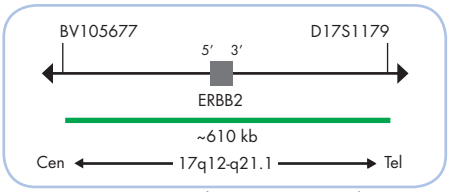
References
Baselga J, et al. (1999) Semin Oncol 26: 78-83.
Brunello E, et al. (2012) Histopathology 60: 482-8.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Coussens L, et al. (1985) Science 230: 1132-9.
Ettl T, et al. (2012) Br J Cancer 106: 719-26.
Hwang CC, et al. (2011) Histopathology 59: 984-92.
Hynes NE & Stern DF (1994) Biochim Biophys Acta 1198: 165-84.
Moelans CB, et al. (2011) Crit Rev Oncol Hematol 80: 380-92.
Park JB, et al. (1989) Cancer Res 49: 6605-9.
Popescu NC, et al. (1989) Genomics 4: 362-6.
Sassen A, et al. (2008) Breast Cancer Res 10: R2.
Slamon DJ, et al. (1987) Science 235: 177-82.
Voutsas IF, et al. (2013) Int J Radiat Biol 89: 319-25.
Wolff AC, et al. (2013) J Clin Oncol 31: 3997-4013.

Probe Description

The SPEC ERBB2/D17S122 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC ERBB2 probe specific for the chromosomal region 17q12-q21.1 harboring the ERBB2 gene and an orange fluorochrome direct labeled SPEC D17S122 probe specific for the chromosomal region 17p12. The SPEC D17S122 probe is designed to be used for chromosome 17 copy number detection.



Ideogram of chromosome 17 indicating the hybridization locations.

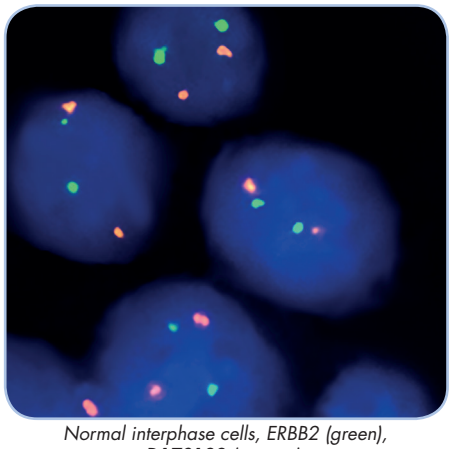


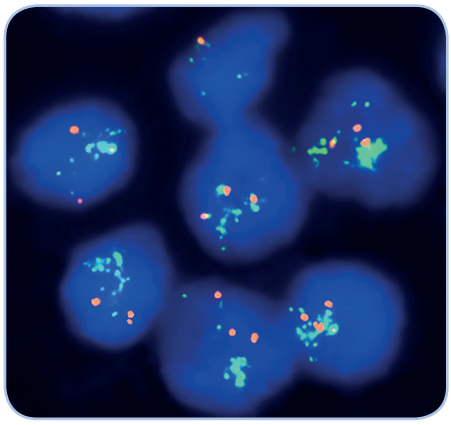
SPEC ERBB2 Probe map (not to scale).

SPEC D17S122 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the ERBB2 gene locus, multiple copies of the green signal or green signal clusters will be observed.


Normal interphase cells, ERBB2 (green), D17S122 (orange).


Breast carcinoma tissue section, ERBB2 gene cluster (green), D17S122 (orange).

Prod. No.	Product	Label	Tests* (Volume)
Z-2190-50	ZytoLight SPEC ERBB2/D17S122 Dual Color Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe

Previously: ZytoLight SPEC HER2/TOP2A/CEN 17 Triple Color Probe

CE IVD

Background

The ZytoLight® SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe is designed for the simultaneous detection of ERBB2 and TOP2A gene status.

The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes a 185 kDa transmembrane glycoprotein. The TOP2A (topoisomerase II alpha) gene is located in the chromosomal region 17q21.2 and encodes a 170 kDa DNA topoisomerase.

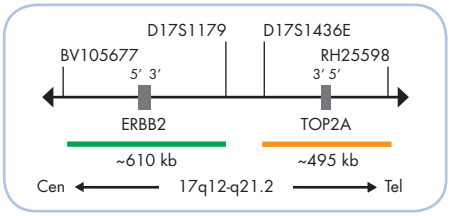
The TOP2A gene is frequently either co-amplified or deleted in ERBB2 positive breast cancer cases. TOP2A functions as the target for several anticancer agents, e.g. anthracyclines. Recent data suggests that amplification and deletion of the TOP2A gene locus may account for relative chemosensitivity or resistance to TOP2A inhibitor therapy in ERBB2 positive breast cancer. Thus, determination of the ERBB2 and TOP2A status may help to predict benefit from adjuvant anthracyclines in breast cancer treatment.

References
Arriola E, et al. (2007) Breast Cancer Res Treat 106: 181-9.
Brunello E, et al. (2012) Histopathology 60: 482–8.
Coussens L, et al. (1985) Science 230: 1132-9.
Fountzilas G, et al. (2012) J Transl Med 10: 212.
Fountzilas G, et al. (2012) PLoS One 7: e37946.
Fountzilas G, et al. (2013) BMC Cancer 13: 163.
Järvinen TA & Liu ET (2006) Curr Cancer Drug Targets 6: 579-602.
Popescu NC, et al. (1989) Genomics 4: 362-6.
Pritchard KI, et al. (2008) J Clin Oncol 26: 736-44.
Razis E, et al. (2011) Breast Cancer Res Treat 128: 447-56.
Tsai-Pflugfelder M, et al. (1988) Proc Nat Acad Sci 85: 7177-81.

Probe Description

The SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe is a mixture of a green fluorochrome direct labeled SPEC ERBB2 probe specific for the chromosomal region 17q12-q21.1 harboring the ERBB2 gene, an orange fluorochrome direct labeled SPEC TOP2A probe specific for the TOP2A gene at 17q21.2, and a blue fluorochrome direct labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1).

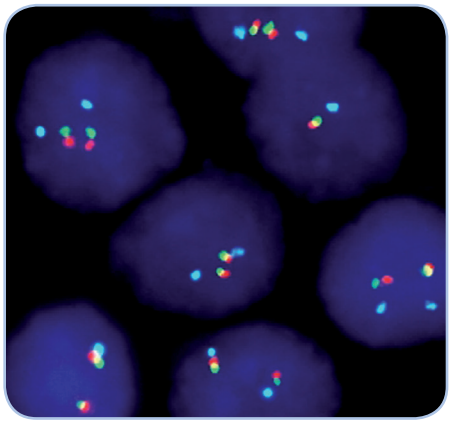
Ideogram of chromosome 17 indicating the hybridization locations.



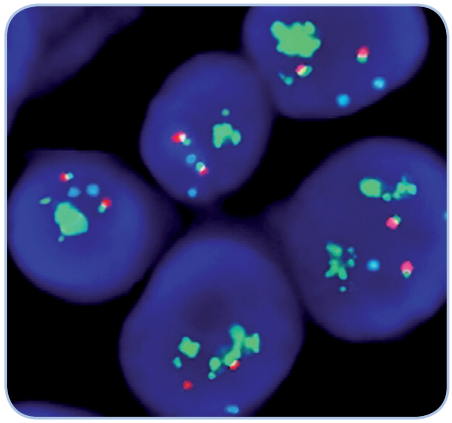
SPEC ERBB2/TOP2A Probe map (not to scale).

Results

In a normal interphase nucleus, two green, two orange, and two blue signals are expected. In a cell with amplification of the ERBB2 gene locus, multiple copies of the green signal or large green signal clusters will be observed. Amplification of TOP2A will result in multiple copies of the orange signal or large orange signal clusters. Deletion of the TOP2A gene results in a reduced number of orange signals.



SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe hybridized to normal interphase cells as indicated by two green, two orange, and two blue signals per nucleus.



Breast cancer tissue section with two copies of chromosome 17 (blue) and TOP2A (orange) and ERBB2 gene clusters (green) in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2093-50	ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	●/●/●	5 (50 µl)
Z-2093-200	ZytoLight SPEC ERBB2/TOP2A/CEN 17 Triple Color Probe CE IVD	●/●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

118

ZytoLight® SPEC COL1A1 Dual Color Break Apart Probe

CE IVD

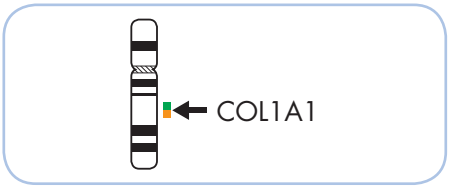
Background

The ZytoLight® SPEC COL1A1 Dual Color Break Apart Probe is designed for the detection of the specific translocations involving the chromosomal region 17q21.33 harboring the COL1A1 (a.k.a. OI4) gene. Reciprocal translocations involving t(17;22)(q21.3;q13.1) are characteristic for dermatofibrosarcoma protuberans (DFSP). DFSP is a highly recurrent, infiltrative skin tumor of intermediate malignancy. The rearrangements are cytogenetically characterized by the presence of supernumerary ring chromosomes containing low-level amplified sequences from chromosomes 17q21-qter and 22q10-q13.1, or unbalanced derivatives of the t(17;22)(q21.3;q13.1) translocation.
The rearrangement frequently results in formation of a COL1A1-PDGFB fusion protein which is post-transcriptionally processed to a functional platelet-derived growth factor beta chain (PDGFB) protein, and results in PDFGB-mediated autocrine and/or paracrine activation of the plateled-derived growth factor receptor-β (PDGFRB).
The accurate diagnosis of DFSP is important because of the intermediate malignant nature of the DFSP and can be facilitated by Fluorescence *in situ* Hybridization (FISH) analyses.

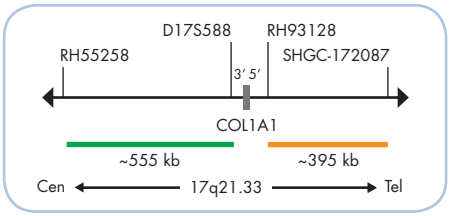
References
Labropoulos SV & Razis ED (2007) Biologics 4: 347-53.
Patel KU, et al. (2008) Human Pathol 39: 184-93.
Shimizu A, et al. (1999) Cancer Res 59: 3719-23.
Simon MP, et al. (1997) Nat Genet 15: 95-8.

Probe Description

The SPEC COL1A1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 17q21.33 band. The orange fluorochrome direct labeled probe hybridizes distal, and the green fluorochrome direct labeled probe hybridizes proximal to the COL1A1 gene.



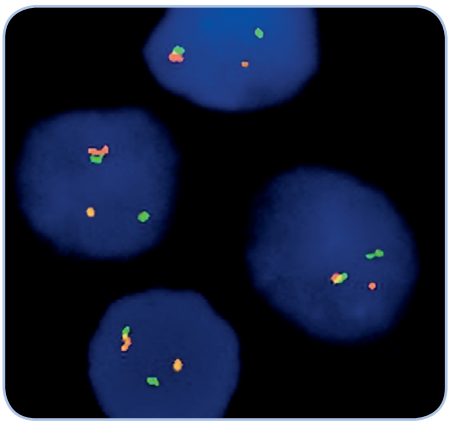
Ideograms of chromosome 17 indicating the hybridization locations.



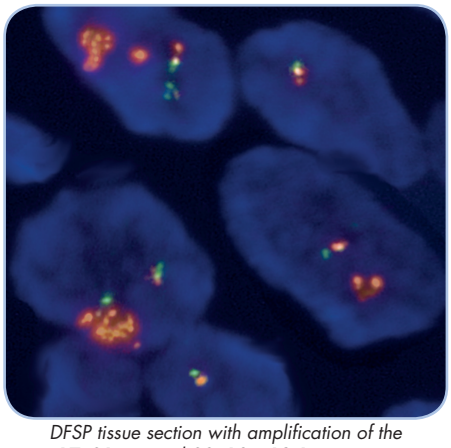
SPEC COL1A1 Probe map (not to scale).

Results

In a normal interphase nucleus lacking a translocation involving the 17q21.33 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 17q21.33 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 17q21.33 locus and one 17q21.33 locus affected by a 17q21.33 translocation.



DFSP tissue section with translocation affecting the 17q21.33 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.



DFSP tissue section with amplification of the 17q21-qter and 22q10–q13.1 sequences probably due to a COL1A1-PDGFB fusion product on the ring chromosome.

Image kindly provided by Dr. Schildhaus, Cologne, Germany.

Prod. No.	Product	Label	Tests* (Volume)
Z-2121-200	ZytoLight SPEC COL1A1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

119

ZytoLight® SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe

CE IVD

Background

The ZytoLight® SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe is designed for the detection of the specific translocations involving the chromosomal region 17q21.33 harboring the COL1A1 (a.k.a. OI4) gene, and the chromosomal region 22q13.1, harboring the PDGFB (a.k.a PDGF2,SIS) gene.

The reciprocal translocations involving t(17;22)(q21.3;q13.1) are characteristic for dermatofibrosarcoma protuberans (DFSP) patients. DFSP is a highly recurrent, infiltrative skin tumor of intermediate malignancy.

The rearrangements are cytogenetically characterized by the presence of supernumerary ring chromosomes containing low-level amplified sequences from chromosomes 17q21-qter and 22q10-q13.1, or unbalanced derivatives of the t(17;22)(q21.3;q13.1) translocation.

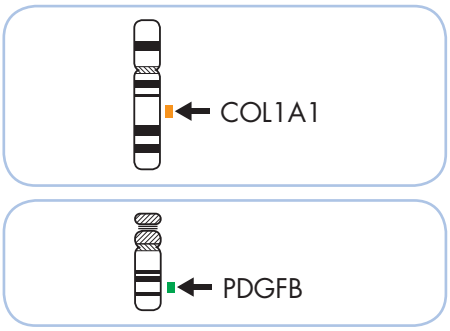
The rearrangement results in a COL1A1-PDGFB fusion protein which is post-transcriptionally processed to a functional platelet-derived growth factor beta chain (PDGFB) protein, and results in PDFGB-mediated autocrine and /or paracrine activation of the plateled-derived growth factor receptor-β (PDGFRB).

The accurate diagnosis of DFSP is important because of the intermediate malignant nature of the DFSP and can be facilitated by Fluorescence *in situ* Hybridization (FISH) analyses.

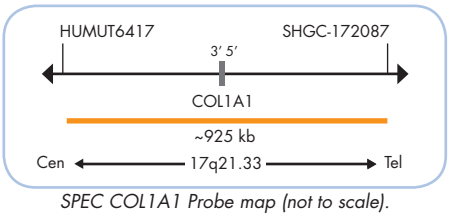
References
Labropoulos SV & Razis ED (2007) Biologics 4: 347-53.
Patel KU, et al. (2008) Human Pathol 39: 184-93.
Shimizu A, et al. (1999) Cancer Res 59: 3719-23.
Simon MP, et al. (1997) Nat Genet 15: 95-8.
Walluks K, et al. (2013) Pathol Res Pract 209: 30-5.

Probe Description

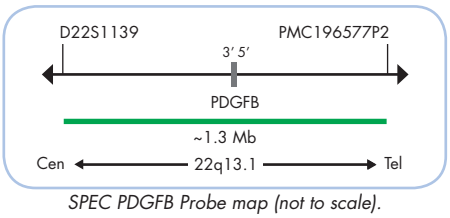
The SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe is a mixture of an orange fluorochrome direct labeled COL1A1 probe covering the breakpoint region of the COL1A1 gene and a green fluorochrome direct labeled PDGFB probe covering the breakpoint region of the PDGFB gene.



Ideograms of chromosomes 17 (above) and 22 (below) indicating the hybridization locations.



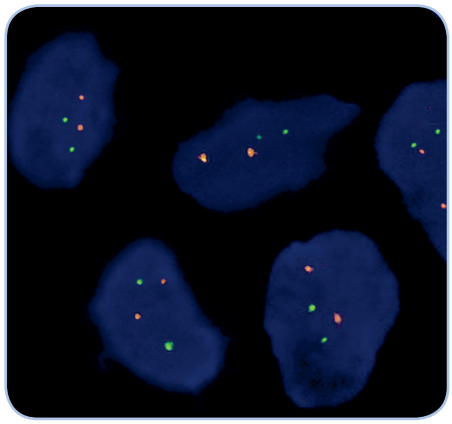
SPEC COL1A1 Probe map (not to scale).



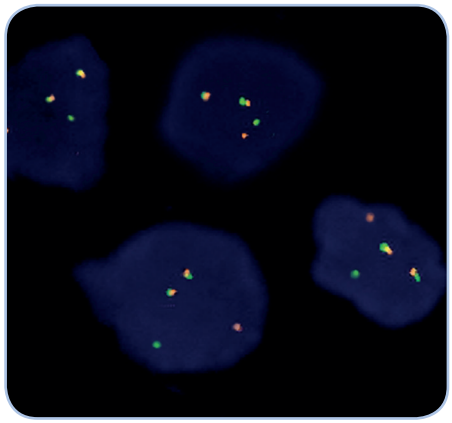
SPEC PDGFB Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange and green signal, respectively.



SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



DFSP tissue section with translocation affecting the COL1A1/PDGFB loci as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2116-50	ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	●/●	5 (50 µl)
Z-2116-200	ZytoLight SPEC COL1A1/PDGFB Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE050-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

120

ZytoLight® SPEC TYMS/CEN 18 Dual Color Probe

CE IVD

Background

The ZytoLight® SPEC TYMS/CEN 18 Dual Color Probe is designed for the detection of TYMS gene amplifications found in gastrointestinal cancer.

The TYMS proto-oncogene (thymidylate synthetase) is located in the chromosomal region 18p11.32. The thymidylate synthetase (TS) in combination with a cofactor maintains the dTMP (thymidine-5-prime monophosphate) pool critical for DNA replication and repair.

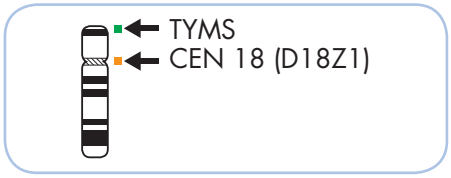
Patients with low expression of TS are shown to be more sensitive to 5-Fluorouracil (5-FU), a drug commonly used for treatment of colorectal cancer. It is suggested that genetic amplification of the TYMS gene is a major mechanism of 5-FU resistance and has important implications for the management of colorectal cancer patients with recurrent disease.

Fluorescence *in situ* Hybridization combines the advantage of possible detection of gene specific copy numbers in morphologically identified tumor cell nuclei.

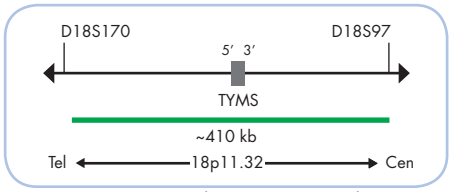
References
Brody JR, et al. (2006) Cancer Res 66: 9369-73.
Jensen SA, et al. (2008) Acta Oncol 47: 1054-61.
Langer R, et al. (2007) Am J Clin Pathol 128: 191-7.
Wang TL, et al. (2004) PNAS 101: 3089-94.
Watson RG, et al. (2010) Eur J Cancer 46: 3358-64.

Probe Description

The SPEC TYMS/CEN 18 Dual Color Probe is a mixture of an orange fluorochrome direct labeled CEN 18 probe specific for the alpha satellite centromeric region of chromosome 18 (D18Z1) and a green fluorochrome direct labeled SPEC TYMS probe specific for the TYMS gene at 18p11.32.



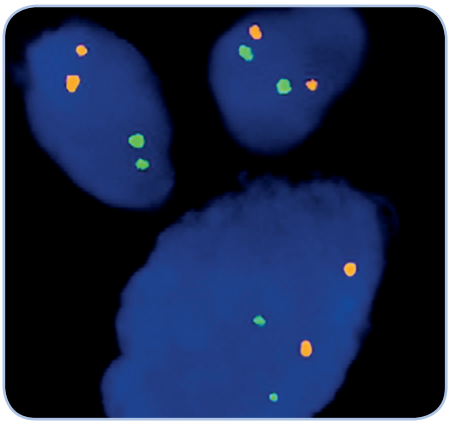
Ideogram of chromosome 18 indicating the hybridization locations.



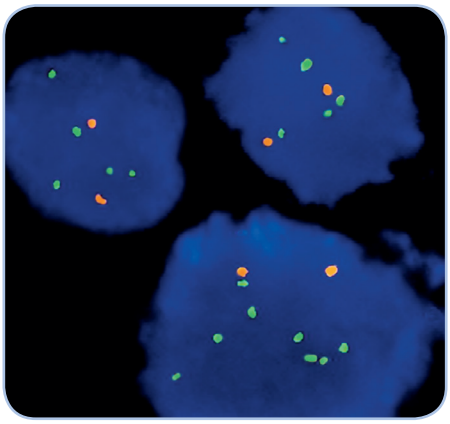
SPEC TYMS Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the TYMS gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC TYMS/CEN 8 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Myxoid liposarcoma tissue section with amplification of the TYMS gene as indicated by multiple green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2098-200	ZytoLight SPEC TYMS/CEN 18 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE044-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC SS18 Dual Color Break Apart Probe

Previously: ZytoLight SPEC SYT Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC SS18 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 18q11.2 harboring the SS18 (synovial sarcoma translocation, chromosome 18) gene (a.k.a. SYT).

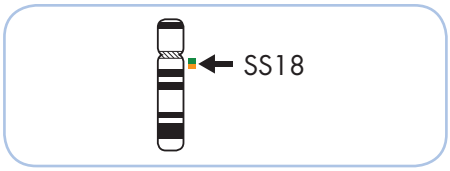
Translocations involving the region 18q11.2 are found in over 90% of synovial sarcoma. Among soft tissue sarcomas, synovial sarcoma is one of the most common and classically occurs in the extremities of young adults with greater prevalence in males even though, the occurrence of synovial sarcoma has also been described in a wide variety of anatomical locations and in all ages.

The most frequent translocation involving the SS18 gene region is t(X;18)(p11.23;q11.2) juxtaposing the SS18 gene in 18q11.2 either next to the SSX1 (synovial sarcoma, translocated to X chromosome) or the SSX2 gene, or very rarely to the SSX4 locus located in Xp11.23. Complex translocations involving other chromo-somes are observed in less than 10% of synovial sarcomas. In combination with histopathological diagnosis, detection of SS18 rearrangements via FISH analysis is a valuable tool to confirm the diagnosis of synovial sarcoma.

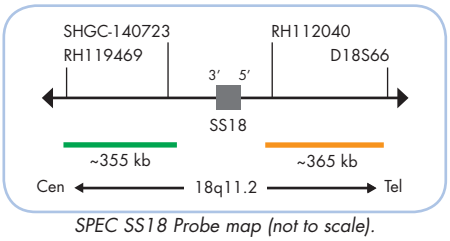
References
Amary MF, et al. (2007) Mod Pathol 20: 482-96.
Clark J, et al. (1994) Nat Genet 7: 502-8.
Ilmiawan MI, et al. (2012) Med J Indones 21: 196-202.
Kawai A, et al. (1998) N Engl J Med 338: 153-60.
Surace C, et al. (2004) Lab Invest 84: 1185-92.
Torres L, et al. (2008) Cancer Genet Cytogenet 187: 45-9.

Probe Description

The SPEC SS18 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 18q11.2 band. The orange fluorochrome direct labeled probe hybridizes distal to the SS18 gene, the green fluorochrome direct labeled probe hybridizes proximal to that gene.



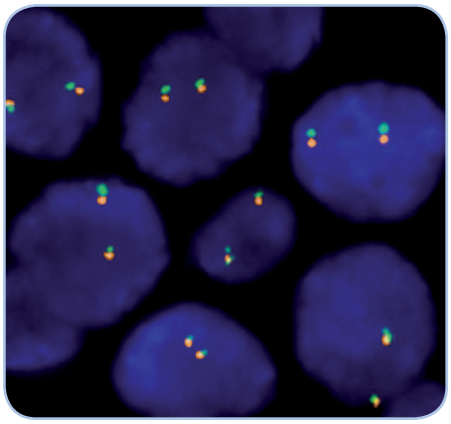
Ideogram of chromosome 18 indicating the hybridization locations.



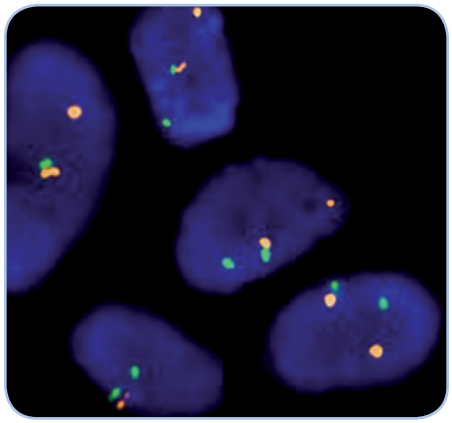
SPEC SS18 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 18q11.2 band two orange/green fusion signals are expected representing two normal (non-rearranged) 18q11.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 18q11.2 locus and one 18q11.2 locus affected by an 18q11.2 translocation.



SPEC SS18 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Synovial sarcoma tissue section with translocation affecting the 18q11.2 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2097-50	ZytoLight SPEC SS18 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE032-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

122

ZytoLight® SPEC BCL2 Dual Color Break Apart Probe

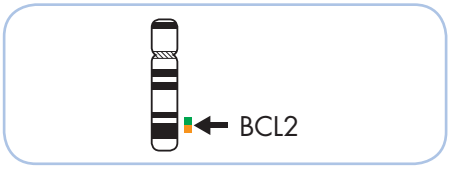
CE IVD

Background

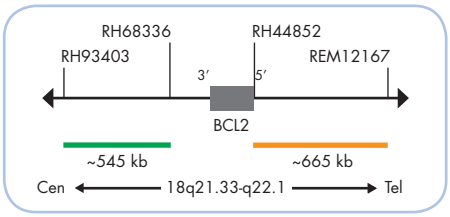
The ZytoLight® SPEC BCL2 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 18q21.33 harboring the BCL2 gene. The BCL2 (B-cell CLL/lymphoma 2, a.k.a. PPP1R50) gene encodes a mitochondrial membrane protein that regulates apoptosis and is expressed in B-cells.
Translocations involving the BCL2 gene are commonly identified in B-cell lymphomas. In particular, the translocation t(14;18)(q32.3;q21.3) has been identified in about 80% of follicular lymphoma (FL), in 20% to 30% of diffuse large B-cell lymphoma (DLBCL), and rarely in B-cell chronic lymphocytic leukemia (B-CLL).
In FL this translocation is considered to be a cytogenetic hallmark. As a result of this rearrangement, the BCL2 gene is juxtaposed to the IGH (Immunglobulin heavy chain) locus at 14q32.33 which leads to overexpression of the anti-apoptotic protein BCL2, and finally to progression to lymphoma.
Alternative BCL2 translocations to immunoglobulin light chain genes as well as non-IG translocation events have been reported.
In DLBCL, BCL2 gene overexpression has been implicated in conferring resistance to chemotherapy and has been associated with poor prognosis.
Hence, detection of BCL2 translocations by Fluorescence *in situ* Hybridization (FISH) may be of diagnostic and prognostic relevance.

Probe Description

The SPEC BCL2 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 18q21.33-q22.1 band. The green fluorochrome direct labeled probe hybridizes proximal to the BCL2 gene, and the orange fluorochrome direct labeled probe hybridizes distal to the BCL2 locus.



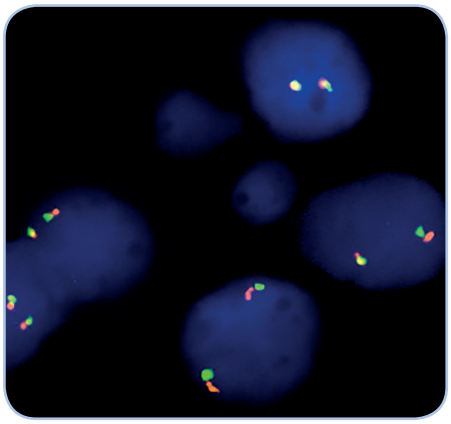
Ideogram of chromosome 18 indicating the hybridization locations.



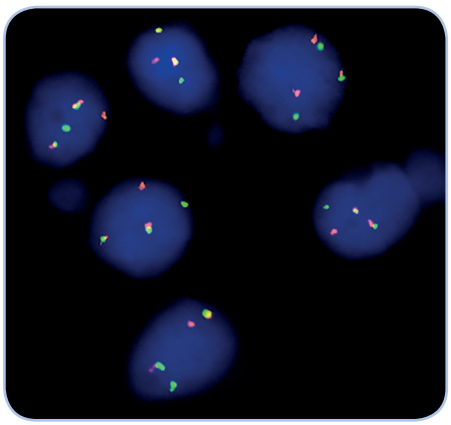
SPEC BCL2 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 18q21.33-q22.1 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 18q21.33-q22.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 18q21.33-q22.1 locus and one 18q21.33-q22.1 locus affected by a translocation.



SPEC BCL2 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Neck lymph node tissue section with translocation of the BCL2 gene as indicated by two non-rearranged orange/green fusion signals, one orange and one separate green signal indicating the translocation.

References
Da Cunha Santos G, et al. (2011) Cancer Cytopathol 119: 254-62.
Dyer MJ, et al. (1994) Blood 83: 3682-8.
Gu K, et al. (2008) Arch Pathol Lab Med 132: 1355-61.
Hockenbery D, et al. (1990) Nature 348: 334-6.
Impera L, et al. (2008) Oncogene 27: 6187-90.
López-Guillermo A, et al. (1999) Blood 93: 3081-7.
Nelson BP, et al. (2007) Am J Clin Pathol 128: 323-32.
Tibiletti MG, et al. (2009) Hum Pathol 40: 645-52.
Tomita N, et al. (2009) Haematologica 94: 935-43.
Weinberg OK, et al. (2007) J Mol Diagn 9: 530-7.

Prod. No.	Product	Label	Tests* (Volume)
Z-2192-200	ZytoLight SPEC BCL2 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

123

ZytoLight® SPEC BCL2/CEN 18 Dual Color Probe

CE IVD

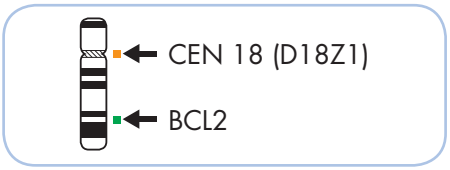
Background

The ZytoLight® SPEC BCL2/CEN 18 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the BCL2 gene.
The BCL2 (B-cell CLL/lymphoma 2, a.k.a. PPP1R50) gene is located on chromosome 18q21.33 and encodes an antiapoptosis factor involved in normal B-cell development and differentiation. The expression of BCL2 usually decreases upon B-cell differentiation. However, increased BCL2 expression has been detected in lymphomas harboring the translocation t(14;18)(q32.3;q21.3). Moreover, overexpression of BCL2 can also be caused by amplification of the BCL2 gene as detected in diffuse large B-cell lymphoma (DLBCL) and mantle cell lymphoma (MCL).
DLBCL is the most common type of non-Hodgkin lymphoma characterized by an aggressive clinical course. On the basis of their gene expression profiles, ABC (activated B-cell-like) and GCB (germinal center B-cell-like) were identified as two molecular subtypes of DLBCL. BCL2 was found to be frequently amplified in the ABC subgroup of DLBCL but rarely in the GCB subgroup. BCL2 overexpression as a result of 18q21 amplification is associated with poor survival in the ABC subgroup. Hence, the identification of BCL2 gene copy number changes by Fluorescence *in situ* Hybridization may be of prognostic significance in non-Hodgkin lymphomas.

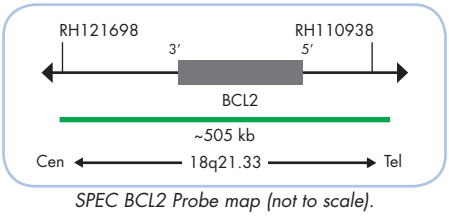
References
Alizadeh AA, et al. (2000) Nature 403: 503-11.
Beà S, et al. (2009) Blood 113: 3059-69.
Iqbal J, et al. (2006) J Clin Oncol 24: 961-8.
Monni O, et al. (1999) Leuk Lymphoma 34: 45-52.

Probe Description

The SPEC BCL2/CEN 18 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC BCL2 probe hybridizing to the human BCL2 gene in the chromosomal region 18q21.33 and an orange fluorochrome direct labeled CEN 18 probe specific for the alpha satellite centromeric region of chromosome 18 (D18Z1).



Ideogram of chromosome 18 indicating the hybridization locations.



SPEC BCL2 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the BCL2 gene locus, multiple copies of the green signal or green signal clusters will be observed.

SPEC BCL2/CEN 18 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2174-200	ZytoLight SPEC BCL2/CEN 18 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC BCL2/IGH Dual Color Dual Fusion Probe

CE IVD

Background

The ZytoLight® SPEC BCL2/IGH Dual Color Dual Fusion Probe is designed to detect the translocation t(14;18)(q32.3;q21.3) affecting the BCL2 gene in the chromosomal region 18q21.33 and the IGH locus in 14q32.33.

Translocations involving the BCL2 (B-cell lymphoma 2) gene and the IGH (immunoglobulin heavy locus, a.k.a. IGH@) gene are considered to be cytogenetic hallmarks for follicular lymphoma (FL). FL represents one of the most common non-Hodgkin lymphoma (NHL).

About 75% of breakpoints on chromosome 18 are clustered in the major breakpoint region (MBR) and the minor cluster region (mcr), whereas the remaining breakpoints are scattered between these clusters, or at the 5′ side (variant cluster region or vcr) of the BCL2 gene.

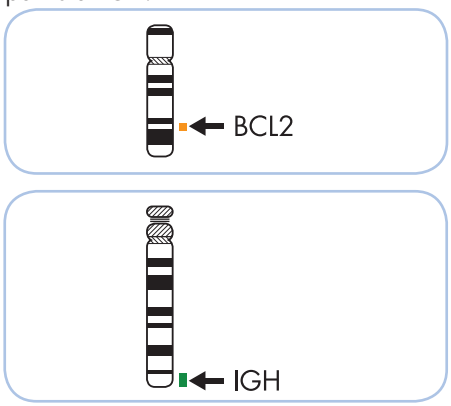
The translocation t(14;18)(q32.3;q21.3) has been identified in about 80% of FLs but is also observed in 20% to 30% of patients with diffuse large B-cell lymphoma (DLBCL). The rearrangement results in juxtaposition of the BCL2 gene at 18q21.33 next to the IgH (immunoglobulin heavy chain) locus at 14q32.33 and leads to overexpression of the anti-apoptotic protein BCL2. This represents most likely the initial step of malignant transformation, leading to suppression of apoptosis and progression to lymphoma.

Detection of t(14;18) by Fluorescence *in situ* Hybridization (FISH) can be used to confirm the diagnosis of FL if histology is inconclusive. Additionally, this method can be used to monitor the response to therapy and detect recurrent disease.

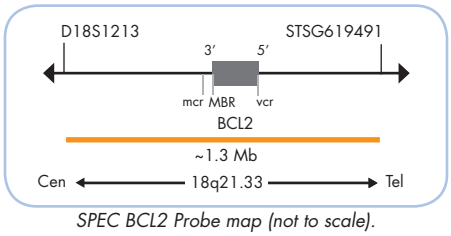
References
Baró C, et al. (2011) Leuk Res 35: 256-9.
Da Cunha Santos G, et al. (2011) Cancer Cytopathol 119: 254-62.
Einerson RR, et al. (2005) Am J Clin Pathol 124: 421-9.
Gu K, et al. (2008) Arch Pathol Lab Med 132: 1355-61.
Nguyen-Khac F, et al. (2011) Am J Blood Res 1: 13-21.
Weinberg OK, et al. (2007) J Mol Diagn 9: 530-7.

Probe Description

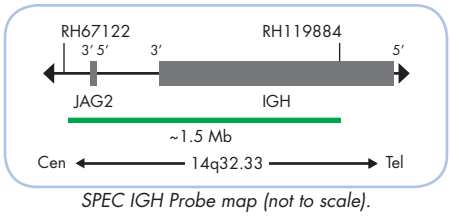
The SPEC BCL2/IGH Dual Color Dual Fusion Probe is a mixture of an orange fluorochrome direct labeled BCL2 probe spanning the known BCL2 breakpoints, and a green fluorochrome direct labeled IGH probe spanning the known breakpoints of IGH.



Ideograms of chromosomes 18 (above) and 14 (below) indicating the hybridization locations.



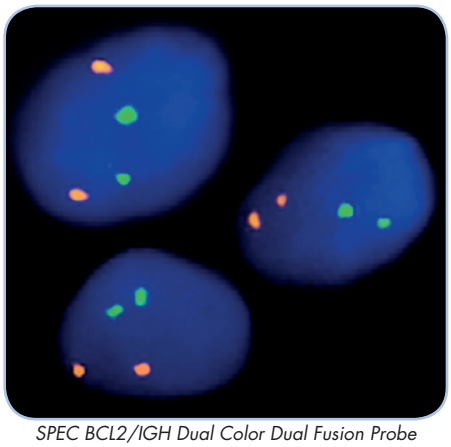
SPEC BCL2 Probe map (not to scale).



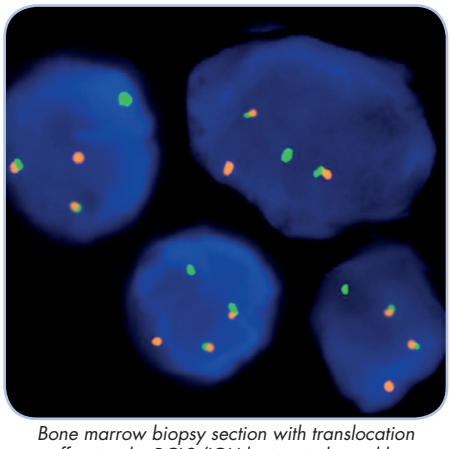
SPEC IGH Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. A reciprocal translocation involving two breakpoints splits the two signals and generates a fusion signal on each of the chromosomes involved. The chromosomal regions which are not translocated are indicated by the single orange and green signal, respectively.



SPEC BCL2/IGH Dual Color Dual Fusion Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



Bone marrow biopsy section with translocation affecting the BCL2/IGH loci as indicated by one separate orange signal, one separate green signal, and two orange/green fusion signals.

Prod. No.	Product	Label	Tests* (Volume)
Z-2114-200	ZytoLight SPEC BCL2/IGH Dual Color Dual Fusion Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

125

ZytoLight® SPEC MALT1 Dual Color Break Apart Probe

CE IVD

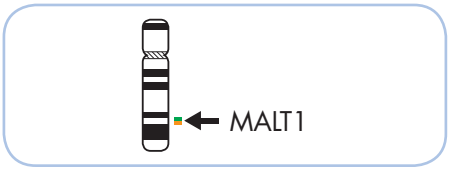
Background

The ZytoLight® SPEC MALT1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 18q21.32 harboring the MALT1 gene. The MALT1 (mucosa associated lymphoid tissue lymphoma translocation gene 1, a.k.a. MLT) gene encodes a human paracaspase and is often rearranged in MALT lymphomas accounting for 5-10% of all B-cell non-Hodgkin lymphomas (NHL). The most common translocations affecting the MALT1 gene are t(11;18)(q22.2;q21.3) and t(14;18)(q32.3;q21.3) occurring in 50% and 15-20% of MALT lymphomas, respectively. These translocations lead to the expression of BIRC3-MALT1 (a.k.a. API2-MALT1) and IGH-MALT1 fusion proteins, resulting in constitutive activation of the NF-κB signaling pathway which controls the expression of numerous anti-apoptotic and proliferation-promoting genes.
The translocation t(11;18)(q22.2;q21.3) is mainly found in pulmonary and gastric lymphomas, whereas t(14;18)(q32.3;q21.3) occurs more frequently in non-gastrointestinal MALT lymphomas, e.g., of the skin and salivary glands.
The presence of a t(11;18)(q22.2;q21.3) correlates with unresponsiveness to eradication of *Helicobacter pylori* in gastric MALT lymphomas. Hence, detection of MALT1 translocations by Fluorescence *in situ* Hybridization (FISH) may be a supportive tool to identify patients eligible for anti *H. pylori* therapy.

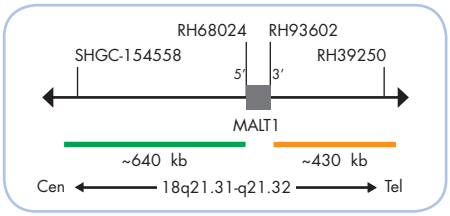
References
Afonina IS, et al. (2015) FEBS J 282: 3286-97.
Beans M, et al. (2014) PloS One 9: e103774.
Dierlamm J, et al. (1999) Blood 93: 3601-9.
Levine EG, et al. (1989) Blood 74: 1796-800.
Lucas PC, et al. (2001) J Biol Chem 276: 19012-9.
Martinelli G, et al. (2005) J Clin Oncol 23: 1979-83.
Pereira MI & Medeiros JA (2014) World J Gastroenterol 20: 684-98.
Troppan K, et al. (2015) Gastroenterol Res Pract 2015: 102656.

Probe Description

The SPEC MALT1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 18q21.31-q21.32 band. The green fluorochrome direct labeled probe hybridizes proximal to the MALT1 gene at 18q21.31-q21.32, and the orange fluorochrome direct labeled probe hybridizes distal to the MALT1 gene region at 18q21.32.



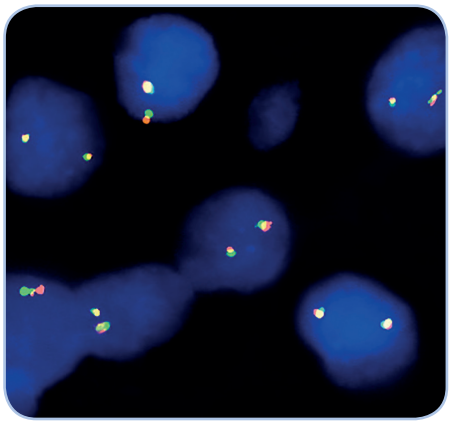
Ideogram of chromosome 18 indicating the hybridization locations.



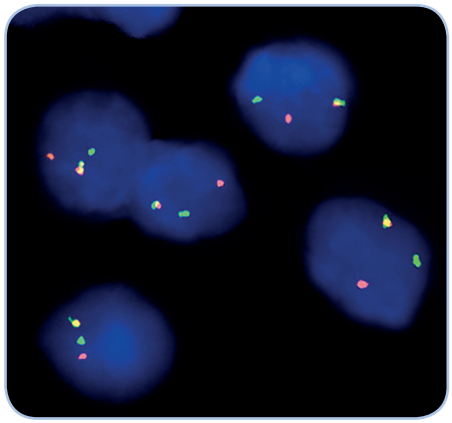
SPEC MALT1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 18q21.31-q21.32 band, two orange/green fusion signals are expected representing two normal (non-rearranged) 18q21.31-q21.32 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 18q21.31-q21.32 locus and one 18q21.31-q21.32 locus affected by a translocation.



SPEC MALT1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Lymphoma tissue section with translocation of the MALT1 gene as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2196-200	ZytoLight SPEC MALT1 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE097-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

126

ZytoLight® SPEC AXL/19p13 Dual Color Probe

CE IVD

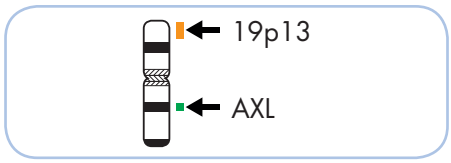
Background

The ZytoLight® SPEC AXL/19p13 Dual Color Probe is designed for the detection of amplifications of the chromosomal region harboring the AXL gene.
The AXL (AXL receptor tyrosine kinase, a.k.a. ARK, Tyro7) gene is located on chromosome 19q13.2 and encodes a receptor tyrosine kinase which is a member of the TAM (TYRO3/AXL/MERTK) family. AXL overexpression has been reported in several human cancers including colon, esophageal, thyroid, breast, lung, liver, glioblastoma, and acute leukemia.
Binding of the ligand growth arrest-specific 6 (GAS6) to AXL activates the downstream MAPK and PI3K/Akt signaling pathways, thereby promoting proliferation and survival of normal and cancer cells. AXL expression was shown to be associated with migration and invasion resulting in tumor progression and metastasis in various cancer types including lung adenocarcinoma where AXL was found to be overexpressed in 48% of patient samples.
Overexpression of AXL tyrosine kinase correlates with an adverse prognosis in glioblastoma multiforme, pancreatic adenocarcinoma, and breast cancer. Inhibition of AXL was shown to reduce tumor growth in xenograft models indicating that AXL may be an important target for new therapeutic developments in AXL overexpressing cancers.
Hence, the identification of AXL gene copy number changes by Fluorescence *in situ* Hybridization and targeted AXL signaling inhibition may be of therapeutic significance in various types of tumors.

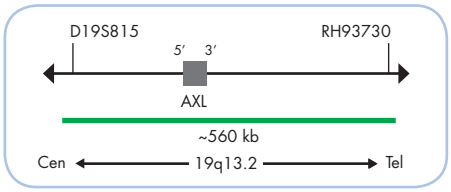
References
Gjerdrum C, et al. (2010) Proc Natl Acad Sci U S A 107: 1124-9.
Hutterer M, et al. (2008) Clin Cancer Res 14: 130-8.
Knubel KH, et al. (2014) Oncotarget 5: 1338- 51.
Koorstra JB, et al. (2009) Cancer Biol Ther 8: 618-26.
Li Y, et al. (2009) Oncogene 28: 3442-55.
Shieh YS, et al. (2005) Neoplasia 7: 1058-64.
Song X, et al. (2011) Cancer 117: 734-43.
Verma A, et al. (2011) Mol Cancer Ther 10: 1763-73.

Probe Description

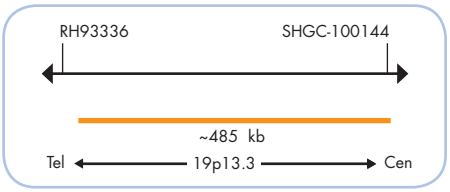
The SPEC AXL/19p13 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC AXL probe hybridizing to the AXL gene in the chromosomal region 19q13.2 and an orange fluorochrome direct labeled SPEC 19p13 probe specific for 19p13.3. Since chromosomes 1, 5, and 19 share the same repetitive sequences, probes specific for 19p13.3 are commonly used for chromosome 19 copy number detection.



Ideogram of chromosome 19 indicating the hybridization locations.



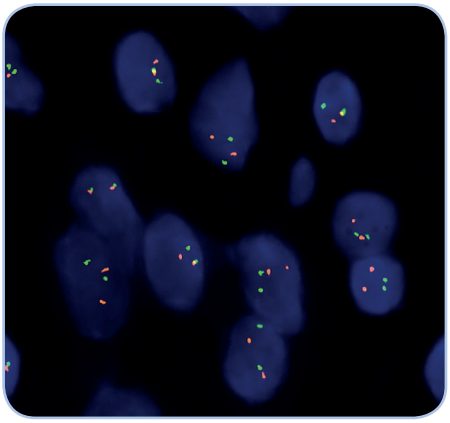
SPEC AXL Probe map (not to scale).



SPEC 19p13 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with amplification of the AXL gene locus, multiple copies of the green signal or green signal clusters will be observed.



SPEC AXL/19p13 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2154-200	ZytoLight SPEC AXL/19p13 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

127

ZytoLight® SPEC BCL2L1/CEN 20 Dual Color Probe

CE IVD

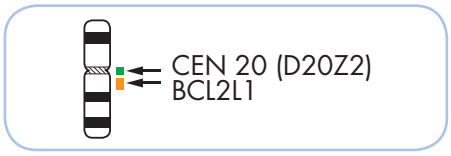
Background

The ZytoLight® SPEC BCL2L1/CEN 20 Dual Color Probe is designed for the detection of BCL2L1 gene amplifications.
The BCL2L1 (BCL2-like 1, a.k.a. BCLX) gene is located in the chromosomal region 20q11.21 and encodes for an anti-apoptotic protein that belongs to the BCL2 family. These genes are involved in a wide variety of cellular activities including lymphocyte development and hematopoiesis.
BCL2L1 amplifications have been reported in several human cancers including lung, ovarian breast, melanoma, and hematologic malignancies.
Overexpression of BCL2L1 reduces MYC-induced apoptosis in immortalized bronchial epithelial cells.
Furthermore, BCL2L1 amplifications are found in many tumor cell lines with resistance to chemotherapeutic agents.
Targeting the BCL2 family proteins with small non-peptidic compounds, so called BH3-mimetics, is currently investigated in clinical trials.
Hence, the identification of BCL2L1 amplifications by Fluorescence *in situ* Hybridization and the inhibition of BCL2L1 signaling may be of therapeutic significance in various types of tumors.

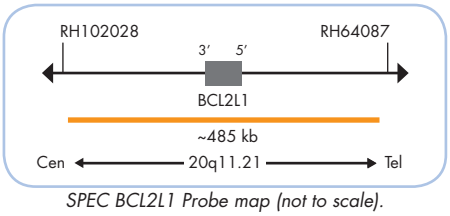
References
Beroukhim R, et al. (2010) Nature 463: 899-905.
Booher RN, et al. (2014) PloS One 9: e108371.
Sochalska M, et al. (2015) FEBS J 282: 834-49.
Yasui K, et al. (2004) Cancer Res 64: 1403-10.

Probe Description

The SPEC BCL2L1/CEN 20 Dual Color Probe is a mixture of an orange fluorochrome direct labeled SPEC BCL2L1 probe hybridizing to the BCL2L1 gene in the chromosomal region 20q11.21 and a green fluorochrome direct labeled CEN 20 probe specific for the alpha satellite centromeric region of chromosome 20 (D20Z2).



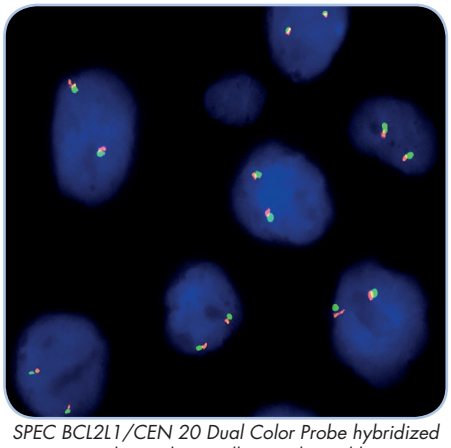
Ideogram of chromosome 20 indicating the hybridization locations.



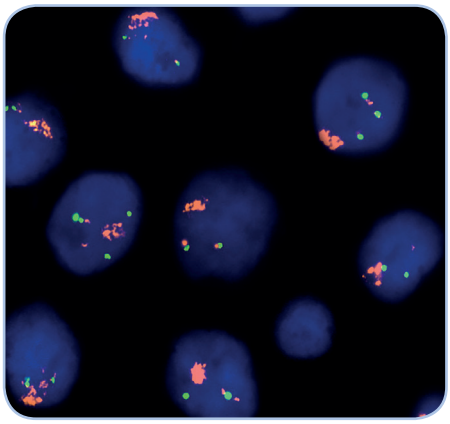
SPEC BCL2L1 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected.
In a cell with amplification of the BCL2L1 gene locus, multiple copies of the orange signal or orange signal clusters will be observed.



SPEC BCL2L1/CEN 20 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals in each nucleus.



SK-LU-1 cell line with interphase cells showing amplification of the BCL2L1 gene locus as indicated by orange signal clusters in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2171-200	ZytoLight SPEC BCL2L1/CEN 20 Dual Color Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE106-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC ERG Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC ERG Dual Color Break Apart Probe is designed to detect aberrations involving the ERG gene at 21q22.2 frequently detected in prostate cancers.

ERG (ETS-related gene) rearrangements have been observed in 40-60% of prostate cancers identified via prostate-specific antigen (PSA) screening. The most common aberration affecting ERG is the interstitial deletion of about 3 Mb at the chromosomal region 21q22 found in 90% of the cases. This deletion leads to the fusion of the hormonally regulated promoter of the TMPRSS2 (transmembrane protease, serine 2) gene to the coding region of ERG, resulting in overexpression of the ERG transcription factor. However, about 10% of the ERG rearranged prostate cancer cases show alternative fusions, as e.g. SLC45A3-ERG or NDRG1-ERG.

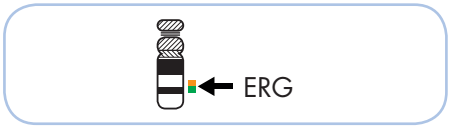
Several studies detected associations of ERG rearrangements with histomorphologic features as well as characteristic copy number gains, and gene expression signatures, defining a distinct sub-class of prostate cancers with unfavorable prognosis. Hence, the evaluation of the ERG rearrangement status in tissue or urine samples by FISH might be of diagnostic and prognostic relevance.

EWSR1-ERG gene fusions present in about 10% of patients with Ewing sarcoma may result from complex genomic rearrangements and may therefore not be detected by FISH analysis or may result in a non-classical translocation signal pattern.

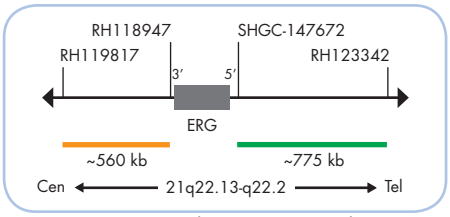
References
Esgueva R, et al. (2010) Mod Pathol 23: 539-46.
Maire G, et al. (2008) Cancer Genet Cytogenet 181: 81-92.
Nam RK, et al. (2007) Br J Cancer 97: 1690-5.
Perner S, et al. (2006) Cancer Res 66: 8337-41.
Pflueger D, et al. (2009) Neoplasia 11: 804-11.
Tomlins SA, et al. (2005) Science 310: 644-8.

Probe Description

The SPEC ERG Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the long arm of chromosome 21. The orange fluorochrome direct labeled probe hybridizes at 21q22.13-q22.2 proximal to the ERG gene breakpoint region, the green direct labeled probe hybridizes at 21q22.2 distal to the ERG gene breakpoint region.



Ideogram of chromosome 21 indicating the hybridization locations.



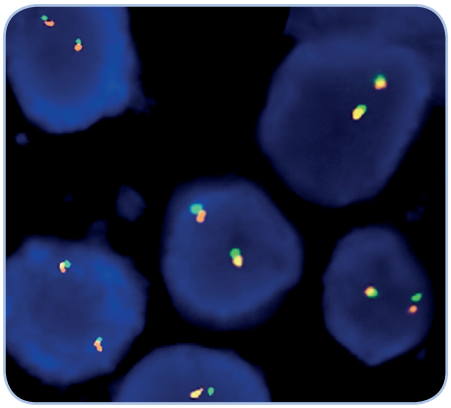
SPEC ERG Probe map (not to scale).

Results

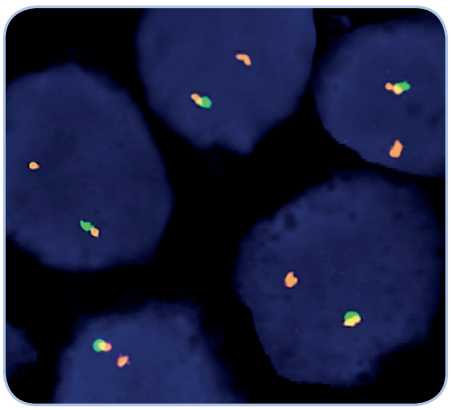
In an interphase nucleus of a normal cell lacking an aberration involving the 21q22.13-q22.2 band, two orange/green fusion signalsare expected representing the two normal (non-rearranged) 21q22.13-q22.2 loci.

One 21q22.13-q22.2 locus affected by a 21q22.2 deletion resulting in the TMPRSS2-ERG fusion is indicated by the loss of one green signal.

A signal pattern consisting of one orange/green fusion signal, a separate green, and a separate orange signal indicates an ERG translocation without involvement of TMPRSS2 (e.g. SLC45A3-ERG).



SPEC ERG Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Prostate cancer tissue section with interstitial deletion of the chromosomal region 21q22.2 resulting in the TMPRSS2-ERG fusion as indicated by the loss of one green signal.

Prod. No.	Product	Label	Tests* (Volume)
Z-2138-200	ZytoLight SPEC ERG Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

129

ZytoLight® SPEC ERG/TMPRSS2 TriCheck™ Probe

CE IVD

Background

The ZytoLight® SPEC ERG/TMPRSS2 TriCheck™ Probe is designed to detect deletions between the ERG and the TMPRSS2 gene at 21q22 resulting in the TMPRSS2-ERG fusion. Furthermore, the triple color approach allows the detection of other translocations affecting either of these genes. ERG (ETS-related gene) rearrangements have been observed in 40-60% of prostate cancers identified via prostate-specific antigen (PSA) screening. The most common aberration affecting ERG is the interstitial deletion of about 3 Mb at the chromosomal region 21q22 found in 90% of the cases. This deletion leads to the fusion of the hormonally regulated promoter of the TMPRSS2 (transmembrane protease, serine 2) gene to the coding region of ERG, resulting in overexpression of the ERG transcription factor. The deleted fragment is sometimes observed as insertion on other chromosomes. However, about 10% of the ERG rearranged prostate cancer cases show alternative fusions, as e.g. SLC45A3-ERG. On the other hand non-ERG translocations fusing TMPRSS2 to other ETS family members, as e.g. TMPRSS2-ETV1, have been found in a few percent of these malignancies.

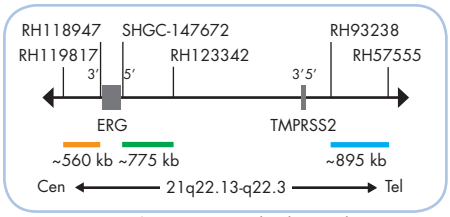
Several studies detected associations of ERG rearrangements with histomorphologic features as well as characteristic copy number gains and gene expression signatures defining a distinct sub-class of prostate cancers with unfavorable prognosis. Hence, the evaluation of the TMPRSS2-ERG rearrangement status in tissue or urine samples by Fluorescence *in situ* Hybridization might be of diagnostic and prognostic relevance.

References
Esgueva R, et al. (2010) Mod Pathol 23: 539-46.
Nam RK, et al. (2007) Br J Cancer 97: 1690-5.
Perner S, et al. (2006) Cancer Res 66: 8337-41.
Tomlins SA, et al. (2005) Science 310: 644-8.

Probe Description

The SPEC ERG/TMPRSS2 TriCheck™ Probe is a mixture of three direct labeled probes hybridizing to the chromosomal regions 21q22.13-q22.3. The orange fluorochrome direct labeled probe hybridizes at 21q22.13-q22.2 proximal to the ERG gene breakpoint region, the green fluorochrome direct labeled probe hybridizes at 21q22.2 distal to that region, and the blue fluorochrome direct labeled probe hybridizes at 21q22.3 distal to the TMPRSS2 gene region.

Ideogram of chromosome 21 indicating the hybridization locations.



SPEC ERG/TMPRSS2 TriCheck™ Probe map (not to scale).

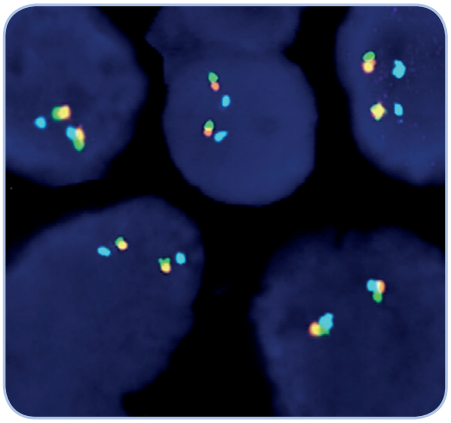
Results

In a normal interphase nucleus, two orange/green fusion signals and two blue signals in close proximity of the respective fusion signals are expected representing two normal (non-rearranged) 21q22.13-q22.3 loci.

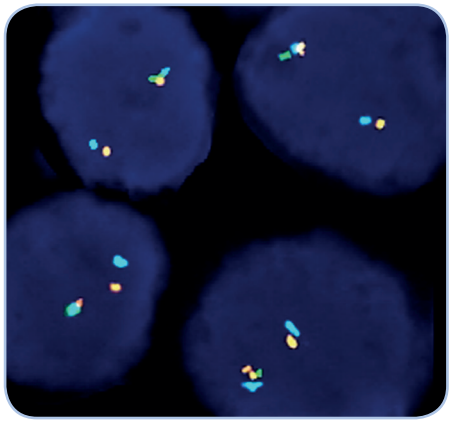
One 21q22 locus affected by a 21q22.2 deletion resulting in the TMPRSS2-ERG fusion is indicated by one separate orange signal co-localizing with one blue signal, and the loss of one green signal.

An ERG translocation without involvement of TMPRSS2 is indicated by a separated orange signal and a blue signal co-localizing with the separate green signal.

A non-ERG translocation affecting TMPRSS2 is indicated by a separated blue signal not co-localizing with the ERG fusion signal.



SPEC ERG/TMPRSS2 TriCheck Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals and two blue signals in close proximity of the respective fusion signals.



Prostate cancer tissue section with one 21q22 locus affected by an interstitial deletion of the chromosomal region 21q22.2 resulting in the TMPRSS2-ERG fusion as indicated by one separate orange signal co-localizing with one blue signal, and the loss of one green signal.

Prod. No.	Product	Label	Tests* (Volume)
Z-2135-200	ZytoLight SPEC ERG/TMPRSS2 TriCheck Probe CE IVD	●/●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

FE062-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC SMARCB1/22q12 Dual Color Probe

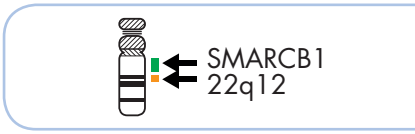
CE IVD

Background

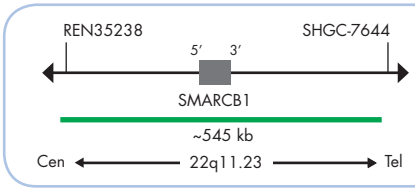
The ZytoLight® SPEC SMARCB1/22q12 Dual Color Probe is designed for the detection of deletions of the chromosomal region harboring the SMARCB1 gene.
The SMARCB1 (SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily b, member 1, a.k.a. INI1, SNF5, or BAF47) gene is located on chromosome 22q11.23 and encodes a tumor suppressor.
Rhabdoid tumors are highly malignant neoplasms that typically arise in infancy and early childhood. They are classified as atypical teratoid/rhabdoid tumors (AT/RT) when they occur in the CNS or as malignant rhabdoid tumors (MRT) when they are found in renal or extra-renal sites. The vast majority of AT/RTs and MRTs are characterized by loss of function of the SMARCB1 gene due to deletions or mutations. The molecular alterations are often bi-allelic resulting in complete loss of this tumor suppressor gene, and thus in cell cycle progression.
Patients with germline alterations of SMARCB1, including deletions, duplications, and mutations, were found to be predisposed to malignant rhabdoid tumors and schwannomatosis.
Moreover, deletions of the SMARCB1 gene were found to occur in patients with highly aggressive renal medullary carcinoma (RMC), epithelioid sarcoma, and poorly differentiated sarcoma.
The identification of SMARCB1 deletions by FISH may represent a powerful adjunctive diagnostic tool useful in the differential diagnosis of rhabdoid tumors. Moreover, prenatal testing should be performed in situations where alterations of SMARCB1 have been documented in the family.

Probe Description

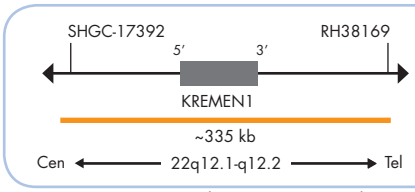
The SPEC SMARCB1/22q12 Dual Color Probe is a mixture of a green fluorochrome direct labeled SPEC SMARCB1 probe hybridizing to the human SMARCB1 gene in the chromosomal region 22q11.23 and an orange fluorochrome direct labeled SPEC 22q12 probe specific for the KREMEN1 (kringle containing transmembrane protein 1) gene region in 22q12.1-q12.2. Due to cross-hybridizations of chromosome 22 alpha satellites to other centromeric regions, probes specific for 22q12 are frequently used for chromosome 22 copy number detection.



Ideogram of chromosome 22 indicating the hybridization locations.



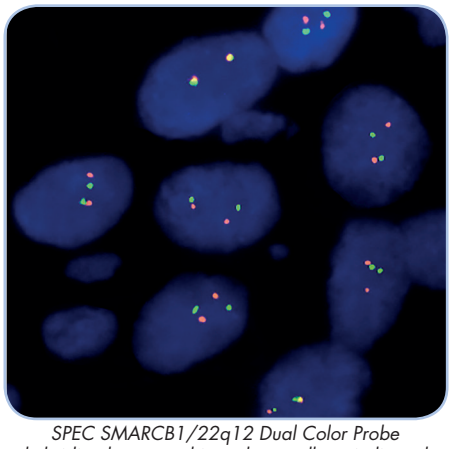
SPEC SMARCB1 Probe map (not to scale).



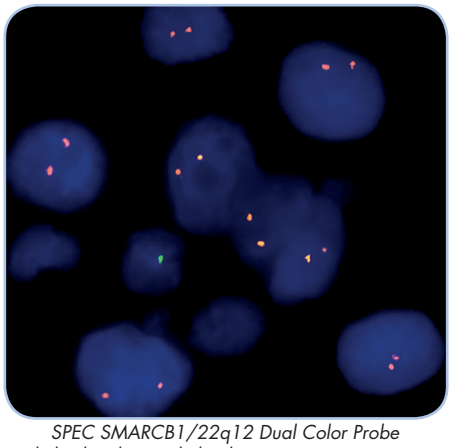
SPEC 22q12 Probe map (not to scale).

Results

In a normal interphase nucleus, two orange and two green signals are expected. In a cell with deletion of the SMARCB1 gene locus, a reduced number of green signals will be observed. Deletions affecting only parts of the SMARCB1 gene might result in a normal signal pattern with green signals of reduced size.



SPEC SMARCB1/22q12 Dual Color Probe hybridized to normal interphase cells as indicated by two orange and two green signals per nucleus.



SPEC SMARCB1/22q12 Dual Color Probe hybridized to epithelioid sarcoma tissue section with biallelic deletion of the SMARCB1 gene as indicated by missing green signals in the nuclei.

References
Calderaro J, et al. (2012) Histopathology 61: 428-35.
Eaton KW, et al. (2011) Pediatr Blood Cancer 56: 7-15.
Mobley BC, et al. (2010) Acta Neuropathol 120: 745-53.
Roberts CW & Biegel JA (2009) Cancer Biol Ther 8: 412-6.
Sullivan LM, et al. (2013) Mod Pathol 26: 385-92.

Prod. No.	Product	Label	Tests* (Volume)
Z-2178-50	ZytoLight SPEC SMARCB1/22q12 Dual Color Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC EWSR1 Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC EWSR1 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region 22q12.2 harboring the EWSR1 (Ewing sarcoma breakpoint region 1) gene (a.k.a. EWS).

Translocations involving the chromosomal region 22q12.2 are found in 90-95% of patients with Ewing sarcoma or peripheral primitive neuroectodermal tumors (PNET). Ewing sarcoma is the second most common, highly malignant bone tumor in children and young adults. The most frequent translocation involving the EWSR1 gene region is t(11;22)(q24.3;q12.2) juxtaposing the EWSR1 gene in 22q12.2 next to the FLI-1 (friend leukemia virus integration 1) locus in 11q24.3. FLI-1 is a member of the ETS family of transcription factors. Less frequently, EWSR1 can also be fused to ERG, a transcription factor closely related to FLI-1 but located in 21q22.2.

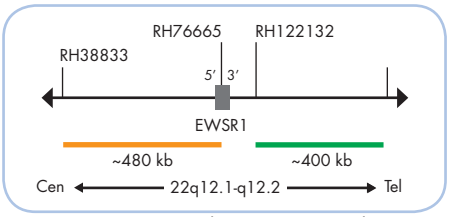
For prognosis and appropriate treatment it is important to differentiate Ewing sarcoma/PNET from classic neuroblastoma, Wilms tumor, and rhabdomyosarcoma. In combination with the histopathological diagnosis, detection of the EWSR1 rearrangements by FISH can be used to confirm the diagnosis of Ewing sarcoma/PNET.

References
Bridge RS, et al. (2006) Mod Pathol 19: 1-8.
Delattre O, et al. (1992) Nature 359: 162-5.
Lee J, et al. (2005) Cancer Genet Cytogenet 159: 177-80.
Rekhi B, et al. (2012) Virchows Arch 461: 687-97.
Romeo S & Dei Tos AP (2010) Virchows Arch 456: 219-34.
Sandberg AA & Bridge JA (2000) Cancer Genet Cytogenet 123: 1-26.
Yang L, et al. (2012) Human Pathology 43: 1463-70.
Zucman J, et al. (1993) EMBO J 12: 4481-7.

Probe Description

The SPEC EWSR1 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 22q12.1-q12.2 band. The orange fluorochrome direct labeled probe hybridizes proximal and extends inward into intron 4 of the EWSR1 gene, the green fluorochrome direct labeled probe hybridizes distal to that gene.

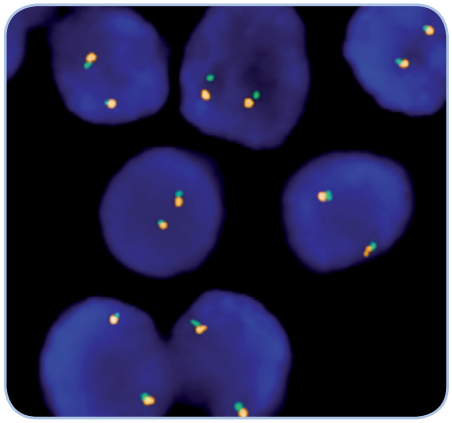
Ideogram of chromosome 22 indicating the hybridization locations.



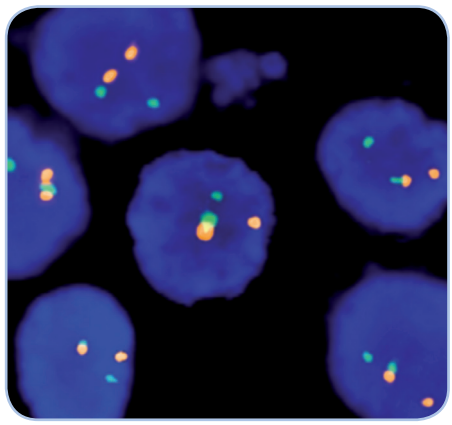
SPEC EWSR1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 22q12.1-q12.2 band two orange/green fusion signals are expected representing two normal (non-rearranged) 22q12.1-q12.2 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 22q12.1-q12.2 locus and one 22q12.1-q12.2 locus affected by a 22q12.1-q12.2 translocation.



SPEC EWSR1 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Ewing sarcoma tissue section with translocation affecting the 22q12.1-q12.2 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2096-50	ZytoLight SPEC EWSR1 Dual Color Break Apart Probe CE IVD	●/●	5 (50 µl)
Related Products			
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml		5

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

132

ZytoLight® SPEC PDGFB Dual Color Break Apart Probe

CE IVD

Background

The ZytoLight® SPEC PDGFB Dual Color Break Apart Probe is designed for the detection of specific translocations involving the chromosomal region 22q13.1 harboring the PDGFB (a.k.a. SIS) gene.

The PDGFB gene (platelet-derived growth factor beta polypeptide) belongs to the platelet-derived growth factor family and encodes a protein which acts as a receptor tyrosine kinase.

The most frequent translocation involving the PDGFB gene is t(17;22)(q21.3;q13.1) juxtaposing the PDGFB gene next to the COL1A1 gene in 17q22. Reciprocal translocations involving t(17;22)(q21.3;q13.1) are characteristic for dermatofibrosarcoma protuberans (DFSP) patients. DFSP is a highly recurrent, infiltrative skin tumor of intermediate malignancy.

The rearrangements are cytogenetically characterized by the presence of supernumerary ring chromosomes containing low-level amplified sequences from chromosomes 17q22-qter and 22q10-q13.1, or unbalanced derivatives of the t(17;22)(q21.3;q13.1) translocation.

The rearrangement results in a COL1A1-PDGFB fusion protein which is post-transcriptionally processed to a functional platelet-derived growth factor beta chain (PDGFB) protein.

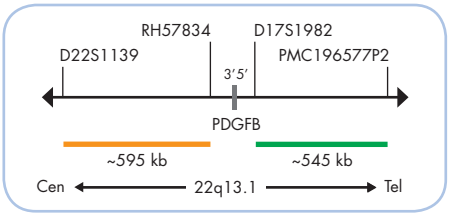
The importance of accurately diagnosing DFSP lies in its intermediate malignant nature and the availability of a therapy with significant anti-neoplastic activity but relatively minor adverse effects for cases not amenable to surgical excision.

References
Broom RJ, et al. (2012) Clin Genitourin Cancer 10: 202-6.
Labropoulos SV & Razis ED (2007) Biologics 4: 347-53.
Patel KU, et al. (2008) Human Pathol 39: 184-93.
Shimizu A, et al. (1999) Cancer Res 59: 3719-23.
Simon MP, et al. (1997) Nat Genet 15: 95-8.
Sirvent N, et al. (2003) Genes Chromosomes Cancer 37: 1-19.

Probe Description

The SPEC PDGFB Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the 22q13.1 band. The orange fluorochrome direct labeled probe hybridizes proximal to the breakpoint region of the PDGFB gene, and the green fluorochrome direct labeled probe hybridizes distal to the breakpoint region of the PDGFB gene.

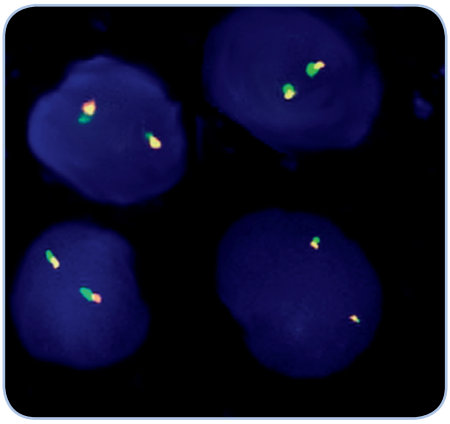
Ideogram of chromosome 22 indicating the hybridization locations.



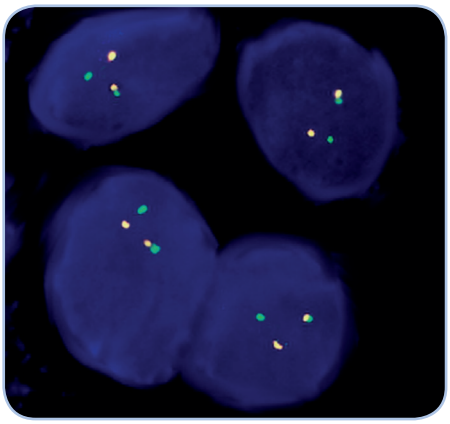
SPEC PDGFB Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 22q13.1 band two orange/green fusion signals are expected representing two normal (non-rearranged) 22q13.1 loci. A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal 22q13.1 locus and one 22q13.1 locus affected by a 22q13.1 translocation.



SPEC PDGFB Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.



Dermatofibrosarcoma protuberans tissue section with translocation affecting the 22q13.1 locus as indicated by one non-rearranged orange/green fusion signal, one orange signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
Z-2119-200	ZytoLight SPEC PDGFB Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

133

ZytoLight® SPEC CRLF2 Dual Color Break Apart Probe

CE IVD

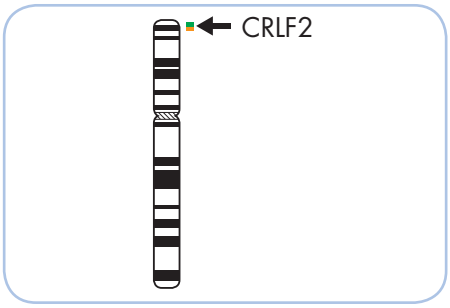
Background

The ZytoLight® SPEC CRLF2 Dual Color Break Apart Probe is designed to detect rearrangements involving the chromosomal regions Xp22.33 and Yp11.32 harboring the CRLF2 (cytokine receptor-like factor 2, a.k.a. CRL2, TSLPR) gene.
The CRLF2 protein interacts with IL7R to form a receptor for TSLP, binding of which activates cell signaling through JAK/STAT pathways.
Approximately 7% of patients with B-cell precursor ALL (B-ALL) and more than 50% of B-ALL in children with Down syndrome harbor alterations involving the CRLF2 gene. These include the translocations t(X;14)(p22.33;q32.3) or t(Y;14)(p11.32;q32.3) which fuse the entire CRLF2 gene to the immunoglobulin heavy chain enhancer region (IGH-CRLF2).
Another common alteration is an interstitial deletion involving the pseudoautosomal region (PAR1) of the sex chromosomes upstream of CRLF2, juxtaposing the first non-coding exon of P2RY8 to the entire coding region of CRLF2 (P2RY8-CRLF2).
These rearrangements, which are often accompanied by JAK mutations, result in overexpression of CRLF2 and were shown to contribute to lymphoid transformation.
Patients with CRLF2 rearrangements and JAK mutations have a poor event-free and overall survival.
Moreover, the detection of CRLF2 rearrangements by FISH may help in selecting B-ALL patients eligible for therapy with inhibitors of the JAK/STAT pathway.

References
Harvey RC, et al. (2010) Blood 115: 5312-21.
Mullighan CG, et al. (2009) Nat Genet 41: 1243-6.
Roberts KG, et al. (2014) N Engl J Med 371: 1005-15.
Russell LJ, et al. (2009) Blood 114: 2688-98.
Tasian SK, et al. (2012) Blood 120: 833-42.

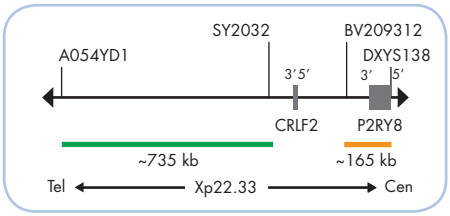
Probe Description

The SPEC CRLF2 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the Xp22.33 and Yp11.32 band, respectively. The orange fluorochrome direct labeled probe hybridizes proximal to the CRLF2 gene at Xp22.33 and Yp11.32, the green fluorochrome direct labeled probe hybridizes distal to the CRLF2 gene at Xp22.33 and Yp11.32.

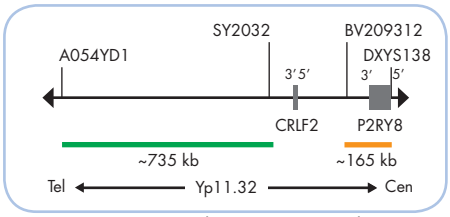


Ideogram of chromosome X indicating the hybridization locations.

Ideogram of chromosome Y indicating the hybridization locations.



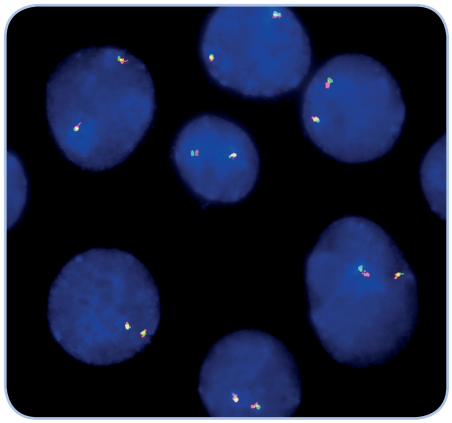
SPEC CRLF2 Probe map (not to scale).



SPEC CRLF2 Probe map (not to scale).

Results

In an interphase nucleus of a normal female cell lacking a translocation involving the Xp22.33 band, two orange/green fusion signals are expected representing normal (non-rearranged) Xp22.33 loci.
In an interphase nucleus of a normal male cell lacking a translocation involving the Xp22.33 or Yp11.32 band, two orange/green fusion signals are expected representing normal (non-rearranged) Xp22.33 and Yp11.32 loci.
A signal pattern consisting of one orange/green fusion signal, one orange signal, and a separate green signal indicates one normal Xp22.33 or Yp11.32 locus and one Xp22.33 or Yp11.32 locus affected by a translocation.
Loss of the orange signals or orange signals of reduced size are the result of deletions proximal to the CRLF2 breakpoint region.



SPEC CRLF2 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2201-200	ZytoLight SPEC CRLF2 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x MgCl2, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® Direct Label System II providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® Repeat Subtraction Technique.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® SPEC TFE3 Dual Color Break Apart Probe

CE IVD

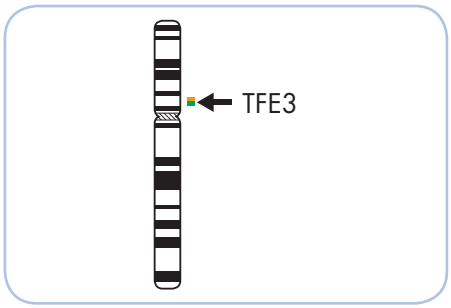
Background

The ZytoLight® SPEC TFE3 Dual Color Break Apart Probe is designed to detect translocations involving the chromosomal region Xp11.23 harboring the TFE3 (transcription factor binding to IGHM enhancer 3, a.k.a. TFEA) gene.
Translocations involving the chromosomal region Xp11.2 are frequently detected in renal cell carcinomas (RCCs) which usually affect children and adolescents. The Xp11.2 translocation RCCs represent a predominant and aggressive subtype in the pediatric age group but can also occur in adults. Macroscopically, Xp11.2 translocation RCCs may mimic conventional clear cell RCCs and thus, differential diagnosis of Xp11.2 translocation RCCs is clinically important.
Additionally, the unbalanced chromosomal translocation of der(17)t(X;17)(p11.23;q25) is cytogenetically characteristic for alveolar soft part sarcoma (ASPS). ASPS is a rare high grade mesenchymal malignancy affecting mainly adolescents. This translocation fuses the TFE3 gene at Xp11.23 to the ASPSCR1 (alveolar soft part sarcoma chromosome region, candidate 1, a.k.a ASPL) gene on 17q25.3. Diagnosis of ASPS is often difficult due to histologic overlap with other tumors, particularly in small biopsies. Thus, FISH analysis can improve accuracy of ASPS diagnosis.

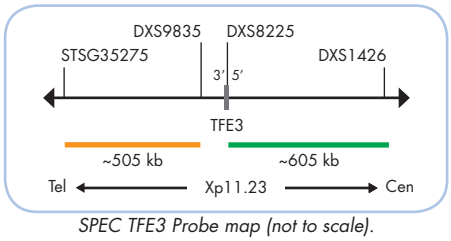
References
Argani P, et al. (2001) Am J Pathol 159: 179-92.
Armah HB, et al. (2009) Diagn Pathol 4: 15.
Dijkhuizen T, et al. (1995) Genes Chromosomes Cancer 14: 43-50.
Ladanyi M, et al. (2001) Oncogene 20: 48-57.
Llamas-Velasco M, et al. (2013) Histopathology 63: 122-9.
Pflueger D, et al. (2013) Neoplasia 15: 1231-40.
Wiliams A, et al. (2011) Virchows Arch 458: 291-300.
Wu A, et al. (2008) Histopathology 53: 533-44.
Yan BC, et al. (2009) Arch Pathol Lab Med 133: 1026-32.

Probe Description

The SPEC TFE3 Dual Color Break Apart Probe is a mixture of two direct labeled probes hybridizing to the Xp11.23 band. The orange fluorochrome direct labeled probe hybridizes distal to the TFE3 gene, the green fluorochrome direct labeled probe hybridizes proximal to that gene.



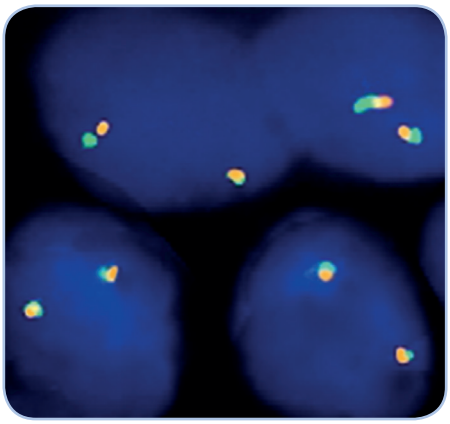
Ideogram of chromosome X indicating the hybridization locations.



SPEC TFE3 Probe map (not to scale).

Results

In a female interphase nucleus lacking a translocation involving the Xp11.23 band two orange/green fusion signals are expected representing two normal (non-rearranged) Xp11.23 loci. In a normal male interphase nucleus one orange/green fusion signal is expected representing one normal (non-rearranged) Xp11.23 locus. One separate green and separate orange signal indicate one Xp11.23 locus affected by a translocation.



SPEC TFE3 Dual Color Break Apart Probe hybridized to normal interphase cells as indicated by two orange/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2109-200	ZytoLight SPEC TFE3 Dual Color Break Apart Probe CE IVD	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

135

ZytoLight® Probes for Chromosome Enumeration

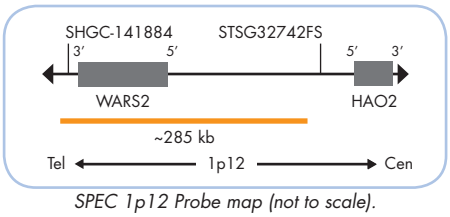
Background

The ZytoLight® Chromosome Enumeration Probes are designed for identification and enumeration of human chromosomes in interphase cells and as an adjunct to standard karyotyping in metaphases. These probes will produce sharp, bright signals specific for each individual chromosome.

Probe Description

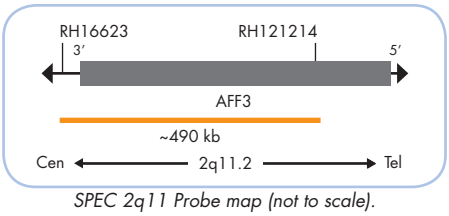
For most chromosomes, direct labeled ZytoLight® CEN™ Probes hybridizing to highly repetitive human satellite DNA sequences mainly located at the centromeric regions of chromosomes are applicable. As several chromosomes share the same repetitive sequences resulting in cross-hybridization signals, they cannot be differentiated by centromere specific probes. Instead, these chromosomes can be identified by direct labeled ZytoLight® SPEC™ Probes hybridizing in close proximity to the respective satellite DNA sequences or to other chromosome specific loci.

The ZytoLight® SPEC 1p12 Probe is designed to hybridize in close proximity of centromere 1 at 1p12 harboring WARS2, and HAO2. Since chromosomes 1, 5, and 19 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



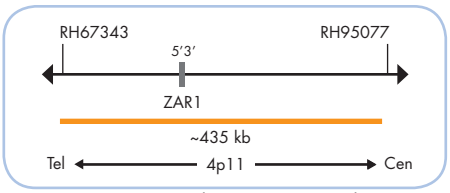
SPEC 1p12 Probe map (not to scale).

The ZytoLight® SPEC 2q11 Probe is specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



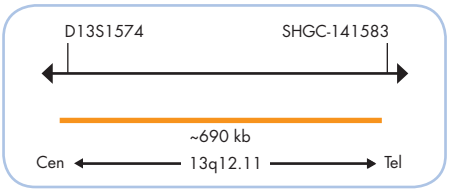
SPEC 2q11 Probe map (not to scale).

The ZytoLight® SPEC 4p11 Probe is designed to hybridize in close proximity of centromere 4 at 4p11 harboring the ZAR1 (zygote arrest 1) gene. For an unambiguous enumeration of chromosome 4 the SPEC 4p11 is found to be more suitable.



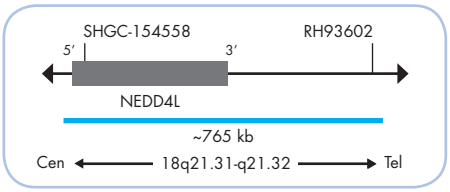
SPEC 4p11 Probe map (not to scale).

The ZytoLight® SPEC 13q12 Probe is designed to hybridize in close proximity of centromere 13 at 13q12.11. Since chromosomes 13 and 21 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



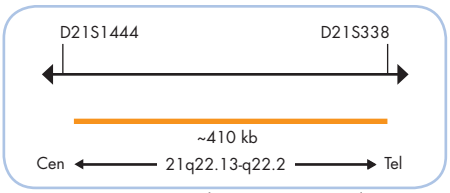
SPEC 13q12 Probe map (not to scale).

The SPEC 18q21 Probe, included in the ZytoLight® SPEC 18/CEN X/Y Triple Color Probe, is specific for NEDD4L (neural precursor cell expressed, developmentally down-regulated 4-like, E3 ubiquitin protein ligase) gene region in 18q21.31-q21.32.



SPEC 18q21 Probe map (not to scale).

The ZytoLight® SPEC 21q22 Probe hybridizes to the so-called Down Syndrome Critical Region on 21q22.13-q22.2 commonly duplicated in cases with partial trisomy 21. Since chromosomes 13 and 21 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



SPEC 21q22 Probe map (not to scale).

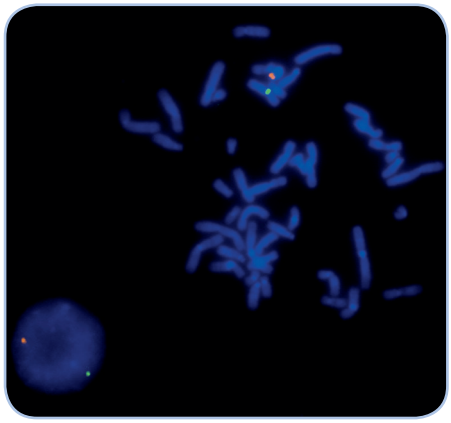
ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

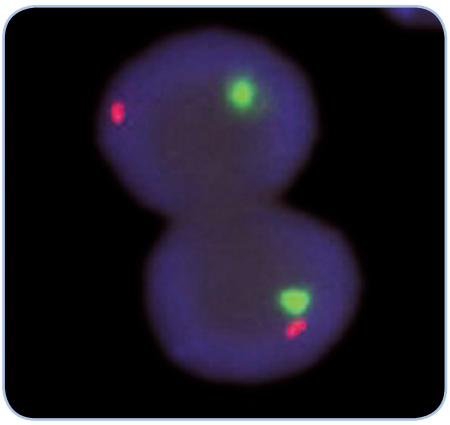
136

Results

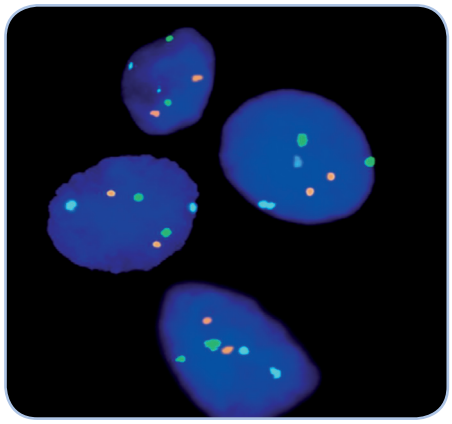
In a normal interphase nucleus, two signals are expected using Chromosome Enumeration Probes specific for autosomes. Using chromosome Y specific probes will result in normal male cells in one signal and in normal female cells in no signal. Using chromosome X specific probes will result in normal male cells in one signal and in normal female cells in two signals per nucleus. Other signal patterns indicate numerical aberrations of the respective chromosome.



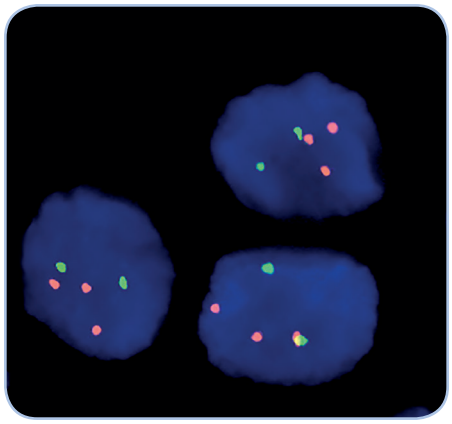
CEN X/Y Dual Color Probe on a metaphase spread.



CEN X/Yq12 Dual Color Probe on interphase cells.



SPEC 13/CEN 18/SPEC 21 Triple Color Probe on cytology specimen.



SPEC 13/21 Dual Color Probe on interphase cells with trisomy of chromosome 21 (orange).

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Prod. No.	Product	Alpha/Class. Sat.	Chr. Band	Label	Tests* (Volume)
Z-2101-200	Zyto*Light* SPEC 1p12 Probe CE IVD	-	1p12	●	20 (200 µl)
Z-2049-200	Zyto*Light* SPEC 2q11 Probe	-	2q11.2	●	20 (200 µl)
Z-2001-200	Zyto*Light* CEN 3 Probe	D3Z1	3p11-q11.1	●	20 (200 µl)
Z-2083-200	Zyto*Light* SPEC 4p11 Probe	-	4p11	●	20 (200 µl)
Z-2002-200	Zyto*Light* CEN 6 Probe	D6Z1	6p11.1-q11.1	●	20 (200 µl)
Z-2003-200	Zyto*Light* CEN 7 Probe	D7Z1	7q11.1	●	20 (200 µl)
Z-2004-200	Zyto*Light* CEN 8 Probe CE IVD	D8Z2	8p11.1-q11.1	●	20 (200 µl)
Z-2067-200	Zyto*Light* CEN 9 Probe	III D9Z3	9q12	●	20 (200 µl)
Z-2079-200	Zyto*Light* CEN 10 Probe	D10Z1	10p11.1-q11.1	●	20 (200 µl)
Z-2005-200	Zyto*Light* CEN 11 Probe	D11Z1	11p11.1-q11	●	20 (200 µl)
Z-2050-200	Zyto*Light* CEN 12 Probe CE IVD	D12Z3	12p11.1-q11	●	20 (200 µl)
Z-2085-200	Zyto*Light* SPEC 13q12 Probe CE IVD	-	13q12.11	●	20 (200 µl)
Z-2095-50	Zyto*Light* SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	D18Z1	13q12.11/18p11.1-q11.1/21q22.13-q22.2	●/●/●	5 (50 µl)
Z-2095-200	Zyto*Light* SPEC 13/CEN 18/SPEC 21 Triple Color Probe CE IVD	D18Z1	13q12.11/18p11.1-q11.1/21q22.13-q22.2	●/●/●	20 (200 µl)
Z-2164-200	Zyto*Light* SPEC 13/21 Dual Color Probe CE IVD	-	13q12.11/21q22.13-q22.2	●/●	20 (200 µl)
Z-2006-200	Zyto*Light* CEN 17 Probe CE IVD	D17Z1	17p11.1-q11.1	●	20 (200 µl)
Z-2007-200	Zyto*Light* CEN 18 Probe	D18Z1	18p11.1-q11.1	●	20 (200 µl)
Z-2163-200	Zyto*Light* SPEC 18/CEN X/Y Triple Color Probe CE IVD	DXZ1/ DYZ3	18q21.31-q21.32/Xp11.1-q11.1/Yp11.1-q11.1	●/●/●	20 (200 µl)
Z-2086-200	Zyto*Light* SPEC 21q22 Probe CE IVD	-	21q22.13-q22.2	●	20 (200 µl)
Z-2180-200	Zyto*Light* SPEC 21/CEN X/Yq12 Triple Color Probe CE IVD	DXZ1/ III DYZ1	21q22.13-q22.2/Xp11.1-q11.1/Yq12	●/●/●	20 (200 µl)
Z-2008-200	Zyto*Light* CEN X Probe	DXZ1	Xp11.1-q11.1	●	20 (200 µl)
Z-2010-200	Zyto*Light* CEN Yq12 Probe	III DYZ1	Yq12	●	20 (200 µl)
Z-2123-200	Zyto*Light* CEN Y (DYZ3) Probe CE IVD	DYZ3	Yp11.1-q11.1	●	20 (200 µl)
Z-2016-200	Zyto*Light* CEN X/Yq12 Dual Color Probe CE IVD	DXZ1/ III DYZ1	Xp11.1-q11.1/Yq12	●/●	20 (200 µl)
Z-2016-50	Zyto*Light* CEN X/Yq12 Dual Color Probe CE IVD	DXZ1/ III DYZ1	Xp11.1-q11.1/Yq12	●/●	5 (50 µl)
Z-2120-200	Zyto*Light* CEN X/Y Dual Color Probe CE IVD	DXZ1/ DYZ3	Xp11.1-q11.1/Yp11.1-q11.1	●/●	20 (200 µl)
Related Products					
Z-2104-10	Zyto*Light* Aneusomy Probe Set CE IVD Incl. Zyto*Light* CEN X/Yq12 Dual Color Probe, 0.05 ml; Zyto*Light* SPEC 13/CEN 18/SPEC 21 Triple Color Probe, 0.05 ml				10
Z-2104-40	Zyto*Light* Aneusomy Probe Set CE IVD Incl. Zyto*Light* CEN X/Yq12 Dual Color Probe, 0.2 ml; Zyto*Light* SPEC 13/CEN 18/SPEC 21 Triple Color Probe, 0.2 ml				40
Z-2028-5	Zyto*Light* FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml				5
Z-2028-20	Zyto*Light* FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml				20
Z-2099-20	Zyto*Light* FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x $MgCl_2$, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8 ml				20

** Using 10 µl probe solution per test.* CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® porcine X/Y Dual Color Probe

Background

The ZytoLight® porcine X/Y Dual Color Probe is designed for the simultaneous identification and enumeration of porcine sex chromosomes X and Y in interphase cells.

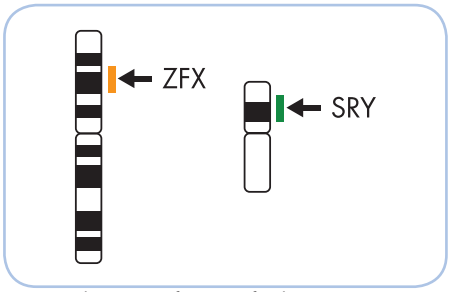
A possible application of this probe is the identification of host and donor cells in porcine homografts in case of sex-mismatched organ transplants. Implanted and host cells can be clearly distinguished without distorting the tissue.

Additionally, the engraftment success of xenotransplants can be determined as this probe has been shown not to hybridize to human chromosomes.

References
Braun J, et al. (1997) J Pathol 183: 99-104.
Quilter CR, et al. (2002) Mamm Genome 13: 588-94.
Riera del Moral L, et al. (2015) J Surg Res 195: 325-33.
Rohrer G, et al. (1996) Genome Res 6: 371-91.
Zudova D, et al. (2003) Cytogenet Genome Res 102: 179-83.

Probe Description

The porcine X/Y Dual Color Probe is a mixture of an orange fluochrome direct labeled probe specific for the porcine ZFX gene region in Xp2.1-p2.2 and a green fluochrome direct labeled probe specific for the porcine SRY gene region in Yp1.2-p1.3. The porcine X/Y Dual Color Probe does not cross-hybridize to human chromosomes.

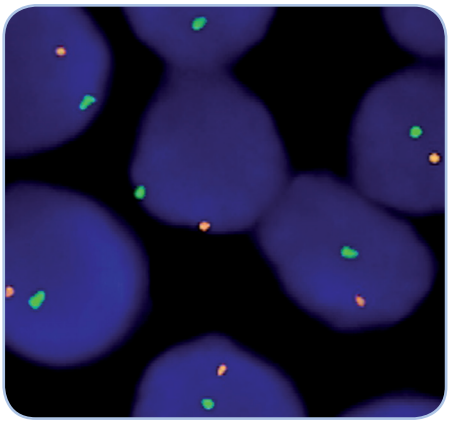


Ideograms of Sus scrofa chromosomes X and Y indicating the hybridization locations.

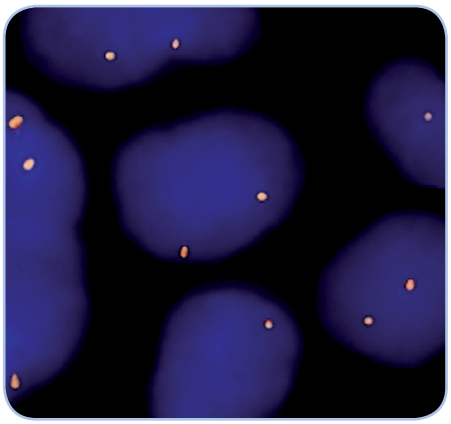
Results

In a normal porcine male interphase nucleus, one orange and one green signal are expected. In a normal porcine female interphase nucleus, two orange signals will be observed. Other signal patterns indicate numerical aberrations of sex chromosomes.

In human nuclei no signals will be visible.



Porcine X/Y Dual Color Probe hybridized to normal male interphase cells of a pig as indicated by one orange (chromosome X) and one green (chromosome Y) signal per nucleus.



Porcine X/Y Dual Color Probe hybridized to normal female interphase cells of a pig as indicated by two orange (chromosome X) signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
Z-2094-200	ZytoLight porcine X/Y Dual Color Probe	●/●	20 (200 µl)
Related Products			
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml		20

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Accessories

ZytoLight® Implementation Kits

For the detection of ZytoLight® Probes

Prod. No.	Product	Tests
Z-2028-5	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; 25x Wash Buffer A, 50 ml; DAPI/DuraTect-Solution, 0.2 ml	5
Z-2028-20	ZytoLight FISH-Tissue Implementation Kit CE IVD Incl. Heat Pretreatment Solution Citric, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; 25x Wash Buffer A, 100 ml; DAPI/DuraTect-Solution, 0.8 ml	20
Z-2099-20	ZytoLight FISH-Cytology Implementation Kit CE IVD Incl. Cytology Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 50 ml; 10x $MgCl_2$, 50 ml; 10x PBS, 50 ml; Cytology Stringency Wash Buffer SSC, 500 ml; Cytology Wash Buffer SSC, 500 ml; DAPI/DuraTect-Solution, 0.8ml	20

ZytoLight® Pretreatment Reagents

Prod. No.	Product
ES-0001-4	Pepsin Solution, 4 ml CE IVD
ES-0001-8	Pepsin Solution Set, 2x 4 ml CE IVD
ES-0001-50	Pepsin Solution, 50 ml CE IVD
ES-0001-1000	Pepsin Solution, 1000 ml CE IVD
ES-0002-4	Cytology Pepsin Solution, 4 ml CE IVD
ES-0002-50	Cytology Pepsin Solution, 50 ml CE IVD
PT-0001-1000	Heat Pretreatment Solution Citric, 1000 ml CE IVD
PT-0006-100	Formaldehyde Dilution Buffer Set CE IVD Incl. 10x $MgCl_2$, 50 ml; 10x PBS, 50 ml

ZytoLight® Wash Buffers & Ancillary Reagents

Prod. No.	Product
E-4005-50	Fixogum, Rubber Cement, 50 g
E-4005-125	Fixogum, Rubber Cement, 125 g
MT-0007-0.8	DAPI/DuraTect™-Solution, 150 ng DAPI/ml, 0.8 ml CE IVD
MT-0008-0.8	DAPI/DuraTect™-Solution (ultra), 1360 ng DAPI/ml, 0.8 ml CE IVD
WB-0001-500	Wash Buffer SSC, 500 ml CE IVD
WB-0002-50	25x Wash Buffer A, 50 ml CE IVD
WB-0003-50	20x SSC Solution, 50 ml
WB-0005-50	20x Wash Buffer TBS, 50 ml CE IVD
WB-0007-500	Cytology Stringency Wash Buffer SSC, 500 ml CE IVD
WB-0008-500	Cytology Wash Buffer SSC, 500 ml CE IVD

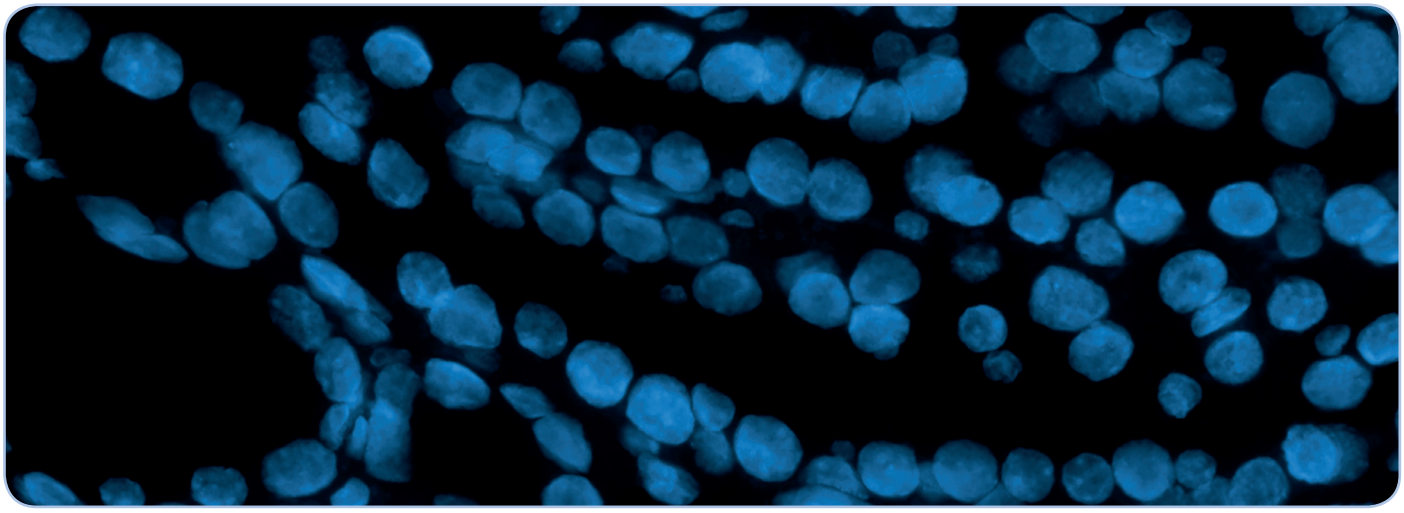
CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ALE002-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

DAPI/Antifade Mounting Solutions



Product Description

ZytoVision's DAPI/Antifade Mounting Solutions are ready-to-use mounting media that are applied directly to fluorescently labeled tissue or cell specimens on microscope slides. They contain the nuclear counterstain DAPI (4', 6-diamidino-2-phenylindole) which produces a blue fluorescence when bound to DNA.

ZytoVision's DAPI/Antifade Mounting Solutions are optimized to be used on tissue or cell specimens that have been hybridized with any available ZytoLight® Probe. They are all particularly compatible with the ZytoVision fluorochromes ZyGreen™, ZyOrange™, ZyBlue™, ZyGold™ and ZyRed™.

ZytoVision's DAPI/Antifade Mounting Solutions prevent permanent loss of fluorescence and protect fluorescent dyes from photobleaching during fluorescence microscopy.

Prod. No.	Product	Concentration	Storage Temperature	Description
MT-0007-0.8	DAPI/DuraTect™-Solution, 0.8 ml CE IVD	150 ng DAPI/ml	2...8°C	· Best overall signal protection · Superior signal stability of mounted tissue sections (≤3 months at 2...21°C)
MT-0008-0.8	DAPI/DuraTect™-Solution (ultra), 0.8 ml CE IVD	1360 ng DAPI/ml	2...8°C	· Best overall signal protection · Superior signal stability of mounted tissue sections (≤3 months at 2...21°C) · Recommended when a more intense DAPI stain is desired

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ALE003-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoLight® Fluorochromes and Filter Recommendations

ZytoLight® Fluorochromes
Two factors that mainly influence FISH analyses:
- **Fluorochromes of the FISH probes**
- **Appropriate filter sets**

Fluorochrome	Excitation	Emission	Equivalent to
ZyBlue™	418 nm	467 nm	DEAC
ZyGreen™	503 nm	528 nm	FITC
ZyGold™	532 nm	553 nm	Rhodamine 6G
ZyOrange™	547 nm	572 nm	Rhodamine
ZyRed™	580 nm	599 nm	TexasRed®

Recommended Filter Sets
All filter sets are produced by well known manufacturers and have a **superior-signal-to-noise ratio!**

Prod. No	Product	Detected Fluorochrome
E-4030-1	DAPI Single Bandpass Filter Set v2	DAPI
E-4026-1	ZyBlue™ Single Bandpass Filter Set v2	●
E-4012-1	ZyGreen™ Single Bandpass Filter Set v2	●
E-4027-1	ZyGold™ Single Bandpass Filter Set v2	●
E-4013-1	ZyOrange™ Single Bandpass Filter Set v2	●
E-4017-1	ZyRed™ Single Bandpass Filter Set v2	●
E-4016-1	ZyGreen™/ZyOrange™ Dual Bandpass Filter Set v2	●/●
E-4010-1	DAPI/ZyGreen™/ZyOrange™ Triple Bandpass Filter Set	DAPI/●/●
E-4028-1	ZyBlue™/ZyGreen™/ZyOrange™ Triple Bandpass Filter Set	●/●/●

Fluorescence Filter Holder
The filter sets need to be assembled in fluorescence filter holder specific for the respective microscope.

Prod. No	Product	Compatible for Microscopes e.g.*
E-4111-1	ZEISS Fluorescence Filter Holder „FL EC P&C“	Zeiss: Axio Imager, Axiostar plus, Axioskop 40
E-4113-1	ZEISS Fluorescence Filter Holder „FL“	Zeiss: Axioplan 2, Axio Scope 2, Axiophot 2
E-4121-1	OLYMPUS Fluorescence Filter Holder „U-MF 2“	Olympus: AX, AX70, BX41, BX50, BX51
E-4122-1	OLYMPUS Fluorescence Filter Holder „U-FF“	Olympus: BX43, BX53, BX63
E-4131-1	LEICA Fluorescence Filter Holder „DM K“	Leica: DM-2000, DM-3000, DM-5500
E-4141-1	NIKON Fluorescence Filter Holder „C-FL“	Nikon: Eclipse 50i, Eclipse 80i, TI Eclipse

*If your model is not listed, please contact info@zytovision.com

Microscope Specifications
In order to provide you with the best possible service, please provide us with the following details:
- **Microscope manufacturer**
- **Type or model of microscope**
- **Approx. age of microscope**

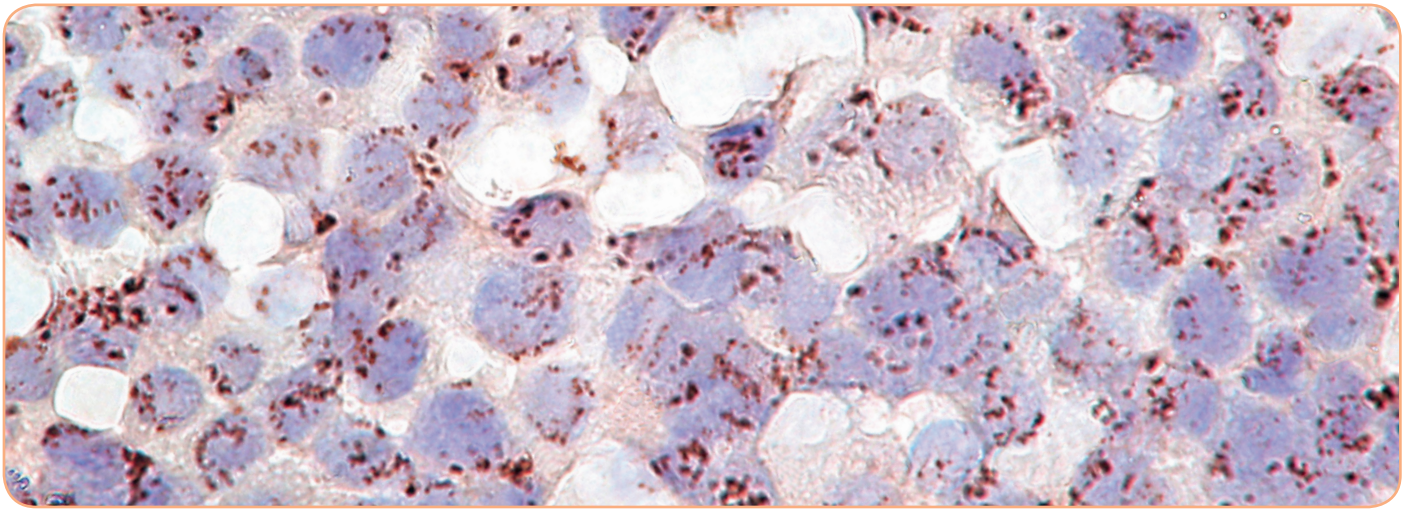
These filter sets, optimized for ZytoLight® FISH probes, will significantly increase brightness and quality of your FISH results!

ALE001-1-16
ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® Products for CISH analysis

143

Reliable and Simple Detection of Genomic Alterations using Light Microscopy!



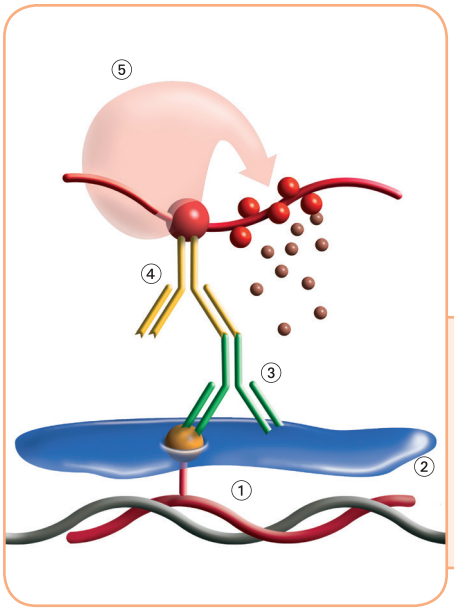
Introduction
The ZytoDot ® products are designed for the detection of aneuploidies and gene amplifications by Chromogenic *in situ* Hybridization (CISH) in formalin-fixed, paraffin-embedded tissue sections, cell samples, blood or bone marrow smears, and metaphase chromosome spreads.

CISH: A reliable Alternative to FISH
High concordance between CISH and FISH ranging from 92-100% has been shown by numerous international studies for ERBB2 amplification.

Advantages of CISH
- Quick and easy interpretation of results comparable to IHC
- Simultaneous observation of tissue morphology and CISH signals
- Storage of slides at room temperature - CISH signals are permanent
- No costly fluorescent microscope needed

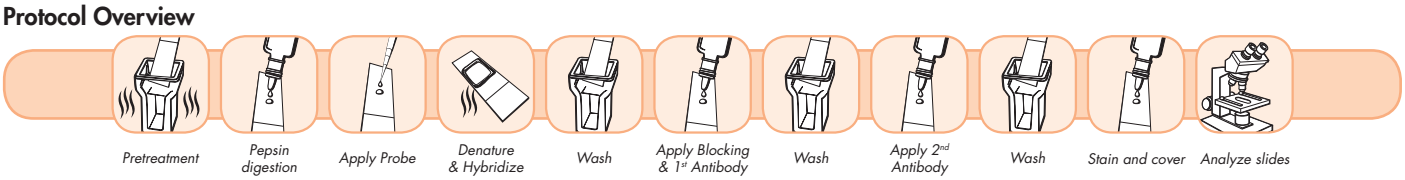
High Signal-to-Noise Ratio
The ZytoDot ® probes are processed by the unique ZytoVision ® *Repeat Subtraction Technique* resulting in advanced specificity and less background. No further blocking of repetitive sequences is needed!

ZytoDot ® Kits – Convenient Solutions
For making CISH analysis reliable and user-friendly, all ZytoDot ® CISH probes can be combined with the ZytoDot ® CISH Implementation Kit (C-3018-40) which includes all necessary pretreatment solutions, wash buffers, antibodies, chromogenic substrates, counterstaining solution, mounting solution and a detailed protocol to perform successful CISH experiments. Additionally, for some major targets, complete kits including probes and all necessary reagents are available.



The ZytoDot ® system uses Digoxigenin-labeled probes ① which are, after blocking ②, detected using a Mouse-anti-Digoxigenin antibody ③. This antibody is detected by a polymerized HRP-Goat-anti-Mouse antibody ④. The enzymatic reaction of DAB ⑤ leads to the formation of strong permanent brown signals that can be visualized by light microscopy using a 40x objective.

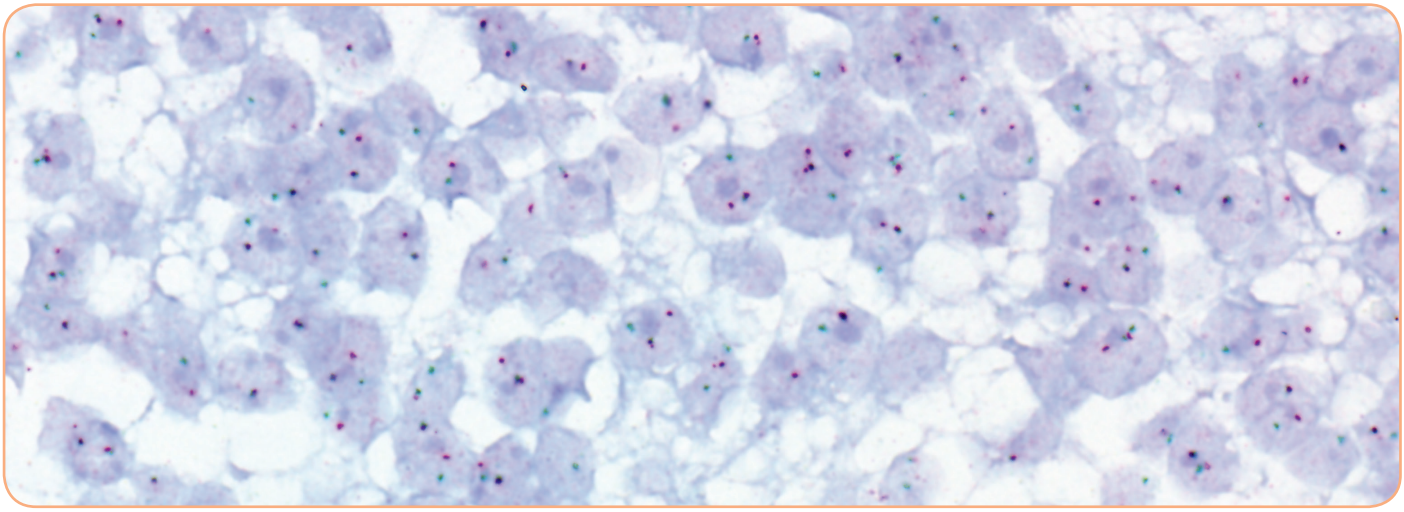
Protocol Overview



Advanced specificity and less background of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot® 2C™ – 2-Color CISH for the Detection of Genomic Alterations



Introduction

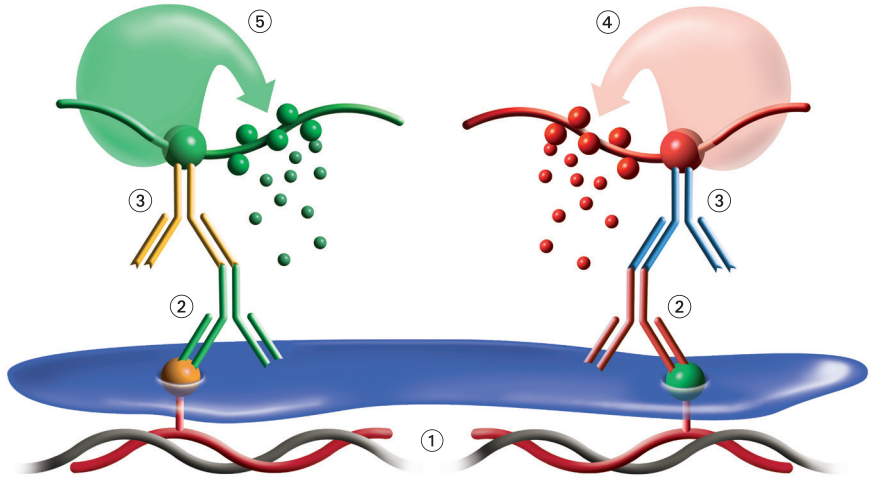
The ZytoDot® 2C™ products are designed for the simultaneous detection of two different genomic targets by Chromogenic *in situ* Hybridization (CISH) in formalin-fixed, paraffin-embedded tissue sections, cell samples, and blood or bone marrow smears. This two color system is especially useful for the differentiation of aneuploidies from gene amplifications, and the detection of deletions and translocations.

Advantages of ZytoDot® 2C™

- Simultaneous observation of tissue morphology and CISH signals at 40x using light microscopy
- Two targets detected simultaneously
- High contrasting distinct red and green signals
- Quick and easy interpretation of results comparable to IHC
- Standardized and complete kits
- No costly fluorescent microscope needed

ZytoDot® 2C™ Kits – Standardized Solutions

For making CISH analysis reliable and user-friendly, complete ZytoDot® 2C™ kits are available for some major targets. These kits include a ZytoDot® 2C™ probe, all necessary pretreatment solutions, wash buffers, antibodies, chromogenic substrates, counterstaining and mounting solutions, and a detailed protocol.
For other targets, any separately available ZytoDot® 2C™ probe can be combined with ZytoDot® 2C™ Implementation Kits resulting in target specific kit solutions.



The ZytoDot® 2C™ system uses DIG- and DNP-labeled probe cocktails targeting different genomic sections ① which are detected using a Mouse-anti-DIG/Rabbit-anti-DNP cocktail ②. These antibodies are detected by a unique cocktail of polymerized HRP-Goat-anti-Mouse/AP-Goat-anti-Rabbit antibodies ③. The enzymatic reaction of AP-Red ④ and HRP-Green ⑤ leads to the formation of strong permanent red respectively green signals that can be visualized by light microscopy using a 40x objective.

Protocol Overview

Advanced specificity and less background of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

MDE002-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

145

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
1	1p36.3	ZytoDot 2C SPEC 1p36/1q25 Probe CE IVD	C-3036-100/-400	100 µl/400 µl	154 f.
	1p12	ZytoDot SPEC 1p12 Probe CE IVD	C-3035-400	400 µl	188 f.
	1q25.3	ZytoDot 2C SPEC 1p36/1q25 Probe CE IVD	C-3036-100/-400	100 µl/400 µl	154 f.
2	2p24	ZytoDot SPEC MYCN Probe CE IVD	C-3029-400	400 µl	156
	2p23	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	C-3055-100/-400	100 µl/400 µl	157
	2p21	ZytoDot 2C SPEC EML4 Break Apart Probe CE IVD	C-3059-400	400 µl	158
	2q11.2	ZytoDot SPEC 2q11 Probe CE IVD	C-3051-400	400 µl	188 f.
3	3p11.1-q11.1	ZytoDot CEN 3 Probe CE IVD	C-3045-400	400 µl	188 f.
4-5		no probes available yet			
6	6p11.1-q11	ZytoDot CEN 6 Probe CE IVD	C-3002-400	400 µl	188 f.
	6q22.1	ZytoDot 2C SPEC ROS1 Break Apart Probe CE IVD	C-3063-100/-400	100 µl/400 µl	159
	6q25.1	ZytoDot SPEC ESR1 Probe CE IVD	C-3024-400	400 µl	160

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
7	7p11.2	ZytoDot SPEC EGFR Probe CE IVD	C-3007-400	400 µl	161
		ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	C-3033-100/-400	100 µl/400 µl	162
	7q11.1	ZytoDot CEN 7 Probe CE IVD	C-3008-400	400 µl	188 f.
	7q31.2	ZytoDot 2C SPEC MET/CEN 7 Probe CE IVD	C-3057-400	400 µl	163
8	8p11.2	ZytoDot SPEC FGFR1 Probe CE IVD	C-3023-400	400 µl	164
		ZytoDot 2C SPEC FGFR1/CEN 8 Probe CE IVD	C-3050-400	400 µl	165
	8p11.1-q11.1	ZytoDot CEN 8 Probe CE IVD	C-3016-400	400 µl	188 f.
	8q24.21	ZytoDot SPEC MYC Probe CE IVD	C-3013-400	400 µl	166
		ZytoDot 2C SPEC MYC Break Apart Probe CE IVD	C-3066-400	400 µl	167
9	9p21	ZytoDot 2C SPEC CDKN2A/CEN 9 Probe CE IVD	C-3067-400	400 µl	168
10	10q11.2	ZytoDot 2C SPEC RET Break Apart Probe CE IVD	C-3064-100/-400	100 µl/400 µl	169
	10q23.3	ZytoDot 2C SPEC PTEN/CEN 10 Probe CE IVD	C-3053-400	400 µl	170
	10q26.1	ZytoDot 2C SPEC FGFR2/CEN 10 Probe CE IVD	C-3056-400	400 µl	171
11	11q13.3	ZytoDot SPEC CCND1 Probe CE IVD	C-3034-400	400 µl	172
12	12p11.1-q11	ZytoDot CEN 12 Probe CE IVD	C-3014-400	400 µl	188 f.
	12q13.3	ZytoDot 2C SPEC DDIT3 Break Apart Probe CE IVD	C-3047-100	100 µl	173
	12q14	ZytoDot 2C SPEC CDK4/CEN 12 Probe CE IVD	C-3062-400	400 µl	174
	12q15	ZytoDot SPEC MDM2 Probe CE IVD	C-3012-400	400 µl	175
		ZytoDot 2C SPEC MDM2/CEN 12 Probe CE IVD	C-3049-100/-400	100 µl/400 µl	176

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
13	13q12.1	ZytoDot SPEC 13q12 Probe CE IVD	C-3052-400	400 µl	188 f.
	13q14.1	ZytoDot 2C SPEC FOXO1 Break Apart Probe CE IVD	C-3065-100	100 µl	177
14-15		no probes available yet			
16	16p11.2	ZytoDot 2C SPEC FUS Break Apart Probe CE IVD	C-3054-100	100 µl	178
17	17p11.1-q11.1	ZytoDot CEN 17 Probe CE IVD	C-3006-400	400 µl	188 f.
	17q12	ZytoDot SPEC ERBB2 Probe CE IVD	C-3001-100/-400	100 µl/400 µl	179
		ZytoDot SPEC ERBB2 Probe Kit CE IVD	C-3003-10/-40	10 Tests/40 Tests	179
		ZytoDot 2C SPEC ERBB2/CEN 17 Probe CE IVD	C-3032-100/-400	100 µl/400 µl	180
		ZytoDot 2C SPEC ERBB2/CEN 17 Probe Kit CE IVD	C-3022-10/-40	10 Tests/40 Tests	180
		ZytoDot 2C SPEC ERBB2/D17S122 Probe CE IVD	C-3068-100	100 µl	181
	17q21.2	ZytoDot SPEC TOP2A Probe CE IVD	C-3021-400	400 µl	182
		ZytoDot 2C SPEC TOP2A/CEN 17 Probe CE IVD	C-3040-400	400 µl	183
18	18q11.2	ZytoDot 2C SPEC SS18 Break Apart Probe CE IVD	C-3046-100	100 µl	184
19	19p13.3	ZytoDot 2C SPEC 19q13/19p13 Probe CE IVD	C-3037-100/-400	100 µl/400 µl	154 f.
	19q13.3	ZytoDot 2C SPEC 19q13/19p13 Probe CE IVD	C-3037-100/-400	100 µl/400 µl	154 f.
20	20q12	ZytoDot 2C SPEC TOP1/CEN 20 Probe CE IVD	C-3069-400	400 µl	185
21	21q22.1-q22.2	ZytoDot SPEC 21q22 Probe CE IVD	C-3026-400	400 µl	188 f.
	21q22.2	ZytoDot 2C SPEC ERG Break Apart Probe CE IVD	C-3058-400	400 µl	186
22	22q12.2	ZytoDot 2C SPEC EWSR1 Break Apart Probe CE IVD	C-3043-100	100 µl	187

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® Direct Label System II providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® Repeat Subtraction Technique.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Chromosome Index, human

	Chr. Band	Product Name	Product No.	Quantity	Page
X	Xp11.1-q11.1	ZytoDot CEN X Probe CE IVD	C-3025-400	400 µl	188 f.
		ZytoDot 2C CEN X/Y Probe CE IVD	C-3048-400	400 µl	188 f.
Y	Yp11.1-q11.1	ZytoDot 2C CEN X/Y Probe CE IVD	C-3048-400	400 µl	188 f.
	Yq12	ZytoDot CEN Yq12 Probe CE IVD	C-3020-400	400 µl	188 f.

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ILE001-1-16

ZytoLight® FISH probes are direct labeled using the unique ZytoLight® *Direct Label System II* providing improved signal intensity. Advanced specificity of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
ALK		CD246	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	C-3055-100/-400	100 µl/400 µl	157
CCND1		BCL1, U21B31	ZytoDot SPEC CCND1 Probe CE IVD	C-3034-400	400 µl	172
CDK4		PSK-J3	ZytoDot 2C SPEC CDK4/CEN 12 Probe CE IVD	C-3062-400	400 µl	174
CDKN2A		p16, ARF, INK4	ZytoDot 2C SPEC CDKN2A/CEN 9 Probe CE IVD	C-3067-400	400 µl	168
DDIT3	CHOP	CHOP10, GADD153	ZytoDot 2C SPEC DDIT3 Break Apart Probe CE IVD	C-3047-100	100 µl	173
EGFR		HER1, ERBB1	ZytoDot SPEC EGFR Probe CE IVD ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	C-3007-400 C-3033-100/-400	400 µl 100 µl/400 µl	161 162
EML4		ROPP120	ZytoDot 2C SPEC EML4 Break Apart Probe CE IVD	C-3059-400	400 µl	158
ERBB2	HER2	HER-2, NEU	ZytoDot SPEC ERBB2 Probe CE IVD ZytoDot SPEC ERBB2 Probe Kit CE IVD ZytoDot 2C SPEC ERBB2/CEN 17 Probe CE IVD ZytoDot 2C SPEC ERBB2/CEN 17 Probe Kit CE IVD ZytoDot 2C SPEC ERBB2/D17S122 Probe CE IVD	C-3001-100/-400 C-3003-10/-40 C-3032-100/-400 C-3022-10/-40 C-3068-100	100 µl/400 µl 10 Tests/40 Tests 100 µl/400 µl 10 Tests/40 Tests 100 µl	179 179 180 180 181
ERG		erg-3, p55	ZytoDot 2C SPEC ERG Break Apart Probe CE IVD	C-3058-400	400 µl	186
ESR1		Era, NR3A1	ZytoDot SPEC ESR1 Probe CE IVD	C-3024-400	400 µl	160
EWSR1		EWS	ZytoDot 2C SPEC EWSR1 Break Apart Probe CE IVD	C-3043-100	100 µl	187
FGFR1		FLT2, BFGFR	ZytoDot SPEC FGFR1 Probe CE IVD ZytoDot 2C SPEC FGFR1/CEN 8 Probe CE IVD	C-3023-400 C-3050-400	400 µl 400 µl	164 165
FGFR2		BEK, CD332	ZytoDot 2C SPEC FGFR2/CEN 10 Probe CE IVD	C-3056-400	400 µl	171
FOXO1		FKHR, FKH1	ZytoDot 2C SPEC FOXO1 Break Apart Probe CE IVD	C-3065-100	100 µl	177
FUS		FUS1	ZytoDot 2C SPEC FUS Break Apart Probe CE IVD	C-3054-100	100 µl	178
MDM2		HDM2	ZytoDot SPEC MDM2 Probe CE IVD ZytoDot 2C SPEC MDM2/CEN 12 Probe CE IVD	C-3012-400 C-3049-100/-400	400 µl 100 µl/400 µl	175 176
MET		HGFR, RCCP2	ZytoDot 2C SPEC MET/CEN 7 Probe CE IVD	C-3057-400	400 µl	163
MYC	CMYC	bHLHe39, c-Myc	ZytoDot SPEC MYC Probe CE IVD ZytoDot 2C SPEC MYC Break Apart Probe CE IVD	C-3013-400 C-3066-400	400 µl 400 µl	166 167
MYCN	NMYC	N-myc	ZytoDot SPEC MYCN Probe CE IVD	C-3029-400	400 µl	156

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

Advanced specificity and less background of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Gene Index

HUGO Name	Previous Product Name	Synonym	Product Name	Product No.	Quantity	Page
PTEN		MMAC1, TEP1	ZytoDot 2C SPEC PTEN/CEN 10 Probe CE IVD	C-3053-400	400 µl	170
RET		HSCR1, CDHF12	ZytoDot 2C SPEC RET Break Apart Probe CE IVD	C-3064-100/-400	100 µl/400 µl	169
ROS1		MCF3, ROS	ZytoDot 2C SPEC ROS1 Break Apart Probe CE IVD	C-3063-100/-400	100 µl/400 µl	159
SS18	SYT	SSXT	ZytoDot 2C SPEC SS18 Break Apart Probe CE IVD	C-3046-100	100 µl	184
TOP1		–	ZytoDot 2C SPEC TOP1/CEN 20 Probe CE IVD	C-3069-400	400 µl	185
TOP2A		TOP2	ZytoDot SPEC TOP2A Probe CE IVD ZytoDot 2C SPEC TOP2A/CEN 17 Probe CE IVD	C-3021-400 C-3040-400	400 µl 400 µl	182 183

The *Gene Index* list includes only those probes directed against DNA sequences assigned to known genes. It does not contain probes directed against other genomic sequences as e.g. repetitive satellite DNA sequences. For a complete overview of all ZytoDot® probes, please refer to the *Chromosome Index*.

For cross referencing of previous ZytoVision probe names and new HUGO gene names - please visit the HUGO gene nomenclature committee website at www.genenames.org.

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

Advanced specificity and less background of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Solid Tumors				
Bladder Cancer	ZytoDot 2C SPEC CDKN2A/CEN 9 Probe CE IVD	C-3067-400	400 µl	168
Brain and Neural Tumors	ZytoDot 2C SPEC 1p36/1q25 Probe CE IVD	C-3036-100/-400	100 µl/400 µl	154 f.
	ZytoDot 2C SPEC 19q13/19p13 Probe CE IVD	C-3037-100/-400	100 µl/400 µl	154 f.
	ZytoDot 2C SPEC CDKN2A/CEN 9 Probe CE IVD	C-3067-400	400 µl	168
	ZytoDot SPEC EGFR Probe CE IVD	C-3007-400	400 µl	161
	ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	C-3033-100/-400	100 µl/400 µl	162
	ZytoDot 2C SPEC MET/CEN 7 Probe CE IVD	C-3057-400	400 µl	163
	ZytoDot SPEC MYCN Probe CE IVD	C-3029-400	400 µl	156
	ZytoDot 2C SPEC PTEN/CEN 10 Probe CE IVD	C-3053-400	400 µl	170
Breast Cancer	ZytoDot SPEC CCND1 Probe CE IVD	C-3034-400	400 µl	172
	ZytoDot SPEC EGFR Probe CE IVD	C-3007-400	400 µl	161
	ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	C-3033-100/-400	100 µl/400 µl	162
	ZytoDot SPEC ERBB2 Probe CE IVD	C-3001-100/-400	100 µl/400 µl	179
	ZytoDot SPEC ERBB2 Probe Kit CE IVD	C-3003-10/-40	10 Tests/40 Tests	179
	ZytoDot 2C SPEC ERBB2/CEN 17 Probe CE IVD	C-3032-100/-400	100 µl/400 µl	180
	ZytoDot 2C SPEC ERBB2/CEN 17 Probe Kit CE IVD	C-3022-10/-40	10 Tests/40 Tests	180
	ZytoDot 2C SPEC ERBB2/D17S122 Probe CE IVD	C-3068-100	100 µl	181
	ZytoDot SPEC ESR1 Probe CE IVD	C-3024-400	400 µl	160
	ZytoDot SPEC FGFR1 Probe CE IVD	C-3023-400	400 µl	164
	ZytoDot 2C SPEC FGFR1/CEN 8 Probe CE IVD	C-3050-400	400 µl	165
	ZytoDot 2C SPEC FGFR2/CEN 10 Probe CE IVD	C-3056-400	400 µl	171
	ZytoDot SPEC MYC Probe CE IVD	C-3013-400	400 µl	166
	ZytoDot SPEC TOP2A Probe CE IVD	C-3021-400	400 µl	182
	ZytoDot 2C SPEC TOP2A/CEN 17 Probe CE IVD	C-3040-400	400 µl	183
Cervical Cancer	ZytoDot SPEC MYC Probe CE IVD	C-3013-400	400 µl	166
Lung Cancer	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	C-3055-100/-400	100 µl/400 µl	157
	ZytoDot 2C SPEC EML4 Break Apart Probe CE IVD	C-3059-400	400 µl	158
	ZytoDot SPEC EGFR Probe CE IVD	C-3007-400	400 µl	161
	ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	C-3033-100/-400	100 µl/400 µl	162
	ZytoDot SPEC ERBB2 Probe CE IVD	C-3001-100/-400	100 µl/400 µl	179
	ZytoDot SPEC ERBB2 Probe Kit CE IVD	C-3003-10/-40	10 Tests/40 Tests	179
	ZytoDot 2C SPEC ERBB2/CEN 17 Probe CE IVD	C-3032-100/-400	100 µl/400 µl	180
	ZytoDot 2C SPEC ERBB2/CEN 17 Probe Kit CE IVD	C-3022-10/-40	10 Tests/40 Tests	180
	ZytoDot 2C SPEC ERBB2/D17S122 Probe CE IVD	C-3068-100	100 µl	181
	ZytoDot SPEC FGFR1 Probe CE IVD	C-3023-400	400 µl	164
	ZytoDot 2C SPEC FGFR1/CEN 8 Probe CE IVD	C-3050-400	400 µl	165
	ZytoDot 2C SPEC FGFR2/CEN 10 Probe CE IVD	C-3056-400	400 µl	171
	ZytoDot 2C SPEC MET/CEN 7 Probe CE IVD	C-3057-400	400 µl	163
	ZytoDot 2C SPEC RET Break Apart Probe CE IVD	C-3064-100/-400	100 µl/400 µl	169
	ZytoDot 2C SPEC ROS1 Break Apart Probe CE IVD	C-3063-100/-400	100 µl/400 µl	159

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

Advanced specificity and less background of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Probes Sorted by Indication

Indication	Product Name	Product No.	Quantity	Page
Other Solid Tumors	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	C-3055-100/-400	100 µl/400 µl	157
	ZytoDot SPEC EGFR Probe CE IVD	C-3007-400	400 µl	161
	ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	C-3033-100/-400	100 µl/400 µl	162
	ZytoDot CEN 8 Probe CE IVD	C-3016-400	400 µl	188 f.
	ZytoDot 2C SPEC MET/CEN 7 Probe CE IVD	C-3057-400	400 µl	163
	ZytoDot SPEC MYCN Probe CE IVD	C-3029-400	400 µl	156
	ZytoDot 2C SPEC TOP1/CEN 20 Probe CE IVD	C-3069-400	400 µl	185
Prostate Cancer	ZytoDot 2C SPEC ERG Break Apart Probe CE IVD	C-3058-400	400 µl	186
	ZytoDot 2C SPEC PTEN/CEN 10 Probe CE IVD	C-3053-400	400 µl	170
Sarcomas	ZytoDot 2C SPEC CDK4/CEN 12 Probe CE IVD	C-3062-400	400 µl	174
	ZytoDot 2C SPEC DDIT3 Break Apart Probe CE IVD	C-3047-100	100 µl	173
	ZytoDot 2C SPEC EWSR1 Break Apart Probe CE IVD	C-3043-100	100 µl	187
	ZytoDot 2C SPEC FOXO1 Break Apart Probe CE IVD	C-3065-100	100 µl	177
	ZytoDot 2C SPEC FUS Break Apart Probe CE IVD	C-3054-100	100 µl	178
	ZytoDot SPEC MDM2 Probe CE IVD	C-3012-400	400 µl	175
	ZytoDot 2C SPEC MDM2/CEN 12 Probe CE IVD	C-3049-100/-400	100 µl/400 µl	176
	ZytoDot 2C SPEC SS18 Break Apart Probe CE IVD	C-3046-100	100 µl	184
Hematology Specific Probes				
Acute Lymphoblastic Leukemia (ALL)	ZytoDot 2C SPEC CDKN2A/CEN 9 Probe CE IVD	C-3067-400	400 µl	168
Acute Myelogenous Leukemia (AML)	ZytoDot CEN 8 Probe CE IVD	C-3016-400	400 µl	188 f.
Chronic Lymphocytic Leukemia (CLL)	ZytoDot SPEC CCND1 Probe CE IVD	C-3034-400	400 µl	172
	ZytoDot SPEC MYC Probe CE IVD	C-3013-400	400 µl	166
Chronic Myelogenous Leukemia (CML)	ZytoDot CEN 8 Probe CE IVD	C-3016-400	400 µl	188 f.
Multiple Myeloma	ZytoDot SPEC CCND1 Probe CE IVD	C-3034-400	400 µl	172
Myelodysplastic Syndrome (MDS)	ZytoDot CEN 8 Probe CE IVD	C-3016-400	400 µl	188 f.
Burkitt Lymphoma	ZytoDot 2C SPEC MYC Break Apart Probe CE IVD	C-3066-400	400 µl	167
Non-Hodgkin Lymphoma, other	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	C-3055-100/-400	100 µl/400 µl	157
	ZytoDot SPEC CCND1 Probe CE IVD	C-3034-400	400 µl	172
	ZytoDot 2C SPEC MYC Break Apart Probe CE IVD	C-3066-400	400 µl	167
Genetics				
Sex Mismatched Bone-Marrow Transplantant Management	ZytoDot CEN X Probe CE IVD	C-3025-400	400 µl	188 f.
	ZytoDot CEN Yq12 Probe CE IVD	C-3020-400	400 µl	188 f.
	ZytoDot 2C CEN X/Y Probe CE IVD	C-3048-400	400 µl	188 f.
Prenatal, Postnatal, and Preimplantation Genetics	ZytoDot SPEC 21q22 Probe CE IVD	C-3026-400	400 µl	188 f.
	ZytoDot CEN X Probe CE IVD	C-3025-400	400 µl	188 f.
	ZytoDot CEN Yq12 Probe CE IVD	C-3020-400	400 µl	188 f.
	ZytoDot 2C CEN X/Y Probe CE IVD	C-3048-400	400 µl	188 f.

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

Advanced specificity and less background of the single copy SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® 2C SPEC 1p36/1q25 Probe
ZytoDot ® 2C SPEC 19q13/19p13 Probe

CE IVD

Background

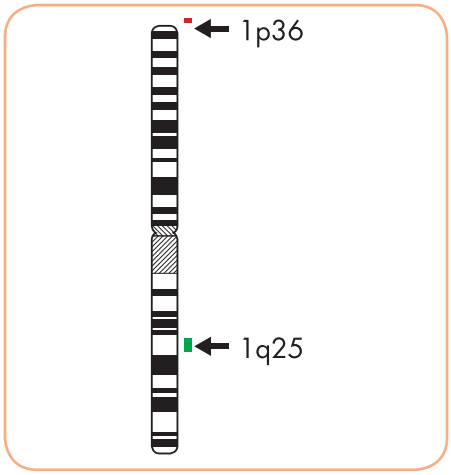
The ZytoDot ® 2C SPEC 1p36/1q25 Probe and the ZytoDot ® 2C SPEC 19q13/19p13 Probe are designed for the detection of 1p and 19q deletions, respectively.

Deletions affecting the short arm of chromosome 1 (1p) are frequently found in human gliomas and neuroblastomas, but also in breast, lung, endometrial, ovarian, and colorectal carcinomas. Loss of 1p is a strong prognostic factor in patients with neuroblastoma. Since loss of 1p reliably identifies patients at high risk in stages I, II, and IVS, which are otherwise clinically favorable, more aggressive therapy may be considered in these patients. Deletions affecting the long arm of chromosome 19 (19q) are frequently found in human malignant gliomas as well as in neuroblastomas and epithelial ovarian cancers. Several studies showed correlation of combined allelic losses at 1p36 and 19q13 with oligodendroglioma histology and association with both chemotherapeutic response and survival in patients with anaplastic oligodendrogliomas. Hence, determination of 1p and 19q status may aid therapeutic decisions and predict outcome in patients with anaplastic oligodendrogliomas.

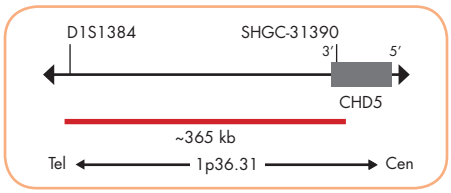
References
Barbashina V, et al. (2005) Clin Cancer Res 11: 1119-28.
Cairncross JG, et al. (1998) J Natl Cancer Inst 90: 1473-9.
Capper D, et al. (2010) Acta Neuropathol 121: 241-52.
Caron H, et al. (1996) N Engl J Med 334: 225-30.
Elsir T, et al. (2011) Br J Cancer 11: 1747-54.
Hoeller S, et al. (2012) Hum Pathol 43: 405-12.
Lass U, et al. (2013) Brain Pathol 23: 311-8.
Ragnarsson G, et al. (1999) Br J Cancer 79: 1468-74.
Rosenberg JE, et al. (1996) Oncogene 13: 2483-5.
Smith JS, et al. (1999) Oncogene 18: 4144-52.
Smith JS, et al. (2000) Genes Chromosomes Cancer 29: 16-25.
White PS, et al. (2005) Oncogene 24: 2684-94.
Woelfel C, et al. (2011) Cancer Genet 204: 671-6.

Probe Description

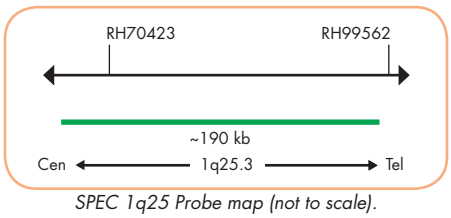
The ZytoDot ® 2C SPEC 1p36/1q25 Probe is a mixture of a Dinitrophenyl-labeled 1p36 probe specific for the smallest region of consistent deletion (SRD) of chromosome 1 defined in neuroblastoma at 1p36.31 and a Digoxigenin-labeled 1q25 probe specific for 1q25.3.



Ideogram of chromosome 1 indicating the hybridization locations.

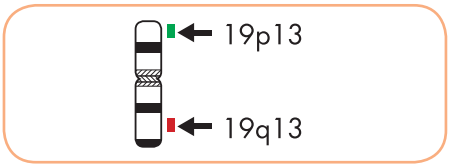


SPEC 1p36 Probe map (not to scale).

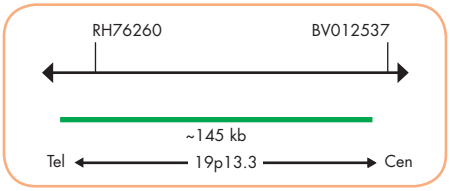


SPEC 1q25 Probe map (not to scale).

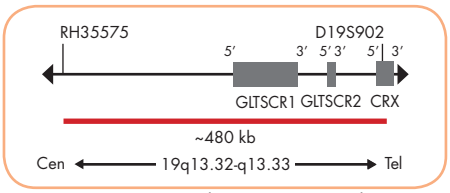
The ZytoDot ® 2C SPEC 19q13/19p13 Probe is a mixture of a Dinitrophenyl-labeled 19q13 probe specific for the region of common deletion in gliomas at 19q13.32-q13.33 and a Digoxigenin-labeled 19p13 probe specific for 19p13.3.



Ideogram of chromosome 19 indicating the hybridization locations.



SPEC 19p13 Probe map (not to scale).



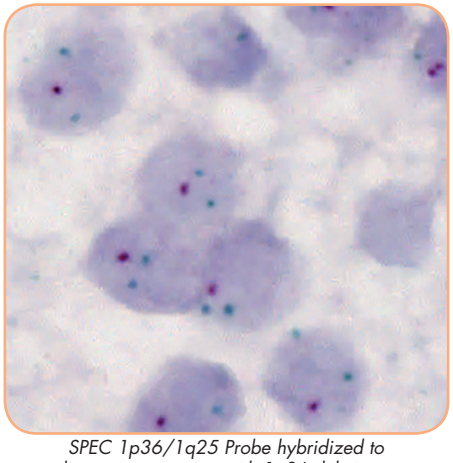
SPEC 19q13 Probe map (not to scale).

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Results

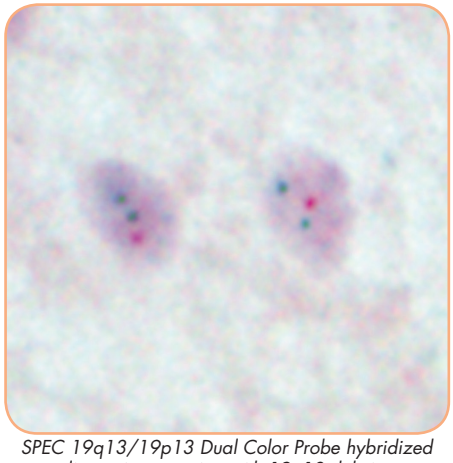
In a normal interphase nucleus, using the ZytoDot ® 2C SPEC 1p36/1q25 Probe in combination with ZytoDot ® 2C CISH Implementation Kit, two red (1p) and two green (1q) signals are expected. In a cell with deletions affecting the 1p36 locus, one or no copy of the red signal will be observed.

Using the ZytoDot ® 2C SPEC 19q13/19p13 Probe in combination with the ZytoDot ® 2C CISH Implementation Kit, two red (19q) and two green (19p) signals are expected in a normal interphase nucleus. In a cell with deletions affecting the 19q13 locus, one or no copy of the red signal will be observed.



SPEC 1p36/1q25 Probe hybridized to glioma tissue section with 1p36 deletion as indicated by one red signal in each nucleus.

Image kindly provided by Prof. W. Müller, University Leipzig, Germany.



SPEC 19q13/19p13 Dual Color Probe hybridized to glioma tissue section with 19q13 deletion as indicated by one red signal in each nucleus.

Image kindly provided by Prof. W. Müller, University Leipzig, Germany.

Prod. No.	Product	Label	Tests* (Volume)
C-3036-100	ZytoDot 2C SPEC 1p36/1q25 Probe CE IVD	DNP /Digoxigenin	10 (100 µl)
C-3036-400	ZytoDot 2C SPEC 1p36/1q25 Probe CE IVD	DNP /Digoxigenin	40 (400 µl)
C-3037-100	ZytoDot 2C SPEC 19q13/19p13 Probe CE IVD	DNP /Digoxigenin	10 (100 µl)
C-3037-400	ZytoDot 2C SPEC 19q13/19p13 Probe CE IVD	DNP /Digoxigenin	40 (400 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40
WB-0009-500	Clear-it™ Stringency Buffer CE IVD		500 ml

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® SPEC MYCN Probe

Previously: ZytoDot SPEC NMYC Probe

CE IVD

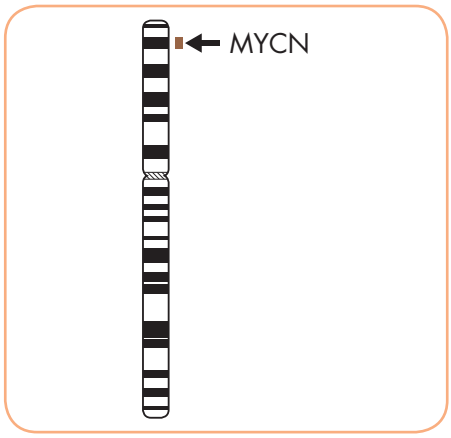
Background

The ZytoDot ® SPEC MYCN Probe is designed for the detection of MYCN amplification which represents the most powerful unfavorable prognostic factor for neuroblastoma. Less frequently amplifications are found in retinoblastoma, small cell lung cancer, astrocytoma and other tumors derived from the neuroectoderm.
The MYCN (v-myc avian myelocytomatosis viral related oncogene, neuroblastoma derived, a.k.a. NMYC) gene is located in the chromosomal region 2p24.3 and encodes a 62-64 kDa transcription factor normally expressed in the developing nervous system and other selected tissues.
The MYCN oncogene is amplified in about 25% of primary neuroblastomas and 90% of tumor-derived cell lines. Additional copies are rarely located at the normal locus but are detected as double minute chromosomes or homogeneously staining regions.
Amplification of the MYCN gene is strongly associated with rapid tumor progression, advanced stages of the disease, and poor prognosis. Hence, amplification status is increasingly being used for stratification of patients to different treatment protocols.

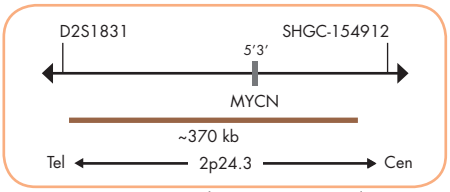
References
Kaneko M, et al. (1998) Med Pediatr Oncol 31: 1-7.
Lee WH, et al. (1984) Nature 309: 458-60.
Maris JM, et al. (2007) Lancet 369: 2106-20.
Slamon DJ, et al. (1986) Science 232: 768-72.
Suita S, et al. (2007) J Pediatr Surg 42: 489-93.
Thorner PS, et al. (2006) Am J Surg Pathol 30: 635-42.

Probe Description

The ZytoDot ® SPEC MYCN Probe is a Digoxigenin-labeled probe specific for the MYCN gene at 2p24.3, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



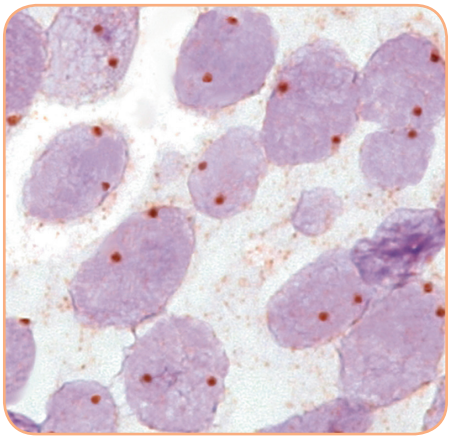
Ideogram of chromosome 2 indicating the hybridization locations.



SPEC MYCN Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the MYCN gene locus or aneuploidy of chromosome 2 will show multiple dots or large signal clusters.



Normal nuclei each with two MYCN signals.

Prod. No.	Product	Label	Tests* (Volume)
C-3029-400	ZytoDot SPEC MYCN Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
156

ZytoDot ® 2C SPEC ALK Break Apart Probe

CE IVD

Background

The ZytoDot ® 2C SPEC ALK Break Apart Probe is designed to detect rearrangements involving the chromosomal region 2p23.2 harboring the ALK (anaplastic lymphoma receptor tyrosine kinase, a.k.a. CD246) gene.

ALK encodes a transmembrane receptor tyrosine kinase. This gene exerts characteristic oncogenic activities through fusion to several gene partners or mutations both in hematopoietic and non-hematopoietic solid tumors.

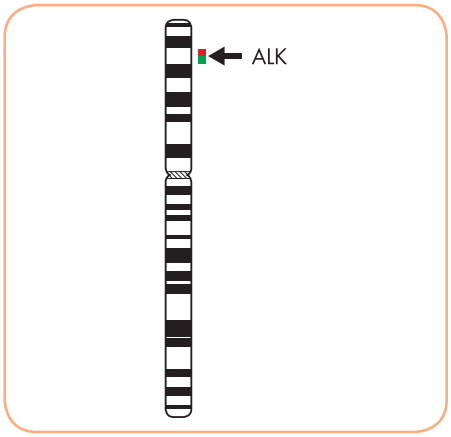
Translocations affecting the ALK gene locus are frequently found in anaplastic large cell lymphoma (ALCL), an aggressive non-Hodgkin lymphoma arising from T-cells. The most frequent translocation t(2;5) results in a fusion with the NPM1 (nucleophosmin a.k.a. nucleolar phosphoprotein B23, numatrin) gene located on chromosome 5q35. This rearrangement results in a NPM1/ALK fusion protein, which is constitutively activated through autophosphorylation, and that in turn mediates malignant cell transformation by activating downstream effectors like e.g. STAT3.

Additionally, inversions affecting the ALK gene located on the short arm of chromosome 2 [inv(2)(p21p23)] have been frequently detected in non-small cell lung cancer (NSCLC) and lead to the formation of EML4-ALK fusion transcripts.

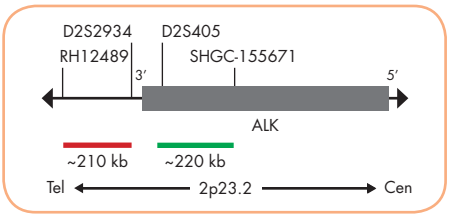
ALK kinase targeted therapies may represent a very effective therapeutic strategy in NSCLC patients carrying EML4-ALK rearrangements.

Probe Description

The ZytoDot ® 2C SPEC ALK Break Apart Probe is a mixture of a Digoxigenin-labeled probe and a Dinitrophenyl-labeled probe hybridizing to the 2p23.2 band. The Digoxigenin-labeled probe hybridizes proximal to the ALK gene at 2p23.2, the Dinitrophenyl-labeled probe hybridizes distal to the ALK gene at 2p23.2.



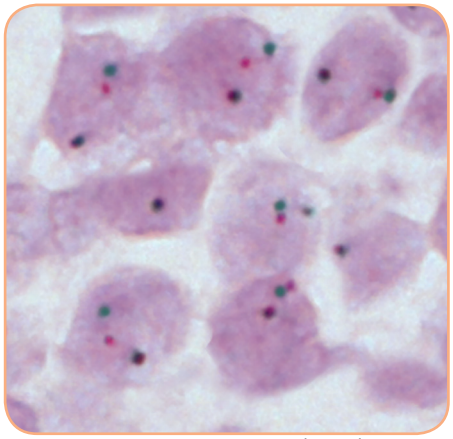
Ideogram of chromosome 2 indicating the hybridization locations.



SPEC ALK Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 2p23.2 band, using the ZytoDot ® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 2p23.2 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 2p23.2 locus and one 2p23.2 locus affected by a translocation or inversion. EML4-ALK inversion with deletion of 5'-ALK sequences is indicated by one or multiple isolated red signals.



Lung carcinoma tissue section with translocation affecting the 2p23.2 locus as indicated by one red/green fusion (non-rearranged) signal, one red signal, and one separate green signal.

References
Inamura K, et al. (2009) Mod Pathol 22: 508-15.
Koivunen JP, et al. (2008) Clin Cancer Res 14: 4275-83.
Martelli MP, et al. (2009) Am J Pathol 174: 661-70.
Palmer RH, et al. (2009) Biochem J 420: 345-61.
Perner S, et al. (2008) Neoplasia 10: 298-302.
Rodig SJ, et al. (2009) Clin Cancer Res 15: 5216-23.
Sasaki T, et al. (2010) Eur J Cancer 46: 1773-80.
Schildhaus HU, et al. (2013) Mod Pathol 26: 1468-77.
von Laffert M, et al. (2014) J Thorac Oncol 9: 1464-9.
Wagner F, et al. (2014) J Clin Pathol 67: 403-7.
Zhang Q, et al. (2007) Nat Med 11:1341-8.

Prod. No.	Product	Label	Tests* (Volume)
C-3055-100	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
C-3055-400	ZytoDot 2C SPEC ALK Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
157

ZytoDot® 2C SPEC EML4 Break Apart Probe

CE IVD

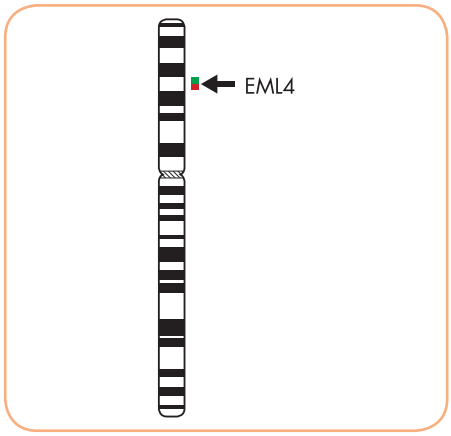
Background

The ZytoDot® 2C SPEC EML4 Break Apart Probe is designed to detect rearrangements involving the chromosomal region 2p21 harboring the EML4 (echinoderm microtubule-associated protein-like 4, a.k.a. ROPP120) gene.
Inversions in the short arm of chromosome 2 [inv(2)(p21p23)] have been frequently detected in non-small cell lung cancer (NSCLC) and lead to the formation of EML4-ALK fusion transcripts. A few reports also identified these fusion transcripts in breast, gastric, and colorectal cancers. EML4 belongs to the family of echinoderm microtubule-associated protein-like proteins. The EML4-ALK fusion transcripts comprise variably truncated N-terminal portions of the EML4 gene and the intracellular signaling domain of the receptor tyrosine kinase ALK (anaplastic lymphoma receptor tyrosine kinase, a.k.a. CD246). It was found that EML4 mediates ligand-independent dimerization of ALK, resulting in constitutive kinase activity. EML4-ALK was demonstrated to possess transforming activity *in vitro* and *in vivo*.
The EML4-ALK fusion transcript is found in about 5% of NSCLC, predominantly adenocarcinomas, and is considered to be mutually exclusive to EGFR or KRAS mutations. The detection of the inversion by *in situ* Hybridization might represent a valuable tool to identify a subpopulation of NSCLC likely to respond to ALK kinase targeting therapies.

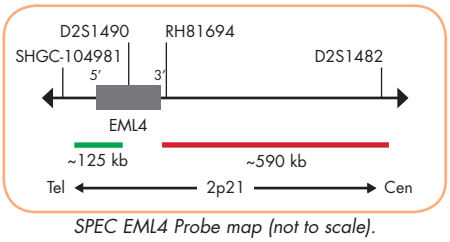
References
Choi YL, et al. (2008) Cancer Res 69: 4971-6.
Inamura K, et al. (2009) Mod Pathol 22: 508-15.
Lin E, et al. (2009) Mol Cancer Res 7: 1466-76.
Perner S, et al. (2008) Neoplasia 10: 298-302.
Rodig SJ, et al. (2009) Clin Cancer Res 15: 5216-23.
Shaw AT, et al. (2009) J Clin Oncol 27: 4247-53.
Soda M, et al. (2007) Nature 448: 561-6.
Schildhaus HU, et al. (2013) Mod Pathol 26: 1468-77.

Probe Description

The ZytoDot® 2C SPEC EML4 Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 2p21 band. The DNP-labeled probe hybridizes proximal to the EML4 gene breakpoint region at 2p21, the DIG-labeled probe hybridizes distal to the EML4 gene breakpoint region.



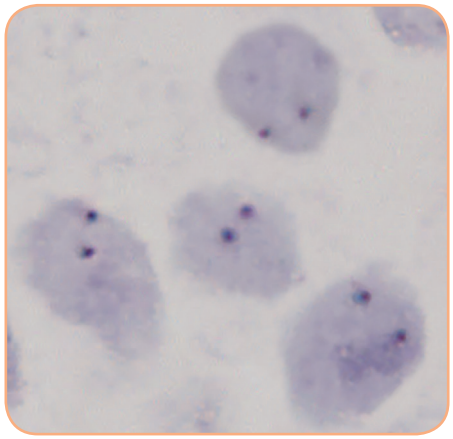
Ideogram of chromosome 2 indicating the hybridization locations.



SPEC EML4 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 2p21 band, using the ZytoDot® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 2p21 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 2p21 locus and one 2p21 locus affected by a translocation or inversion.



SPEC EML4 Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals pert nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3059-400	ZytoDot 2C SPEC EML4 Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
158

ZytoDot ® 2C SPEC ROS1 Break Apart Probe

CE IVD

Background

The ZytoDot ® 2C SPEC ROS1 Break Apart Probe is designed to detect translocations involving the chromosomal region 6q22.1 harboring the c-ros oncogene 1 (ROS1, a.k.a. MCF3) gene.

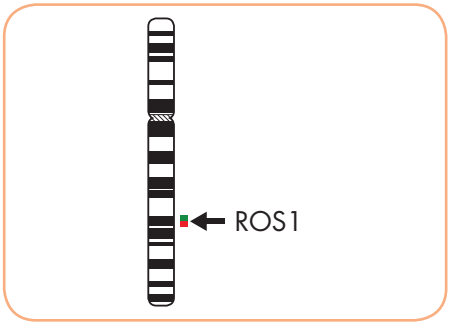
The ROS1 gene is located on 6q22.1 and encodes a receptor tyrosine kinase. Translocations affecting ROS1 have been detected in glioblastoma, cholangiocarcinoma, and non-small cell lung cancer (NSCLC).

In NSCLC several ROS1 translocation partners have been detected all of which result in the fusion of variably truncated forms of e.g. TPM3, SDC4, SLC34A2, CD74, EZR, or LRIG3 to the kinase domain of ROS1. GOPC has also been found to be fused to ROS1 in NSCLC. GOPC-ROS1 fusions result from interstitial deletion of approx. 240 kb on 6q22.1. ROS1 rearrangements have been exclusively detected in adenocarcinoma of the lung and are thought to define a molecular subset of NSCLC with distinct clinical characteristics that are similar to those observed in patients with ALK rearranged NSCLC.

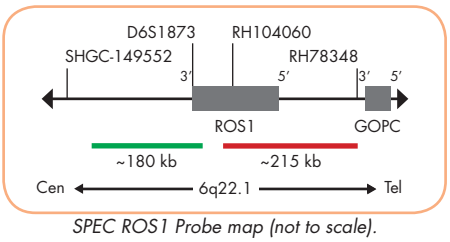
First evidence suggests that administration of ROS1 kinase inhibitors may represent a very effective therapeutic strategy in NSCLC patients harboring activating ROS1 rearrangements. Accordingly, detection of ROS1 rearrangements using Chromogenic *in situ* Hybridization might be a helpful tool for the identification of patients likely to respond to ROS1 kinase targeting therapies.

Probe Description

The ZytoDot ® 2C SPEC ROS1 Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 6q22.1 band. The DNP-labeled probe hybridizes distal to the ROS1 gene breakpoint region at 6q22.1, the DIG-labeled probe hybridizes proximal to the ROS1 gene breakpoint region.



Ideogram of chromosome 6 indicating the hybridization locations.



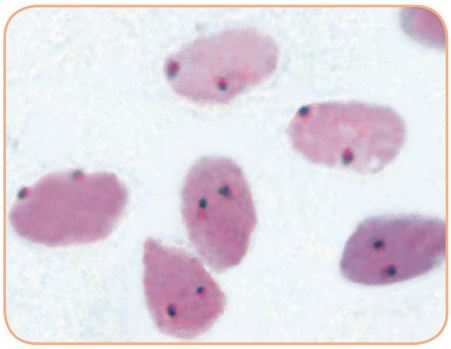
SPEC ROS1 Probe map (not to scale).

References
Bergethon K, et al. (2012) J Clin Oncol 30: 863-70.
Bos M, et al. (2013) Lung Cancer 81: 142-3.
Rikova K, et al. (2007) Cell 131: 1190-203.
Rimkunas VM, et al. (2012) Clin Cancer Res 18: 4449-57.
Suehara Y, et al. (2012) Clin Cancer Res 18: 6599-608.
Takeuchi K, et al. (2012) Nat Med 18: 378-81.

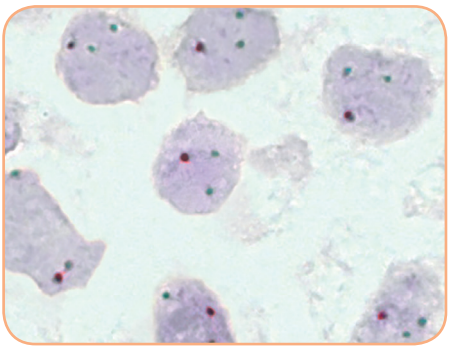
Results

In an interphase nucleus of a normal cell lacking an aberration involving the 6q22.1 band, using the ZytoDot ® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 6q22.1 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 6q22.1 locus and one 6q22.1 locus affected by a translocation.

Isolated green signals are the result of deletions distal to the ROS1 breakpoint region or are due to unbalanced translocations affecting this chromosomal region.



SPEC ROS1 Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.



Lung cancer tissue section with rearrangement of the ROS1 gene as indicated by isolated green signals.

Prod. No.	Product	Label	Tests* (Volume)
C-3063-100	ZytoDot 2C SPEC ROS1 Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
C-3063-400	ZytoDot 2C SPEC ROS1 Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
159

ZytoDot ® SPEC ESR1 Probe

CE IVD

Background

The ZytoDot ® SPEC ESR1 Probe is designed for the detection of ESR1 gene amplification frequently observed in breast cancer.

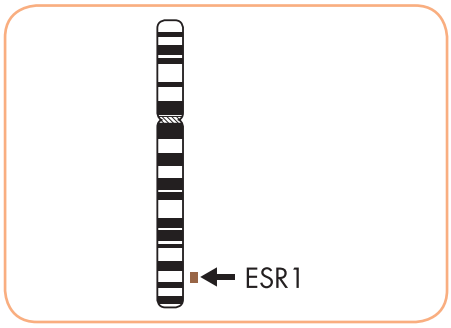
The ESR1 (estrogen receptor 1) gene is located in the chromosomal region 6q25.1 and encodes estrogen receptor alpha (ER). ER expression is one of the most important known factors in the development of breast cancer, and assessing its status by immunohistochemistry is important for determining the use of anti-estrogen receptor therapies.

ESR1 gene amplification has been found frequently in ER-positive breast tumors. Additionally, it has been recently shown for breast cancer patients receiving adjuvant tamoxifen monotherapy that survival is significantly longer in cases of ESR1 gene amplification as determined by FISH compared to immunohistochemically ER-positive cases without gene amplification. Additionally, it has been shown that response to tamoxifen is dependent on the absolute ESR1 copy number. Thus, determination of ESR1 amplification may identify a subgroup of breast cancer patients particularly likely to respond to anti-estrogen therapy.

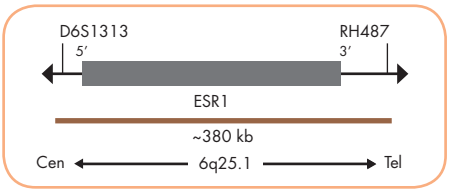
References
Holst F, et al. (2007) Nature Genet 39: 655-60.
Lacroix M (2006) Endocr Relat Cancer 13: 1033-67.
Marchio C, et al. (2008) J Pathol 215: 398-410.
Nembrot M, et al. (1990) Biochem Biophys Res Comm 166: 601-7.
Nessling M, et al. (2005) Cancer Res 65: 439-47.

Probe Description

The ZytoDot ® SPEC ESR1 Probe is a Digoxigenin-labeled probe specific for the ESR1 gene region at 6q25.1, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



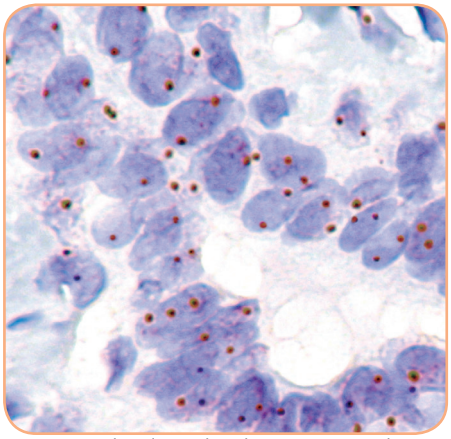
Ideogram of chromosome 6 indicating the hybridization locations.



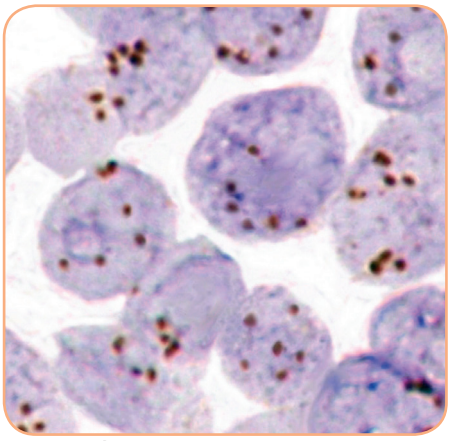
SPEC ESR1 Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the ESR1 gene locus or aneusomy of chromosome 6 will show multiple dots or large signal clusters.



Normal nuclei each with two ESR1 signals.



Breast carcinoma tissue section with ESR1 amplification.

Prod. No.	Product	Label	Tests* (Volume)
C-3024-400	ZytoDot SPEC ESR1 Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® SPEC EGFR Probe

CE IVD

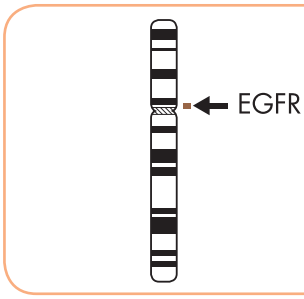
Background

The ZytoDot ® SPEC EGFR Probe is designed for the detection of EGFR gene amplification frequently observed in solid neoplasms including non-small-cell lung cancer (NSCLC) and glioblastoma. The EGFR gene (a.k.a. ERBB1 and HER1) is located in the chromosomal region 7p11.2 and encodes a transmembrane glycoprotein acting as a cellular growth factor receptor.
Overexpression of EGFR has been shown in a number of tumor entities and is associated with poor prognosis. EGFR copy number identified by *in situ* Hybridization is thought to be a molecular predictor in neoplasms.

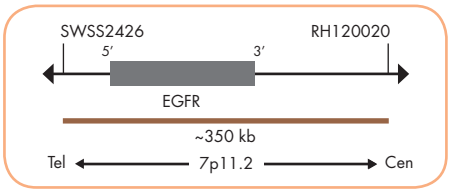
References
Balla P, et al. (2011) Histopathology 59: 376-89.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Ettl T, et al. (2012) Hum Pathol 43: 921-31.
Gont A, et al. (2013) Oncotarget 4: 1266-79.
Isola J & Tanner M (2004) Methods Mol Med 97: 133-44.
Kondo I & Shimizu N (1983) Cytogenet Cell Genet 35: 9-14.
Laurent-Puig P, et al. (2009) J Clin Oncol 27: 5924-30.
Marquez A, et al. (2004) Diagn Mol Pathol 13: 1-8.
Miyazawa H, et al. (2008) Cancer Sci 99: 595-600.
Oikawa M, et al. (2013) J Oral Pathol Med 42: 424-34.
Thomas F, et al. (2007) Clin Cancer Res 13: 7086-92.
Tsukamoto T, et al. (1991) Int J Dev Biol 35: 25-32.
Walker F, et al. (2009) Hum Pathol 40: 1517-27.
Yoo SB, et al. (2010) Lung Cancer 67: 301-5.
Zaczek A, et al. (2005) Histol Histopathol 20: 1005-15.

Probe Description

The ZytoDot ® SPEC EGFR Probe is a Digoxigenin-labeled probe specific for the EGFR gene at 7p11.2, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



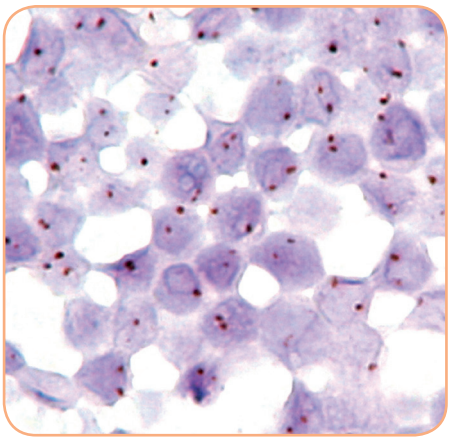
Ideogram of chromosome 7 indicating the hybridization locations.



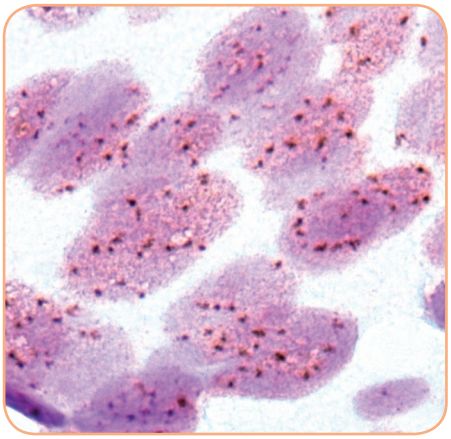
SPEC EGFR Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the EGFR gene locus or aneuploidy of chromosome 7 will show multiple dots or large signal clusters.



Normal nuclei each with two EGFR signals.



Cancer cells with multiple EGFR signals in sputum sample from a NSCLC patient.

Prod. No.	Product	Label	Tests* (Volume)
C-3007-400	ZytoDot SPEC EGFR Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
161

ZytoDot ® 2C SPEC EGFR/CEN 7 Probe

CE IVD

Background

The ZytoDot ® 2C SPEC EGFR/CEN 7 Probe is designed for the simultaneous detection of EGFR and centromere 7 in formalin-fixed, paraffin-embedded tissue sections and cell samples.

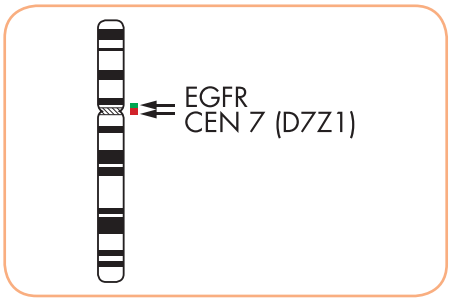
The EGFR gene (a.k.a. ERBB1 and HER1) is located in the chromosomal region 7p11.2 and encodes a transmembrane glycoprotein acting as a cellular growth factor receptor.

Overexpression of EGFR has been shown in a number of tumor entities and is associated with poor prognosis. EGFR copy number identified by *in situ* Hybridization is thought to be a molecular predictor in neoplasms.

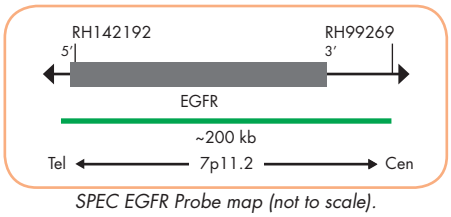
References
Balla P, et al. (2011) Histopathology 59: 376-89.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Ettl T, et al. (2012) Hum Pathol 43: 921-31.
Isola J & Tanner M (2004) Methods Mol Med 97: 133-44.
Kondo I & Shimizu N (1983) Cytogenet Cell Genet 35: 9-14.
Marquez A, et al. (2004) Diagn Mol Pathol 13: 1-8.
Tsukamoto T, et al. (1991) Int J Dev Biol 35: 25-32.
Zaczek A, et al. (2005) Histol Histopathol 20: 1005-15.

Probe Description

The ZytoDot ® 2C SPEC EGFR/CEN 7 Probe is a mixture of a Digoxigenin-labeled probe specific for the EGFR gene at 7p11.2 and a Dinitrophenyl-labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1).



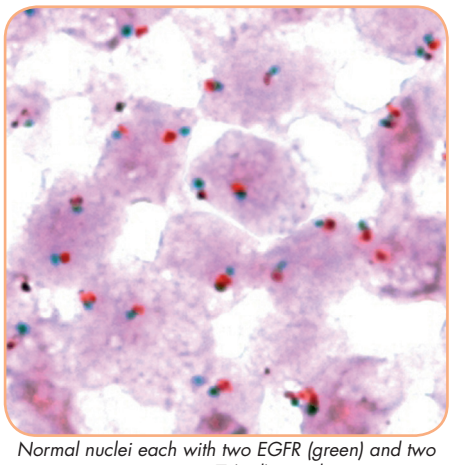
Ideogram of chromosome 7 indicating the hybridization locations.



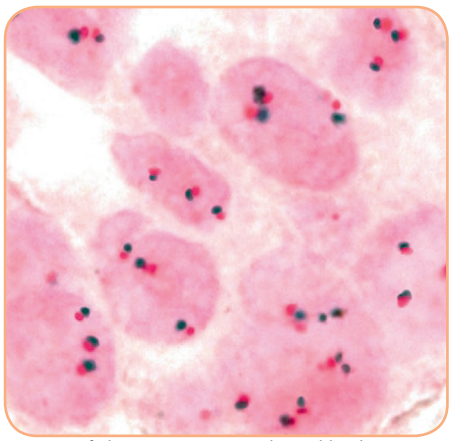
SPEC EGFR Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit two green and two red signals are expected. In a cell with amplification of the EGFR gene locus, multiple copies of the green signal or green signal clusters will be observed.



Normal nuclei each with two EGFR (green) and two centromere 7 (red) signals.



Trisomy of chromosome 7 as indicated by three EGFR (green) and three CEN 7 (red) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3033-100	ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
C-3033-400	ZytoDot 2C SPEC EGFR/CEN 7 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
162

ZytoDot ® 2C SPEC MET/CEN 7 Probe

CE IVD

Background

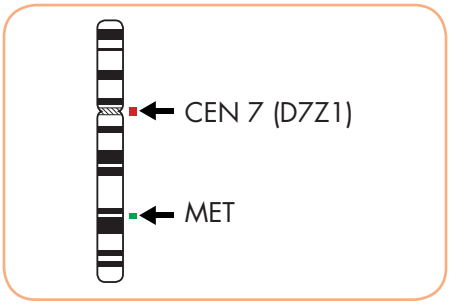
The ZytoDot ® 2C SPEC MET/CEN 7 Probe is designed for the detection of MET gene amplifications found in a variety of human tumors.

The MET gene (a. k. a. c-Met) is located in the chromosomal region 7q31.2 and encodes a transmembrane tyrosine kinase receptor for the hepathocyte growth factor (HGF). HGF and MET play an important role in angiogenesis and tumor growth. Activation or upregulation of MET was found in a number of carcinomas including lung, breast, colorectal, prostate, and gastric carcinomas as well as in gliomas, melanomas and some sarcomas. MET overexpression is known as a negative prognostic indicator in patients with various carcinomas, multiple myeloma, or glioma. Therefore, several inhibitors of the HGF/MET signaling pathway are being studied and developed as potent therapies to inhibit angiogenesis and tumor growth. Recently, it was shown that MET amplification leads to resistance to gefitinib or erlotinib in lung cancer by driving ERBB3-dependent activation of the PI3K pathway.

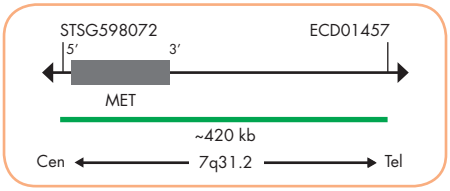
References
Cooper CS, et al. (1984) Nature 311: 29-32.
Engelman JA, et al. (2007) Science 316: 1039-43.
Garcia S, et al. (2007) Int J Oncol 31: 49-58.
Hara T, et al. (1998) Lab Invest 78: 1143-53.

Probe Description

The ZytoDot ® 2C SPEC MET/CEN 7 Probe is a mixture of a Dinitrophenyl-labeled CEN 7 probe specific for the alpha satellite centromeric region of chromosome 7 (D7Z1) and a Digoxigenin-labeled probe specific for the chromosomal region 7q31.2 harboring the MET gene.



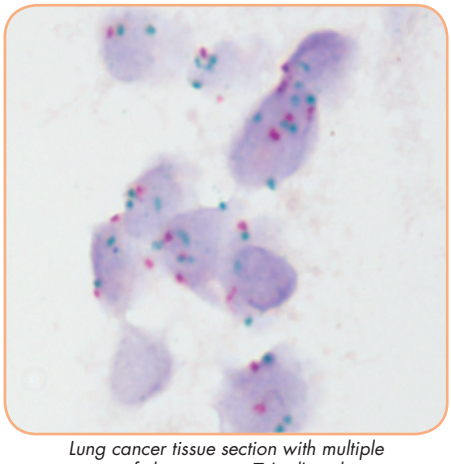
Ideogram of chromosome 7 indicating the hybridization locations.



SPEC MET Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit two red (CEN 7) and two green (MET) signals are expected. In a cell with amplification of the MET gene locus, multiple copies of the green signal or green signal clusters will be observed.



Lung cancer tissue section with multiple copies of chromosome 7 (red) and extra MET signals (green) in the nuclei.

Prod. No.	Product	Label	Tests* (Volume)
C-3057-400	ZytoDot 2C SPEC MET/CEN 7 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
163

ZytoDot ® SPEC FGFR1 Probe

CE IVD

Background

The ZytoDot ® SPEC FGFR1 Probe is designed for the detection of FGFR1 gene amplification frequently observed in malignant tumors e.g. breast and prostate cancer and oral squamous cell carcinoma (OSCC).

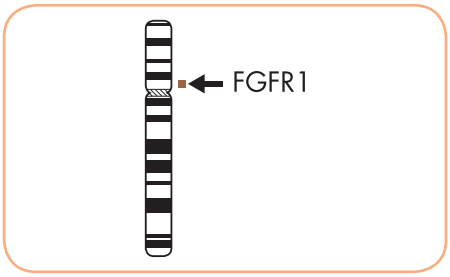
The FGFR1 (fibroblast growth factor receptor 1) gene is located in the chromosomal region 8p11.23-p11.22 and encodes a transmembrane receptor tyrosine kinase. Amplification of the FGFR1 gene, observed in approximately 10% of all breast cancer samples, has revealed to be an independent prognostic factor for overall survival. FGFR1 is believed to emerge as a potential therapeutic target for lobular breast carcinomas.

In prostate cancer, FGFR1 gene amplification seems to be an important step during the transmission to hormone resistance. In OSCC, FGFR1 gene amplification, observed in nearly 20% of all cases, is indicated to contribute to oral carcinogenesis at an early stage of development.

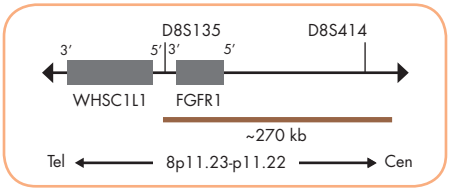
References
Brunello E, et al. (2012) J Exp Clin Cancer Res 31: 103.
Edwards J, et al. (2003) Clin Cancer Res 9: 5271-81.
Elbauomy Elsheikh S, et al. (2007) Breast Cancer Res 9: R23.
Freier K, et al. (2007) Oral Oncology 43: 60-6.
Lacroix-Triki M, et al. (2010) J Pathol 222: 282-98.
Lee PL, et al. (1989) Science 245: 57-60.
Reis-Filho JS, et al. (2006) Clin Cancer Res 12: 6652-62.
Turner N, et al. (2010) Cancer Res 70: 2085-94.
Wetterskog D, et al. (2012) J Pathol 226: 84-96.

Probe Description

The ZytoDot ® SPEC FGFR1 Probe is a Digoxigenin-labeled probe specific for the FGFR1 gene at 8p11.23-p11.22, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



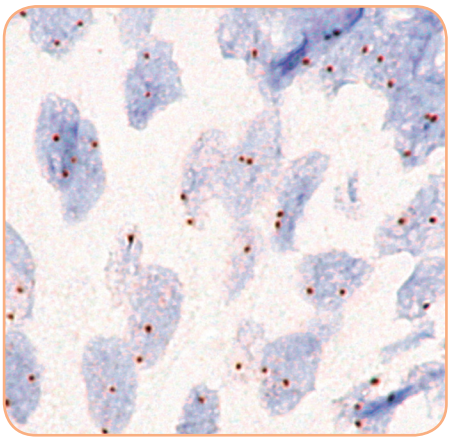
Ideogram of chromosome 8 indicating the hybridization locations.



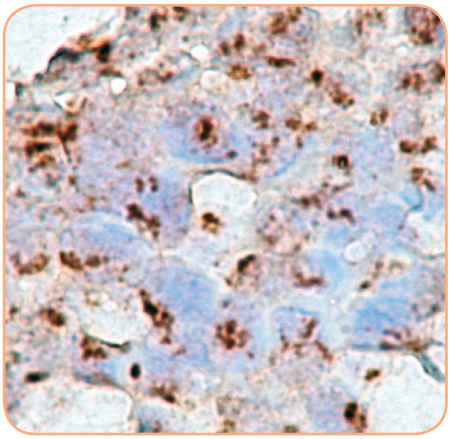
SPEC FGFR1 Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the FGFR1 gene locus or polysomy of chromosome 8 will show multiple dots or large signal clusters.



Normal nuclei each with two FGFR1 signals.



Nuclei with strong FGFR1 amplification.

Prod. No.	Product	Label	Tests* (Volume)
C-3023-400	ZytoDot SPEC FGFR1 Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
164

ZytoDot ® 2C SPEC FGFR1/CEN 8 Probe

CE IVD

Background

The ZytoDot ® 2C SPEC FGFR1/CEN 8 Probe is designed for the detection of FGFR1 gene amplification frequently observed in malignant tumors e.g. breast and prostate cancer and oral squamous cell carcinoma (OSCC).

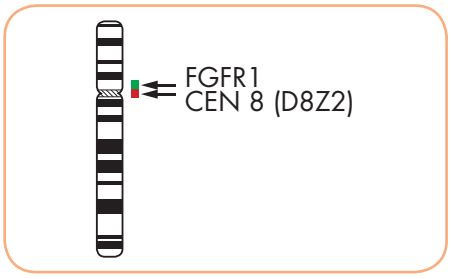
The FGFR1 (fibroblast growth factor receptor 1) gene is located in the chromosomal region 8p11.23-p11.22 and encodes a transmembrane receptor tyrosine kinase. Amplification of the FGFR1 gene, observed in approximately 10% of all breast cancer samples, has revealed to be an independent prognostic factor for overall survival. FGFR1 is believed to emerge as a potential therapeutic target for lobular breast carcinomas.

In prostate cancer, FGFR1 gene amplification seems to be an important step during the transmission to hormone resistance. In OSCC, FGFR1 gene amplification, observed in nearly 20% of all cases, is indicated to contribute to oral carcinogenesis at an early stage of development.

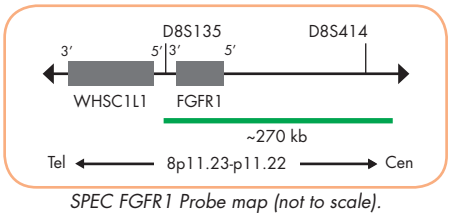
References
Edwards J, et al. (2003) Clin Cancer Res 9: 5271-81.
Elbauomy Elsheikh S, et al. (2007) Breast Cancer Res 9: R23.
Freier K, et al. (2007) Oral Oncology 43: 60-6.
Lee PL, et al. (1989) Science 245: 57-60.
Lacroix-Triki M, et al. (2010) J Pathol 222: 282-98.
Swoboda A, et al. (2011) Genes Chromosomes Cancer 50: 680-8.
Turner N, et al. (2010) Cancer Res 70: 2085-94.
Wetterskog D, et al. (2012) J Pathol 226: 84-96.

Probe Description

The ZytoDot ® 2C SPEC FGFR1/CEN 8 Probe is a mixture of a Digoxigenin-labeled probe specific for the FGFR1 gene at 8p11.23-p11.22 and a Dinitrophenyl-labeled CEN 8 probe specific for the alpha satellite centromeric region of chromosome 8 (D8Z2).



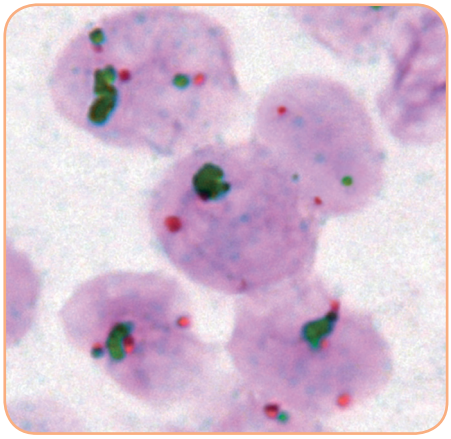
Ideogram of chromosome 8 indicating the hybridization locations.



SPEC FGFR1 Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit two green (FGFR1) and two red (CEN 8) signals are expected. In a cell with an amplification of the FGFR1 gene locus, multiple copies of the green signal or green signal clusters will be observed.



Breast carcinoma tissue section with FGFR1 amplification as indicated by large green clusters.

Prod. No.	Product	Label	Tests* (Volume)
C-3050-400	ZytoDot 2C SPEC FGFR1/CEN 8 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
165

ZytoDot ® SPEC MYC Probe

Previously: ZytoDot SPEC CMYC Probe

CE IVD

Background

The ZytoDot ® SPEC MYC Probe is designed for the detection of MYC gene amplification frequently observed in malignant tumors e.g. breast and endometrial cancer.

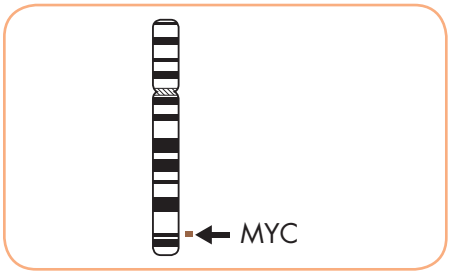
The proto-oncogene MYC (a.k.a. CMYC) is located in the chromosomal region 8q24.21 and encodes a nuclear transcription factor displaying high-affinity, site specific DNA-binding capacity when complexed with its cellular partners. Thus, the MYC protein is involved in proliferation, growth, differentiation, and apoptosis. Amplification of the chromosomal MYC gene region has been detected in many types of malignant neoplasms e.g. breast, lung, head, colon, kidney, neck, ovary, bladder, and endometrial cancers. It was shown that MYC amplification occurs in advanced, widespread tumors or in aggressive, primary tumors. In non-small cell lung cancer (NSCLC) and breast cancer, for example, MYC amplification was strongly associated with lymph node status. Accordingly, the MYC gene can be considered as a powerful prognostic marker.

Additionally, malignant cutaneous angiosarcomas but not benign and atypical vascular lesions occurring after radiotherapy of breast cancer are characterized by amplification of the MYC gene. The presence of MYC amplification is thus of considerable diagnostic importance for the distinction of malignant from atypical postradiation vascular neoplasms of the skin.

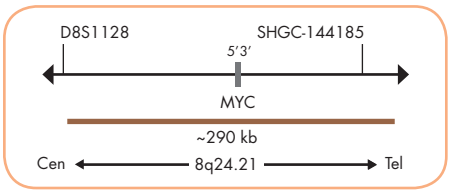
References
Alves Rde C, et al. (2014) J Cancer Res Clin Oncol 140: 2021-5.
Butt AJ, et al. (2005) Endocr Relat Cancer 12: 47-59.
Dalla-Favera R, et al. (1982) Proc Natl Acad Sci USA 79: 6497-501.
Deming SL, et al. (2000) Br J Cancer 83: 1688-95.
Hara T, et al. (1998) Lab Invest 78: 1143-53.
Kubokura H, et al. (2001) Ann Thorac Cardiovasc Surg 7: 197-203.
Mentzel T, et al. (2012) Mod Pathol 25: 75-95.
Rummukainen JK, et al. (2001) Lab Invest 81: 1445-51.
Schraml P, et al. (1999) Clin Cancer Res 5: 1966-75.
Yokota J, et al. (1986) Science 231: 261-5.

Probe Description

The ZytoDot ® SPEC MYC Probe is a Digoxigenin-labeled probe specific for the MYC gene region at 8q24.21, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



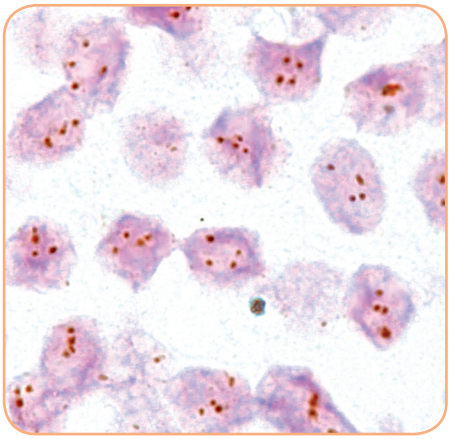
Ideogram of chromosome 8 indicating the hybridization locations.



SPEC MYC Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the MYC gene locus or polysomy of chromosome 8 will show multiple dots or large signal clusters.



Tetrasomy of chromosome 8 as indicated by four MYC signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3013-400	ZytoDot SPEC MYC Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
166

ZytoDot® 2C SPEC MYC Break Apart Probe

CE IVD

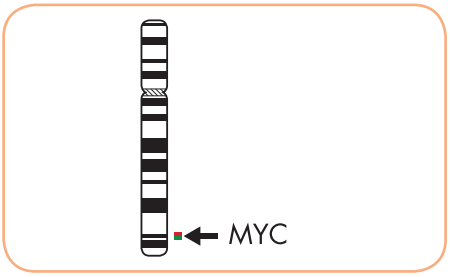
Background

The ZytoDot® 2C SPEC MYC Break Apart Probe is designed to detect translocations involving the chromosomal region 8q24.21 harboring the MYC gene.
The MYC proto-oncogene (v-myc avian myelocytomatosis viral oncogene homolog, a.k.a. CMYC) encodes a transcription factor essential for cell growth and proliferation and is broadly implicated in tumorigenesis. Translocations involving the MYC gene are considered to be cytogenetic hallmarks for Burkitt Lymphoma but are also found in other types of lymphomas.
The most frequent translocation involving the MYC gene region is t(8;14)(q24.21;q32.3) juxtaposing the MYC gene in 8q24.21 next to the IgH (immunoglobulin heavy chain) locus in 14q32.33. Further translocations affecting the MYC gene are t(8;22)(q24.21;q11.2) and t(2;8)(p11.2;q24.21), both of which involve one of the two immunoglobulin light chain loci. All three translocations bring the MYC gene under
the control of a regulatory element from one of the immunoglobulin loci resulting in constitutive overexpression of MYC.

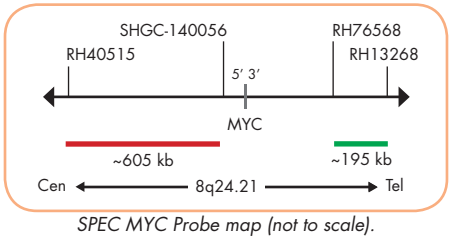
References
Boerma EG, et al. (2009) Leukemia 23: 225-34.
Dalla-Favera R, et al. (1982) PNAS 79: 6497-501.
Haralambieva E, et al. (2004) Genes Chromosomes Cancer 40: 10-8.
Veronese ML, et al. (1995) Blood 85: 2132-8.
Walker BA, et al. (2014) Blood Cancer J 4: e191.

Probe Description

The ZytoDot® 2C SPEC MYC Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 8q24.21 band. The DNP-labeled probe hybridizes proximal to the MYC gene breakpoint region at 8q24.21, the DIG-labeled probe hybridizes distal to the MYC gene breakpoint region.



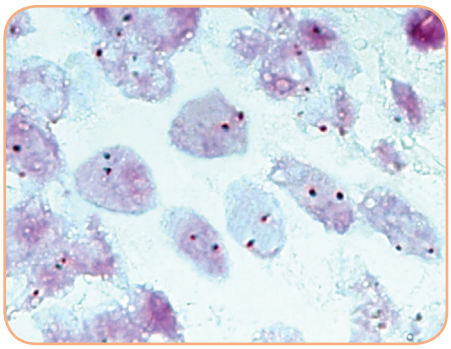
Ideogram of chromosome 8 indicating the hybridization locations.



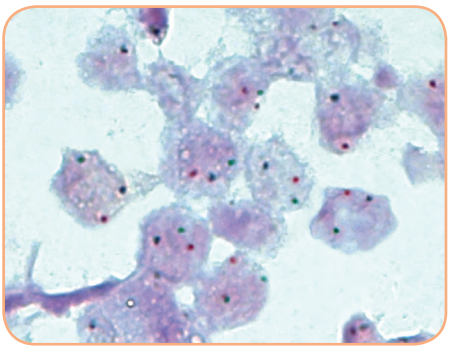
SPEC MYC Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 8q24.21 band, using the ZytoDot® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 8q24.21 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 8q24.21 locus and one 8q24.21 locus affected by a translocation.
Alternative break points particularly observed in variant MYC translocations t(8;22) and t(2;8) might result in different signal patterns.



SPEC MYC Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.



Non-Hodgkin lymphoma tissue section with translocation affecting the 8q24.21 locus as indicated by one red/green fusion (non-rearranged) signal, one red signal, and one separate green signal.

Prod. No.	Product	Label	Tests* (Volume)
C-3066-400	ZytoDot 2C SPEC MYC Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
167

ZytoDot ® 2C SPEC CDKN2A/CEN 9 Probe

CE IVD

Background

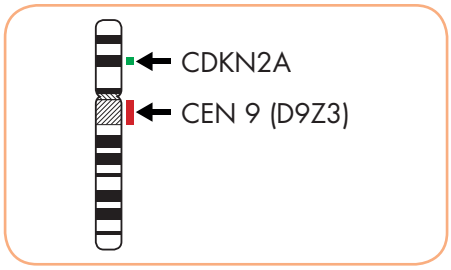
The ZytoDot ® 2C SPEC CDKN2A/CEN 9 Probe is designed for the detection of CDKN2A deletions frequently observed in most tumor cell lines as well as in primary human malignancies.

The CDKN2A gene, often referred to as p16 or INK4a/ARF, is located in the chromosomal region 9p21.3. Using alternative first exons and an alternative reading frame, the gene encodes for two distinct tumor suppressor proteins p16INK4a and p14ARF, both involved in cell cycle regulation. CDKN2A has been identified as a major susceptibility gene for melanoma. The tumor suppressor gene CDKN2A is inactivated by homozygous deletions with high frequency in a variety of human primary tumors e.g. bladder and renal cell carcinoma, prostate and ovarian adenocarcinoma, non-small cell lung cancer, sarcoma, glioma, mesothelioma, and melanoma. Furthermore, deletion of the CDKN2A gene is found in up to 80% of T-cell acute lymphoblastic leukemia cases and is associated with poor prognosis and relapse of the disease.

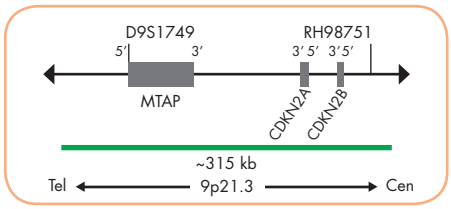
References
Arif Q & Husain AN (2015) Arch Pathol Lab Med 139: 978-80.
Cowan JM et al. (1988) J Natl Cancer Inst 80: 1159-64.
Holley T, et al. (2012) PLoS One 7: e50586.
Hussussian CJ, et al. (1994) Nat Genet 8: 15-21.
Kamb A, et al. (1994) Science 264: 436-40.
Nobori T, et al. (1994) Nature 368: 753-6.
Quelle DE, et al. (1995) Cell 83: 993-1000.
Rocco JW & Sidransky D (2001) Exp Cell Res 264: 42-55.
Schopmeyer K, et al. (1999) Neoplasia 1: 128-37.
Schwarz S, et al. (2008) Cytometry A 73: 305-11.
Sharpless NE (2005) Mutat Res 576: 22-38.

Probe Description

The ZytoDot ® 2C SPEC CDKN2A/CEN 9 Probe is a mixture of a Digoxigenin-labeled probe specific for the CDKN2A gene at 9p21.3 and a Dinitrophenyl-labeled CEN 9 probe specific for the classical satellite III region of chromosome 9 (D9Z3) at 9q12.



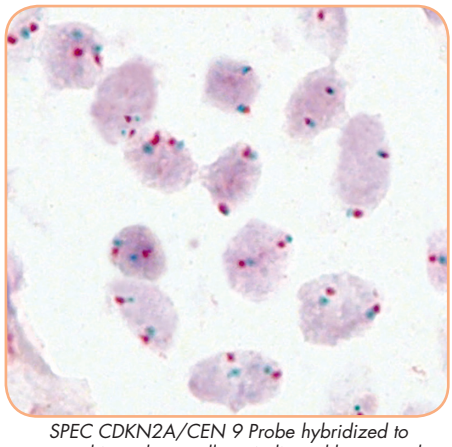
Ideogram of chromosome 9 indicating the hybridization locations.



SPEC CDKN2A Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit two green (CDKN2A) and two red (CEN 9) signals are expected. In a cell with deletion of the CDKN2A gene locus, a reduced number of green signals will be observed. Deletions affecting only parts of the CDKN2A gene might result in a normal signal pattern with green signals of reduced size.



SPEC CDKN2A/CEN 9 Probe hybridized to normal interphase cells as indicated by two red and two green signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3067-400	ZytoDot 2C SPEC CDKN2A/CEN 9 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
168

ZytoDot® 2C SPEC RET Break Apart Probe

CE IVD

Background

The ZytoDot® 2C SPEC RET Break Apart Probe is designed to detect translocations involving the chromosomal region 10q11.21 harboring the RET (rearranged during transfection proto-oncogene) gene. RET encodes a tyrosine kinase (TK) receptor.

Translocations involving RET were first described in papillary thyroid carcinoma (PTC) where somatic rearrangements result in the fusion of its TK catalytic domain with an N-terminal dimerization domain encoded by various fusion partner genes.

More recently, recurrent inversions [inv (10)(p11.2q11.2)] fusing the coiled-coil domains of the kinesin family member 5B (KIF5B) gene to the RET kinase domain have been detected in lung adenocarcinoma.

The resulting KIF5B-RET fusion protein can form homodimers through the coiled-coil domains of KIF5B, causing an aberrant activation of the TK of RET, a mechanism known from KIF5B-ALK fusions which is also found in lung adenocarcinoma.

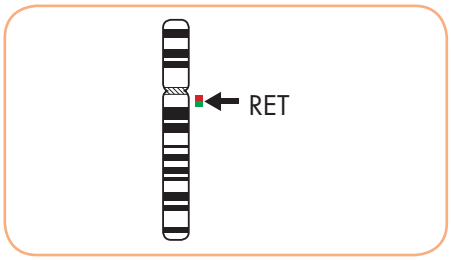
Since *in vitro* studies showed transforming activity of KIF5B-RET which could be suppressed by a TK inhibitor, it was assumed that the chimeric oncogene might be a promising molecular target for the treatment of lung cancer.

The same holds true for the BCR-RET and FGFR1OP-RET fusion genes in chronic myelomonocytic leukemia (CMML) generated by two balanced translocations t(10;22)(q11.2;q11.2) and t(6;10)(q27;q11.2), respectively.

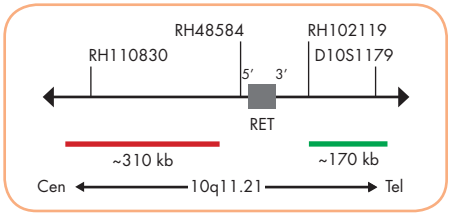
References
Ballerini P, et al. (2012) Leukemia 26: 2384-9.
Gautschi O, et al. (2013) J Thorac Oncol 8: e43-4.
Ju YS, et al. (2012) Genome Res 22: 436-45.
Kohno T, et al. (2012) Nat Med 18: 375-7.
Nikiforov YE (2002) Endocr Pathol 13: 3-16.
Takahashi M, et al. (1985) Cell 42: 581-8.
Takeuchi K, et al. (2012) Nat Med 18: 378-81.

Probe Description

The ZytoDot® 2C SPEC RET Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 10q11.21 band. The DNP-labeled probe hybridizes proximal to the RET gene breakpoint region at 10q11.21, the DIG-labeled probe hybridizes distal to the RET gene breakpoint region.



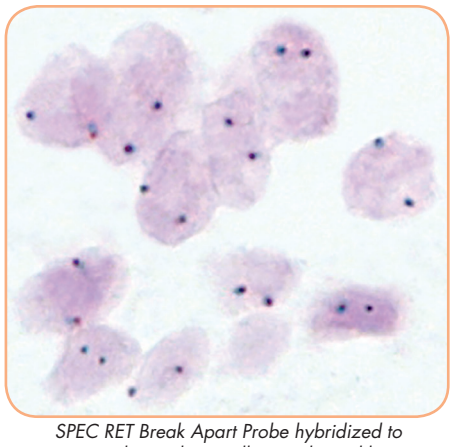
Ideogram of chromosome 10 indicating the hybridization locations.



SPEC RET Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 10q11.21 band, using the ZytoDot® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 10q11.21 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 10q11.21 locus and one 10q11.21 locus affected by a translocation or inversion.



SPEC RET Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3064-100	ZytoDot 2C SPEC RET Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
C-3064-400	ZytoDot 2C SPEC RET Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
169

ZytoDot ® 2C SPEC PTEN/CEN 10 Probe

CE IVD

Background

The ZytoDot ® 2C SPEC PTEN/CEN 10 Probe is designed for the detection of PTEN deletions frequently observed in many tumor types, including renal, melanoma, endometrial, breast, prostate, lung, bladder, and thyroid cancer but also in hematological neoplasms.

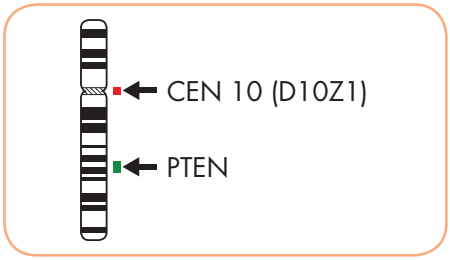
The tumor suppressor gene PTEN (phosphatase and tensin homolog deleted on chromosome ten), often referred to as MMAC1 (mutated in multiple advanced cancers 1), is located on 10q23.31 and encodes a 47 kDa dual-specificity phosphatase that has both lipid and protein phosphatase activity. Its inactivation results in constitutive activation of the PI3K/AKT pathway and in subsequent increase in protein synthesis, cell cycle progression, migration, and survival.

Deletions affecting the long arm of chromosome 10 have been detected in 30 to 50% of early and advanced stage sporadic melanomas and about 40 to 70% of prostate cancers. In both tumor entities loss of PTEN has been associated with poor clinical outcome. Currently, several drugs targeting the PI3K/AKT pathway for the therapy of solid tumors have entered clinical trials.

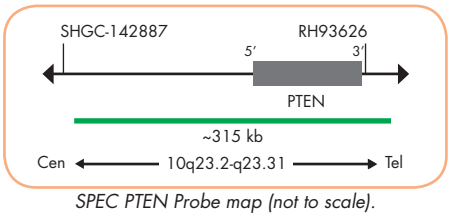
References
Dahia PLM, et al. (1999) Hum Mol Genet 8: 185-93.
Healy E, et al. (1998) Oncogene 16: 2213-8.
Li J, et al. (1997) Science 275: 1943-7.
Swoboda A, et al. (2011) Genes Chromosomes Cancer 50: 680-8.
Weng LP, et al. (2001) Hum Mol Genet 10: 599-604.
Yoshimoto M, et al. (2006) Cancer Genet Cytogenet 169: 128-37.
Yoshimoto M, et al. (2007) Br J Cancer 97: 678-85.

Probe Description

The ZytoDot ® 2C SPEC PTEN/CEN 10 Probe is a mixture of a Dinitrophenyl-labeled CEN 10 probe specific for the alpha satellite centromeric region of chromosome 10 (D10Z1) and a Digoxigenin-labeled probe specific for the chromosomal region 10q23.2-q23.31 harboring the PTEN gene.



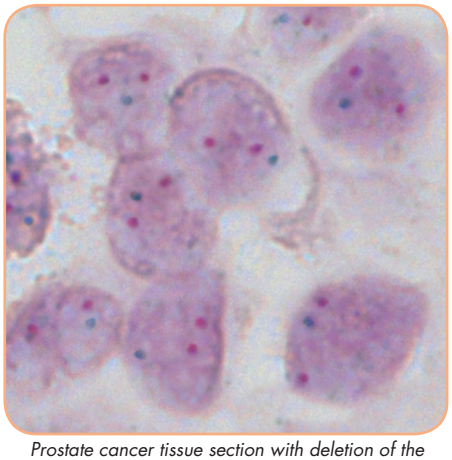
Ideogram of chromosome 10 indicating the hybridization locations.



SPEC PTEN Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit two red (CEN 10) and two green (PTEN) signals are expected. In a cell with a deletion of the PTEN gene locus a reduced number of green signals will be observed. Deletions affecting only parts of the PTEN gene might result in normal signal pattern with green signals of reduced size.



Prostate cancer tissue section with deletion of the PTEN gene as indicated by one green signal.

Prod. No.	Product	Label	Tests* (Volume)
C-3053-400	ZytoDot 2C SPEC PTEN/CEN 10 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot® 2C SPEC FGFR2/CEN 10 Probe

CE IVD

Background

The ZytoDot® 2C SPEC FGFR2/CEN 10 Probe is designed for the detection of FGFR2 gene amplifications frequently observed in breast cancer as well as in gastric cancer.

The FGFR2 (fibroblast growth factor gene 2, a.k.a. BEK) gene is located on chromosome 10q26.13 and encodes splice variants of the receptor tyrosine kinases FGFR2b and FGFR2c.

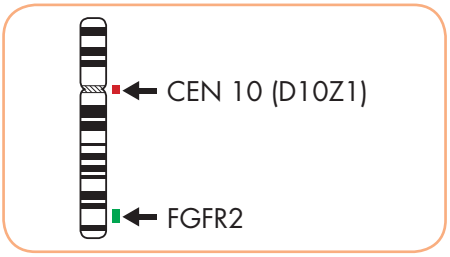
Amplification of the FGFR2 gene leads to overexpression of the FGFR2 protein and subsequently to signal activation. Additionally, during the amplification process the C-terminal deletion of FGFR2 can occur due to exclusion of the last exon from the FGFR2 amplicon. Both, overexpression and deletion of the last exon result in FGFR2 signaling activation based on constitutive phosphorylation of the FRS2 adaptor molecule.

The process of ligand independent FGFR2 signaling leads to a more severe malignant phenotype of these tumors. Moreover, high FGFR2 expression is correlated with poor overall survival (OS) and poor disease-free survival (DFS) rates in breast cancer patients. Consequently, FGFR2 gene amplification detected by Chromogenic *in situ* Hybridization might be used as a prognostic marker in breast cancer.

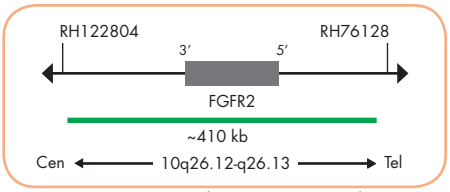
References
Azuma K, et al. (2011) Biochem Biophys Res Commun 407: 219-24.
Katoh M (2010) Expert Rev Anticancer Ther 10: 1375-9.
Katoh Y & Katoh M (2009) Int J Mol Med 23: 307-11.
Moffa AB, et al. (2004) Mol Cancer Res 2: 643-52.
Sun S, et al. (2012) J Surg Oncol 105: 773-9

Probe Description

The ZytoDot® 2C SPEC FGFR2/CEN 10 Probe is a mixture of a Dinitrophenyl-labeled CEN 10 probe specific for the alpha satellite centromeric region of chromosome 10 (D10Z1) and a Digoxigenin-labeled probe specific for the chromosomal region 10q26.12-q26.13 harboring the FGFR2 gene.



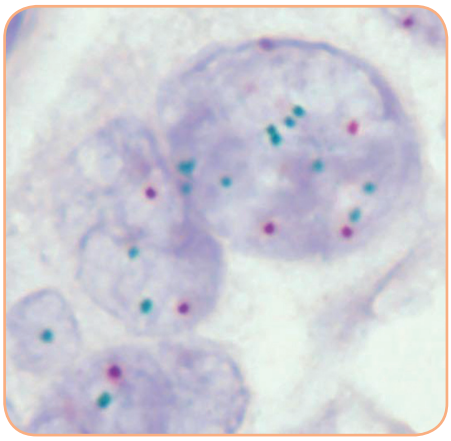
Ideogram of chromosome 10 indicating the hybridization locations.



SPEC FGFR2 Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot® 2C CISH Implementation Kit two red (CEN 10) and two green (FGFR2) signals are expected. Nuclei with amplification of the FGFR2 gene locus at 10q26.12-q26.13 or polysomy of chromosome 10 will show multiple copies of the green signal or large green signal clusters.



Breast carcinoma tissue section with FGFR2 (green) amplification.

Prod. No.	Product	Label	Tests* (Volume)
C-3056-400	ZytoDot 2C SPEC FGFR2/CEN 10 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
171

ZytoDot ® SPEC CCND1 Probe

CE IVD

Background

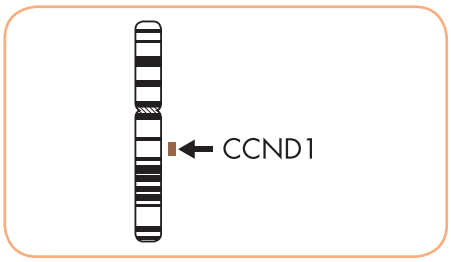
The ZytoDot ® SPEC CCND1 Probe is designed for the detection of CCND1 gene amplifications frequently observed in breast cancer and other human tumors. The cyclin D1 gene (a.k.a. CCND1 or PRAD1) is located in the chromosomal region 11q13.3 and encodes a regulatory subunit of cyclin-dependent kinases that promote progression through the cell cycle.

The proto-oncogene CCND1 is amplified in a number of solid tumors including approx. 20% of all human breast cancer cases and about 30% of squamous cell carcinomas of the esophagus and the head and neck region. Amplification of chromosomal material from 11q13.3 harboring the CCND1 gene is discussed as prognostic marker in terms of metastasis, tumor recurrence, and survival for several tumor entities. In gastrointestinal stromal tumors (GIST), CCND1 amplification was found in 16% of high-risk tumors and was absent in low- or intermediate-risk tumors indicating the prognostic relevance of this genetic alteration in GIST.

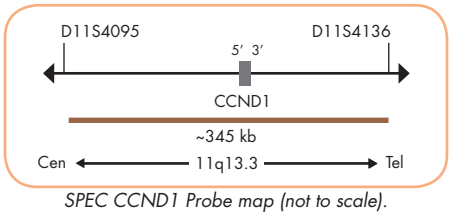
References
Al-Kuraya K, et al. (2004) Cancer Res 64: 8534-40.
Courjal F, et al. (1997) Cancer Res 57: 4360-7.
Duprez R, et al. (2012) J Pathol 226: 427-41.
Motokura T, et al. (1991) Nature 350: 512-5.
Ormandy CJ, et al. (2003) Breast Cancer Res Treat 78: 323-35.
Schuuring E (1995) Gene 159: 83-96.
Tornillo L, et al. (2005) Lab Invest 85: 921-31.
Xiong Y, et al. (1991) Cell 65: 691-9.

Probe Description

The ZytoDot ® SPEC CCND1 Probe is a Digoxigenin-labeled probe specific for the CCND1 gene region at 11q13.3, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



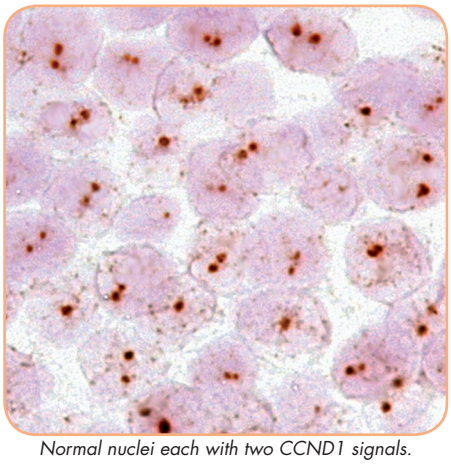
Ideogram of chromosome 11 indicating the hybridization locations.



SPEC CCND1 Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the CCND1 gene locus or polysomy of chromosome 11 will show multiple dots or large signal clusters.



Normal nuclei each with two CCND1 signals.

Prod. No.	Product	Label	Tests* (Volume)
C-3034-400	ZytoDot SPEC CCND1 Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
172

ZytoDot® 2C SPEC DDIT3 Break Apart Probe

Previously: ZytoDot 2C SPEC CHOP Break Apart Probe

CE IVD

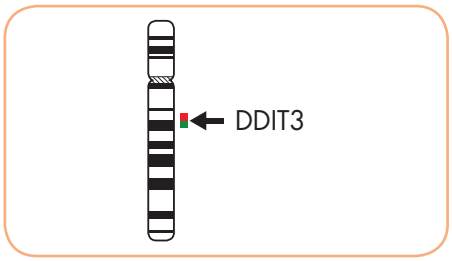
Background

The ZytoDot® 2C SPEC DDIT3 Break Apart Probe is designed to detect translocations involving the chromosomal region 12q13.3 harboring the DDIT3 (C/EBP-homologous protein) gene (a.k.a. CHOP, GADD153) in formalin-fixed, paraffin-embedded tissue sections or cell samples. The DDIT3 gene encodes for a stress-induced dominant-negative inhibitor of the transcription factors C/EBP and LAP. DDIT3 is consistently rearranged in myxoid liposarcomas (MLS). The most frequent translocation involving the DDIT3 gene region is t(12;16)(q13.3;p11.2) and occurs in about 90% of patients with MLS. The rearrangement results in a fusion gene comprising the 5´part of the FUS (fused in sarcoma) gene, located in 16p11.2, and the complete coding region of the DDIT3 gene. The FUS-DDIT3 fusion protein acts as an abnormal transcription factor and development of myxoid liposarcomas is thus regarded as a consequence of deregulated FUS-DDIT3 target genes. Differential diagnosis of liposarcomas and accurate classification, the latter being especially important with regard to appropriate treatment and prognosis, are often problematic. Therefore, detection of DDIT3 rearrangements via ISH analysis is a valuable tool to confirm the histopathological diagnosis of myxoid liposacrcoma.

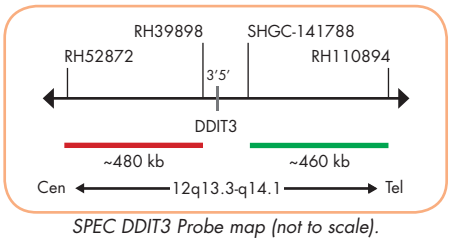
References
Åman P, et al. (1992) Genes Chromosomes Cancer 5: 278-85.
Andersson M, et al. (2010) BMC Cancer 10: 249-58.
Germano G, et al. (2010) Cancer Res 70: 2235-44.
Meis-Kindblom JM, et al. (2001) Virchows Arch 439: 141-51.
Panagopoulos I, et al. (1994) Cancer Res 54: 6500-3.
Ron D & Habener JF (1992) Genes Dev 6: 439-53.

Probe Description

The ZytoDot® 2C DDIT3 Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 12q13.3-q14.1 band. The DNP-labeled probe hybridizes proximal to the DDIT3 gene and the DIG-labeled probe hybridizes distal to that gene.



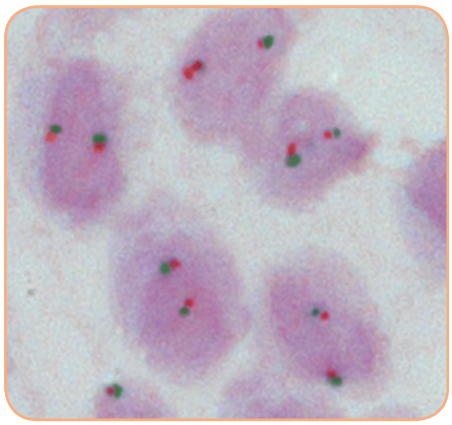
Ideogram of chromosome 12 indicating the hybridization locations.



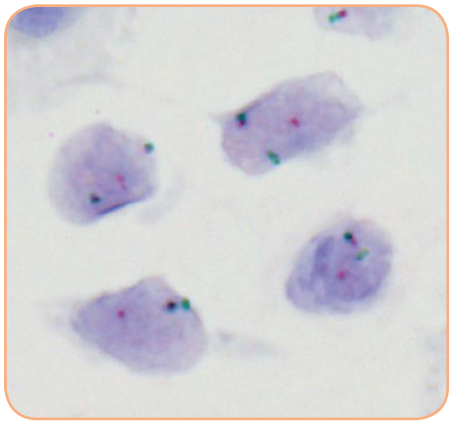
SPEC DDIT3 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 12q13.3-q14.1 band, using the ZytoDot® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 12q13.3-q14.1 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 12q13.3-q14.1 locus and one 12q13.3-q14.1 locus affected by a translocation or inversion.



SPEC DDIT3 Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.



Myxoid liposarcoma tissue section with translocation affecting the 12q13.3-q14.1 locus as indicated by one non-rearranged red/green fusion signal, one red signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
C-3047-100	ZytoDot 2C SPEC DDIT3 Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
WB-0009-500	Clear-it™ Stringency Buffer CE IVD		500 ml

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
173

ZytoDot ® 2C SPEC CDK4/CEN 12 Probe

CE IVD

Background

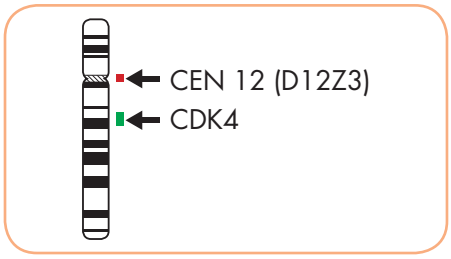
The ZytoDot ® 2C SPEC CDK4/CEN 12 Probe is designed for the detection of CDK4 gene amplifications. The cyclin-dependent kinase 4 (CDK4) gene is located in the chromosomal region 12q14.1, ~10 Mb centromeric to the murine double minute (MDM2) gene and is frequently coamplified with MDM2 in different malignancies.

In a complex with cyclin D1 (CCND1), the CDK4 encoded serine/threonine kinase phosphorylates the retinoblastoma protein 1 (RB1) which in turn leads to the release of the EF2 transcription factor and subsequently to an upregulation of genes which are required for progression through the S-, G2-, and M-phases of the cell cycle. Due to amplification of the respective chromosomal region, CDK4 is overexpressed in many human tumors such as soft tissue sarcomas, osteosarcomas (OS), and gliomas. In glioblastomas, the lack of amplification of several genes like CDK4 was recognized to be associated with a longer survival time. In OS, coamplification of MDM2 and CDK4, located in two discontinuous regions, occurs frequently in parosteal OS and less often in classical high-grade OS.

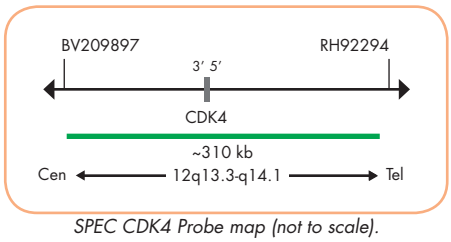
Although MDM2/CDK4 coamplification is not restricted to atypical lipomatous tumors/well-differentiated liposarcomas (ALT/WDLPS) and dedifferentiated liposarcomas (DDLPS), its detection is a strong criterion for distinguishing these tumor types from other undifferentiated sarcomas and even from carcinomas and lymphomas. Moreover, CDK4 amplification is a poor prognostic factor in WDLPS and DDLPS.

Probe Description

The ZytoDot ® 2C SPEC CDK4/CEN 12 Probe is a mixture of a Digoxigenin-labeled probe specific for the chromosomal region 12q13.3-q14.1 harboring the CDK4 gene and a Dinitrophenyl-labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3).



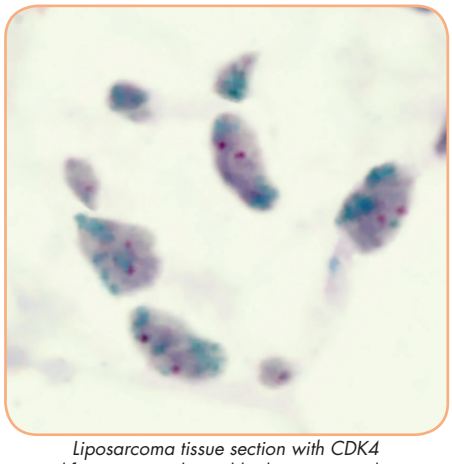
Ideogram of chromosome 12 indicating the hybridization locations.



SPEC CDK4 Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit, two green (CDK4) and two red (CEN 12) signals are expected. In a cell with amplification of the CDK4 gene locus or polysomy of chromosome 12, multiple copies of the green signal or green signal clusters will be observed.



Liposarcoma tissue section with CDK4 amplification as indicated by large green clusters.

References
Binh MB, et al. (2005) Am J Surg Pathol 29: 1340-7.
Fischer U, et al. (2010) Int J Cancer 126: 2594-602.
Lee SE, et al. (2014) Histol Histopathol 29: 127-38.
Lopes MA, et al. (2001) Oral Oncol 37: 566-71.
Mejia-Guerrero S, et al. (2010) Genes Chromosomes Cancer 49: 518-25.
Sirvent A, et al. (2007) Am J Surg Pathol 31: 1476-89.
Wunder JS, et al. (1999) Oncogene 18: 783-8.

Prod. No.	Product	Label	Tests* (Volume)
C-3062-400	ZytoDot 2C SPEC CDK4/CEN 12 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
174

ZytoDot ® SPEC MDM2 Probe

CE IVD

Background

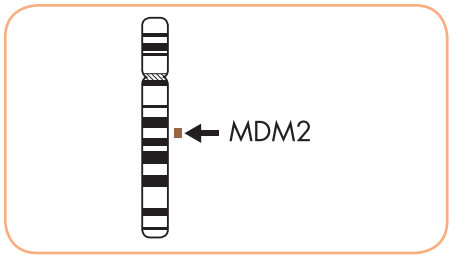
The ZytoDot ® SPEC MDM2 Probe is designed for the detection of MDM2 gene amplifications found in more than 10% of human tumors.

The MDM2 (murine double minute 2) gene is located in the chromosomal region 12q15 and encodes for an E3 ubiquitin ligase which acts as a major negative regulator of the tumor suppressor p53. Due to the amplification of the respective chromosomal region, MDM2 is overexpressed in many human tumors such as soft tissue sarcomas, osteosarcomas, gliomas, NSCLC, gastric and breast carcinomas. Well-differentiated liposarcomas (WDLPS), the most common soft tissue tumors in adults, are characterized by the amplification of 12q-derived chromosomal material, harboring the MDM2 oncogene while lipomas show balanced translocations involving 12q13-15. Accordingly, detection of the 12q14-15 amplification is regarded as a valuable tool for the differential diagnosis between well-differentiated liposarcomas and lipomas. Furthermore, detection of the MDM2 amplification might have prognostic relevance in gastrointestinal stromal tumors (GIST), the most common primary mesenchymal tumor of the gastrointestinal tract.

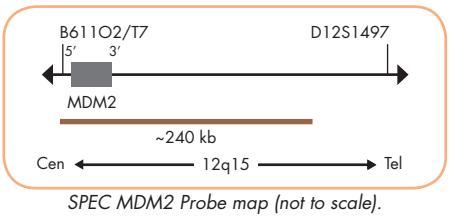
References
Korcheva VB, et al. (2011) Appl Immunhistochem Mol Morphol 19: 119-25.
Larousserie F, et al. (2013) Eur J Radiol 82: 2149-53.
Luan SL, et al. (2010) J Pathol 222: 166-79.
Momand J, et al. (1992) Cell 69: 1237-45.
Oliner JD, et al. (1992) Nature 358: 80-3.
Pedeutour F, et al. (1994) Genes Chromosomes Cancer 10: 85-94.
Pedeutour F, et al. (2004) Bull Cancer 91: 317-23.
Poaty H, et al. (2012) PLoS One 7: e29426.
Toledo F & Wahl GM (2006) Nat Rev Cancer 6: 909-23.
Tornillo L, et al. (2005) Lab Invest 85: 921-31.
Vassilev LT (2007) Trends Mol Med 13: 23-31.

Probe Description

The ZytoDot ® SPEC MDM2 Probe is a Digoxigenin-labeled probe specific for the MDM2 gene region at 12q15, processed by the the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



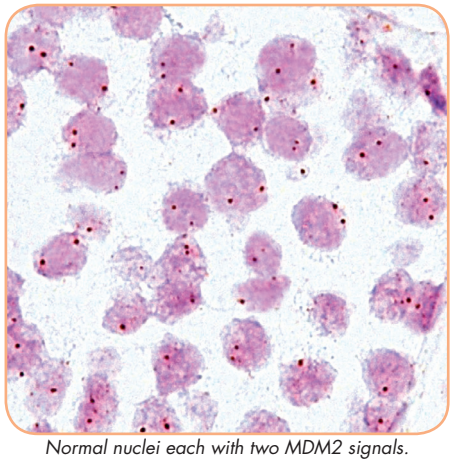
Ideogram of chromosome 12 indicating the hybridization locations.



SPEC MDM2 Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the MDM2 gene locus or polysomy of chromosome 12 will show multiple dots or large signal clusters.



Normal nuclei each with two MDM2 signals.

Prod. No.	Product	Label	Tests* (Volume)
C-3012-400	ZytoDot SPEC MDM2 Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
175

ZytoDot ® 2C SPEC MDM2/CEN 12 Probe

CE IVD

Background

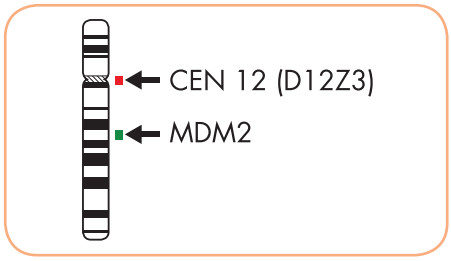
The ZytoDot ® 2C SPEC MDM2/CEN 12 Probe is designed for the simultaneous detection of MDM2 and centromere 12 in formalin-fixed, paraffin-embedded tissue sections or cell samples.

The MDM2 (mouse double minute 2) gene is located in the chromosomal region 12q15 and encodes for an E3 ubiquitin ligase which acts as a major negative regulator of the tumor suppressor p53.

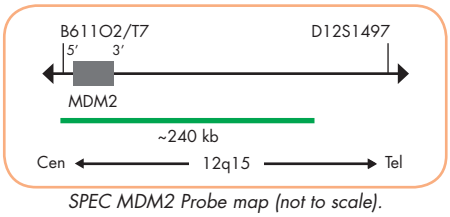
MDM2 gene amplifications are found in more than 10% of human tumors. Due to the amplification of the respective chromosomal region, MDM2 is overexpressed in many human tumors such as soft tissue sarcomas, osteosarcomas, gliomas, NSCLC, gastric and breast carcinomas. Well-differentiated liposarcomas (WDLPS), the most common soft tissue tumors in adults, are characterized by the amplification of 12q-derived chromosomal material, harboring the MDM2 oncogene while lipomas show balanced translocations involving 12q13-15. Accordingly, detection of the 12q14-15 amplification is regarded as a valuable tool for the differential diagnosis between well-differentiated liposarcomas and lipomas. Furthermore, detection of the MDM2 amplification might have prognostic relevance in gastrointestinal stromal tumors (GIST), the most common primary mesenchymal tumor of the gastrointestinal tract.

Probe Description

The ZytoDot ® 2C SPEC MDM2/CEN 12 Probe is a mixture of a Digoxigenin-labeled probe specific for MDM2 gene at 12q15 and a Dinitrophenyl-labeled CEN 12 probe specific for the alpha satellite centromeric region of chromosome 12 (D12Z3).



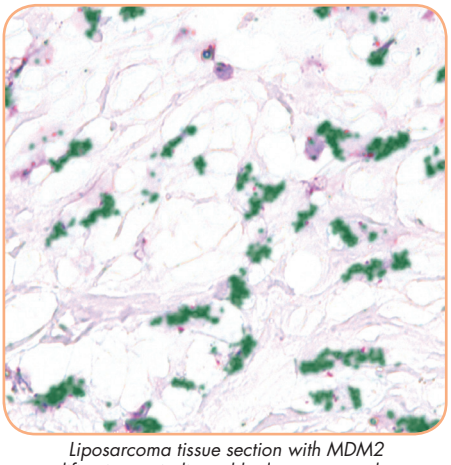
Ideogram of chromosome 12 indicating the hybridization locations.



SPEC MDM2 Probe map (not to scale).

Results

In a normal interphase nucleus,using the ZytoDot ® 2C CISH Implementation Kit two red and two green signals are expected. In a cell with amplification of the MDM2 gene locus, multiple copies of the green signal or green signal clusters will be observed.



Liposarcoma tissue section with MDM2 amplification as indicated by large green clusters.

References
Flanagan A, et al. (2010) Skeletal Radiol 39: 213-24.
Kashima T, et al. (2012) Mod Pathol 25: 1384-96.
Korcheva VB, et al. (2012) Appl Immunhistochem Mol Morphol 19: 119-25.
Larousserie F, et al. (2013) Eur J Radiol 82: 2149-53.
Luan SL, et al. (2010) J Pathol 222: 166-79.
Momand J, et al. (1992) Cell 69: 1237-45.
Oliner JD, et al. (1992) Nature 358: 80-3.
Pedeutour F, et al. (1994) Genes Chromosomes Cancer 10: 85-94.
Pedeutour F, et al. (2004) Bull Cancer 91: 317-23.
Poaty H, et al. (2012) PLoS One 7: e29426.
Toledo F & Wahl GM (2006) Nat Rev Cancer 6: 909-23.
Tornillo L, et al. (2005) Lab Invest 85: 921-31.
Vassilev LT (2007) Trends Mol Med 13: 23-31.

Prod. No.	Product	Label	Tests* (Volume)
C-3049-100	ZytoDot 2C SPEC MDM2/CEN12 Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
C-3049-400	ZytoDot 2C SPEC MDM2/CEN12 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
176

ZytoDot ® 2C SPEC FOXO1 Break Apart Probe

CE IVD

Background

The ZytoDot ® 2C SPEC FOXO1 Break Apart Probe is designed for the detection of specific translocations involving the chromosomal region 13q14.11 harboring the FOXO1 (forkhead box O1, a.k.a. FKHR) gene characteristic for alveolar rhabdomyosarcoma.

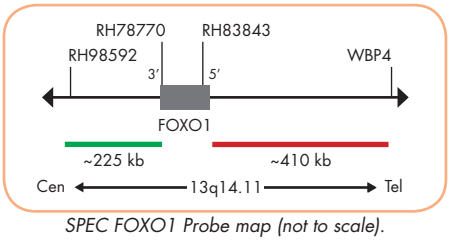
Among solid tumors of the childhood, rhabdomyosarcoma (RMS) is the most common soft tissue sarcoma. RMS are classified in two main categories: embryonal rhabdomyosarcoma (ERMS) and alveolar rhabdomyosarcoma (ARMS). The alveolar histology is associated with a poorer prognosis. ARMS is characterized by two tumor-specific reciprocal translocations t(2;13)(q36;q14.1) and t(1;13)(p36.1;q14.1) detectable in more than 80% of all ARMS. These translocations fuse the FOXO1 locus on 13q14.11 to either PAX3 on chromosome 2 or to PAX7 on chromosome 1. The resulting fusion transcripts encode for the chimeric proteins PAX3-FOXO1 and PAX7-FOXO1 that combine transcriptional domains from the corresponding wild-type proteins and thereby acquire oncogenic activity. The translocations and their fusion genes represent highly specific genetic markers useful in the diagnosis of ARMS.

References
Dal Cin P, et al. (1991) Cancer Genet Cytogenet 55: 191-5.
Douglass EC, et al. (1991) Genes Chromosomes Cancer 3: 480-2.
Gunawan B, et al. (1999) Pathol Oncol Res 5: 211-3.
Seidal T, et al. (1982) Acta Pathol Microbiol Immunol Scand A 90: 345-54.
Sorensen PH, et al. (2002) J Clin Oncol 20: 2672-9.

Probe Description

The ZytoDot ® 2C SPEC FOXO1 Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 13q14.11 band. The DNP-labeled probe hybridizes distal to the FOXO1 gene breakpoint region at 13q14.11, the DIG-labeled probe hybridizes proximal to the FOXO1 gene breakpoint region.

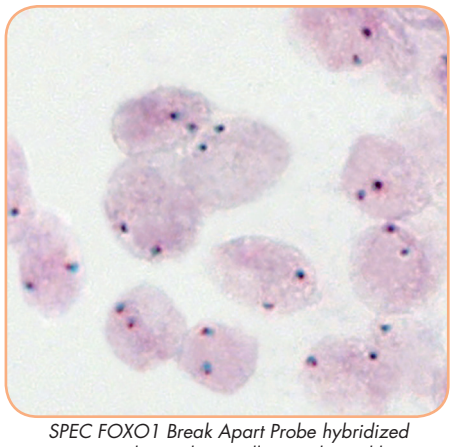
Ideogram of chromosome 13 indicating the hybridization locations.



SPEC FOXO1 Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking a translocation involving the 13q14.11 band, using the ZytoDot ® 2C CISH Implementation Kit, two red/green fusion signals are expected representing two normal (non-rearranged) 13q14.11 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 13q14.11 locus and one 13q14.11 locus affected by a translocation.



SPEC FOXO1 Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3065-100	ZytoDot 2C SPEC FOXO1 Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
177

ZytoDot ® 2C SPEC FUS Break Apart Probe

CE IVD

Background

The ZytoDot ® 2C SPEC FUS Break Apart Probe is designed to detect translocations involving the chromosomal region 16p11.2 harboring the FUS (FUsed in Sarcoma) gene (a.k.a. TLS, FUS/TLS, hnRNP P2).

The FUS gene encodes an RNA-binding protein, the C-terminal end of which is involved in protein and RNA binding and which appears to be involved in transcriptional activation with its N-terminal end. It shares distinct characteristics with EWS and TAF15 which together with FUS are frequently referred to as the FET family of proteins.

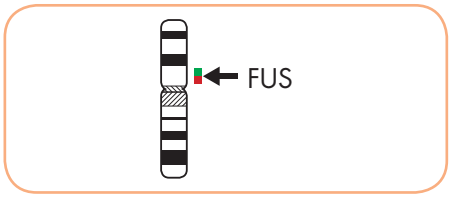
FUS gene rearrangements have been shown to be involved in both solid tumors and leukemias fusing the N-terminal end of FUS to various fusion partners. The most frequent translocation involving the FUS gene region is t(12;16)(q13.3;p11.2). Occurring in over 90% of myxoid liposarcomas, the FUS-DDIT3 fusion protein is regarded as being consequential for the development of myxoid liposarcomas by acting as an abnormal transcription factor and thus deregulating FUS-DDIT3 target genes.

Differential diagnosis of liposarcomas and accurate classification, the latter being especially important with regard to appropriate treatment and prognosis, are often problematic. Therefore, detection of FUS rearrangements via *in situ* Hybridization analysis is a valuable tool to confirm the histopathological diagnosis of myxoid liposarcoma.

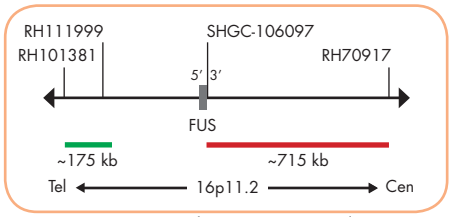
References
Andersson M, et al. (2010) BMC Cancer 10: 249-58.
Antonescu C, et al. (2000) J Mol Diagn 2: 132-8.
Germano G, et al. (2010) Cancer Res 70: 2235-44.
Kuroda M, et al. (1995) Am J Pathol 147: 1221-7.
Meis-Kindblom JM, et al. (2001) Virchows Arch 439: 141-51.
Panagopoulos I, et al. (1994) Cancer Res 54: 6500-3.
Panagopoulos I, et al. (1997) Oncogene 15: 1357-62.

Probe Description

The ZytoDot ® 2C SPEC FUS Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the 16p11.2 band. The DNP-labeled probe hybridizes proximal to the FUS gene, the DIG-labeled probe hybridizes distal to that gene.



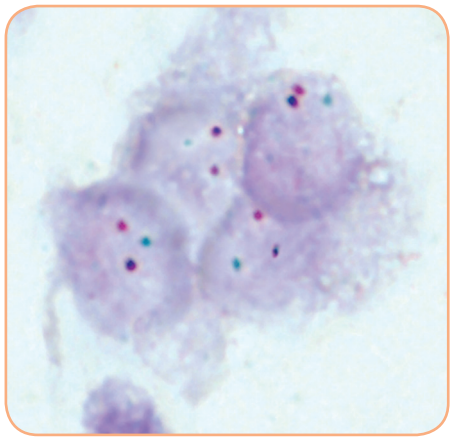
Ideogram of chromosome 16 indicating the hybridization locations.



SPEC FUS Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 16p11.2 band, using the ZytoDot ® 2C CISH Implementation Kit two red/green fusion signals are expected representing two normal (non-rearranged) 16p11.2 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 16p11.2 locus and one 16p11.2 locus affected by a 16p11.2 translocation.



Myxoid liposarcoma tissue section with translocation affecting the 16p11.2 locus as indicated by one non-rearranged red/green fusion signal, one red signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
C-3054-100	ZytoDot 2C SPEC FUS Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10
WB-0009-500	Clear-it™ Stringency Buffer CE IVD		500 ml

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
178

ZytoDot ® SPEC ERBB2 Probe

Previously: ZytoDot SPEC HER2 Probe

CE IVD

Background

The ZytoDot ® SPEC ERBB2 Probe is designed for the detection of ERBB2 gene amplification, frequently observed in solid malignant neoplasms, in formalin-fixed, paraffin-embedded tissue sections or cell samples.

The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes the cellular growth factor receptor p185.

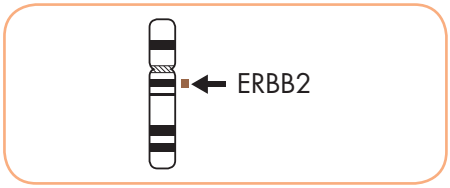
Amplification of the proto-oncogene ERBB2, observed in approximately 20% of all breast cancer samples, has been correlated with a poor prognosis of the disease. Similar results have been obtained for a variety of other malignant neoplasms e.g. ovarian cancer, stomach cancer, and carcinomas of the salivary gland.

References

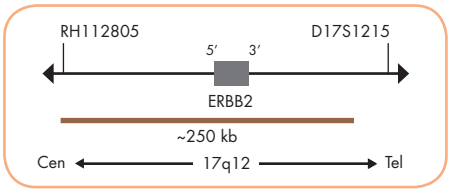
Ataseven B, et al. (2012) Breast Care 7: 465-70.
Bhargava R, et al. (2005) Am J Clin Pathol 123: 237-43.
Boissière-Michot F, et al. (2013) Pathol Oncol Res 19: 41-53.
Brunello E, et al. (2012) Histopathology 60: 482-8.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Coussens L, et al. (1985) Science 230: 1132-9.
Cruz-Reyes C & Gamboa-Dominguez A (2013) Int J Surg Pathol 21: 240-6.
Di Palma S, et al. (2008) J Clin Pathol 61: 757-60.
Ettl T, et al. (2012) Hum Pathol 43: 921-31.
Fasching P, et al. (2011) BMC Cancer 11: 486.
Haas M, et al. (2011) Virchows Arch 458: 403-11.
Hauser-Kronberger C & Dandachi N (2004) J Mol Histol 35: 647-53.
Hwang CC, et al. (2011) Histopathology 59: 984-92.
Kounelis S, et al. (2005) Anticancer Res 25: 939-46.
Kuijpers CCHJ, et al. (2013) PLoS One 19: 3078-87.
Lehmann-Che L, et al. (2011) Br J Cancer 104: 1739-46.
Moelans CB, et al. (2011) Crit Rev Oncol Hematol 80: 380-92.
Mori N, et al. (2010) Br J Cancer 103: 889-98.
Nie X, et al. (2013) J Huazhong Univ Sci Technolog Med Sci 33: 379-84.
Oikawa M, et al. (2013) J Oral Pathol Med 42: 424-34.
Oliveira-Costa JP, et al. (2011) Diagn Pathol 6: 73.
Shim BY, et al. (2009) Asia Pac J Clin Oncol 5: 232-41.
Tsukamoto T, et al. (1991) Int J Dev Biol 35: 25-32.

Probe Description

The ZytoDot ® SPEC ERBB2 Probe is a Digoxigenin-labeled probe specific for the ERBB2 gene at 17q12, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



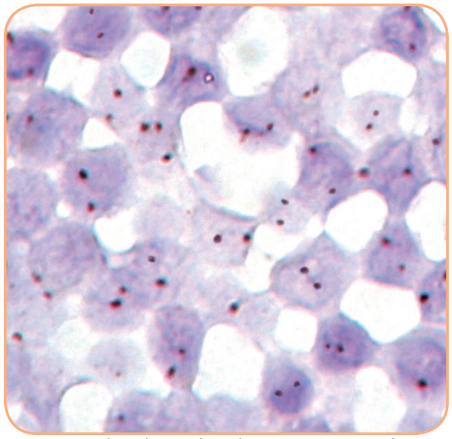
Ideogram of chromosome 17 indicating the hybridization locations.



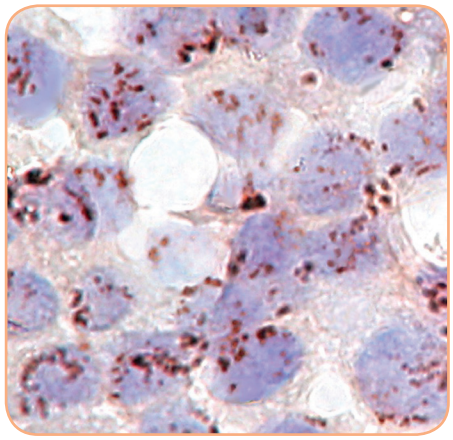
SPEC ERBB2 Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the ERBB2 gene locus or polysomy of chromosome 17 will show multiple dots or large signal clusters.



Normal nuclei each with two ERBB2 signals.



Breast carcinoma tissue section with ERBB2 amplification.

Prod. No.	Product	Label	Tests* (Volume)
C-3001-100	ZytoDot SPEC ERBB2 Probe CE IVD	Digoxigenin	10 (100 µl)
C-3001-400	ZytoDot SPEC ERBB2 Probe CE IVD	Digoxigenin	40 (400 µl)
C-3003-10	ZytoDot SPEC ERBB2 Probe Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1 ml; Probe, 0.1 ml; Wash Buffer SSC, 150 ml; PBS/Tween, good for 1000 ml; Blocking Solution, 1 ml; Mouse-anti-DIG, 1 ml; Anti-Mouse-HRP-Polymer, 1 ml; DAB Solution A, 0.1 ml; DAB Solution B, 2 ml; Mayer's Hematoxylin Solution, 4 ml; Mounting Solution (alcoholic), 1 ml; Control Slides, 1 pcs.	Digoxigenin	10
C-3003-40	ZytoDot SPEC ERBB2 Probe Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Probe, 0.4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml; Control Slides, 2 pcs.	Digoxigenin	40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® 2C SPEC ERBB2/CEN 17 Probe

Previously: ZytoDot 2C SPEC HER2/CEN 17 Probe

CE IVD

Background

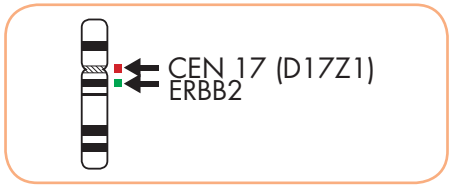
The ZytoDot ® 2C SPEC ERBB2/CEN 17 Probe is designed for the simultaneous detection of ERBB2 and centromere 17 in formalin-fixed, paraffin-embedded tissue sections or cell samples.

The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes the cellular growth factor receptor p185. Amplification of the proto-oncogene ERBB2, observed in approximately 20% of all breast cancer samples, has been correlated with a poor prognosis of the disease. Similar results have been obtained for a variety of other malignant neoplasms e.g. ovarian cancer, stomach cancer, and carcinomas of the salivary gland.

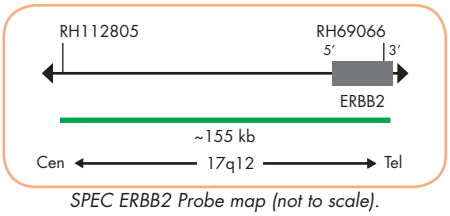
References
Bhargava R, et al. (2005) Am J Clin Pathol 123: 237-43.
Brunello E, et al. (2012) Histopathology 60: 482-8.
Brunner K, et al. (2010) Anal Quant Cytol Histol 32: 78-89.
Carbone A, et al. (2008) J Mol Diagn 10: 527-36.
Coussens L, et al. (1985) Science 230: 1132-9.
Ettl T, et al. (2012) Hum Pathol 43: 921-31.
Fasching P, et al. (2011) BMC Cancer 11: 486.
Haas M, et al. (2011) Virchows Arch 458: 403-11.
Hauser-Kronberger C & Dandachi N (2004) J Mol Histol 35: 647-53.
Hopman AHN, et al. (1997) Histochem Cell Biol 108: 291-8.
Hwang CC, et al. (2011) Histopathology 59: 984-92.
Kounelis S, et al. (2005) Anticancer Res 25: 939-46.
Lehmann-Che L, et al. (2011) Br J Cancer 104: 1739-46.
Mayr D, et al. (2009) Histopathology 55: 716-23.
Mosch B, et al. (2007) J Neuroscience 27: 6859-67.
Moelans CB, et al. (2011) Crit Rev Oncol Hematol 80: 380-92.
Nie X, et al. (2013) J Huazhong Univ Sci Technolog Med Sci 33: 379-84.
Oliveira-Costa JP, et al. (2010) Hum Pathol 41: 1624-30.
Oliveira-Costa JP, et al. (2011) Diagn Pathol 6: 73.
Santos PB, et al. (2012) Diagn Pathol 7: 104.
Schiavon BN, et al. (2012) Am J Surg Pathol 36: 1489-96.
Silveira G, et al. (2012) Histol Histopathol 27: 1353-9.
Speel EJ, et al. (1994) J Histochem Cytochem 42: 1299-307.
Vasconcellos FA, et al. (2013) Acta Histochem 115: 240-4.
Wachter DL, et al. (2013) Arch Gynecol Obstet 287: 337-44.
Yildirim S, et al. (2012) UHOD 3: 156-62.

Probe Description

The ZytoDot ® 2C SPEC ERBB2/CEN 17 Probe is a mixture of a Digoxigenin-labeled probe specific for the ERBB2 gene at 17q12 and a Dinitrophenyl-labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1).



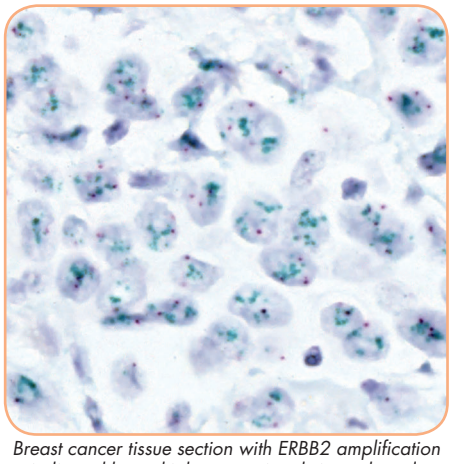
Ideogram of chromosome 17 indicating the hybridization locations.



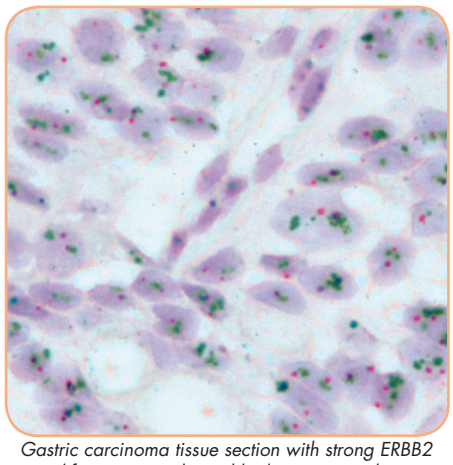
SPEC ERBB2 Probe map (not to scale).

Results

Using the ZytoDot ® 2C SPEC ERBB2/CEN 17 Probe Kit, two green (ERBB2) and two red (CEN 17) signals are expected in a normal interphase nucleus. In a cell with amplification of the ERBB2 gene locus, multiple copies of the green signal or green signal clusters will be observed.



Breast cancer tissue section with ERBB2 amplification as indicated by multiple green signals in each nucleus.



Gastric carcinoma tissue section with strong ERBB2 amplification as indicated by large green clusters.

Prod. No.	Product	Label	Tests* (Volume)
C-3032-100	ZytoDot 2C SPEC ERBB2/CEN 17 Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
C-3032-400	ZytoDot 2C SPEC ERBB2/CEN 17 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
C-3022-10	ZytoDot 2C SPEC ERBB2/CEN 17 Probe Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Probe, 0.1 ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml; Control Slides, 1 pcs.	Digoxigenin/DNP	10
C-3022-40	ZytoDot 2C SPEC ERBB2/CEN 17 Probe Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Probe, 0.4 ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml; Control Slides, 2 pcs.	Digoxigenin/DNP	40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot® 2C SPEC ERBB2/D17S122 Probe

CE IVD

Background

The ZytoDot® 2C SPEC ERBB2/D17S122 Probe is designed for the detection of ERBB2 gene amplification frequently observed in solid malignant neoplasms e.g. breast cancer samples.

The ERBB2 gene (a.k.a. HER2 and NEU) is located in the chromosomal region 17q12 and encodes a 185-190 kDa transmembrane glycoprotein, p185, acting as a cellular growth factor receptor. The p185 protein belongs to the EGFR (epidermal growth factor receptor) subgroup of the RTK (receptor tyrosine kinase) superfamily also including ERBB1 (HER1), ERBB3 (HER3), and ERBB4 (HER4).

Amplification of the proto-oncogene ERBB2, observed in approximately 20% of all breast cancer samples, has been correlated with a poor prognosis of the disease.

Similar results have been obtained for a variety of other malignant neoplasms e.g. ovarian cancer, stomach cancer, and carcinomas of the salivary gland.

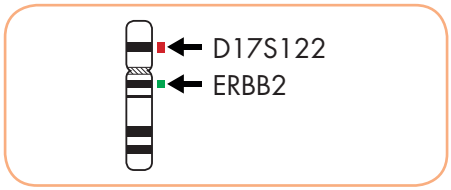
Chromogenic *in situ* Hybridization targeting the alpha satellite centromeric regions of chromosome 17 may be misleading in some cases due to possible gains or losses of this region. For these cases, judged as equivocal according to the ASCO guidelines, reflex testing is recommended using the SPEC ERBB2/D17S122 Probe.

References

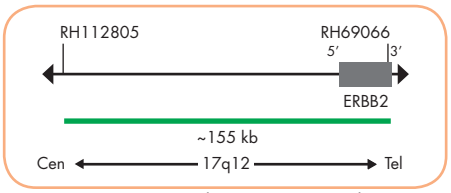
Baselga J, et al. (1999) Semin Oncol 26: 78-83.
Coussens L, et al. (1985) Science 230: 1132-9.
Hwang CC, et al. (2011) Histopathology 59: 984-92.
Hynes NE & Stern DF (1994) Biochim Biophys Acta 1198: 165-84.
Moelans CB, et al. (2011) Crit Rev Oncol Hematol 80: 380-92.
Park JB, et al. (1989) Cancer Res 49: 6605-9.
Popescu NC, et al. (1989) Genomics 4: 362-6.
Slamon DJ, et al. (1987) Science 235: 177-82.
Voutsas IF, et al. (2013) Int J Radiat Biol 89: 319-25.
Wolff AC, et al. (2013) J Clin Oncol 31: 3997-4013.

Probe Description

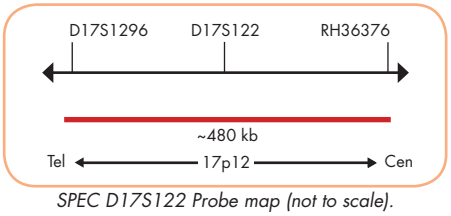
The ZytoDot® 2C SPEC ERBB2/D17S122 Probe is a mixture of a Digoxigenin-labeled probe specific for the chromosomal region 17q12 harboring the ERBB2 gene and a Dinitrophenyl-labeled SPEC D17S122 probe specific for the chromosomal region 17p12. The SPEC D17S122 probe is designed to be used for chromosome 17 copy number detection.



Ideogram of chromosome 17 indicating the hybridization locations.



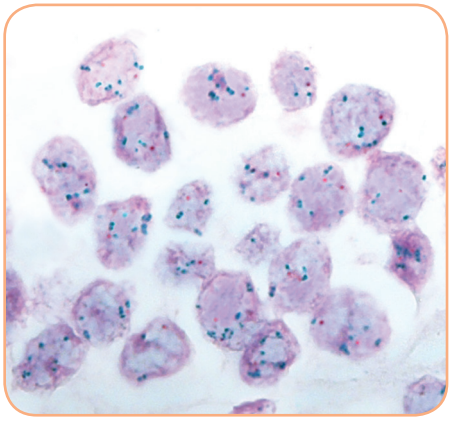
SPEC ERBB2 Probe map (not to scale).



SPEC D17S122 Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot® 2C CISH Implementation Kit, two green (ERBB2) and two red (D17S122) signals are expected. In a cell with amplification of the ERBB2 gene locus or polysomy of chromosome 17, multiple copies of the green signal or green signal clusters will be observed.



Breast carcinoma tissue section with amplification of the ERBB2 gene as indicated by multiple green signals in relation to red (D17S122) signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3068-100	ZytoDot 2C SPEC ERBB2/D17S122 Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
181

ZytoDot ® SPEC TOP2A Probe

CE IVD

Background

The ZytoDot ® SPEC TOP2A Probe is designed for the detection of TOP2A deletions and gene amplifications in formalin-fixed, paraffin-embedded tissue sections or cell samples.

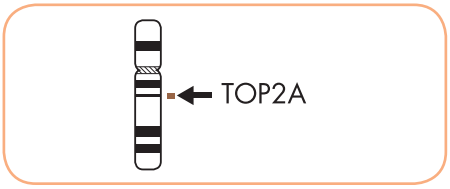
The TOP2A (topoisomerase II alpha) gene is located in the chromosomal region 17q21.2 and encodes for a 170 kDa DNA topoisomerase which controls and alters the topologic state of DNA during replication, transcription, and chromosome segregation.

TOP2A gene copy number changes are frequently observed in the majority of ERBB2 amplified primary breast tumors as well as in other human malignancies without simultaneous ERBB2 amplification e.g. acute lymphoblastic leukemias, gastric and bladder carcinomas. Recent data suggests that amplification and deletion of the TOP2A gene locus may account for relative chemosensitivity or resistance to TOP2A inhibitor therapy, respectively. Thus, determination of the TOP2A status may predict benefit from adjuvant anthracyclines in ERBB2 positive breast cancer.

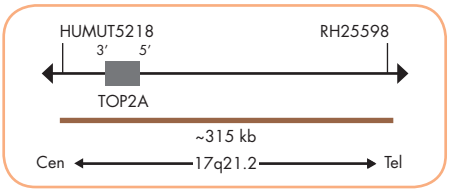
References
Arriola E, et al. (2007) Breast Cancer Res Treat 106: 181-9.
Ataseven B, et al. (2012) Breast Care 7: 465-70.
Järvinen TA & Liu ET (2006) Curr Cancer Drug Targets 6: 579-602.
Järvinen TA, et al. (2000) Am J Pathol 156: 839-47.
Tanner M, et al. (2006) J Clin Oncol 24: 2428-36.
Tewey KM, et al. (1984) Science 226: 466-8.
Tsai-Pflugfelder M, et al. (1988) Proc Nat Acad Sci 85: 7177-81.
Wang JC (1996) Annu Rev Biochem 65: 635-92.

Probe Description

The ZytoDot ® SPEC TOP2A Probe is a Digoxigenin-labeled probe specific for the TOP2A gene at 17q21.2, processed by the unique *ZytoVision® Repeat Subtraction Technique* resulting in advanced specificity and less background.



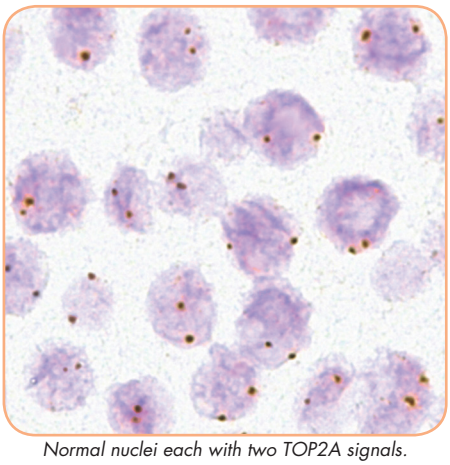
Ideogram of chromosome 17 indicating the hybridization locations.



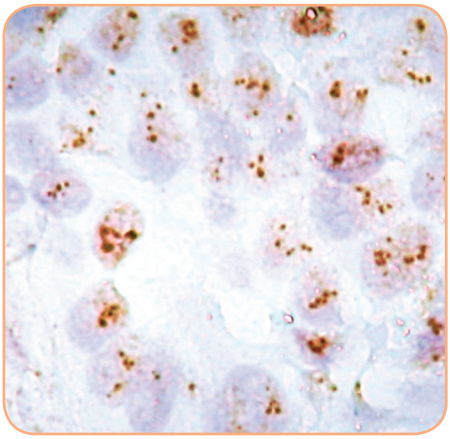
SPEC TOP2A Probe map (not to scale).

Results

In normal cells, two distinct dot-shaped signals per nucleus will be observed. Nuclei with amplification of the TOP2A gene locus or polysomy of chromosome 17 will show multiple dots or large signal clusters. Deletion of the TOP2A gene results in one or no signal per nucleus.



Normal nuclei each with two TOP2A signals.



Breast carcinoma tissue section with TOP2A amplification.

Prod. No.	Product	Label	Tests* (Volume)
C-3021-400	ZytoDot SPEC TOP2A Probe CE IVD	Digoxigenin	40 (400 µl)
Related Products			
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® 2C SPEC TOP2A/CEN 17 Probe

CE IVD

Background

The ZytoDot ® 2C SPEC TOP2A/CEN 17 Probe is designed for the detection of TOP2A deletions and gene amplifications in formalin-fixed, paraffin-embedded tissue sections or cell samples.

The TOP2A (topoisomerase II alpha) gene is located in the chromosomal region 17q21.2 and encodes for a 170 kDa DNA topoisomerase which controls and alters the topologic state of DNA during replication, transcription, and chromosome segregation.

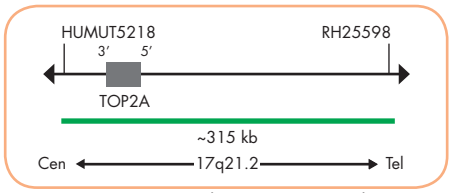
TOP2A gene copy number changes are frequently observed in the majority of ERBB2 amplified primary breast tumors as well as in other human malignancies without simultaneous ERBB2 amplification e.g. acute lymphoblastic leukemias, gastric and bladder carcinomas. Recent data suggests that amplification and deletion of the TOP2A gene locus may account for relative chemosensitivity or resistance to TOP2A inhibitor therapy, respectively. Thus, determination of the TOP2A status may predict benefit from adjuvant anthracyclines in ERBB2 positive breast cancer.

References
Arriola E, et al. (2007) Breast Cancer Res Treat 106: 181-9.
Brunello E, et al. (2012) Histopathology 60: 482-8.
Järvinen TA & Liu ET (2006) Curr Cancer Drug Targets 6: 579-602.
Järvinen TA, et al. (2000) Am J Pathol 156: 839-47.
Razis E, et al. (2011) Breast Cancer Res Treat 128: 447-56.
Tanner M, et al. (2006) J Clin Oncol 24: 2428-36.
Tewey KM, et al. (1984) Science 226: 466-8.
Tsai-Pflugfelder M, et al. (1988) Proc Nat Acad Sci 85: 7177-81.
Wang JC (1996) Annu Rev Biochem 65: 635-92.

Probe Description

The ZytoDot ® 2C SPEC TOP2A/CEN 17 Probe is a mixture of a Digoxigenin-labeled probe specific for the TOP2A gene at 17q21.2 and a Dinitrophenyl-labeled CEN 17 probe specific for the alpha satellite centromeric region of chromosome 17 (D17Z1).

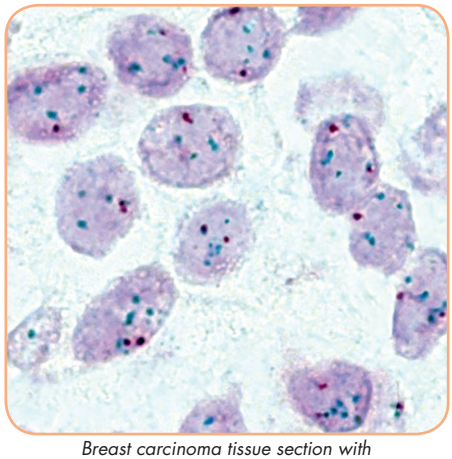
Ideogram of chromosome 17 indicating the hybridization locations.



SPEC TOP2A Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit two green and two red signals are expected. In a cell with amplification of the TOP2A gene locus, multiple copies of the green signal or green signal clusters will be observed.



Breast carcinoma tissue section with TOP2A amplification as indicated by multiple green signals per nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3040-400	ZytoDot 2C SPEC TOP2A/CEN 17 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot® 2C SPEC SS18 Break Apart Probe

Previously: ZytoDot 2C SPEC SYT Break Apart Probe

CE IVD

Background

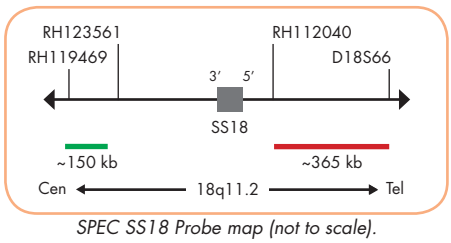
The ZytoDot® 2C SPEC SS18 Break Apart Probe is designed to detect translocations involving the chromosomal region 18q11.2 harboring the SS18 (synovial sarcoma translocation, chromosome 18) gene (a.k.a. SYT).
Translocations involving the region 18q11.2 are found in over 90% of synovial sarcoma. Among soft tissue sarcomas, synovial sarcoma is one of the most common and classically occurs in the extremities of young adults with greater prevalence in males even though, the occurrence of synovial sarcoma has also been described in a wide variety of anatomical locations and in all ages.
The most frequent translocation involving the SS18 gene region is t(X;18)(p11.23;q11.2) juxtaposing the SS18 gene in 18q11.2 either next to the SSX1 (synovial sarcoma, translocated to X chromosome) or the SSX2 gene, or very rarely to the SSX4 locus located in Xp11.23. Complex translocations involving other chromosomes are observed in less than 10% of synovial sarcomas. In combination with histopathological diagnosis, detection of SS18 rearrangements via *in situ* Hybridization (ISH) analysis is a valuable tool to confirm the diagnosis of synovial sarcoma.

References
Amary MF, et al. (2007) Mod Pathol 20: 482-96.
Clark J, et al. (1994) Nat Genet 7: 502-8.
Kawai A, et al. (1998) N Engl J Med 338: 153-60.
Surace C, et al. (2004) Lab Invest 84: 1185-92.
Torres L, et al. (2008) Cancer Genet Cytogenet 187: 45-9.

Probe Description

The ZytoDot® 2C SPEC SS18 Break Apart Probe is a mixture of a Digoxigenin-labeled probe and a Dinitrophenyl-labeled probe hybridizing to the 18q11.2 band. The DNP-labeled probe hybridizes distal to the SS18 gene and the DIG-labeled probe hybridizes proximal to that gene.

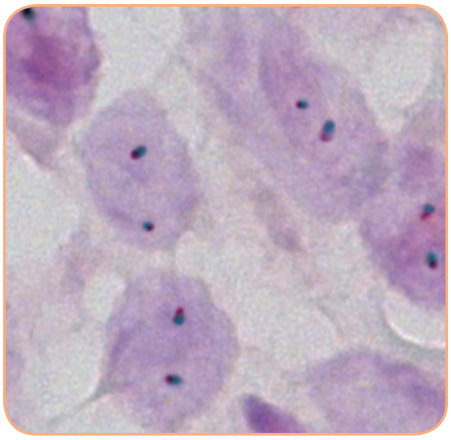
Ideogram of chromosome 18 indicating the hybridization locations.



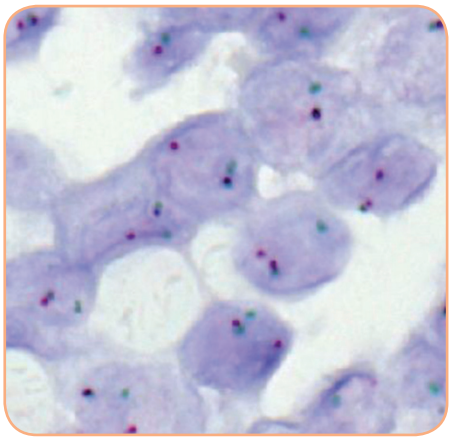
SPEC SS18 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 18q11.2 band, using the ZytoDot® 2C CISH Implementation Kit two red/green fusion signals are expected representing two normal (non-rearranged) 18q11.2 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 18q11.2 locus and one 18q11.2 locus affected by an 18q11.2 translocation.



SPEC SS18 Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.



Synovial sarcoma tissue section with translocation affecting the 18q11.2 locus as indicated by one non-rearranged red/green fusion signal, one red signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
C-3046-100	ZytoDot 2C SPEC SS18 Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
184

ZytoDot ® 2C SPEC TOP1/CEN 20 Probe

CE IVD

Background

The ZytoDot ® 2C SPEC TOP1/CEN 20 Probe is designed for the detection of TOP1 gene amplifications.

The TOP1 (topoisomerase (DNA) I) gene is located in the chromosomal region 20q12 and encodes a DNA topoisomerase 1, a nuclear enzyme that is required in replication and which is responsible for unwinding DNA and preventing lethal strand breaks.

The TOP1 locus appears to undergo frequent copy number alterations which are either focal in nature, e.g., amplicon-driven, or may involve larger chromosomal regions, such as 20q.

TOP1 copy number gain has been reported in several tumor entities, as e.g. breast cancer, melanoma, gastric cancer, and in colorectal cancer. In stage III colorectal cancer patients, TOP1 copy number increase seems to be associated with longer overall survival.

For metastatic colorectal cancer (mCRC), irinotecan is included in the treatment regimens. The active metabolite is SN-38, which is cytotoxic and destabilizes the TOP1-DNA covalent complex leading to cancer cell death. Studies evaluating the efficacy of this topoisomerase I inhibtor in metastatic breast cancer are currently ongoing.

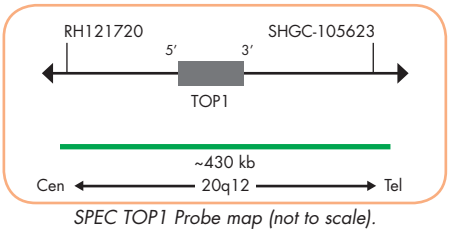
Thus, detection of TOP1 gene status by Chromogenic *in situ* Hybridization might be of predictive value.

References
Kümler I, et al. (2015) BMC Cancer 15: 78.
McLeod HL & Keith KN (1996) Br J Cancer 74: 508-12.
Panczyk M (2014) World J Gastroenterol 20: 9775-827.
Rømer MU, et al. (2012) Mol Oncol 7: 101-11.
Sønderstrup IM, et al. (2015) Mol Oncol 9: 1207-17.
Stenvang J, et al. (2013) Front Oncol 3: 313.

Probe Description

The ZytoDot ® 2C SPEC TOP1/CEN 20 Probe is a mixture of a Digoxigenin-labeled probe specific for the chromosomal region 20q12 harboring the TOP1 gene and a Dinitrophenyl-labeled CEN 20 probe specific for the alpha satellite centromeric region of chromosome 20 (D20Z2).

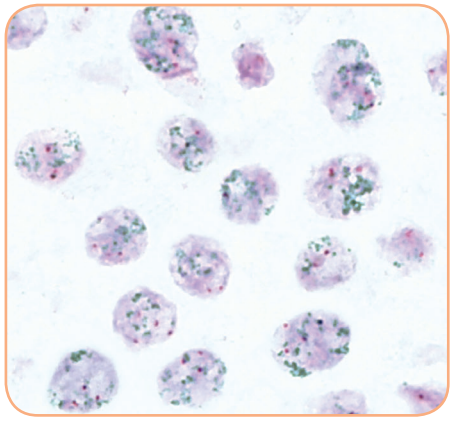
Ideogram of chromosome 20 indicating the hybridization locations.



SPEC TOP1 Probe map (not to scale).

Results

In a normal interphase nucleus, using the ZytoDot ® 2C CISH Implementation Kit, two green (TOP1) and two red (CEN 20) signals are expected. In a cell with amplification or gain of the TOP1 gene locus, polysomy of chromosome 20, or gain of the chromosomal arm 20q, multiple copies of the green signal or green signal clusters will be observed.



Breast carcinoma tissue section with amplification of the TOP1 gene as indicated by multiple green signals in each nucleus.

Prod. No.	Product	Label	Tests* (Volume)
C-3069-400	ZytoDot 2C SPEC TOP1/CEN 20 Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
185

ZytoDot® 2C SPEC ERG Break Apart Probe

CE IVD

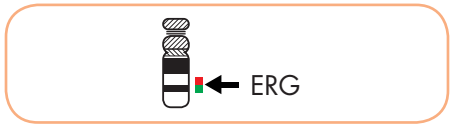
Background

The ZytoDot® 2C SPEC ERG Break Apart Probe is designed to detect aberrations involving the ERG gene at 21q22.2 frequently found in prostate cancers.
ERG (ETS-related gene) rearrangements have been observed in 40-60% of prostate cancers identified via prostate-specific antigen (PSA) screening. The most common aberration affecting ERG is the interstitial deletion of about 3 Mb at the chromosomal region 21q22 found in 90% of the cases. This deletion leads to the fusion of the hormonally regulated promoter of the TMPRSS2 (transmembrane protease, serine 2) gene to the coding region of ERG, resulting in overexpression of the ERG transcription factor. However, about 10% of the ERG rearranged prostate cancer cases show alternative fusions, as e.g. SLC45A3-ERG or NDRG1-ERG.
Several studies detected associations of ERG rearrangements with histomorphologic features as well as characteristic copy number gains, and gene expression signatures, defining a distinct sub-class of prostate cancers with unfavorable prognosis. Hence, the evaluation of the ERG rearrangement status in tissue or urine samples by CISH might be of diagnostic and prognostic relevance.
EWSR1-ERG gene fusions present in about 10% of patients with Ewing sarcoma may result from complex genomic rearrangements and may therefore not be detected by CISH analysis or may result in a non-classical translocation signal pattern.

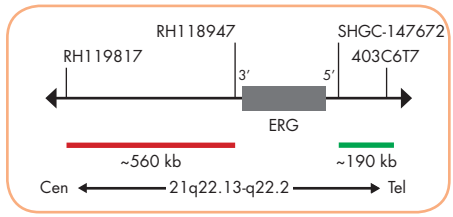
References
Esgueva R, et al. (2010) Mod Pathol 23: 539-46.
Maire G, et al. (2008) Cancer Genet Cytogenet 181: 81-92.
Nam RK, et al. (2007) Br J Cancer 97: 1690-5.
Perner S, et al. (2006) Cancer Res 66: 8337-41.
Pflueger D, et al. (2009) Neoplasia 11: 804-11.
Tomlins SA, et al. (2005) Science 310: 644-8.

Probe Description

The ZytoDot® 2C SPEC ERG Break Apart Probe is a mixture of a Digoxigenin-labeled and a Dinitrophenyl-labeled probe hybridizing to the long arm of chromosome 21. The DNP- labeled probe hybridizes proximal to the ERG gene breakpoint region at 21q22.13-q22.2, the DIG-labeled probe hybridizes distal to the ERG gene breakpoint region at 21q22.2.



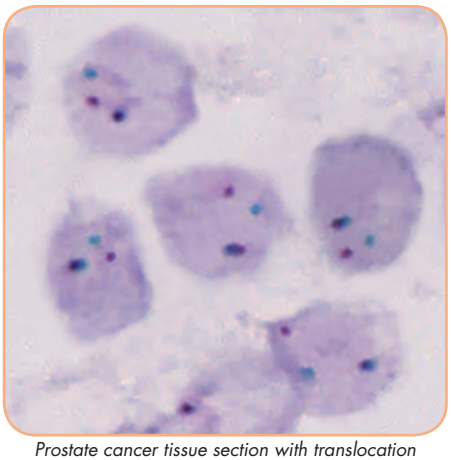
Ideogram of chromosome 21 indicating the hybridization locations.



SPEC ERG Probe map (not to scale).

Results

In an interphase nucleus of a normal cell lacking an aberration involving the 21q22.13-q22.2 band, using the ZytoDot® 2C CISH Implementation Kit, two red/green fusion signals are expected representing the two normal (non-rearranged) 21q22.13-q22.2 loci.
A 21q22.13-q22.2 locus affected by a 21q22.2 deletion resulting in the TMPRSS2-ERG fusion is indicated by the loss of one green signal.
A signal pattern consisting of one red/green fusion signal, a separate green, and a separate red signal indicates an ERG translocation without involvement of TMPRSS2 (e.g. SLC45A3-ERG).



Prostate cancer tissue section with translocation affecting the 21q22.13-q22.2 locus as indicated by one non-rearranged red/green fusion signal, one red signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
C-3058-400	ZytoDot 2C SPEC ERG Break Apart Probe CE IVD	Digoxigenin/DNP	40 (400 µl)
Related Products			
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml		40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
186

ZytoDot® 2C SPEC EWSR1 Break Apart Probe

CE IVD

Background

The ZytoDot® 2C SPEC EWSR1 Break Apart Probe is designed to detect translocations involving the chromosomal region 22q12.2 harboring the EWSR1 (Ewing sarcoma breakpoint region 1) gene (a.k.a. EWS).

Translocations involving the chromosomal region 22q12.2 are found in 90-95% of patients with Ewing sarcoma or peripheral primitive neuroectodermal tumors (PNET). Ewing sarcoma is the second most common, highly malignant bone tumor in children and young adults. The most frequent translocation involving the EWSR1 gene region is t(11;22)(q24.3;q12.2) juxtaposing the EWSR1 gene in 22q12.2 next to the FLI-1 (friend leukemia virus integration 1) locus in 11q24.3. FLI-1 is a member of the ETS family of transcription factors. Less frequently, EWSR1 can also be fused to ERG, a transcription factor closely related to FLI-1 but located in 21q22.2.

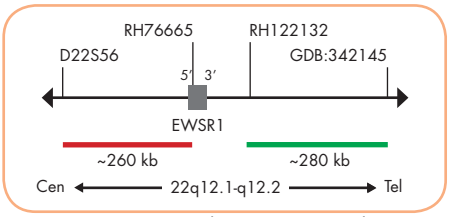
For prognosis and appropriate treatment it is important to differentiate Ewing sarcoma/PNET from classic neuroblastoma, Wilms tumor, and rhabdomyosarcoma. In combination with the histopathological diagnosis, detection of EWSR1 rearrangements by using *in situ* Hybridization can be used to confirm the diagnosis of Ewing sarcoma/PNET.

References
Bridge RS, et al. (2006) Mod Pathol 19: 1-8.
Delattre O, et al. (1992) Nature 359: 162-5.
Lee J, et al. (2005) Cancer Genet Cytogenet 159: 177-80.
Romeo S & Dei Tos AP (2010) Virchows Arch 456: 219-34.
Sandberg AA & Bridge JA (2000) Cancer Genet Cytogenet 123: 1-26.
Zucman J, et al. (1993) EMBO J 12: 4481-7.

Probe Description

The ZytoDot® 2C SPEC EWSR1 Break Apart Probe is a mixture of a Digoxigenin-labeled probe and a Dinitrophenyl-labeled probe hybridizing to the 22q12.1-q12.2 band. The DNP-labeled probe hybridizes proximal and extends inward intron 4 of the EWSR1 gene, the DIG-labeled probe hybridizes distal to that gene.

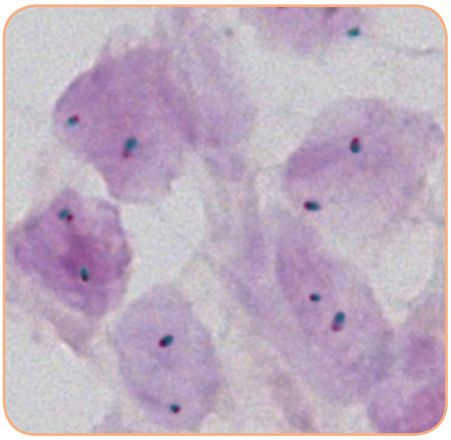
Ideogram of chromosome 22 indicating the hybridization locations.



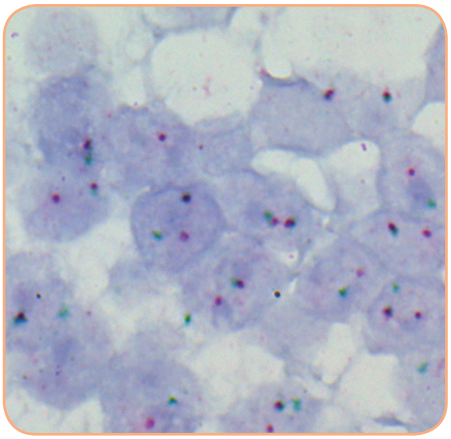
SPEC EWSR1 Probe map (not to scale).

Results

In an interphase nucleus lacking a translocation involving the 22q12.1-q12.2 band, using the ZytoDot® 2C CISH Implementation Kit two red/green fusion signals are expected representing two normal (non-rearranged) 22q12.1-q12.2 loci. A signal pattern consisting of one red/green fusion signal, one red signal, and a separate green signal indicates one normal 22q12.1-q12.2 locus and one 22q12.1-q12.2 locus affected by a 22q12.1-q12.2 translocation.



SPEC EWSR1 Break Apart Probe hybridized to normal interphase cells as indicated by two red/green fusion signals per nucleus.



Ewing sarcoma tissue section with translocation affecting the 22q12.1-q12.2 locus as indicated by one non-rearranged red/green fusion signal, one red signal, and one separate green signal indicating the translocation.

Prod. No.	Product	Label	Tests* (Volume)
C-3043-100	ZytoDot 2C SPEC EWSR1 Break Apart Probe CE IVD	Digoxigenin/DNP	10 (100 µl)
Related Products			
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml		10

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoDot ® Probes for Chromosome Enumeration

CE IVD

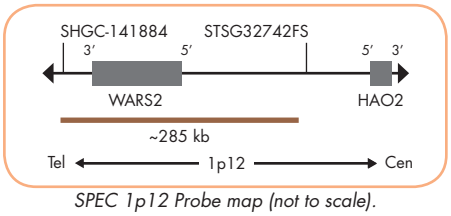
Background

The ZytoDot ® Chromosome Enumeration Probes are designed for identification and enumeration of human chromosomes in interphase cells and as an adjunct to standard karyotyping in metaphases. These probes will produce sharp, bright signals specific for each individual chromosome.

Probe Description

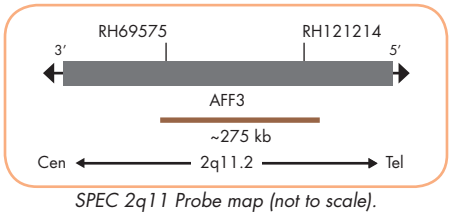
For most chromosomes, direct labeled ZytoDot ® CEN ™ Probes hybridizing to highly repetitive human satellite DNA sequences mainly located at the centromeric regions of chromosomes are applicable. As several chromosomes share the same repetitive sequences resulting in cross-hybridization signals, they cannot be differentiated by centromere specific probes. Instead these chromosomes can be identified by direct labeled ZytoDot ® SPEC ™ Probes hybridizing in close proximity to the respective satellite DNA sequences or to other chromosome specific loci.

The ZytoDot ® SPEC 1p12 Probe is designed to hybridize in close proximity of centromere 1 at 1p12 harboring the WARS2 gene. Since chromosomes 1, 5, and 19 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



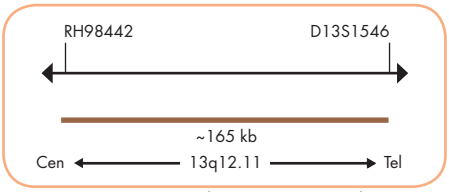
SPEC 1p12 Probe map (not to scale).

The ZytoDot ® SPEC 2q11 Probe is specific for the AFF3 (AF4/FMR2 family, member 3) gene region in 2q11.2. Due to cross-hybridizations of chromosome 2 alpha satellites to other centromeric regions, probes specific for 2q11 are frequently used for chromosome 2 copy number detection.



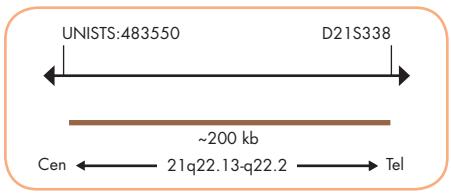
SPEC 2q11 Probe map (not to scale).

The ZytoDot ® SPEC 13q12 Probe is designed to hybridize in close proximity of centromere 13 at 13q12.11. Since chromosomes 13 and 21 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.



SPEC 13q12 Probe map (not to scale).

The ZytoDot ® SPEC 21q22 Probe hybridizes to the so-called Down Syndrome Critical Region on 21q22.13-q22.2 commonly duplicated in cases with partial trisomy 21. Since chromosomes 13 and 21 share the same repetitive sequences, they cannot be differentiated by probes detecting centromere specific repeats.

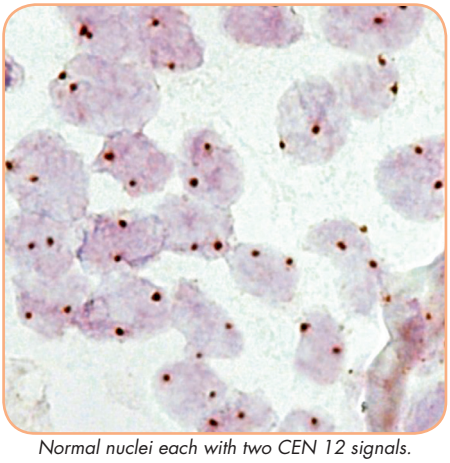


SPEC 21q22 Probe map (not to scale).

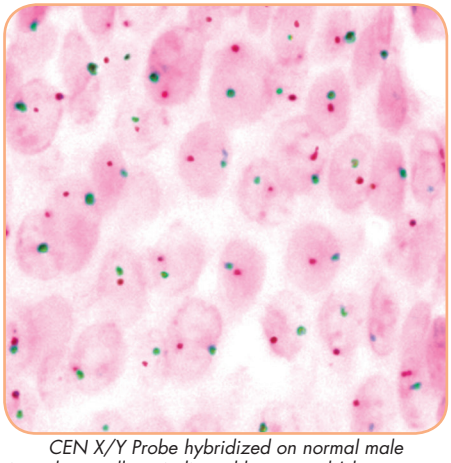
Results

In a normal interphase nucleus, two signals are expected using Chromosome Enumeration Probes specific for autosomes. Using chromosome Y specific probes will result in normal male cells in one signal and in normal female cells in no signal. Using chromosome X specific probes will result in normal male cells in one signal and in normal female cells in two signals per nucleus. Other signal patterns indicate numerical aberrations of the respective chromosome.

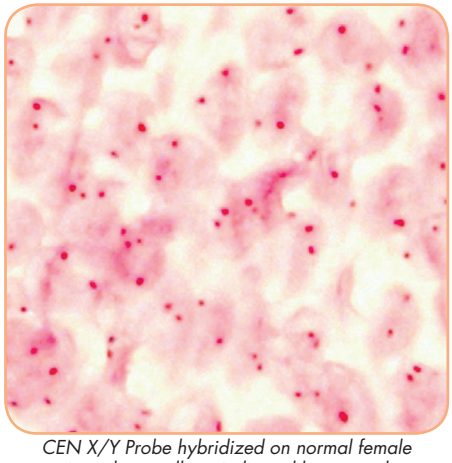
ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com



Normal nuclei each with two CEN 12 signals.



CEN X/Y Probe hybridized on normal male interphase cells as indicated by one red (chromosome X) and one green (chromosome Y) signal per nucleus.



CEN X/Y Probe hybridized on normal female interphase cells as indicated by two red (chromosome X) signals per nucleus.

Prod. No.	Product	Alpha/Class. Sat.	Chr. Band	Label	Tests* (Volume)
C-3035-400	ZytoDot SPEC 1p12 Probe CE IVD	-	1p12	Digoxigenin	40 (400 µl)
C-3051-400	ZytoDot SPEC 2q11 Probe CE IVD	-	2q11.2	Digoxigenin	40 (400 µl)
C-3045-400	ZytoDot CEN 3 Probe CE IVD	D3Z1	3p11-q11.1	Digoxigenin	40 (400 µl)
C-3002-400	ZytoDot CEN 6 Probe CE IVD	D6Z1	6p11.1-q11.1	Digoxigenin	40 (400 µl)
C-3008-400	ZytoDot CEN 7 Probe CE IVD	D7Z1	7q11.1	Digoxigenin	40 (400 µl)
C-3016-400	ZytoDot CEN 8 Probe CE IVD	D8Z2	8p11.1-q11.1	Digoxigenin	40 (400 µl)
C-3014-400	ZytoDot CEN 12 Probe CE IVD	D12Z3	12p11.1-q11	Digoxigenin	40 (400 µl)
C-3052-400	ZytoDot SPEC 13q12 Probe CE IVD	-	13q12.11	Digoxigenin	40 (400 µl)
C-3006-400	ZytoDot CEN 17 Probe CE IVD	D17Z1	17p11.1-q11.1	Digoxigenin	40 (400 µl)
C-3026-400	ZytoDot SPEC 21q22 Probe CE IVD	-	21q22.13-q22.2	Digoxigenin	40 (400 µl)
C-3025-400	ZytoDot CEN X Probe CE IVD	DXZ1	Xp11.1-q11.1	Digoxigenin	40 (400 µl)
C-3020-400	ZytoDot CEN Yq12 Probe CE IVD	III DYZ1	Yq12	Digoxigenin	40 (400 µl)
C-3048-400	ZytoDot 2C CEN X/Y Probe CE IVD	DXZ1/DYZ3	Xp11.1-q11.1/Yp11.1-q11.1	DNP/Digoxigenin	40 (400 µl)
Related Products					
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml				40
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml				40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Accessories

ZytoDot ® Kits

For the detection of Digoxigenin-labeled ZytoDot ® Probes

Prod. No.	Product	Tests
C-3005-10	ZytoDot CISH Polymer Detection Kit CE IVD Incl. Blocking Solution, 1 ml; Mouse-anti-DIG, 1 ml; Anti-Mouse-HRP-Polymer, 1 ml; DAB Solution A, 0.1 ml; DAB Solution B, 2 ml; Mayer's Hematoxylin Solution, 4 ml; Mounting Solution (alcoholic), 1 ml	10
C-3005-40	ZytoDot CISH Polymer Detection Kit CE IVD Incl. Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
C-3018-10	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1 ml; Wash Buffer SSC, 150 ml; PBS/Tween, good for 1000 ml; Blocking Solution, 1 ml; Mouse-anti-DIG, 1 ml; Anti-Mouse-HRP-Polymer, 1 ml; DAB Solution A, 0.1 ml; DAB Solution B, 2 ml; Mayer's Hematoxylin Solution, 4 ml; Mounting Solution (alcoholic), 1 ml	10
C-3018-40	ZytoDot CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml; Blocking Solution, 4 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

ZytoDot ® 2C Kits

For the detection of Digoxigenin/Dinitrophenyl-labeled ZytoDot ® 2C Probes

FASTER · IMPROVED SIGNALS · LESS HANDS ON TIME · 2.0 version

Prod. No.	Product	Tests
C-3028-40	ZytoDot 2C CISH Polymer Detection Kit CE IVD Incl. 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
C-3044-10	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 150 ml; Pepsin Solution, 1ml; Wash Buffer SSC, 150 ml; 20x Wash Buffer TBS, 50 ml; Anti-DIG/DNP-Mix, 1 ml; HRP/AP-Polymer-Mix,1 ml; AP-Red Solution A, 0.1 ml; AP-Red Solution B, 4 ml; HRP-Green Solution A, 0.2 ml; HRP-Green Solution B, 4 ml; Nuclear Blue Solution, 4 ml; Mounting Solution (alcoholic), 1 ml	10
C-3044-40	ZytoDot 2C CISH Implementation Kit CE IVD Incl. Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4ml; Wash Buffer SSC, 500 ml; 20x Wash Buffer TBS, 2x 50 ml; Anti-DIG/DNP-Mix, 4 ml; HRP/AP-Polymer-Mix, 4 ml; AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

ZytoDot ® Pretreatment Reagents

Prod. No.	Product
C-3004-40	ZytoDot Pretreatment Kit CE IVD Incl. Pepsin Solution, 4 ml; Heat Pretreatment Solution EDTA, 500 ml
ES-0001-4	Pepsin Solution, 4 ml CE IVD
ES-0001-8	Pepsin Solution Set, 2x 4 ml CE IVD
ES-0001-50	Pepsin Solution, 50 ml CE IVD
ES-0001-1000	Pepsin Solution, 1000 ml CE IVD
PT-0002-500	Heat Pretreatment Solution EDTA, 500 ml CE IVD

CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

Accessories

ZytoDot ® Wash Buffers & Ancillary Reagents

Prod. No.	Product
AB-0001-4	Mouse-anti-DIG, 4 ml CE IVD
AB-0001-30	Mouse-anti-DIG, 30 ml CE IVD
AB-0002-4	Anti-Mouse-HRP-Polymer, 4 ml CE IVD
AB-0013-4	HRP/AP-Polymer-Mix, 4 ml CE IVD
AB-0014-4	Anti-DIG/DNP-Mix, 4 ml CE IVD
BS-0001-4	Blocking Solution, 4 ml CE IVD
C-3011-40	ZytoDot Wash Buffer Set CE IVD Incl. Wash Buffer SSC, 500 ml; PBS/Tween, good for 2000 ml
C-3015-100	DAB Solution Set CE IVD Incl. DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; good for 10 ml DAB Solution
C-3038-100	ZytoDot AP-Red Solution Set CE IVD Incl. AP-Red Solution A, 0.4 ml; AP-Red Solution B, 15 ml; good for 15 ml AP-Red Solution
C-3039-100	ZytoDot HRP-Green Solution Set CE IVD Incl. HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; good for 15 ml HRP-Green Solution
CS-0002-20	Nuclear Blue Solution, 20 ml CE IVD
E-4005-50	Fixogum, Rubber Cement, 50 g
E-4005-125	Fixogum, Rubber Cement, 125 g
E-4007-2	ERBB2 Control Slide Set, 2 pcs. CE IVD
E-4009-2	EGFR Control Slide Set, 2 pcs. CE IVD
WB-0001-500	Wash Buffer SSC, 500 ml CE IVD
WB-0004-1000	PBS/Tween, good for 1000 ml CE IVD
WB-0005-50	20x Wash Buffer TBS, 50 ml CE IVD
WB-0009-500	Clear-it™ Stringency Buffer, 500 ml CE IVD

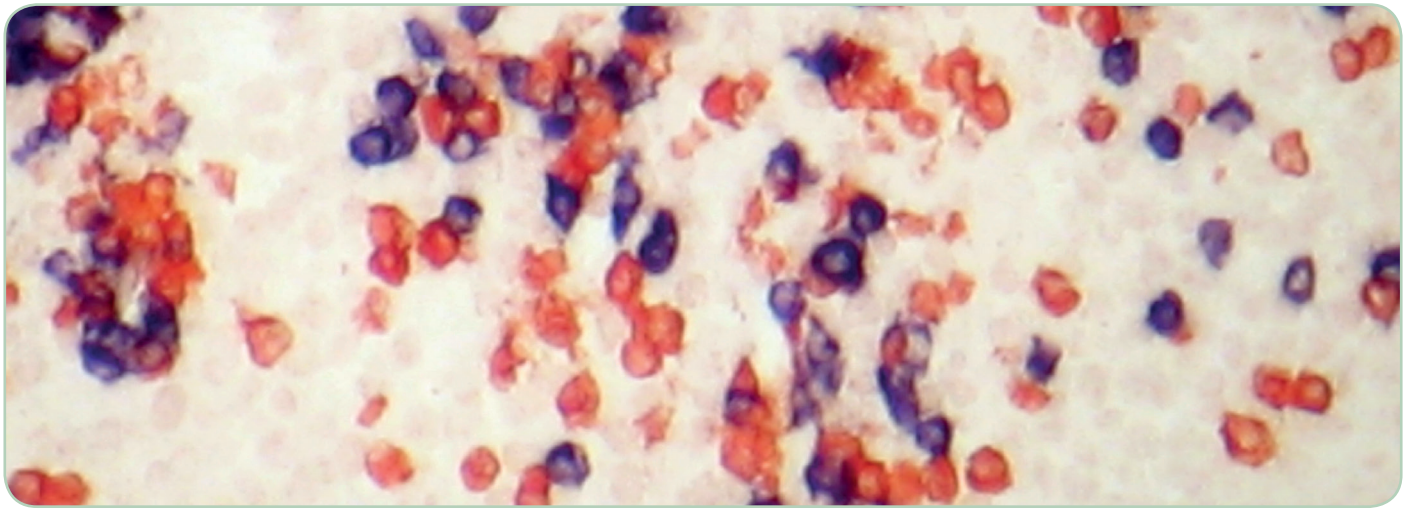
CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoFast®

Products for CISH analysis

192

Achieving Chromogenic *in situ* Hybridization Results in just 4 Hours!



Introduction

The Zyto*Fast* ® products are designed for outstandingly fast detection and discrimination of human pathogen viruses, e.g. HPV, EBV, CMV, and the determination of lymphocyte clonality by detecting Ig-κ and Ig-λ light chain RNA by Chromogenic *in situ* Hybridization (CISH) in formalin-fixed, paraffin-embedded tissue sections and cell samples.

Zyto*Fast* ®: Outstandingly fast CISH

Optimized protocols and faster tissue penetration due to short oligonucleotide probes of the Zyto*Fast* ® system, make the Zyto*Fast* ® CISH procedure outstandingly fast.

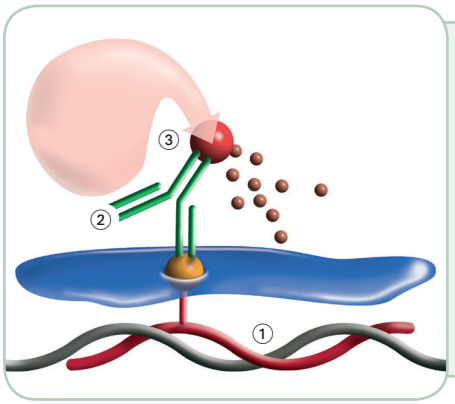
Single color results can be achieved within just 4 hours, hands-on time is about 2 hours!

High Sensitivity and Specificity

All Zyto*Fast* ® probes are tagged using the unique Zyto*Fast* ® *HighTag System* providing improved signal intensity! High specificity without risk of cross-hybridizations is obtained due to optimized oligonucleotide probes.

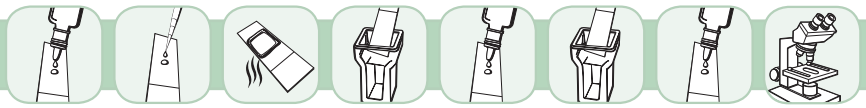
Advantages of CISH

- Simultaneous observation of tissue morphology and CISH signals
- No risk of false positives due to mis-priming or contamination as with PCR
- Easy method comparable to IHC
- No costly equipment needed
- Ability to test archival specimens
- High sensitivity and specificity

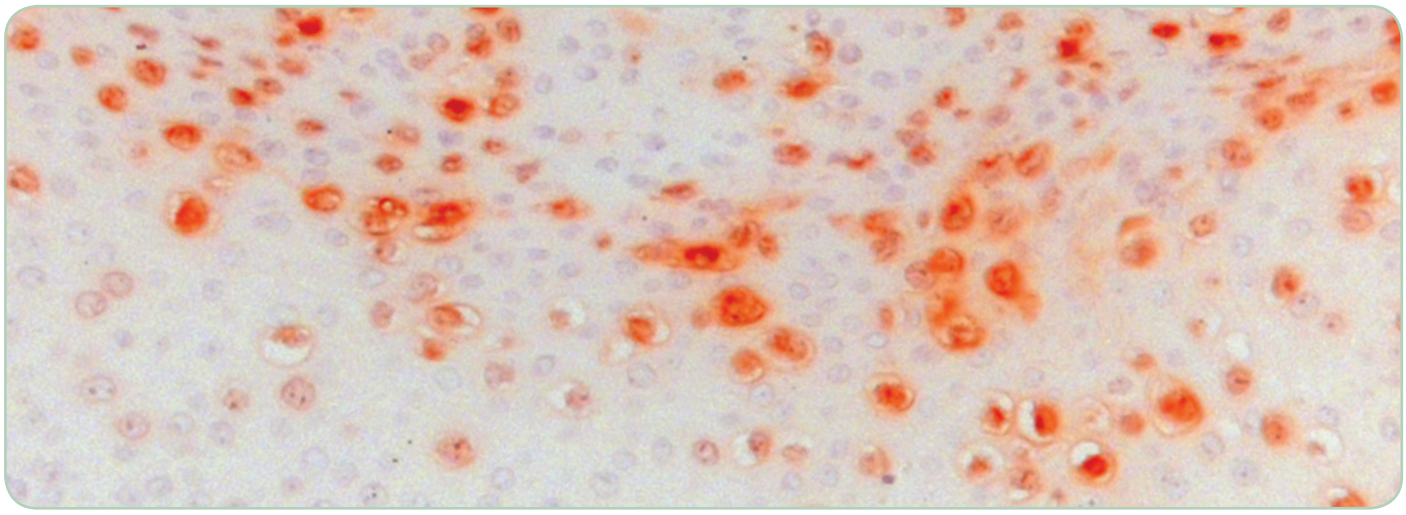


The Zyto*Fast* ® system uses oligonucleotide probes tagged with Biotin or Digoxigenin ① which are detected using enzyme-conjugated antibodies or streptavidin targeting the tags ②. The enzymatic reaction of chromogenic substrates ③, e.g. BCIP/NBT or AEC, leads to the formation of strong color precipitates that can be visualized by light microscopy.

Protocol Overview



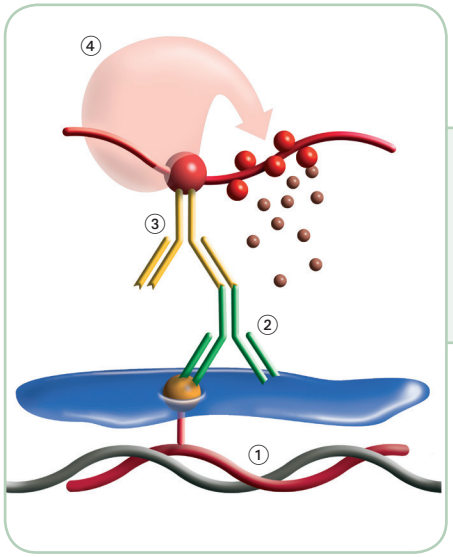
ZytoFast® PLUS for Increased Sensitivity!



Introduction
The ZytoFast® PLUS products are designed for outstandingly fast and sensitive detection and discrimination of human pathogen viruses, e.g. HPV, EBV, CMV, and the determination of lymphocyte clonality by detecting Ig-κ and Ig-λ light chain RNA by Chromogenic *in situ* Hybridization (CISH) in formalin-fixed, paraffin-embedded tissue sections and cell samples. The signal intensity of ZytoFast® probes is increased even more when using the ZytoFast® PLUS Implementation Kits.

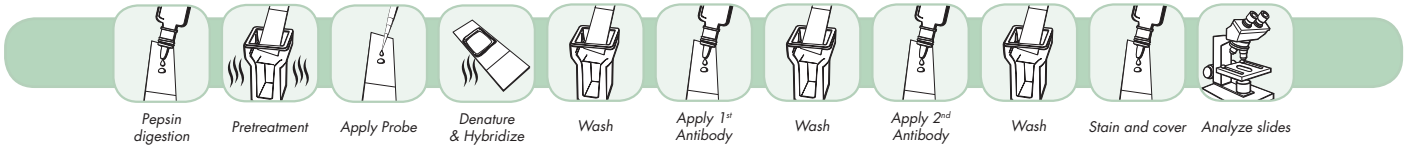
ZytoFast® PLUS – Outstandingly fast and sensitive CISH
Depending on the time required for dewaxing and pretreatment of tissue sections, ZytoFast® PLUS protocols can be performed within approx. 4 hours!
Thus, due to optimized protocols, the ZytoFast® PLUS method takes only slightly more time compared to ZytoFast® protocols while being much more sensitive!

ZytoFast® PLUS – Flexibility that meets your Needs
Several ZytoFast® PLUS CISH Implementation Kits using different enzyme/substrate combinations can be combined with any separately available Digoxigenin-labeled ZytoFast® probe to meet your preferences concerning the detection chemistry, counterstaining, and embedding. Each ZytoFast® PLUS CISH Implementation Kit includes a detailed protocol, all necessary reagents as well as positive and negative control probes for versatile use in DNA as well as RNA *in situ* hybridizations.



The ZytoFast® PLUS system uses Digoxigenin-labeled probes ① which are detected using primary antibodies ②. These antibodies are detected by polymerized enzyme-conjugated secondary antibodies ③. The enzymatic reaction of chromogenic substrates ④, e.g. NBT/BCIP, AEC or DAB, leads to the formation of strong color precipitates that can be visualized by light microscopy.

Protocol Overview



ZytoFast® CISH probes are tagged using the unique ZytoFast® *HighTag System* providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

Virus Index

Virus Index	Product Name	Label	Product No.	Quantity	Page
HPV	ZytoFast HPV type 6/11 Probe CE IVD	Biotin	T-1032-400	400 µl	197 f.
	ZytoFast HPV type 6/11 Probe CE IVD	Digoxigenin	T-1055-400	400 µl	197 f.
	ZytoFast HPV type 16/18 Probe CE IVD	Biotin	T-1035-400	400 µl	197 f.
	ZytoFast HPV type 16/18 Probe CE IVD	Digoxigenin	T-1056-400	400 µl	197 f.
	ZytoFast HPV type 31/33 Probe CE IVD	Biotin	T-1038-400	400 µl	197 f.
	ZytoFast HPV type 31/33 Probe CE IVD	Digoxigenin	T-1057-400	400 µl	197 f.
	ZytoFast HPV type 16/18/31/33/35 Probe	Biotin	T-1040-400	400 µl	197 f.
	ZytoFast HPV High-Risk (HR) Types Probe CE IVD (specific for HPV type 16/18/31/33/35/39/45/51/52/56/58/59/66/68/82)	Digoxigenin	T-1140-400	400 µl	197 f.
	ZytoFast HPV type 6/11/16/18/31/33/35 Screening Probe	Biotin	T-1044-400	400 µl	197 f.
	ZytoFast HPV Screening Probe CE IVD (specific for HPV type 6/11/16/18/31/33/35/39/45/51/52/56/58/59/66/68/82)	Digoxigenin	T-1144-400	400 µl	197 f.
EBV (a.k.a. HHV-4)	ZytoFast EBV Probe	Biotin	T-1014-400	400 µl	199 f.
	ZytoFast EBV Probe CE IVD	Digoxigenin	T-1114-400	400 µl	199 f.
CMV (a.k.a. HHV-5)	ZytoFast CMV Probe	Biotin	T-1013-400	400 µl	201 f.
	ZytoFast CMV Probe	Digoxigenin	T-1113-400	400 µl	201 f.

mRNA Index

mRNA Index	Product Name	Label	Product No.	Quantity	Page
Ig-kappa	ZytoFast human Ig-kappa Probe	Biotin	T-1015-400	400 µl	203 f.
	ZytoFast human Ig-kappa Probe CE IVD	Digoxigenin	T-1115-400	400 µl	203 f.
	ZytoFast human Ig-kappa/Ig-lambda Probe CE IVD	Digoxigenin/Biotin	T-1017-400	400 µl	203 f.
	ZytoFast human Ig-kappa/Ig-lambda CISH Kit CE IVD	Digoxigenin/Biotin	T-1005-40	40 Tests	203 f.
	ZytoFast human Ig-kappa/Ig-lambda Permanent CISH Kit CE IVD	Digoxigenin/Biotin	T-1105-40	40 Tests	203 f.
Ig-lambda	ZytoFast human Ig-lambda Probe	Biotin	T-1016-400	400 µl	203 f.
	ZytoFast human Ig-lambda Probe CE IVD	Digoxigenin	T-1116-400	400 µl	203 f.
	ZytoFast human Ig-kappa/Ig-lambda Probe CE IVD	Digoxigenin/Biotin	T-1017-400	400 µl	203 f.
	ZytoFast human Ig-kappa/Ig-lambda CISH Kit CE IVD	Digoxigenin/Biotin	T-1005-40	40 Tests	203 f.
	ZytoFast human Ig-kappa/Ig-lambda Permanent CISH Kit CE IVD	Digoxigenin/Biotin	T-1105-40	40 Tests	203 f.

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoFast® CISH probes are tagged using the unique ZytoFast® HighTag System providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

195

Probes Sorted by Indication

Indication	Product Name	Label	Product No.	Quantity	Page
Solid Tumors					
Cervical Cancer	ZytoFast HPV type 6/11 Probe CE IVD	Biotin	T-1032-400	400 µl	197 f.
	ZytoFast HPV type 6/11 Probe CE IVD	Digoxigenin	T-1055-400	400 µl	197 f.
	ZytoFast HPV type 16/18 Probe CE IVD	Biotin	T-1035-400	400 µl	197 f.
	ZytoFast HPV type 16/18 Probe CE IVD	Digoxigenin	T-1056-400	400 µl	197 f.
	ZytoFast HPV type 31/33 Probe CE IVD	Biotin	T-1038-400	400 µl	197 f.
	ZytoFast HPV type 31/33 Probe CE IVD	Digoxigenin	T-1057-400	400 µl	197 f.
	ZytoFast HPV type 16/18/31/33/35 Probe	Biotin	T-1040-400	400 µl	197 f.
	ZytoFast HPV High-Risk (HR) Types Probe CE IVD (specific for HPV type 16/18/31/33/35/39/45/51/52/56/58/59/66/68/82)	Digoxigenin	T-1140-400	400 µl	197 f.
	ZytoFast HPV type 6/11/16/18/31/33/35 Screening Probe	Biotin	T-1044-400	400 µl	197 f.
	ZytoFast HPV Screening Probe CE IVD (specific for HPV type 6/11/16/18/31/33/35/39/45/51/52/56/58/59/66/68/82)	Digoxigenin	T-1144-400	400 µl	197 f.
Hematology					
Burkitt Lymphoma	ZytoFast EBV Probe	Biotin	T-1014-400	400 µl	199 f.
	ZytoFast EBV Probe CE IVD	Digoxigenin	T-1114-400	400 µl	199 f.
Lymphoma, other	ZytoFast human Ig-kappa Probe	Biotin	T-1015-400	400 µl	203 f.
	ZytoFast human Ig-kappa Probe CE IVD	Digoxigenin	T-1115-400	400 µl	203 f.
	ZytoFast human Ig-lambda Probe	Biotin	T-1016-400	400 µl	203 f.
	ZytoFast human Ig-lambda Probe CE IVD	Digoxigenin	T-1116-400	400 µl	203 f.
	ZytoFast human Ig-kappa/Ig-lambda Probe CE IVD	Digoxigenin/Biotin	T-1017-400	400 µl	203 f.
	ZytoFast human Ig-kappa/Ig-lambda CISH Kit CE IVD	Digoxigenin/Biotin	T-1005-40	40 Tests	203 f.
	ZytoFast human Ig-kappa/Ig-lambda Permanent CISH Kit CE IVD	Digoxigenin/Biotin	T-1105-40	40 Tests	203 f.

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

ZytoFast® CISH probes are tagged using the unique ZytoFast® HighTag System providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

196

ZytoFast® HPV-CISH System

CE IVD

Background

The ZytoFast® HPV-CISH System is designed for the detection and discrimination of human papilloma virus (HPV) DNA in paraffin-embedded tissue sections or cell samples.

At least 50 percent of sexually active men and women acquire some form of genital HPV infection at some point in their lives. Most of the approx. 30 identified genital HPV types, predominantly types 6 and 11, are called "low-risk" types, and may cause mild Pap test abnormalities or genital warts.

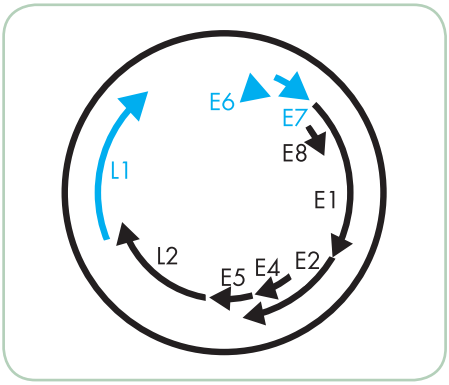
Until now, approximately 10–15 HPV types are associated with lesions that can progress to cancer. Among those are the HPV types 16/18/31/33/35/39/45/51/52/56/58/59/66/68/82.

These cancer-associated HPV types are designated as high-risk HPV (hr-HPV) types. The infection with the HPV hr-types can lead to development of cancer of the cervix, vulva, vagina, anus, or penis. The majority of malignant cervical carcinomas (approx. 70%) occur as a result of infections with HPV types 16 or 18.

References
Cothran MM & White JP (2002) Health Care Women Int 23: 306-19.
Cubie HA & Norval M (1988) J Virol Methods 20: 239-49.
Faulkner-Jones BE, et al. (1993) J Virol Methods 41: 277-96.
Francis IM, et al. (2013) Sultan Qaboos Univ Med J 13: 527-33.
Grundmeier N, et al. (2011) Dermatology 223: 293-300.
Kaspersen MD, et al. (2011) PLoS One 6: e18095.
Mirasoli M, et al. (2009) Anal Bioanal Chem 394: 981-7.
Montag M, et al. (2011) Arch Gynecol Obstet 284: 999-1005.
Poljak M & Kocjan BJ (2010) Expert Rev Anti Infect Ther 8: 1139-62.
Reinholz M, et al. (2013) Arch Dermatol Res 305: 723-32.
Walboomers JMM, et al. (1999) J Pathol 189: 12-9.

Probe Description

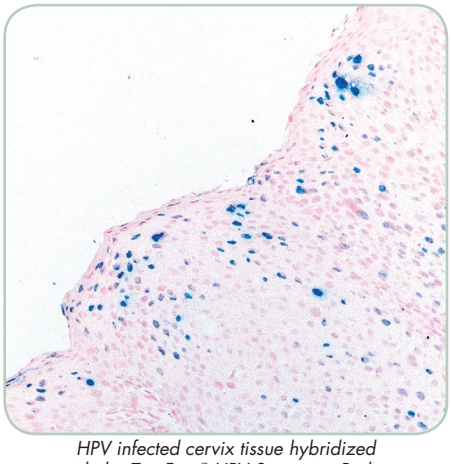
ZytoFast® HPV specific probes are directed against DNA sequences which encode the HPV proteins E6, E7 and/or L1. The probes consist of HPV-type-specific oligonucleotides, Biotin or Digoxigenin labeled by using the unique ZytoFast® *HighTag System* providing improved signal intensity. In addition to the detection of HPV at the DNA level, HPV probes will also allow detection of E6, E7, and/or L1 RNAs, which are expressed during some stages of infection.



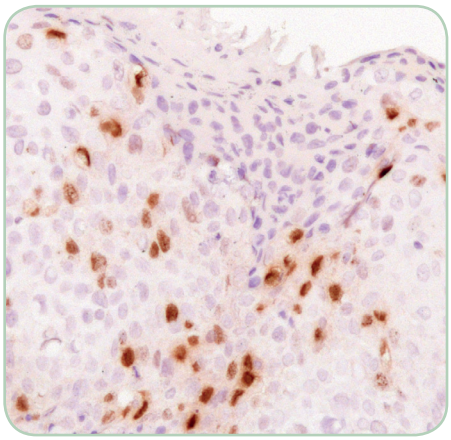
Schematic representation of the HPV genome with E and L open reading frames. Genomic regions targeted by ZytoFast® HPV specific oligonucleotides are indicated in blue.

Results

A positive reactivity for HPV DNA in epithelial cells is indicated by a distinctly stained nucleus. Due to the detection of HPV DNA as well as E6, E7, and/or L1 RNAs, depending on the infection stage, cytoplasmic staining might be observed additionally. Depending on the detection chemistry that is used, colored precipitates, which can be clearly distinguished from the background, will be dark violet-blue when using NBT/BCIP as substrate, strong red when using AEC, dark brown when using DAB, green when using HRP-Green, or strong red when using Permanent Red.



HPV infected cervix tissue hybridized with the ZytoFast® HPV Screening Probe, detected with the ZytoFast® PLUS CISH Implementation Kit HRP-HRP-Green.



HPV infected cervix tissue hybridized with the ZytoFast® HPV High-Risk (HR) Types Probe, detected with the ZytoFast® PLUS CISH Implementation Kit HRP-DAB.

ZytoFast® HPV Probes

Biotin-labeled

Prod. No.	Product	Tests* (Volume)
T-1032-400	ZytoFast HPV type 6/11 Probe CE IVD	40 (400 µl)
T-1035-400	ZytoFast HPV type 16/18 Probe CE IVD	40 (400 µl)
T-1038-400	ZytoFast HPV type 31/33 Probe CE IVD	40 (400 µl)
T-1040-400	ZytoFast HPV type 16/18/31/33/35 Probe	40 (400 µl)
T-1044-400	ZytoFast HPV type 6/11/16/18/31/33/35 Screening Probe	40 (400 µl)
Related Products		
T-1070-40	ZytoFast CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; AP-Streptavidin, 4 ml; NBT/BCIP Solution, 4 ml	40
T-1071-40	ZytoFast CISH Implementation Kit HRP-AEC Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-Streptavidin, 4 ml; AEC Solution, 4 ml	40

ZytoFast® HPV-Probes

Digoxigenin-labeled

Prod. No.	Product	Tests* (Volume)
T-1055-400	ZytoFast HPV type 6/11 Probe CE IVD	40 (400 µl)
T-1056-400	ZytoFast HPV type 16/18 Probe CE IVD	40 (400 µl)
T-1057-400	ZytoFast HPV type 31/33 Probe CE IVD	40 (400 µl)
T-1140-400	ZytoFast HPV High-Risk (HR) Types Probe (specific for HPV type 16/18/31/33/35/39/45/51/52/56/58/59/66/68/82) CE IVD	40 (400 µl)
T-1144-400	ZytoFast HPV Screening Probe (specific for HPV type 6/11/16/18/31/33/35/39/45/51/52/56/58/59/66/68/82) CE IVD	40 (400 µl)
Related Products		
T-1061-40	ZytoFast PLUS CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; NBT/BCIP Solution, 4ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1062-40	ZytoFast PLUS CISH Implementation Kit HRP-AEC CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; AEC Solution, 4 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (aqueous), 4 ml	40
T-1063-40	ZytoFast PLUS CISH Implementation Kit HRP-DAB CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1073-40	ZytoFast PLUS CISH Implementation Kit HRP-HRP-Green CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; HRP-Green-Solution A, 0.8 ml; HRP-Green-Solution B, 15 ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1151-40	ZytoFast PLUS CISH Implementation Kit AP-Permanent Red CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; Permanent Red Solution A, 0.25 ml; Permanent Red Solution B, 15 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoFast® CISH probes are tagged using the unique ZytoFast® HighTag System providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

198

ZytoFast® EBV-CISH System

CE IVD

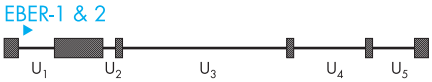
Background

The ZytoFast® EBV-CISH System is designed for the detection of Epstein-Barr virus (EBV) RNA in paraffin-embedded tissue sections or cell samples.
EBV (a.k.a. human herpesvirus-4, HHV-4) is a member of the gamma-herpesvirus group and one of the most common viruses in humans.
Transmission of EBV requires close, intimate contact with a person excreting the virus in its saliva. EBV has two major target tissues *in vivo*, B lymphocytes and squamous pharyngeal epithelium. Infection of B lymphocytes with EBV results in persistant latent infection, immortalization of the cells, and perpetual proliferation. EBV, the first virus to be identified as an oncovirus, is the etiological agent of infectious mononucleosis and has been implicated in the pathogenesis of an increasing number of human malignancies such as Burkitt's lymphoma, nasopharyngeal carcinoma, and polyclonal lymphomas in immunocompromised individuals. CISH-based diagnosis of EBV infection has the advantage over other methods in that it permits unequivocal localization of EBV genomes in cells and thereby obviates the risk of false positive results due to laboratory or clinical contamination.

References
Agaimy A & Wünsch PH (2006) Pathol Res Pract 202: 541-8.
Fuchs S, et al. (2012) J Immunol 88: 1523-33.
Gaiser T, et al. (2012) Diagn Pathol 7: 38.
Greifenegger N, et al. (1998) J Virol 72: 9323-8.
Khan G, et al. (1992) J Clin Pathol 45: 616-20.
Kim DN, et al. (2013) J Gen Virol 94: 497-506.
Murphy JK, et al. (1990) J Clin Pathol 43: 220-3.
Rosa MD, et al. (1981) Mol Cell Biol 1: 785-96.
Sides MD, et al. (2013) Virol J 10: 152.
Thorley-Lawson DA (2001) Nat Rev Immunol 1: 75-82.

Probe Description

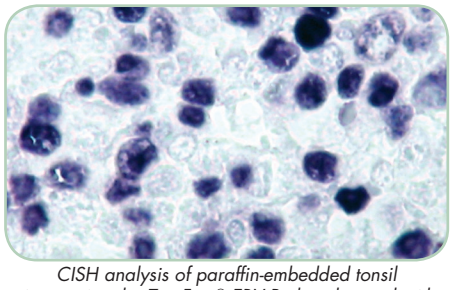
The ZytoFast® EBV Probe is directed against EBER-1 and EBER-2 RNA sequences that were found to be transcribed in every latently infected cell. Due to the large number (up to 10^7) of copies per cell, these RNAs are the most abundant transcripts in latently EBV-infected cells.
The probe consists of EBV-specific oligonucleotides, Biotin or Digoxigenin labeled by using the unique ZytoFast® *High Tag System* providing improved signal intensity.



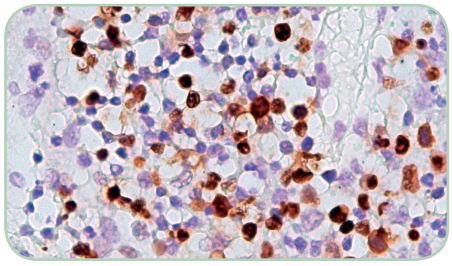
Schematic representation of the EBV genome with the EBER-1 and EBER-2 encoding region indicated in blue. U1-U5 indicate unique nucleotide sequences, hatched boxes represent terminal and internal repeats.

Results

A positive reactivity for Epstein-Barr-Virus (EBV) EBER RNA in the target cells is indicated by a distinctly stained nucleus. Depending on the detection chemistry that is used, colored precipitates, which can be clearly distinguished from the background, will be dark violet-blue when using NBT/BCIP as substrate, strong red when using AEC, dark brown when using DAB green when using HRP-Green, or strong red when using Permanent Red.



CISH analysis of paraffin-embedded tonsil tissue using the ZytoFast® EBV Probe, detected with ZytoFast® CISH Implementation Kit AP-NBT/BCIP.



EBV infected tonsil tissue hybridized with ZytoFast® EBV Probe, detected with ZytoFast® PLUS CISH Implementation Kit HRP-DAB.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoFast® EBV-CISH Probes

Biotin-labeled

Prod. No.	Product	Tests* (Volume)
T-1014-400	ZytoFast EBV Probe	40 (400 µl)
Related Products		
T-1070-40	ZytoFast CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; AP-Streptavidin, 4 ml; NBT/BCIP Solution, 4 ml	40
T-1071-40	ZytoFast CISH Implementation Kit HRP-AEC Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-Streptavidin, 4 ml; AEC Solution, 4 ml	40

ZytoFast® EBV-CISH Probes

Digoxigenin-labeled

Prod. No.	Product	Tests* (Volume)
T-1114-400	ZytoFast EBV Probe CE IVD	40 (400 µl)
Related Products		
T-1061-40	ZytoFast PLUS CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; NBT/BCIP Solution, 4ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1062-40	ZytoFast PLUS CISH Implementation Kit HRP-AEC CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; AEC Solution, 4 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (aqueous), 4 ml	40
T-1063-40	ZytoFast PLUS CISH Implementation Kit HRP-DAB CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1073-40	ZytoFast PLUS CISH Implementation Kit HRP-HRP-Green CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; HRP-Green-Solution A, 0.8 ml; HRP-Green-Solution B, 15 ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1151-40	ZytoFast PLUS CISH Implementation Kit AP-Permanent Red CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; Permanent Red Solution A, 0.25 ml; Permanent Red Solution B, 15 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoFast® CISH probes are tagged using the unique ZytoFast® HighTag System providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

ZytoFast® CMV-CISH System

Background

The ZytoFast® CMV-CISH System is designed for the detection of cytomegalovirus (CMV) DNA in paraffin-embedded tissue sections or cell samples. CMV (a.k.a. human herpesvirus-5, HHV-5) is a member of the beta-herpesvirus group and may be found in 40-100% of people. CMV can be transmitted sexually as well as via breast milk, transplanted organs, and rarely from blood transfusions.

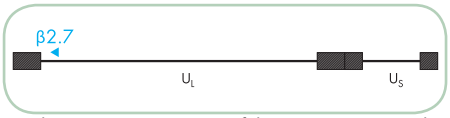
Following primary CMV infection in the normal host, the virus remains in a latent state and can be found in multiple body sites as it is, unlike other herpesviruses, not restricted to certain body areas. Among immunosuppressed patients, such as recipients of solid organ or haematopoietic stem cell allografts, CMV infections are common causes of morbidity and mortality.

In histology, the hallmark of CMV infection is the finding of intranuclear inclusions consistent with the virus. CISH-based diagnosis of CMV infection has the advantage over other methods in that it permits unequivocal localization of CMV genomes in cells and thereby obviates the risk of false positive results due to laboratory or clinical contamination.

References
Cobbs CS (2002) Cancer Res 62: 3347-50.
Chen HP, et al. (2012) J Clin Virol 54: 240-4.
Greenaway PJ & Wilkinson GWG (1987) Virus Res 7: 17-31.
Spector SA (1990) Semin Hematol 27 (2 Suppl 1): 11-6; 28-9.
Wu TC, et al. (1992) Am J Pathol 141: 1247-54.

Probe Description

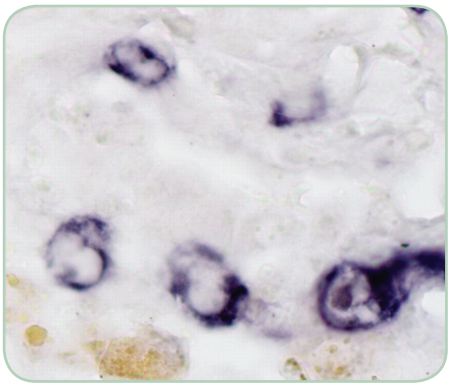
The ZytoFast® CMV Probe is directed against the sequence of the β2.7 gene, the most abundantly transcribed early CMV gene. The probe consists of CMV-specific oligonucleotides, Biotin or Digoxigenin labeled by using the unique ZytoFast® *HighTag System* providing improved signal intensity. In addition to the detection of CMV at the DNA level, the CMV Probe will also allow detection of the β2.7 RNA, which is expressed during all stages of infection.



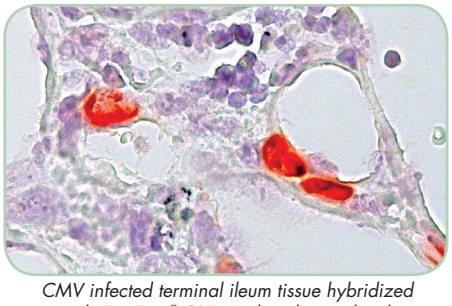
Schematic representation of the CMV genome with the β2.7 encoding region indicated in blue. UL and US indicate unique nucleotide sequences, hatched boxes represent terminal and internal repeats.

Results

Due to the detection of CMV DNA as well as of the abundantly transcribed β2.7 RNA, a positive reactivity for cytomegalovirus (CMV) in the target cells is indicated by a cytoplasmic and/or nuclear staining pattern. Depending on the detection chemistry that is used, colored precipitates, which can be clearly distinguished from the background, will be dark violet-blue when using NBT/BCIP as substrate, strong red when using AEC, dark brown when using DAB, green when using HRP-Green, or strong red when using Permanent Red.



CISH analysis of paraffin-embedded lung tissue using the ZytoFast® CMV Probe, detected with ZytoFast® CISH Implementation Kit AP-NBT/BCIP.



CMV infected terminal ileum tissue hybridized with ZytoFast® CMV Probe, detected with ZytoFast® PLUS CISH Implementation Kit HRP-AEC.

ZytoFast® CISH probes are tagged using the unique ZytoFast® *HighTag System* providing improved signal intensity.

CE003-1-16

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

201

ZytoFast® CMV-CISH Probes

Biotin-labeled

Prod. No.	Product	Tests* (Volume)
T-1013-400	ZytoFast CMV Probe	40 (400 µl)
Related Products		
T-1070-40	ZytoFast CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; AP-Streptavidin, 4 ml; NBT/BCIP Solution, 4 ml	40
T-1071-40	ZytoFast CISH Implementation Kit HRP-AEC Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-Streptavidin, 4 ml; AEC Solution, 4 ml	40

ZytoFast® CMV-CISH Probes

Digoxigenin-labeled

Prod. No.	Product	Tests* (Volume)
T-1113-400	ZytoFast CMV Probe	40 (400 µl)
Related Products		
T-1061-40	ZytoFast PLUS CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; NBT/BCIP Solution, 4ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1062-40	ZytoFast PLUS CISH Implementation Kit HRP-AEC CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; AEC Solution, 4 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (aqueous), 4 ml	40
T-1063-40	ZytoFast PLUS CISH Implementation Kit HRP-DAB CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1073-40	ZytoFast PLUS CISH Implementation Kit HRP-HRP-Green CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; HRP-Green-Solution A, 0.8 ml; HRP-Green-Solution B, 15 ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1151-40	ZytoFast PLUS CISH Implementation Kit AP-Permanent Red CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; Permanent Red Solution A, 0.25 ml; Permanent Red Solution B, 15 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoFast® CISH probes are tagged using the unique ZytoFast® HighTag System providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

202

ZytoFast® Ig-kappa/Ig-lambda-CISH System

CE IVD

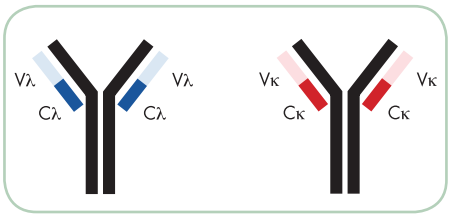
Background

The ZytoFast® Ig-kappa/Ig-lambda-CISH System is designed for the detection of Ig-kappa (κ) and/or Ig-lambda (λ) light chain mRNA in paraffin-embedded tissue sections or cell samples.
B-cells (a.k.a. B lymphocytes) develop from lymphoid stem cells in the bone marrow. Each clone of B-cells expresses a unique antibody molecule, composed of 2 identical heavy and 2 identical light chains, the latter either of κ or λ type. Determination of kappa-to-lambda ratio is useful to distinguish between neoplastic and reactive lymphoid proliferations. Polyclonal expression of κ or λ light chains is considered to reflect a reactive hyperplasia in contrast to the monoclonal expression in malignant lymphoma, the most common hematologic malignancy encountered in the Western world. Whereas detection of Ig-κ and Ig-λ by immunohistochemistry often results in excessive background staining, *in situ* Hybridization has the advantage of a virtually background-free signal, allowing a safe and simple analysis of the clonality of a given lymphocyte population.

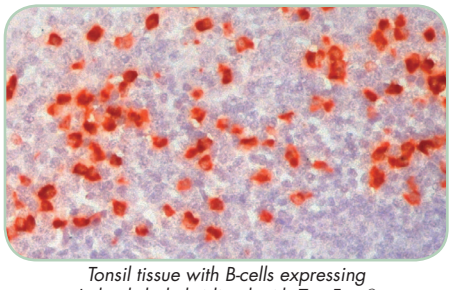
References
Erber WN, et al. (1993) Pathology 25: 63-7.
Ke L, et al. (2011) Int J Clin Exp Pathol 4: 190-6.
McElroy MK, et al. (2011) Hum Pathol 42: 1813-8.
McNicol AM & Farquharson MA (1997) J Pathol 182: 250-61.
Pringle JH, et al. (1990) J Pathol 162: 197-207.

Probe Description

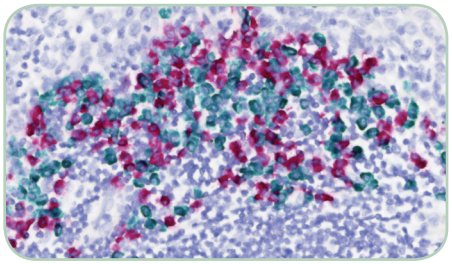
ZytoFast® human Ig-kappa Probe is directed against mRNA sequences encoding κ light chain constant regions of human immunoglobulins.
The ZytoFast® human Ig-lambda Probe is directed against mRNA sequences encoding λ light chain constant regions of human immunoglobulins.
The ZytoFast® human Ig-kappa/Ig-lambda Probe is a probe mixture consisting of a Digoxigenin labeled Ig-κ mRNA specific probe and a Biotin labeled Ig-λ mRNA specific probe. All probes are tagged by using the unique ZytoFast® *HighTag System* providing improved signal intensity.



Basic immunoglobulin structure indicating the heavy chains (black), λ (blue) and κ (red) lights chains. The light chain constant regions (C) whose encoding mRNA sequences are targeted by ZytoFast® Ig-lambda and Ig-kappa probes are indicated in dark blue and red respectively, the variable regions (V) in light blue and red.



Tonsil tissue with B-cells expressing Ig-lambda hybridized with ZytoFast® human Ig-lambda Probe, detected with ZytoFast® PLUS CISH Implementation Kit HRP-AEC.



CISH analysis of a paraffin-embedded tonsil tissue using the ZytoFast® human Ig-kappa/Ig-lambda Permanent CISH Kit.

Results

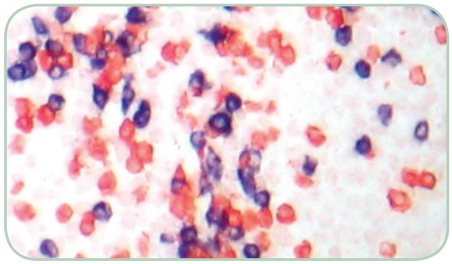
A positive reactivity in the target cells is indicated by cytoplasmic staining. Depending on the detection chemistry that is used, colored precipitates, which can be clearly distinguished from the background, will be dark violet-blue when using NBT/BCIP as substrate, strong red when using AEC, dark brown when using DAB, green when using HRP-Green, or strong red when using Permanent Red.

Using the ZytoFast® human Ig-kappa Probe, B-cells expressing antibodies with κ light chains will result in cytoplasmic staining whereas Ig-λ expressing B-cells are not stained.

Using the ZytoFast® human Ig-lambda Probe, B-cells expressing antibodies with λ light chains will result in cytoplasmic staining whereas Ig-κ expressing B-cells are not stained.

Using the ZytoFast® human Ig-kappa/Ig-lambda CISH Kit, B-cells expressing antibodies with κ light chains will result in a red cytoplasmic staining and simultaneously Ig-λ expressing B-cells will result in a dark violet-blue cytoplasmic staining.

Using the ZytoFast® human Ig-kappa/Ig-lambda Permanent CISH Kit, B-cells expressing antibodies with κ light chains will result in a green cytoplasmic staining and simultaneously Ig-λ expressing B-cells will result in permanent red cytoplasmic staining.



CISH analysis of a paraffin-embedded bone marrow biopsy specimen using the ZytoFast® human Ig-kappa/Ig-lambda CISH Kit.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

203

ZytoFast® Ig-kappa/Ig-lambda Probes
Biotin-labeled

Prod. No.	Product	Tests* (Volume)
T-1015-400	ZytoFast human Ig-kappa Probe	40 (400 µl)
T-1016-400	ZytoFast human Ig-lambda Probe	40 (400 µl)
Related Products		
T-1070-40	ZytoFast CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; AP-Streptavidin, 4 ml; NBT/BCIP Solution, 4 ml	40
T-1071-40	ZytoFast CISH Implementation Kit HRP-AEC Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-Streptavidin, 4 ml; AEC Solution, 4 ml	40

ZytoFast® Ig-kappa/Ig-lambda Probes
Digoxigenin-labeled

Prod. No.	Product	Tests* (Volume)
T-1115-400	ZytoFast human Ig-kappa Probe CE IVD	40 (400 µl)
T-1116-400	ZytoFast human Ig-lambda Probe CE IVD	40 (400 µl)
Related Products		
T-1061-40	ZytoFast PLUS CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; NBT/BCIP Solution, 4ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1062-40	ZytoFast PLUS CISH Implementation Kit HRP-AEC CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; AEC Solution, 4 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (aqueous), 4 ml	40
T-1063-40	ZytoFast PLUS CISH Implementation Kit HRP-DAB CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1073-40	ZytoFast PLUS CISH Implementation Kit HRP-HRP-Green CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; HRP-Green-Solution A, 0.8 ml; HRP-Green-Solution B, 15 ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1151-40	ZytoFast PLUS CISH Implementation Kit AP-Permanent Red CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; Permanent Red Solution A, 0.25 ml; Permanent Red Solution B, 15 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

ZytoFast® Ig-kappa/Ig-lambda Probes
Biotin/Digoxigenin-labeled

Prod. No.	Product	Tests* (Volume)
T-1017-400	ZytoFast human Ig-kappa/Ig-lambda Probe CE IVD	40 (400 µl)
Related Products		
T-1005-40	ZytoFast human Ig-kappa/Ig-lambda CISH Kit CE IVD Incl. Ig-kappa/Ig-lambda Probe (Digoxigenin/Biotin labeled), 0.4 ml; 28S rRNA (+) Control Probe (Biotin labeled), 0.1 ml; RNA (-) Control Probe (Biotin labeled), 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-anti-Digoxigenin, 4 ml; AP-Streptavidin, 4 ml; AEC Solution, 4 ml; NBT/BCIP Solution, 4 ml	40
T-1105-40	ZytoFast human Ig-kappa/Ig-lambda Permanent CISH Kit CE IVD Incl. Ig-kappa/Ig-lambda Probe (Digoxigenin/Biotin labeled), 0.4 ml; 28S rRNA (+) Control Probe (Biotin labeled), 0.1 ml; RNA (-) Control Probe (Biotin labeled), 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-anti-Digoxigenin, 4 ml; AP-Streptavidin, 4 ml; HRP-Green-Solution A, 0.8 ml; HRP-Green-Solution B, 15 ml; Permanent Red Solution A, 0.25 ml; Permanent Red Solution B, 15 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

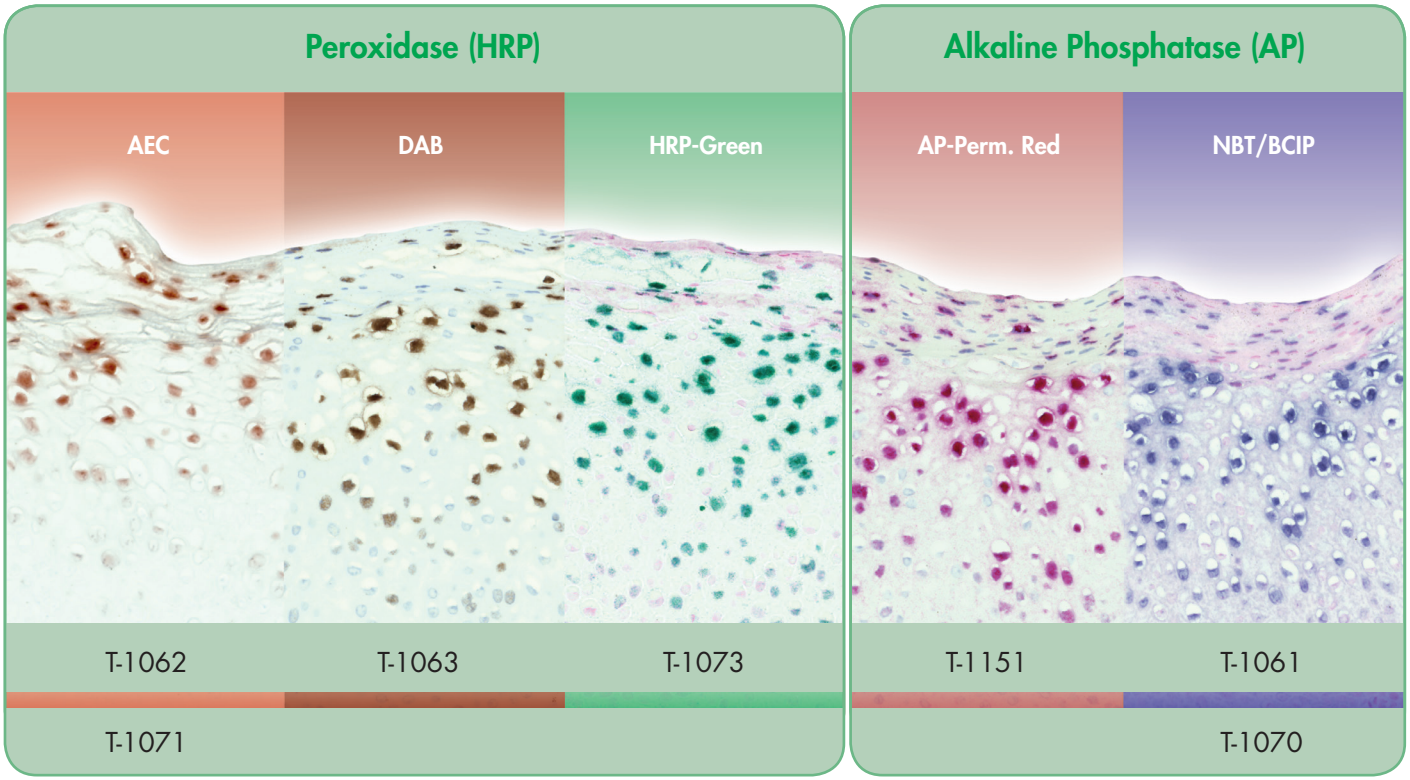
** Using 10 µl probe solution per test.* CE IVD *only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

ZytoFast® CISH probes are tagged using the unique ZytoFast® HighTag System providing improved signal intensity.

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

204

Accessories



ZytoFast® PLUS Implementation Kits

For the detection of Digoxigenin-labeled ZytoFast® Probes

Prod. No.	Product	Tests
T-1061-40	ZytoFast PLUS CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; NBT/BCIP Solution, 4ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1062-40	ZytoFast PLUS CISH Implementation Kit HRP-AEC CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; AEC Solution, 4 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (aqueous), 4 ml	40
T-1063-40	ZytoFast PLUS CISH Implementation Kit HRP-DAB CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; Nuclear Blue Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1073-40	ZytoFast PLUS CISH Implementation Kit HRP-HRP-Green CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x 50 ml; Mouse-anti-DIG, 4 ml; Anti-Mouse-HRP-Polymer, 4 ml; HRP-Green-Solution A, 0.8 ml; HRP-Green-Solution B, 15 ml; Nuclear Red Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40
T-1151-40	ZytoFast PLUS CISH Implementation Kit AP-Permanent Red CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Heat Pretreatment Solution EDTA, 500 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 4x50 ml; Rabbit-anti-DIG, 4 ml; Anti-Rabbit-AP-Polymer, 4 ml; Permanent Red Solution A, 0.25 ml; Permanent Red Solution B, 15 ml; Mayer's Hematoxylin Solution, 20 ml; Mounting Solution (alcoholic), 4 ml	40

ZytoFast® Implementation Kits

For the detection of Biotin-labeled ZytoFast® Probes

Prod. No.	Product	Tests
T-1070-40	ZytoFast CISH Implementation Kit AP-NBT/BCIP CE IVD Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; AP-Streptavidin, 4 ml; NBT/BCIP, 4 ml	40
T-1071-40	ZytoFast CISH Implementation Kit HRP-AEC Incl. DNA (+) Control Probe, 0.1 ml; DNA (-) Control Probe, 0.1 ml; 28S rRNA (+) Control Probe, 0.1 ml; RNA (-) Control Probe, 0.1 ml; Pepsin Solution, 4 ml; 20x Wash Buffer TBS, 2x 50 ml; HRP-Streptavidin, 4 ml; AEC Solution, 4 ml	40

CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.

Accessories

ZytoFast® Pretreatment Reagents

Prod. No.	Product
ES-0001-4	Pepsin Solution, 4 ml CE IVD
ES-0001-8	Pepsin Solution Set, 2x 4 ml CE IVD
ES-0001-50	Pepsin Solution, 50 ml CE IVD
ES-0001-1000	Pepsin Solution, 1000 ml CE IVD
PT-0002-500	Heat Pretreatment Solution EDTA, 500 ml CE IVD

ZytoFast® Wash Buffers & Ancillary Reagents

Prod. No.	Product
AB-0001-4	Mouse-anti-DIG, 4 ml CE IVD
AB-0001-30	Mouse-anti-DIG, 30 ml CE IVD
AB-0002-4	Anti-Mouse-HRP-Polymer, 4 ml CE IVD
AB-0008-4	HRP-anti-Digoxigenin, 4 ml CE IVD
AB-0009-4	AP-Streptavidin, 4 ml CE IVD
AB-0011-4	Rabbit-anti-DIG, 4 ml CE IVD
C-3015-100	DAB Solution Set CE IVD Incl. DAB Solution A, 0.3 ml; DAB Solution B, 10 ml; good for 10 ml DAB Solution
C-3039-100	ZytoDot HRP-Green Solution Set CE IVD Incl. HRP-Green Solution A, 0.8 ml; HRP-Green Solution B, 15 ml; good for 15 ml HRP-Green Solution
CS-0002-20	Nuclear Blue Solution, 20 ml CE IVD
CS-0003-20	Nuclear Red Solution, 20 ml CE IVD
E-4005-50	Fixogum, Rubber Cement, 50 g
E-4005-125	Fixogum, Rubber Cement, 125 g
E-4006-2	HPV Control Slide Set, 2 pcs.
SB-0004-4	NBT/BCIP Solution, 4 ml CE IVD
SB-0005-4	AEC Solution, 4 ml CE IVD
T-1006-40	ZytoFast AP-Streptavidin Detection Kit, Incl. NBT/BCIP, 4 ml; AP-Streptavidin, 4ml
WB-0005-50	20x Wash Buffer TBS, 50 ml CE IVD
WB-0006-0.5	2x Oligo Buffer RNA, 0.5 ml; good for 1 ml customer made labeled oligonucleotides

ZytoFast® Control Probes
Biotin-labeled

Prod. No.	Product	Tests* (Volume)
T-1022-100	ZytoFast DNA (+) Control Probe	10 (100 µl)
T-1023-100	ZytoFast DNA (–) Control Probe	10 (100 µl)
T-1020-100	ZytoFast 28S rRNA (+) Control Probe	10 (100 µl)
T-1019-100	ZytoFast RNA (–) Control Probe	10 (100 µl)

ZytoFast® Control Probes
Digoxigenin-labeled

Prod. No.	Product	Tests* (Volume)
T-1053-400	ZytoFast DNA (+) Control Probe CE IVD	40 (400 µl)
T-1054-400	ZytoFast DNA (–) Control Probe CE IVD	40 (400 µl)
T-1120-400	ZytoFast 28S rRNA (+) Control Probe CE IVD	40 (400 µl)
T-1119-400	ZytoFast RNA (–) Control Probe CE IVD	40 (400 µl)

** Using 10 µl probe solution per test. CE IVD only available in certain countries. All other countries research use only! Please contact your local dealer for more information.*

Product Use

All products manufactured and/or distributed by ZytoVision GmbH should be used in accordance with the labeled intended use of the given product. Products labeled as CE/IVD are *in vitro* diagnostic medical devices according to the European Directive 98/79/EC. Products labeled as "For research use only" should be used for research applications, not for use in diagnostic procedures.

Trademarks

Zyto*Dot*®, Zyto*Fast*®, Zyto*Light*®, and ZytoVision® are registered trademarks of ZytoVision GmbH. CEN™, SPEC™, ZyBlue™, ZyGold™, ZyGreen™, ZyOrange™, ZyRed™, Zyto*Dot*® 2C™, TriCheck™, Clear-it™, DuraTect™ are trademarks of ZytoVision GmbH. TexasRed® is a registered trademark of Molecular Probes, Inc., Eugene, OR.

CE Marking & ISO Certificates

All probes in this catalog are manufactured by ZytoVision GmbH, Bremerhaven, Germany. Zyto*Light*® probes are direct labeled using the unique Zyto*Light*® *Direct Label System II* (ZytoVision GmbH) providing improved signal intensity. Advanced specificity of single copy Zyto*Light*® and Zyto*Dot*® SPEC probes is obtained by the unique ZytoVision® *Repeat Subtraction Technique* (ZytoVision GmbH). Zyto*Fast*® probes are tagged using the unique Zyto*Fast*® *HighTag System* (ZytoVision) providing improved signal intensity.

Product development and manufacturing of all products by ZytoVision GmbH is carried out according to ISO 9001:2008 and ISO 13485:2003 regulations, for which ZytoVision GmbH holds certificates. These certificates were issued and are annually monitored by mdc medical device certification GmbH, Germany. mdc was, as one of the first German entities, notified in 1994 by the German Ministry of Health to the European Commission for conformity assessment procedures under the European Directive 98/79/EC for *in vitro* diagnostic devices.

Certificate

mdc medical device certification GmbH
certifies that

ZytoVision GmbH
Fischkai 1
27572 Bremerhaven
Germany

for the scope

development, manufacture and distribution of
in-vitro diagnostic devices based on nucleic acids

has introduced and applies a

Quality Management System

The mdc audit has proven that this quality management system meets all requirements of the following standard

EN ISO 9001

Quality management systems – Requirements

(ISO 9001:2008)

Valid from	2014-03-20
Valid until	2017-03-19
Registration no.	D1099800006
Report no.	E-D10998_2014-02-24
Stuttgart	2014-02-24

Head of Certification Body

mdc medical device certification

DAkkS Deutsche Akkreditierungsstelle D-ZM-16002-01-01

mdc medical device certification GmbH
Kriegerstraße 6
D-70191 Stuttgart, Germany
Phone: +49-(0)711-253597-0
Fax: +49-(0)711-253597-10
Internet: http://www.mdc-ce.de

Certificate

mdc medical device certification GmbH
certifies that

ZytoVision GmbH
Fischkai 1
27572 Bremerhaven
Germany

for the scope

development, manufacture and distribution of
in-vitro diagnostic devices based on nucleic acids

has introduced and applies a

Quality Management System

The mdc audit has proven that this quality management system meets all requirements of the following standard

EN ISO 13485

Medical devices – Quality management systems – Requirements for regulatory purposes

EN ISO 13485:2012 + AC:2012 - ISO 13485:2003 + Cor. 1:2009

Valid from	2014-03-20
Valid until	2019-03-20
Registration no.	D1099800007
Report no.	E-D10998_2014-02-24
Stuttgart	2014-02-24

Head of Certification Body

mdc medical device certification

ZLG-ZQ-976.00.03-45

mdc medical device certification GmbH
Kriegerstraße 6
D-70191 Stuttgart, Germany
Phone: +49-(0)711-253597-0
Fax: +49-(0)711-253597-10
Internet: http://www.mdc-ce.de

Index

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
208

Index

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com
209

Index

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
www.zytovision.com

210

Prod. # M-5005

ZYTOVISION

Molecular diagnostics simplified

ZytoVision GmbH · Fischkai 1
27572 Bremerhaven · Germany
Phone: +49 (0)471/4832-300
Fax: +49 (0)471/4832-509
info@zytovision.com
www.zytovision.com

Your local distributor