Antibodies and Kits
for the Study of

Angiogenesis &
Cardiovascular
Development

Cell Signaling
T E C H N O L O G Y®

XP® Monoclonal Antibodies
for Angiogenesis & Cardiovascular Development

XP® monoclonal antibodies are a line of high quality rabbit monoclonal antibodies exclusively available from Cell Signaling Technology (CST). Any product labeled with XP has been carefully selected based on superior performance in the most relevant applications.

XP monoclonal antibodies are generated using XMT® technology, a proprietary monoclonal method developed at CST. This technology provides access to a broad range of antibody-producing B cells unattainable with traditional monoclonal technologies, allowing more comprehensive screening and the identification of XP monoclonal antibodies with:

eXceptional specificity
As with all CST™ antibodies, the antibody is specific to your target of interest, saving you valuable time and resources.

+ eXceptional sensitivity
The antibody will provide a stronger signal for your target protein in cells and tissues, allowing you to monitor expression of low levels of endogenous proteins, saving you valuable materials.

+ eXceptional stability and reproducibility
XMT technology combined with our stringent quality control ensures maximum lot-to-lot consistency and the most reproducible results.

= eXceptional Performance™
XMT technology coupled with our extensive antibody validation and stringent quality control delivers XP monoclonal antibodies with eXceptional Performance in the widest range of applications.

PDGF Receptor α (D13C6) XP® Rabbit mAb #5241 is an example of an antibody with superior performance in a wide range of tested applications.
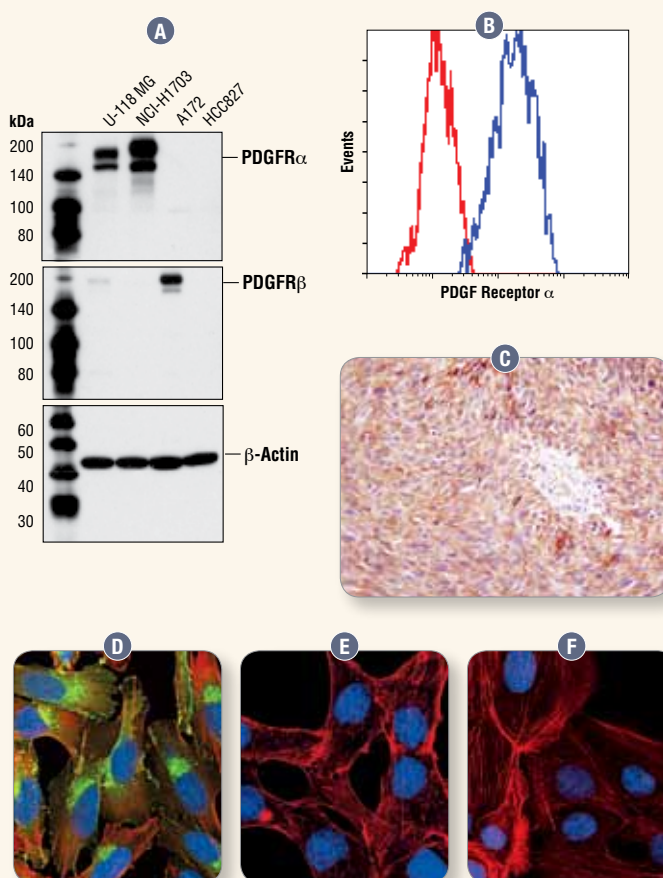
PDGF Receptor α (D13C6) XP® Rabbit mAb #5241: Western blot analysis (**A**) of extracts from various cell lines using #5241 (upper), PDGF Receptor β (28E1) Rabbit mAb #3169 (middle), and β-Actin Antibody #4967 (lower). Flow cytometric analysis (**B**) of A-204 cells using #5241 (blue) compared to a nonspecific negative control antibody (red). IHC analysis (**C**) of paraffin-embedded human leiomyosarcoma using #5241. Confocal IF analysis of NCI-H1703 (**D**), A172 (**E**), and HCC827 cells (**F**) using #5241 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Visit our website for more experimental details, additional information, and a complete list of available XP® monoclonal antibodies.

Antibodies and Kits for the Study of

Angiogenesis & Cardiovascular Development

Cell Signaling Technology (CST) provides the highest quality activation state and total protein antibodies for the study of angiogenesis and cardiovascular development. CST™ antibodies have been extensively validated in-house for multiple applications including western blot, immunofluorescence, immunohistochemistry, and flow cytometry. XP® monoclonal antibodies are exclusively available from CST and demonstrate exceptional performance in the widest range of applications. As always, technical support is provided by the same scientists who produce and validate our products and know them best.

Angiogenesis is the formation of new blood vessels from pre-existing blood vessels. It is important for new blood vessel growth, wound healing, and female reproduction. When angiogenesis is stimulated, pro-angiogenic growth factors such as VEGF, PDGF, and FGF are released. These growth factors trigger a signaling cascade that activates several signaling pathways such as PI3K/Akt, Erk1/2, and nitric oxide synthase and results in endothelial cell (EC) proliferation and migration. ECs use matrix metalloproteases and integrins to digest extracellular matrix and migrate into new territory where they lengthen and form tubes. Pro-angiogenic therapies combat cardiovascular disease, diabetic blindness, and other conditions where new vessel growth is desired. Extensive research continues on anti-angiogenic therapies to inhibit tumor angiogenesis, a condition whereby cancer cells stimulate new blood vessel growth to bring oxygen and nutrients to a tumor. CST offers an extensive line of phospho-specific and total protein antibodies to growth factor receptors, intracellular signaling molecules, and matrix remodeling proteins important to angiogenic signaling pathways and EC migration, allowing focused studies of pro- and anti-angiogenic signaling events in the normal and disease state. We also offer a growing list of growth factors and cytokines for stimulation of angiogenesis in cultured cells or *in vivo* applications.

During development, the early mesoderm differentiates along multiple discrete branches to form the components of the cardiovascular system. In one branch, early mesoderm differentiates into cardiac progenitor cells that later develop into cardiomyocytes and other cells of the heart. A second mesoderm branch differentiates into the hemangioblast, a precursor to hematopoietic stem cells (HSCs), and the angioblast, a precursor to vascular smooth muscle and ECs. Development along each of these branches requires multiple signaling pathways such as Wnt, Hippo, and Notch. CST offers phospho-specific and total protein antibodies, including our exclusive XP® monoclonal antibodies, to many signaling proteins important to cardiovascular development. CST also offers antibodies to lineage markers specific for cardiomyocytes, HSCs, the hemangioblast, and other descendents of mesoderm differentiation. Many of these antibodies are validated for immunofluorescence and flow cytometry applications and can be used to visually monitor the differentiation process.
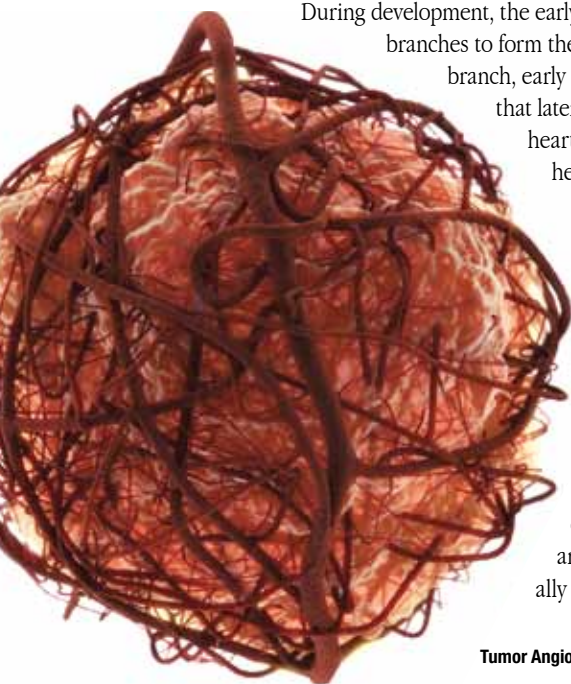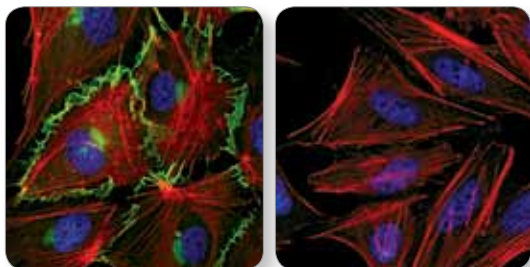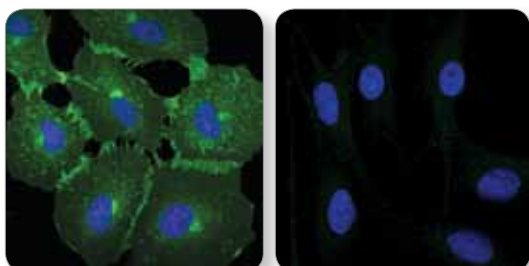
Tumor Angiogenesis

Angiogenesis

VE-Cadherin (D87F2) XP® Rabbit mAb #2500: Confocal IF analysis of HUVEC (left) and HeLa cells (right) using #2500 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

EphA2 (D4A2) XP® Rabbit mAb #6997: Confocal IF analysis of A549 (left) and SK-MEL-28 cells (right) using #6997 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

|		Applications	Reactivity
#4749	Integrin Antibody Sampler Kit		
#9360	PDGF Receptor α Antibody Sampler Kit		
#9970	PDGF Receptor β Antibody Sampler Kit		
#2948	Angiopoietin-2 Antibody	W	M
#5648	CA9 (D10C10) Rabbit mAb	W, IHC-P	H
#5649	CA9 (D47G3) Rabbit mAb	W, IP, IHC-P	H
XP® #2500	VE-Cadherin (D87F2) XP® Rabbit mAb	W, IP, IF-IC, F	H, Dm, B, Pg, (Mk)
#2158	VE-Cadherin Antibody	W, IF-IC	H, Dm, B
#4771	Acetyl-CBP (Lys1535)/p300 (Lys1499) Antibody	W, IP, ChIP	H, M, R, Mk
#7389	CBP (D6C5) Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#7425	CBP (D9B6) Rabbit mAb	W, IP, ChIP	H, M, R, Mk
#3528	CD31 (PECAM-1) (89C2) Mouse mAb	W, IP, IHC-P, IF-IC, F	H
#3568	CD31 (PECAM-1) (158-2B3) Mouse mAb	F	H
#4842	Cox2 Antibody	W, IHC-P	H, M, (R)
#2020	Cripto Antibody (Human Specific)	W, IP	H
#2818	Cripto Antibody (Mouse Specific)	W, IP, IF-IC	M
#2589	DLL4 Antibody	W, IP	H
#4335	Endoglin (D50G1) Rabbit mAb	W	H
#9575	Phospho-eNOS (Ser113) Antibody	W	B, (H)
#9574	Phospho-eNOS (Thr495) Antibody	W, IP	B, Pg, (H, M, R)
#9570	Phospho-eNOS (Ser1177) (C9C3) Rabbit mAb	W, IP, E-P	B, Pg, (H, M, R)
#9571	Phospho-eNOS (Ser1177) Antibody	W	R, B, Pg, (H, M)
#9586	eNOS (49G3) Rabbit mAb	W, IP	H, B, (M, R)
#9572	eNOS Antibody	W	B, Pg, (H, M, R)
#5880	eNOS (6H2) Mouse mAb	W, IP, IHC-P	H, B
#7980	PathScan® Phospho-eNOS (Ser1177) Sandwich ELISA Kit	ELISA	B

Application References

#4771 Acetyl-CBP (Lys1535)/p300 (Lys1499) Antibody: Thompson, P. R. et al. (2004) *Nat Struct Mol Biol* 11, 308-315. (WB)
#4842 Cox2 Antibody: Lee, J.K. et al. (2004) *Proc Natl Acad Sci U S A* 101, 8815-20. (WB)
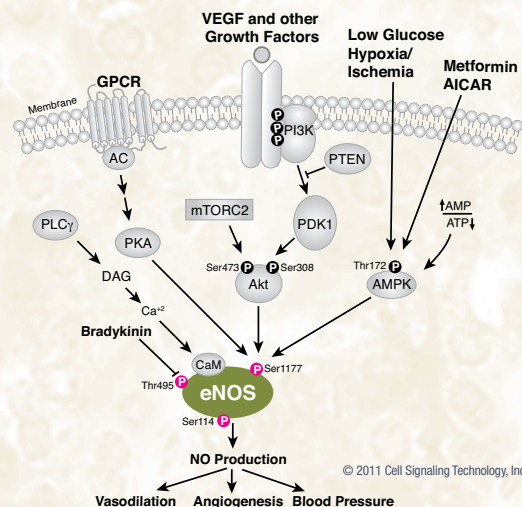
eNOS

Endothelial nitric oxide synthase (eNOS) is an important enzyme in the cardiovascular system. It catalyzes the production of nitric oxide (NO), a key regulator of blood pressure, vascular remodeling, and angiogenesis. The activity of eNOS is regulated by phosphorylation at multiple sites. The two most thoroughly studied sites are the activation site Ser1177 and the inhibitory site Thr495. Several protein kinases including Akt/PKB, PKA, and AMPK activate eNOS by phosphorylating Ser1177 in response to various stimuli. In contrast, bradykinin and H_2O_2 activate eNOS activity by promoting both Ser1177 phosphorylation and Thr495 dephosphorylation.
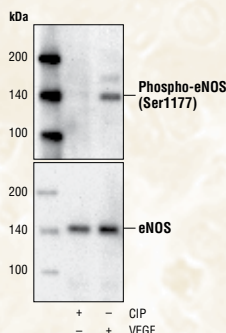
Phospho-eNOS (Ser1177) (C9C3) Rabbit mAb #9570: Western blot analysis of extracts from BAEC, phosphatase- or VEGF-treated, using #9570 (upper) or eNOS Antibody #9572 (lower).
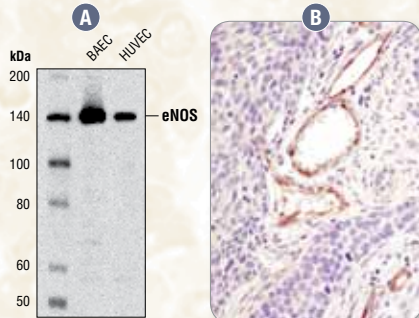

eNOS (6H2) Mouse mAb #5880: Western blot analysis (**A**) of extracts from BAEC and HUVEC using #5880. IHC analysis (**B**) of paraffin-embedded human lung adenocarcinoma using #5880.

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Application References

#9571 Phospho-eNOS (Ser1177) Antibody: Brouet, A. et al. (2001) *J Biol Chem* 276, 32663-32669. (WB) / Thomas, S.R. et al. (2002) *J Biol Chem* 277, 6017-6024. (WB) / Du, X.L. et al. (2001) *J Clin Invest* 108, 1341-1348. (WB) / Boo, Y.C. et al. (2002) *J Biol Chem* 277, 3388-3396. (WB) / Makarova, A.M. et al. (2011) *J Biol Chem* 286, 23044-23053. (IF-IC, WB)
#9572 eNOS Antibody: Wu, M. et al. (2009) *PLoS One* 4, e6430. (WB) / Makarova, A.M. et al. (2011) *J Biol Chem* 286, 23044-23053. (WB)

|	Applications	Reactivity
#1133 eNOS (Ser1177) Biotinylated Peptide		
#3970 Phospho-EphA2 (Tyr594) Antibody	W	H
XP #6997 EphA2 (D4A2) XP® Rabbit mAb	W, IP, IF-IC	H, M, R, Mk
#3974 EphA2 Antibody	W	H
#3481 Phospho-Ephrin B (Tyr324/329) Antibody	W	H
#3139 Acidic FGF (11H11) Rabbit mAb	W, IP	H
#3196 Basic FGF (19A9) Rabbit mAb	W, IP	H
#3471 Phospho-FGF Receptor (Tyr653/654) Antibody	W	H, (M, R)
#3476 Phospho-FGF Receptor (Tyr653/654) (55H2) Mouse mAb	W	H, (M, R)
#2544 Phospho-FGF Receptor 1 (Tyr766) (1E5) Rabbit mAb	W	H
#3472 FGF Receptor 1 Antibody	W, IP	H, (M, R)
#7954 PathScan® Phospho-FGFR2 (panTyr) Sandwich ELISA Kit	ELISA	H
#7939 PathScan® Total FGFR2 Sandwich ELISA Kit	ELISA	H
#3163 FGF Receptor 3 (D2G7E) Rabbit mAb	W, IP	H, M
#4574 FGF Receptor 3 (C51F2) Rabbit mAb	W, IP, IHC-P, IF-IC	H
#3160 FGF Receptor 3 Antibody	W	H, M
#2894 FGF Receptor 4 Antibody	W	M, (H)
#4426 FIH (D19B3) Rabbit mAb	W	H, M, R, Mk
#4383 Gremlin Antibody	W	M, (H, R)
XP #3434 Hydroxy-HIF-1α (Pro564) (D43B5) XP® Rabbit mAb	W, IP, IF-IC	H, (M, R, Mk, C, X, Z, Pg)
#3716 HIF-1α Antibody	W	H
#3414 HIF-1β/ARNT (C15A11) Rabbit mAb	W, IP, IF-IC	H, Mk
#3718 HIF-1β/ARNT Antibody	W, IF-IC	H, M, R, Mk
#5853 HO-1 (D60G11) Rabbit mAb	W, IP	H, (Mk)
#5141 HO-1 (P109) Antibody	W	H, M, R, Mk
#5061 HO-1 (P249) Antibody	W	H, M
#4705 Integrin α5 Antibody	W	H, M, Mk
#4711 Integrin αV Antibody	W, IP	H, R
#3750 Integrin α6 Antibody	W	H, M, R, Mk
#4706 Integrin β1 Antibody	W	H, M, R, Mk
#4702 Integrin β3 Antibody	W	H, M, R, Mk, B
#3629 Integrin β5 (D24A5) Rabbit mAb	W, IP	H, M, R, Mk
#4708 Integrin β5 Antibody	W, IP, IF-IC	H
#2620 Jagged1 (28H8) Rabbit mAb	W, IP	H, (M, R)
#2155 Jagged1 (1C4) Rabbit mAb	W	H
#4608 MAML1 Antibody	W, IP, IF-IC	H
#6988 MAML2 (D41E6) Rabbit mAb	W, IP	H, M, R
#4618 MAML2 Antibody	W, IP	H, M, R, Mk
#9119 Maspin (L250) Antibody	W	H, (Mk)
#9117 Maspin (T50) Antibody	W, IP	H, M, R, (Mk)
#2027 MCP-1 Antibody	W	H, (Mk)
#2029 MCP-1 Antibody (Mouse Specific)	W	M
#4022 MMP-2 Antibody	W	H, (M, R)
XP #3801 MMP-7 (D4H5) XP® Rabbit mAb	W, IHC-P	M, R
#2270 MMP-9 (G657) Antibody	W	H, M
#3852 MMP-9 Antibody	W, IHC-P	H, (R)
#3506 Phospho-NDRG1 (Ser330) Antibody	W, IP	H, M, (R, Mk)
XP #5482 Phospho-NDRG1 (Thr346) (D98G11) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, M, R, Mk
#3217 Phospho-NDRG1 (Thr346) Antibody	W, IP	H, M, R, (Mk)
#5196 NDRG1 Antibody	W, IP, IHC-P	H, M, R, Mk
#5667 NDRG2 Antibody	W	H, M, R
#5846 NDRG3 Antibody	W, IP	H, M, R, Mk
#8216 PhosphoPlus® Notch1 (Cleaved, Val1744) Antibody Duet		
#4147 Cleaved Notch1 (Val1744) (D3B8) Rabbit mAb	W, IP	H, M
#2421 Cleaved Notch1 (Val1744) Antibody	W, IP	H, M, R, Mk
XP #3608 Notch1 (D1E11) XP® Rabbit mAb	W, IHC-P	H, M, R
#3439 Notch1 (C37C7) Rabbit mAb	W, IP	H
#3268 Notch1 (C44H11) Rabbit mAb	W	H, (M, R)
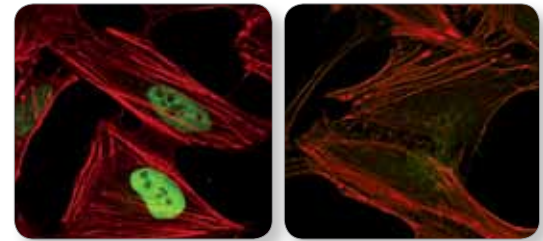
Hydroxy-HIF-1α (Pro564) (D43B5) XP® Rabbit mAb #3434: Confocal IF analysis of HeLa cells, treated with either MG132 (10 μM, left) or MG132 (10 μM) and DMOG (1 mM, right), using #3434 (green). Actin filaments were labeled using DY-554 phalloidin (red).
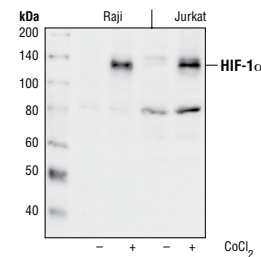
HIF-1α Antibody #3716: Western blot analysis of extracts from Raji and Jurkat cells, untreated or treated with cobalt chloride (0.1 mM, 4 hr), using #3716.
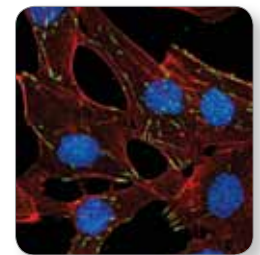
Integrin β5 Antibody #4708: Confocal IF analysis of A172 cells using #4708 (green). Actin filaments were labeled with Alexa Fluor® 555 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).
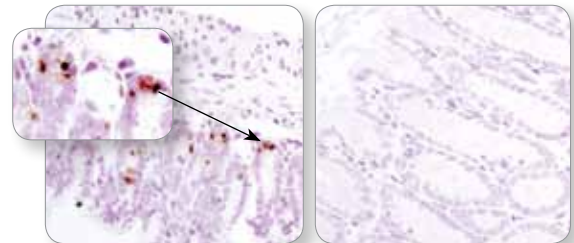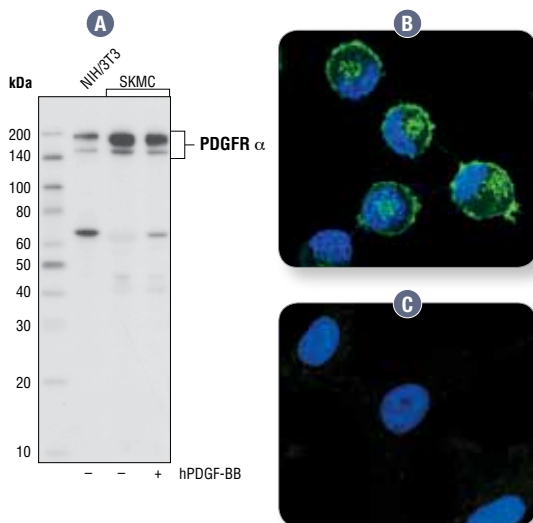

MMP-7 (D4H5) XP® Rabbit mAb #3801: IHC analysis of paraffin-embedded mouse small intestine (positive, left) and mouse colon (negative, right) using #3801.

Application References

#3481 Phospho-Ephrin B (Tyr324/329) Antibody: Palmer, A. et al. (2002) *Mol Cell* 9, 1-20. (WB)

#2620 Jagged1 (28H8) Rabbit mAb: Ghosh, S. et al. (2011) *J Biol Chem* 286, 22678-22687. (WB)

#2155 Jagged1 (1C4) Rabbit mAb: Ghosh, S. et al. (2011) *J Biol Chem* 286, 22678-22687. (WB)

#3506 Phospho-NDRG1 (Ser330) Antibody: Hoang, B. et al. (2010) *Blood* 116, 4560-4568. (WB)

#4147 Cleaved Notch1 (Val1744) (D3B8) Rabbit mAb: Treanor, L.M. et al. (2011) *Blood* 117, 5453-5462. (WB)

#2421 Cleaved Notch1 (Val1744) Antibody: Phiel, C. J. et al. (2003) *Nature* 423, 435-439. (WB) / Tokunaga, A. et al. (2004) *J Neurochem* 90, 142-154. (IF-IC, WB) / Ishikura, N. et al. (2005) *Proc Natl Acad Sci USA* 102, 886-891. (WB) / Palomero, T. et al. (2006) *Leukemia* 20, 1279-1287. (WB) / O'Neil, J. et al. (2007) *J Exp Med* 204, 1813-1824. (WB) / Huppert, S.S. et al. (2005) *Dev Cell* 8, 677-688. (WB) / Köchert, K. et al. (2011) *Oncogene* 30, 1831-1840. (WB)

#3608 Notch1 (D1E11) XP® Rabbit mAb: Choi, P.S. et al. (2011) *Proc Natl Acad Sci U S A* 108, 17432-17437. (WB)

REACTIVITY KEY:

H human / **M** mouse / **R** rat / **Hm** hamster / **Mk** monkey / **C** chicken / **Mi** mink / **Dm** D. melanogaster / **X** Xenopus / **Z** zebra fish / **B** bovine / **Dg** dog / **Pg** pig / **Sc** S. cerevisiae / **All** all species expected / **( )** 100% sequence homology

5

PDGF Receptor α (D1E1E) XP® Rabbit mAb #3174: Western blot analysis (**A**) of extracts from NIH/3T3 and human skeletal muscle cells (SKMC), untreated or treated with hPDGF-BB #8912, using #3174. Confocal IF analysis of A-204 (**B**) and U-87 MG cells (**C**) using #3174 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).
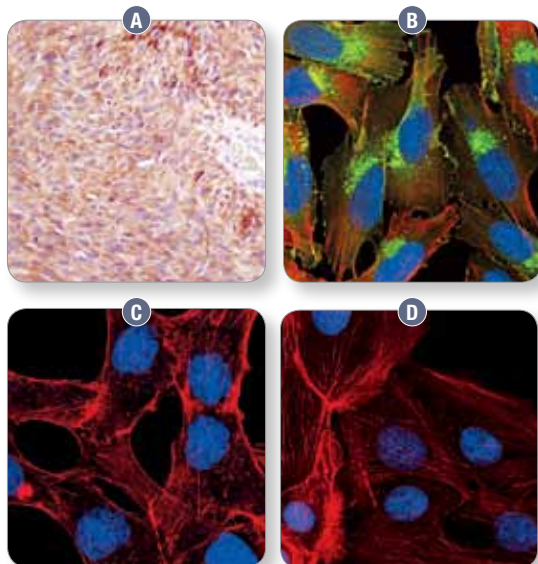
PDGF Receptor α (D13C6) XP® Rabbit mAb #5241: IHC analysis (**A**) of paraffin-embedded human leiomyosarcoma using #5241. Confocal IF analysis of NCI-H1703 (**B**), A172 (**C**), and HCC827 cells (**D**) using #5241 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Application References

#3446 Notch3 (8G5) Rat mAb: Ghosh, S. et al. (2011) *J Biol Chem* 286, 22678-22687. (WB)

#3711 TGF-β Antibody: Nishida, M. et al. (2008) *EMBO J* 27, 3104-3115. (WB)

#2478 Phospho-VEGF Receptor 2 (Tyr1175) (19A10) Rabbit mAb: Antonescu, C.R. et al. (2009) *Cancer Res* 69, 7175-7179. (WB) / Kappas, N.C. et al. (2008) *J Cell Biol* 181, 847-858. (IF-IC, WB)

#2479 VEGF Receptor 2 (55B11) Rabbit mAb: Antonescu, C.R. et al. (2009) *Cancer Res* 69, 7175-7179. (IF-IC, IHC-P, WB)

		Applications	Reactivity
	#3447 Notch1 (5B5) Rat mAb	W, IP	H, M, R, B
	#2420 Notch2 (8A1) Rabbit mAb	W, IP	H
	#5276 Notch3 (D11B8) Rabbit mAb	W, IP	H
	#2889 Notch3 Antibody	W, IP	H
	#3446 Notch3 (8G5) Rat mAb	W, IP	H, R
	#2423 Notch4 (L5C5) Mouse mAb	W, IP	H
XP	#3366 Neuropilin-2 (D39A5) XP® Rabbit mAb	W, IP, IHC-P, IF-F	M, R
	#6976 PAR2 (D61D5) Rabbit mAb	W, IP	H
	#2992 Phospho-PDGF Receptor α (Tyr754) (23B2) Rabbit mAb	W, IP	H, M, (R)
	#3170 Phospho-PDGF Receptor α (Tyr849)/PDGF Receptor β (Tyr857) (C43E9) Rabbit mAb	W, IP	H, M, R
	#4547 Phospho-PDGF Receptor α (Tyr1018) Antibody	W	H, M
XP	#3174 PDGF Receptor α (D1E1E) XP® Rabbit mAb	W, IP, IHC-P, IF-IC, F	H, M
XP	#5241 PDGF Receptor α (D13C6) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H
XP	#5278 PDGF Receptor α (D13C6) XP® Rabbit mAb (Biotinylated)	W	H
	#3164 PDGF Receptor α Antibody	W, IP, IHC-P, F	H, M, R
	#3168 Phospho-PDGF Receptor β (Tyr740) (32A9) Rabbit mAb	W	M, (H)
	#4549 Phospho-PDGF Receptor β (Tyr751) (C63G6) Rabbit mAb	W	H, M, (R)
	#3161 Phospho-PDGF Receptor β (Tyr751) Antibody	W, F	H, M, R
	#3166 Phospho-PDGF Receptor β (Tyr751) (88H8) Mouse mAb	W, IP	H, M, R
	#3173 Phospho-PDGF Receptor β (Tyr771) (76D6) Rabbit mAb	W	M, (H)
	#3124 Phospho-PDGF Receptor β (Tyr1009) (42F9) Rabbit mAb	W, IP	H, M
	#2227 Phospho-PDGF Receptor β (Tyr1021) (6F10) Rabbit mAb	W	H, M, R
	#4564 PDGF Receptor β (C82A3) Rabbit mAb	W, IHC-P, F	H, M, R
	#3169 PDGF Receptor β (28E1) Rabbit mAb	W, IP, IHC-P, IHC-F, IF-IC	H, M, R
	#8044 PDGF Receptor β (28E1) Rabbit mAb (Biotinylated)	W	H, M, R
	#3162 PDGF Receptor β Antibody	W	H, M, R
	#3175 PDGF Receptor β (2B3) Mouse mAb	W, IP	M, R, (H)
	#7235 PathScan® Phospho-PDGF Receptor α/β (panTyr) Sandwich ELISA Kit	ELISA	H M
	#7296 PathScan® Phospho-PDGF Receptor α (Tyr849) Sandwich ELISA Kit	ELISA	H
	#7317 PathScan® Phospho-PDGF Receptor α (Tyr849) Sandwich ELISA Antibody Pair	ELISA	H
	#7318 PathScan® Total PDGF Receptor α Sandwich ELISA Kit	ELISA	H
	#7264 PathScan® Total PDGF Receptor α Sandwich ELISA Antibody Pair	ELISA	H
	#7345 PathScan® Phospho-PDGF Receptor β (Tyr751) Sandwich ELISA Kit	ELISA	H M
	#7826 PathScan® Phospho-PDGF Receptor β (Tyr751) Sandwich ELISA Antibody Pair	ELISA	H M
	#3293 PHD-2/Egln1 Antibody	W	H
	#5442 RBPSUH Antibody	W	H, M, R, Mk
	#3433 RECK (D8C7) Rabbit mAb	W	H, M, R, Mk
	#5250 Renin Antibody	W	H
	#2654 Ron (C81H9) Rabbit mAb	W	H
	#4269 Ron (1B5) Mouse mAb	W	H
	#3715 Pro-TGF-α Antibody	W	H, M, (R)
	#3711 TGF-β Antibody	W, IP	H, M, R
	#3712 TGF-β Receptor I Antibody	W	H, R, Mi, (Pg)
	#2519 TGF-β Receptor III Antibody	W, IP	H, M, (R)
	#4221 Phospho-Tie2 (Tyr992) Antibody	W	H, (M)
	#4226 Phospho-Tie2 (Ser1119) Antibody	W	H
	#4224 Tie2 (AB33) Mouse mAb	W, IP	H, B
	#8946 TIMP1 (D10E6) Rabbit mAb	W	H, Mk
	#5738 TIMP2 (D18B7) Rabbit mAb	W	H, M, Mk
	#5673 TIMP3 (D74B10) Rabbit mAb	W	H, M, R, Mk
	#4307 Thymidine Phosphorylase/ECGF1 (D69B12) Rabbit mAb	W, IP	H
	#2937 TP/ECGF1 Antibody	W	H
	#2463 VEGF-B Antibody	W	H
	#2445 VEGF-C Antibody	W	H
	#2893 VEGF Receptor 1 Antibody	W	H
	#4991 Phospho-VEGF Receptor 2 (Tyr951) (15D2) Rabbit mAb	W, IHC-P	H, M
	#2471 Phospho-VEGF Receptor 2 (Tyr951) Antibody	W	H, M
	#2476 Phospho-VEGF Receptor 2 (Tyr951) (7H11) Mouse mAb	W	H, M

APPLICATIONS KEY:

W Western / **IP** Immunoprecipitation / **IHC** Immunohistochemistry / **IF** Immunofluorescence / **F** Flow Cytometry / **ChIP** Chromatin Immunoprecipitation / **(-IC** Immunocytochemistry, **-P** Paraffin, **-F** Frozen) / **E-P** Peptide ELISA

|	Applications	Reactivity
#2474 Phospho-VEGF Receptor 2 (Tyr996) Antibody	W	H, M
#2478 Phospho-VEGF Receptor 2 (Tyr1175) (19A10) Rabbit mAb	W, IHC-P, IF-IC	H, M
#2477 Phospho-VEGF Receptor 2 (Tyr1212) (11A3) Rabbit mAb	W	H, M
#2479 VEGF Receptor 2 (55B11) Rabbit mAb	W, IP, IHC-P, IF-F, IF-IC	H, M
#5168 VEGF Receptor 2 (55B11) Rabbit mAb (Sepharose Bead Conjugate)	IP	H, M
#2472 VEGF Receptor 2 Antibody	W	H, M, (R)
#7335 PathScan® Phospho-VEGFR-2 (Tyr1175) Sandwich ELISA Kit	ELISA	H
#7824 PathScan® Phospho-VEGFR-2 (Tyr1175) Sandwich ELISA Antibody Pair	ELISA	H
#7340 PathScan® Total VEGFR-2 Sandwich ELISA Kit	ELISA	H
#7825 PathScan® Total VEGFR-2 Sandwich ELISA Antibody Pair	ELISA	H
#2904 VEGF Receptor 2 Control Proteins		
#3408 VEGF Receptor 3 (C82A2) Rabbit mAb	W	H
#2638 VEGF Receptor 3 (C28G5) Rabbit mAb	W	H
#2485 VEGF Receptor 3 Antibody	W	H
#2738 VHL Antibody	W	H, M, R, Mk, (B)
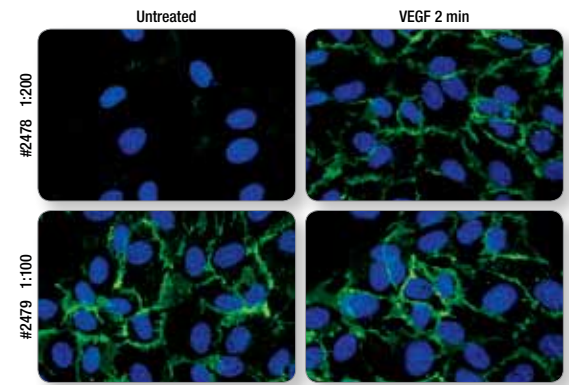
Phospho-VEGF Receptor 2 (Tyr1175) (19A10) Rabbit mAb #2478: Confocal IF analysis of HUVEC, untreated (left) or treated with Human Vascular Endothelial Growth Factor-165 (hVEGF$_{165}$) #8065 (right), using #2478 (top, green) and VEGF Receptor 2 (55B11) Rabbit mAb #2479 (bottom, green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Growth Factors and Cytokines

Unparalleled Product Quality, Consistency, and Dependability

Cell Signaling Technology (CST) offers a growing selection of cytokines and growth factors. These reagents are produced and bioassayed in-house, and are held to the same unparalleled quality standards as the CST™ antibodies you know and trust.

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- Multi-milligram quantities available.
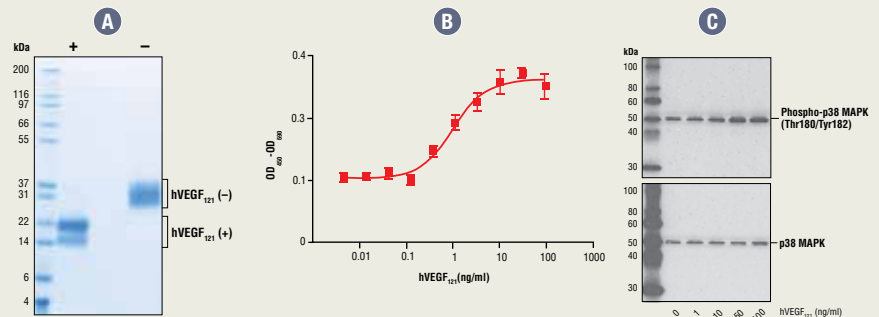
Human Vascular Endothelial Growth Factor-121 (hVEGF$_{121}$) #8908: The purity of recombinant hVEGF$_{121}$ was determined by SDS-PAGE (**A**) of 6 µg reduced (+) and non-reduced (-) recombinant hVEGF$_{121}$ and staining overnight with Coomassie Blue. The proliferation of HUVEC treated with increasing concentrations of hVEGF$_{121}$ was assessed (**B**). After 72-hour treatment with hVEGF$_{121}$, cells were incubated with a tetrazolium salt and the OD$_{450}$ - OD$_{650}$ was determined. Western blot analysis (**C**) of extracts from HUVEC, untreated or treated with hVEGF$_{121}$ for 15 minutes, using Phospho-p38 MAPK (Thr180/Tyr182) (3D7) Rabbit mAb #9215 (upper) and p38 MAPK Antibody #9212 (lower).

#5493 Human Epigen	#5273 Mouse Interleukin-1α (mIL-1α)	#5154 Human Latent Transforming Growth Factor β1 (hLatent TGF-β1)
#6980 Human Erythropoietin (hEPO)	#8900 Human Interleukin-1β (hIL-1β)	#8406 Human Transforming Growth Factor β2 (hTGF-β2)
#5234 Human FGF acidic (hFGF acidic)	#5204 Mouse Interleukin-1β (mIL-1β)	#8425 Human Transforming Growth Factor β3 (hTGF-β3)
#5414 Mouse Basic Fibroblast Growth Factor (mFGF basic/FGF2)	#8929 Human Macrophage Colony Stimulating Factor (hM-CSF)	#5314 Mouse Vascular Endothelial Growth Factor-120 (mVEGF$_{120}$)
#8930 Human Granulocyte Colony Stimulating Factor (hG-CSF)	#5228 Mouse Macrophage Colony Stimulating Factor (mM-CSF)	#8908 Human Vascular Endothelial Growth Factor-121 (hVEGF$_{121}$)
#8922 Human Granulocyte Macrophage Colony Stimulating Factor (hGM-CSF)	#8913 Human Platelet-Derived Growth Factor AA (hPDGF-AA)	#5211 Mouse Vascular Endothelial Growth Factor-164 (mVEGF$_{164}$)
#5191 Mouse Granulocyte Macrophage Colony Stimulating Factor (mGM-CSF)	#8912 Human Platelet-Derived Growth Factor BB (hPDGF-BB)	#5874 Rat Vascular Endothelial Growth Factor-164 (rVEGF$_{164}$)
#8901 Human Interferon-γ (hIFN-γ)	#8925 Human Stem Cell Factor (hSCF)	#8065 Human Vascular Endothelial Growth Factor-165 (hVEGF$_{165}$)
#5222 Mouse Interferon-γ (mIFN-γ)	#5223 Mouse Stem Cell Factor (mSCF)	
#5236 Human Interleukin-1α (hIL-1α)	#5495 Human Transforming Growth Factor α (hTGF-α)	
	#8915 Human Transforming Growth Factor β1 (hTGF-β1)	
	#5231 Mouse Transforming Growth Factor β1 (mTGF-β1)	

Visit www.cellsignal.com for complete product listing.

REACTIVITY KEY:

H human / **M** mouse / **R** rat / **Hm** hamster / **Mk** monkey / **C** chicken / **Mi** mink / **Dm** D. melanogaster / **X** Xenopus / **Z** zebra fish / **B** bovine / **Dg** dog / **Pg** pig / **Sc** S. cerevisiae / **All** all species expected / **( )** 100% sequence homology

7

Cardiovascular Development

Cardiomyocyte Development

β-catenin

The Wnt Signaling pathway is a critical regulator of early cardiomyocyte development. β-catenin is a key downstream effector in the Wnt signaling pathway. In the absence of Wnt signal, β-catenin is phosphorylated by CK1 at Ser45 and GSK-3 at Ser33, Ser37, and Thr41, leading to its ubiquitination and proteasomal degradation. When Wnt ligand is present, GSK-3 is pulled away from the degradation complex, and β-catenin levels are stabilized. β-catenin enters the nucleus where it complexes with the transcription factors LEF and TCF to promote transcription of cardiac-specific genes.

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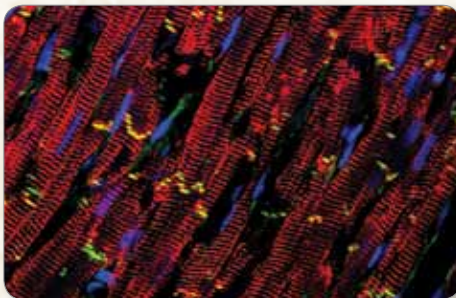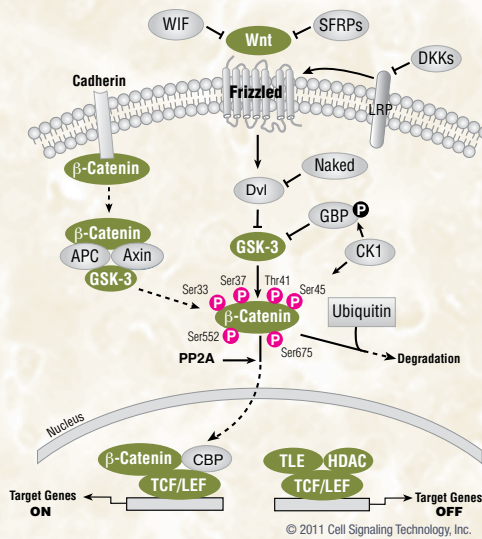
β-Catenin (L54E2) Mouse mAb (Alexa Fluor® 488 Conjugate) #2849: Confocal IF analysis of rat heart using #2849 (green) and Desmin (D93F5) XP® Rabbit mAb #5332 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Wnt/β-catenin Signaling

	Applications	Reactivity
#2951 β-Catenin Antibody Sampler Kit		
#9369 GSK-3 Antibody Sampler Kit		
#2915 Wnt Signaling Antibody Sampler Kit		
#2087 Axin1 (C76H11) Rabbit mAb	W, IP, IHC-P	H, M
#3323 Axin1 (C7B12) Rabbit mAb	W, IP	H, M, R
#2074 Axin1 (C95H11) Rabbit mAb	W, IP, IHC-P	H, Mk
#2151 Axin2 (76G6) Rabbit mAb	W, IP	H
#5863 Axin2 (D48G4) Rabbit mAb	W, IP	H
#2009 Phospho-β-Catenin (Ser33/37) Antibody	W, IP	H, (M, R, X, Z)
#9561 Phospho-β-Catenin (Ser33/37/Thr41) Antibody	W	H, M, R, Mk, (C, X, Z, B, Dg, Pg)
#9565 Phospho-β-Catenin (Thr41/Ser45) Antibody	W	H, M, Mk, (Pg)
#9564 Phospho-β-Catenin (Ser45) Antibody	W	H, (M, R, Pg)
#5651 Phospho-β-Catenin (Ser552) (D8E11) Rabbit mAb	W, IP	H, (M, R, X, Z)
#9566 Phospho-β-Catenin (Ser552) Antibody	W, IP	H, M, (R, C, X, Z)
XP® #4176 Phospho-β-Catenin (Ser675) (D2F1) XP® Rabbit mAb	W, IP, IF-F, IF-IC	H, (M, R, C, X, Z)
#9567 Phospho-β-Catenin (Ser675) Antibody	W, IP	H, R, (M, C, X, Z)
#4270 Non-phospho-β-Catenin (Ser33/37/Thr41) Antibody	W	H, M, R, Mk, (C, X, Z)
#9534 Acetyl-β-Catenin (Lys49) Antibody	W	H, (M, R, Pg)
#9582 β-Catenin (6B3) Rabbit mAb	W, IP, IHC-P, IHC-F	H, M, R, Mk, (X, B, Dg, Pg)
#9562 β-Catenin Antibody	W, IP, IHC-P, ChIP	H, M, R, Mk, (Z)
#9581 β-Catenin Antibody (Amino-terminal Antigen)	W, IP, IF-F	H, M, R, Mk
#9587 β-Catenin Antibody (Carboxy-terminal Antigen)	W, IP, IHC-P, IHC-F, ChIP	H, M, R, Mk, (C, X, B, Dg, Pg)
#2677 β-Catenin (L54E2) Mouse mAb (IF Preferred)	IP, IF-IC, F	H, (M, R, Mk, Pg)
#2849 β-Catenin (L54E2) Mouse mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, (M, R, Mk, Pg)
#5612 β-Catenin (L54E2) Mouse mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H, (M, R, Mk, Pg)
#4627 β-Catenin (L54E2) Mouse mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (M, R, Mk, Pg)
#5265 β-Catenin (L54E2) Mouse mAb (Biotinylated)	F	H
#6898 β-Catenin (L54E2) Mouse mAb (PE Conjugate)	F	H, (M, R, Mk, Pg)
#2698 β-Catenin (L87A12) Mouse mAb	W, IP	H, M, R, Mk
#4500 Phospho-CYLD (Ser418) Antibody	W	H
#8462 CYLD (D1A10) Rabbit mAb	W, IP	H, (M, B)
#3224 Dvl2 (30D2) Rabbit mAb	W, IP	H M R Mk
#3216 Dvl2 Antibody	W, IP	H M R Hm Mk Mi
#3218 Dvl3 Antibody	W, IP	H M R Hm Mk Mi B
#9316 Phospho-GSK-3α (Ser21) (36E9) Rabbit mAb	W, IHC-P	H, M, R, Mk
#8452 Phospho-GSK-3α (Ser21) (D1G2) Rabbit mAb	W, IP	H, M, R, Mk
#9337 Phospho-GSK-3α (Ser21) (46H12) Mouse mAb	W	H, M, R, Mk, Z
#5090 Phospho-GSK-3α (Ser21) (27E5) Mouse mAb	E-P	H
#9327 Phospho-GSK-3α/β (Ser21/9) (37F11) Rabbit mAb (GSK-3α Preferred)	W, IP	H, M, R, Mk
#8566 Phospho-GSK-3α/β (Ser21/9) (D17D2) Rabbit mAb	W, IP	H, M, R, Hm, Mk
#9331 Phospho-GSK-3α/β (Ser21/9) Antibody	W, IHC-P	H, M, R, Mk, Z
XP® #5558 Phospho-GSK-3β (Ser9) (D85E12) XP® Rabbit mAb	W, IP, IF-IC, F	H, M, R, Hm
#9322 Phospho-GSK-3β (Ser9) (D3A4) Rabbit mAb	W, IP	H, M, R
#9323 Phospho-GSK-3β (Ser9) (5B3) Rabbit mAb	W, IHC-P, IF-IC	H, M, R, Mk
#9336 Phospho-GSK-3β (Ser9) Antibody	W	H, M, R, Mk, (Z, B)
#3548 Phospho-GSK-3β (Thr390) Antibody	W	H
XP® #4818 GSK-3α (D80D1) XP® Rabbit mAb	IF-IC, F	H, M, (R)
#4337 GSK-3α (D80E6) Rabbit mAb	W, IP	H, M, R, Hm, Mk
#9338 GSK-3α Antibody	W	H, M, R, Mk
XP® #5676 GSK-3α/β (D75D3) XP® Rabbit mAb	W, IP, IF-IC	H, M, R, Hm, Mk
#9315 GSK-3β (27C10) Rabbit mAb	W, IP, IHC-P	H, M, R, Mk
#9832 GSK-3β (3D10) Mouse mAb	W, IP, IF-IC, F	H, M, R, Hm, Mk

	Applications	Reactivity
#8213 PhosphoPlus® GSK-3β (Ser9) Antibody Duet		
#6312 SignalSilence® GSK-3α siRNA I		H, Mk, (M, R)
#6524 SignalSilence® GSK-3α siRNA II		H
#6301 SignalSilence® GSK-3α/β siRNA		H, (M, R)
#6333 SignalSilence® GSK-3α siRNA I (Mouse Specific)		M
#6335 SignalSilence® GSK-3α siRNA II (Mouse Specific)		M
#6993 SignalSilence® GSK-3β siRNA I (Mouse Specific)		M
#2230 LEF1 (C12A5) Rabbit mAb	W, IP, IF-IC, F	H, M, R
#2286 LEF1 (C18A7) Rabbit mAb	W, IP, F	H, M
#3889 LRP5 (D23F7) Rabbit mAb	W, IP	H
#5440 LRP5 (D5G4) Rabbit mAb	W	H, M, R, Mk
#5731 LRP5 (D80F2) Rabbit mAb	W, IP	H, M, R
#2568 Phospho-LRP6 (Ser1490) Antibody	W, IP	H (M)
#3395 LRP6 (C47E12) Rabbit mAb	W, IP	H, M, (R)
#2560 LRP6 (C5C7) Rabbit mAb	W, IP	H, R
#2206 TCF1 (C46C7) Rabbit mAb	W, IP	H, M, R
#2203 TCF1 (C63D9) Rabbit mAb	W, IP, IHC-P, IF-IC, F	H, M
#2883 TCF3 (D15G11) Rabbit mAb	W, IP	H, Mk
#2569 TCF4 (C48H11) Rabbit mAb	W, IP, ChIP	H, (M, C)
#2565 TCF4 (C9B9) Rabbit mAb	W, IP, ChIP	H, (M, R)
#2953 TCF4 (L40C3) Mouse mAb	W, IP	H
#3396 TCF8/ZEB1 (D80D3) Rabbit mAb	W, IP	H, (M, R)
#2721 Wnt3a (C64F2) Rabbit mAb	W, IP	M, (H, R)
#2391 Wnt3a Antibody	W	M, (H)
#2530 Wnt5a/b (C27E8) Rabbit mAb	W	H, M
#2392 Wnt5a Antibody	W	M, (H)

Hippo Signaling

	Applications	Reactivity
#9157 Phospho-LATS1 (Ser909) Antibody	W	H, (M, R, Mk)
#8654 Phospho-LATS1 (Thr1079) (D57D3) Rabbit mAb	W	H, (M, R, Mk)
#9159 Phospho-LATS1 (Thr1079) Antibody	W, IF-IC	H, M, Mk, (R, C, Z, B)
#3477 LATS1 (C66B5) Rabbit mAb	W, IP	H, M, Mk
#9153 LATS1 Antibody	W	H, Mk
#5888 LATS2 (D83D6) Rabbit mAb	W	H, (Mk)
#8843 Phospho-MOB1 (Thr12) (D2E3) Rabbit mAb	W	H, M, R, Mk,(X)
#3863 MOB1 Antibody	W	H, M, R
#3681 Phospho-Mst1 (Thr183)/Mst2 (Thr180) Antibody	W	H, M, (R)
#3682 Mst1 Antibody	W, IP	H, M, R, Mk, B
#3507 Sav1 Antibody	W, IP	H, R, Mk
#4883 TAZ (V386) Antibody	W	H, M, R
#2149 TAZ Antibody	W	H
#8526 TEAD1 Antibody	W	H, M, R, (Mk)
#4911 Phospho-YAP (Ser127) Antibody	W, IHC-P	H, M, R, (Mk, B)
#4912 YAP Antibody	W, IP, IHC-P, IF-IC, F	H, M, R, Mk
#8418 YAP/TAZ (D24E4) Rabbit mAb	W, IP, IHC-P	H, Mk

Application References

#9561 Phospho-β-Catenin (Ser33/37/Thr41) Antibody:
Amit, S. et al. (2002) *Genes and Development* 16, 1066-1076. (WB) / Hagen, T. et al. (2002) *J Biol Chem* 277, 23330-23335. (WB)

#9565 Phospho-β-Catenin (Thr41/Ser45) Antibody:
Amit, S. et al. (2002) *Genes and Development* 16, 1066-1076. (WB)

#9562 β-Catenin Antibody: Zhao, J.X. et al. (2011) *J Biol Chem* 286, 16426-16434. (WB)

#3216 Dvl2 Antibody: Liang, J. et al. (2011) *Mol Cell Biol* 31, 2577-2590. (WB)

#9316 Phospho-GSK-3α (Ser21) (36E9) Rabbit mAb:
Allard, D. et al. (2008) *J Biol Chem* 283, 19739-19747. (IHC-P)

#9323 Phospho-GSK-3β (Ser9) (5B3) Rabbit mAb:
Guertin, D.A. et al. (2009) *Cancer Cell* 15, 148-159. (IHC-P)

#9331 Phospho-GSK-3α/β (Ser21/9) Antibody:
Armstrong, J. L. et al. (2001) *J Biol Chem* 276, 952-956. (WB) / Fasshauer, M. et al. (2000) *J Biol Chem* 275, 25494-25501. (WB) / Zheng, W. H. et al. (2000) *J Biol Chem* 275, 39152-39158. (WB) / Peyssonnaux, C. et al. (2000) *Mol Cell Biol* 20, 7068-7079. (WB) / Allard, D. et al. (2008) *J Biol Chem* 283, 19739-19747. (WB) / Popkie, A.P. et al. (2010) *J Biol Chem* 285, 41337-41347. (WB)

#9336 Phospho-GSK-3β (Ser9) Antibody: Crowder, R.J. and Freeman, R.S. (2000) *J Biol Chem* 275, 34266-34271. (WB) / Fasshauer, M. et al. (2000) *J Biol Chem* 275, 25494-25501. (WB) / Ohteki, T. et al. (2000) *J. Exp. Med.* 192, 991-1004. (WB) / Okano, J. et al. (2000) *J Biol Chem* 275, 30934-30942. (WB) / Nakamura, N. et al. (2000) *Mol Cell Biol* 20, 8969-8982. (WB) / Morfini, G. et al. (2002) *EMBO* 21, 281-293. (IF-IC)

Application References continued on next page.

YAP

YAP is a critical downstream effector of the Hippo signaling pathway. YAP and TAZ are transcriptional co-activators that bind transcription factors to regulate cell proliferation, differentiation, and organ size during development.
At high cell density, Hippo signaling through Mst1/2 and LATS1/2 results in YAP/TAZ phosphorylation, which causes cytoplasmic anchoring by 14-3-3 proteins and inhibition of transcription. Hippo signaling has been recently shown to inhibit the Wnt/β-catenin pathway and limit cardiomyocyte proliferation and heart size in mouse embryos.
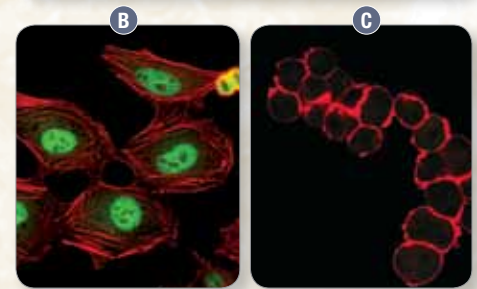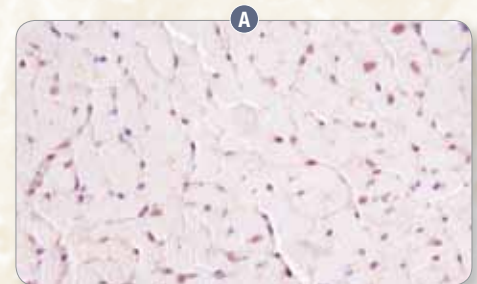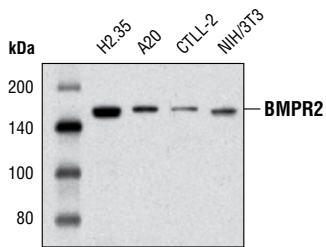
YAP Antibody #4912: IHC analysis (**A**) of paraffin-embedded mouse heart using #4912. Confocal IF analysis of HeLa (**B**) and Jurkat cells (**C**) using #4912 (green). Actin filaments were labeled with DY-554 phalloidin (red).
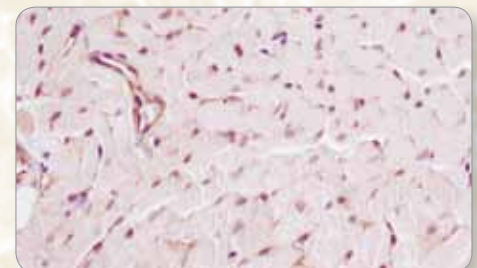
**YAP/TAZ (D24E4) Rabbit mAb #8418:** IHC analysis of paraffin-embedded mouse heart using #8418.

REACTIVITY KEY:
H human / **M** mouse / **R** rat / **Hm** hamster / **Mk** monkey / **C** chicken / **Mi** mink / **Dm** D. melanogaster / **X** Xenopus / **Z** zebra fish / **B** bovine / **Dg** dog / **Pg** pig / **Sc** S. cerevisiae / **All** all species expected / **( )** 100% sequence homology
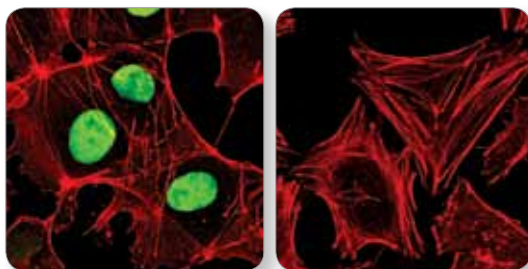
9

BMPR2 Antibody #6979: Western blot analysis of extracts from various cell lines using #6979.
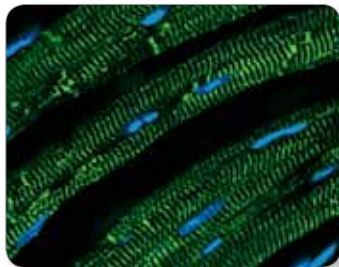
Desmin (D93F5) XP® Rabbit mAb #5332: Confocal IF analysis of mouse heart tissue using #5332 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).
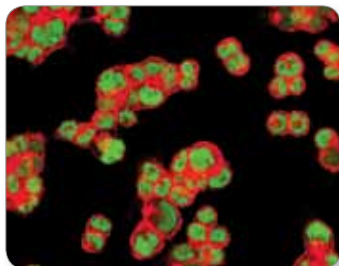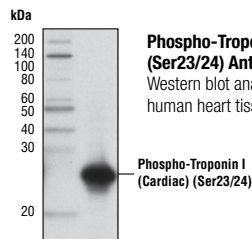

GATA-6 (D61E4) XP® Rabbit mAb #5851: Confocal IF analysis of KM12 cells using #5851 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Cardiomyocyte Markers

		Applications	Reactivity
#9776	Myosin Light Chain 2 Antibody Sampler Kit		
#3134	α-Actinin Antibody	W, IF-IC	H, M, R, Hm, Mk
#6979	BMPR2 Antibody	W, IP	H, M
XP® #5332	Desmin (D93F5) XP® Rabbit mAb	W, IF-F, IF-IC	H, M, R, (Mk)
#4024	Desmin Antibody	W, IF-F	M, R, (H, Mk)
XP® #5851	GATA-6 (D61E4) XP® Rabbit mAb	W, IF-IC	H
#4253	GATA-6 (A549) Antibody	W	H
XP® #5030	MEF2C (D80C1) XP® Rabbit mAb	W, IP, IF-IC	H, M
#3674	Phospho-Myosin Light Chain 2 (Thr18/Ser19) Antibody	W, IF-IC	H, M, (R, C, X, Z, B, Pg)
#3671	Phospho-Myosin Light Chain 2 (Ser19) Antibody	W, IF-IC	H, M, R, Dm, (C, X, Z, B, Pg)
#3675	Phospho-Myosin Light Chain 2 (Ser19) Mouse mAb	W, IF-IC	H, M, R, B, Pg
#3672	Myosin Light Chain 2 Antibody	W	H, M, R, (C, B, Pg)
#5444	NKX2.5 Antibody	W, IP	H
#8496	Phospho-Phospholamban (Ser16/Thr17) Antibody	W	R, (H, M, B, Dg, Pg)
#8495	Phospholamban Antibody	W	H, M, R
XP® #3579	Sox2 (D6D9) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, (Mk, B, Dg)
XP® #5049	Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
XP® #5179	Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H, (Mk, B, Dg)
XP® #5067	Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
XP® #5024	Sox2 (D6D9) XP® Rabbit mAb (ChIP Formulated)	ChIP	H, (Mk, B, Dg)
#3728	Sox2 (C70B1) Rabbit mAb (IHC Preferred)	W, IHC-P	M
#2748	Sox2 Antibody	W, IP, ChIP	H, M, (R, Mk, B, Dg)
#4900	Sox2 (L1D6A2) Mouse mAb	W, IF-IC, F	H, M, (R, B, Dg)
#4195	Sox2 (L73B4) Mouse mAb	W	H, M, (Mk, B, Dg)
#8888	Phospho-Survivin (Thr34) (D2E11) Rabbit mAb	W, IP	H (Mk)
#2808	Survivin (71G4B7) Rabbit mAb	W, IP, IHC-P, IHC-F, IF-IC, F	H, M, R
#4004	Phospho-Troponin I (Cardiac) (Ser23/24) Antibody	W	H, M, R
#4002	Troponin I Antibody	W	M, (H, R, Pg)
#5593	Troponin T (Cardiac) Antibody	W	H, R, (Mk)
#3910	Tropomyosin-1 (D12H4) Rabbit mAb	W	H, M, R
#3913	Tropomyosin-1/3 (D17B8) Rabbit mAb	W	H, M, R

Sox2 (D6D9) XP® Rabbit mAb #3579: Confocal IF analysis of NTERA-2 (left) and HeLa cells (right) using #3579 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Phospho-Troponin I (Cardiac) (Ser23/24) Antibody #4004: Western blot analysis of extracts from human heart tissue using #4004.
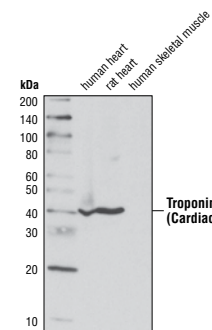
Troponin T (Cardiac) Antibody #5593: Western blot analysis of extracts from human and rat heart and human skeletal muscle using #5593.

Unparalleled Product Quality, Validation, and Technical Support

Application References

#9338 GSK-3α Antibody: Wu, M. et al. (2009) *PLoS One* 4, e6430. (WB)

#9315 GSK-3β (27C10) Rabbit mAb: Laguë, M.N. et al. (2008) *Carcinogenesis* 29, 2062-2072. (WB) / Guertin, D.A. et al. (2009) *Cancer Cell* 15, 148-159. (WB) / Wu, M. et al. (2009) *PLoS One* 4, e6430. (WB) / Wang, J. et al. (2009) *J Histochem Cytochem* 57, 363-371. (IHC-P) / Perez-Costas, E. et al. (2010) *PLoS One* 5, e8911. (IF-IC)

#2230 LEF1 (C12A5) Rabbit mAb: Luderer, H.F. et al. (2011) *J Biol Chem* 286, 18444-18451. (WB)

#2568 Phospho-LRP6 (Ser1490) Antibody: Liang, J. et al. (2011) *Mol Cell Biol* 31, 2577-2590. (WB)

#2560 LRP6 (C5C7) Rabbit mAb: Liang, J. et al. (2011) *Mol Cell Biol* 31, 2577-2590. (WB)

#3681 Phospho-Mst1 (Thr183)/Mst2 (Thr180) Antibody: Lehtinen, M.K. et al. (2006) *Cell* 125, 987-1001. (WB)

#3682 Mst1 Antibody: Reu, F.J. et al. (2006) *Cancer Res* 66, 2785-2793. (WB)

#3674 Phospho-Myosin Light Chain 2 (Thr18/Ser19) Antibody: Birukova, A. A. et al. (2004) *J Cellular Phys* 201, 55-50. (IF-IC, WB) / Watanabe, T. et al. (2007) *Mol Biol Cell* 18, 605-616. (WB) / Bhadriraju, K. et al. (2007) *BMC Cell Biol* 8, 43. (IF-IC, WB) / Ponsaerts, R. et al. (2008) *Invest Ophthalmol Vis Sci* 49, 4816-4827. (IF-IC) / Li, Z. et al. (2006) *Mol Biol Cell* 26, 4240-4256. (WB)

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Hemangioblast Markers

	Applications	Reactivity
XP #4336 AML1 (D33G6) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, Mk
#8529 AML1 (D4A6) Rabbit mAb (Mouse Preferred)	W, IP	H, M, (R, Mk)
#4334 AML1 Antibody	W, IF-IC, F	H, Mk
#8229 AML1 Antibody (Mouse Preferred)	W	H, M, (R, Mk)
#3569 CD34 (ICO115) Mouse mAb	IHC-P, F	H
XP #4589 GATA-1 (D24E4) XP® Rabbit mAb	W, IP, IF-IC, F	H
XP #3535 GATA-1 (D52H6) XP® Rabbit mAb	W, IP, IHC-P, IF-IC, F	H, M, R
#4591 GATA-1 Antibody	W, IP	H
#2479 VEGF Receptor 2 (55B11) Rabbit mAb	W, IP, IHC-P, IF-F, IF-IC	H, M
#5168 VEGF Receptor 2 (55B11) Rabbit mAb (Sepharose Bead Conjugate)	IP	H, M
#2472 VEGF Receptor 2 Antibody	W	H, M, (R)

Angioblast Markers

	Applications	Reactivity
XP #2500 VE-Cadherin (D87F2) XP® Rabbit mAb	W, IP, IF-IC, F	H, Dm, B, Pg, (Mk)
#2158 VE-Cadherin Antibody	W, IF-IC	H, Dm, B
#2479 VEGF Receptor 2 (55B11) Rabbit mAb	W, IP, IHC-P, IF-F, IF-IC	H, M
#5168 VEGF Receptor 2 (55B11) Rabbit mAb (Sepharose Bead Conjugate)	IP	H, M
#2472 VEGF Receptor 2 Antibody	W	H, M, (R)

Endothelial Cell Markers

	Applications	Reactivity
XP #2500 VE-Cadherin (D87F2) XP® Rabbit mAb	W, IP, IF-IC, F	H, Dm, B, Pg, (Mk)
#2158 VE-Cadherin Antibody	W, IF-IC	H, Dm, B
#3568 CD31 (PECAM-1) (158-2B3) Mouse mAb	F	H
#3528 CD31 (PECAM-1) (89C2) Mouse mAb	W, IP, IHC-P, IF-IC, F	H
#3290 Endoglin Antibody (Mouse Specific)	W	M
#4706 Integrin β1 Antibody	W	H, M, R, Mk
#4224 Tie2 (AB33) Mouse mAb	W, IP	H, B

Hemangioblast, the precursor of both blood and endothelial cells

VEGF Receptor 2 (55B11) Rabbit mAb #2479: IHC analysis of paraffin-embedded breast angiosarcoma using #2479 (left). A serial section is stained for CD31 (PECAM-1), an endothelial cell marker (right).

CD31 (PECAM-1) (89C2) Mouse mAb #3528: Confocal IF analysis of HUVEC (**A**) and HeLa cells (**B**) using #3528 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® (fluorescent DNA dye). IHC analysis (**C**) of paraffin-embedded human capillary hemangioma using #3528.

VE-Cadherin (D87F2) Rabbit mAb #2500: Flow cytometric analysis of HeLa cells (blue) and HUVEC (green) using #2500.
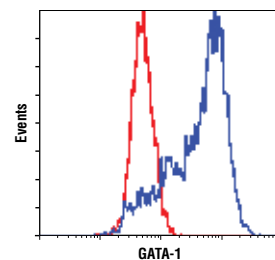
GATA-1 (D52H6) XP® Rabbit mAb #3535: Flow cytometric analysis of HeLa (red) and K-562 cells (blue) using #3535.

Application References

#3671 Phospho-Myosin Light Chain 2 (Ser19) Antibody: John, G. R. et al. (2004) *J Neurosci* 24, 2837-2845. (IF-IC, WB) / Iwabu, A. et al. (2004) *J Biol Chem* 279, 14551-14560. (WB) / Kamijo, K. et al. (2006) *Mol Biol Cell* 17, 43-55. (IF-IC) / Mayanagi, T. et al. (2008) *J Biol Chem* 283, 31183-31196. (WB) / Wardle, R.L. et al. (2007) *Am J Physiol Heart Circ Physiol* 293, H23-H29. (WB)

#3675 Phospho-Myosin Light Chain 2 (Ser19) Mouse mAb: Sakurada, K. et al. (1998) *Am J Physiol* 274, 1563-1572. (IF-IC, WB) / Totsukawa, F. et al. (2000) *J Cell Biol* 150, 797-806. (IF-IC) / Watanabe, T. et al. (2007) *Mol Biol Cell* 18, 605-616. (WB)
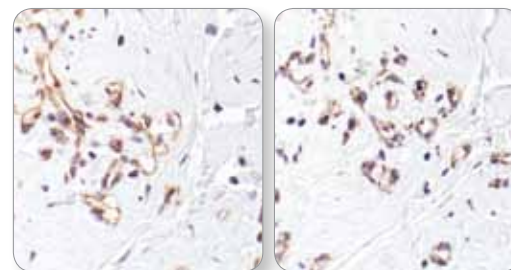
#3672 Myosin Light Chain 2 Antibody: Watanabe, T. et al. (2007) *Mol Biol Cell* 18, 605-616. (WB) / Wardle, R.L. et al. (2007) *Am J Physiol Heart Circ Physiol* 293, H23-H29. (WB) / Mayanagi, T. et al. (2008) *J Biol Chem* 283, 31183-31196. (WB) / Faure-André, G. et al. (2008) *Science* 322, 1705-1710. (WB)

#4004 Phospho-Troponin I (Cardiac) (Ser23/24) Antibody: Birkeland, J.A. et al. (2007) *Am J Physiol Heart Circ Physiol* 293, H2367-H2376. (WB) / Palpant, N.J. et al. (2008) *Cardiovasc Res* 80, 209-218. (WB)
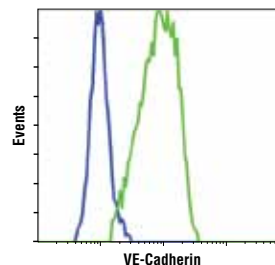
**#4911 Phospho-YAP (Ser127) Antibody:** Donninger, H. et al. (2011) *J Biol Chem* 286, 18483-18491. (WB)

REACTIVITY KEY:

H human / **M** mouse / **R** rat / **Hm** hamster / **Mk** monkey / **C** chicken / **Mi** mink / **Dm** D. melanogaster / **X** Xenopus / **Z** zebra fish / **B** bovine / **Dg** dog / **Pg** pig / **Sc** S. cerevisiae / **All** all species expected / **( )** 100% sequence homology

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Cardiovascular Development continued

Hematopoietic Stem Cell Markers

|	Applications	Reactivity
#4477 ABCG2 Antibody	W	H, M, R, (Mk, X, B, Dg)
XP® #4336 AML1 (D33G6) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, Mk
#4334 AML1 Antibody	W, IF-IC, F	H, Mk
#8229 AML1 Antibody (Mouse Preferred)	W	H, M, (R, Mk)
XP® #6964 Bmi1 (D20B7) XP® Rabbit mAb	W, IP, IF-IC, ChIP	H, Mk
#5856 Bmi1 (D42B3) Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#2830 Bmi1 Antibody	W	H, Mk, (B)
#5855 Bmi1 (DC9) Mouse mAb	W	H, M, R, Mk
#3569 CD34 (ICO115) Mouse mAb	IHC-P, F	H
#4115 CDCP1 Antibody	W, IP, IF-IC	H
#4540 EOMES Antibody	W	M, (H, R, Mk)
XP® #4589 GATA-1 (D24E4) XP® Rabbit mAb	W, IP, IF-IC, F	H
XP® #3535 GATA-1 (D52H6) XP® Rabbit mAb	W, IP, IHC-P, IF-IC, F	H, M, R
#4591 GATA-1 Antibody	W, IP	H
#4595 GATA-2 Antibody	W	H, M, R
XP® #5852 GATA-3 (D13C9) XP® Rabbit mAb	W, IF-IC, F	H, (Mk)
#5849 GFI1b (D3G2) Rabbit mAb	W	H, M, R, Mk
XP® #3074 c-Kit (D13A2) XP® Rabbit mAb	W, IP, IF-IC	H, M
XP® #5749 c-Kit (D13A2) XP® Rabbit mAb (Biotinylated)	W	H, M
#3392 c-Kit Antibody	W	H
#3308 c-Kit (Ab81) Mouse mAb	W, IP, IF-IC, F	H
#3310 c-Kit (Ab81) Mouse mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H
#3606 NCAM (CD56) Antibody	W	H, M, R
#3576 CD56 (NCAM) (123C3) Mouse mAb	W, IHC-P, F	H
#2258 PU.1 (9G7) Rabbit mAb	W, IP, IHC-P, IF-IC, F, ChIP	H, M, (Mk, Pg)
#2216 PU.1 (9G7) Rabbit mAb (Alexa Fluor® 488 Conjugate)	F	H, M
#2240 PU.1 (9G7) Rabbit mAb (Alexa Fluor® 647 Conjugate)	F	H, M
#2266 PU.1 Antibody	W, IP, IHC-P, IF-IC, F, ChIP	H, M, (Mk, Pg)
#2093 SCF (C19H6) Rabbit mAb	W, IHC-P, F	H
#2273 SCF Antibody	W	H
#5419 ZFX (L28B6) Mouse mAb	W	H

Application References

#3535 GATA-1 (D52H6) XP® Rabbit mAb: Liu, Z.J. et al. (2011) *Blood* 117, 4106-4117. (WB) / Skorokhod, O.A. et al. (2010) *Blood* 116, 4328-4337. (WB)

#5852 GATA-3 (D13C9) XP® Rabbit mAb: Malu, D.T. et al. (2011) *J Immunol* 186, 6271-6279. (F)
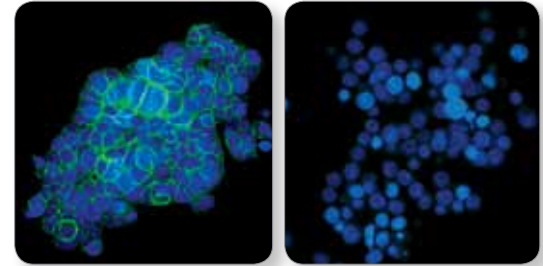
c-Kit (D13A2) XP® Rabbit mAb #3074: Confocal IF analysis of NCI-H526 (left) and Jurkat cells (right) using #3074 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).
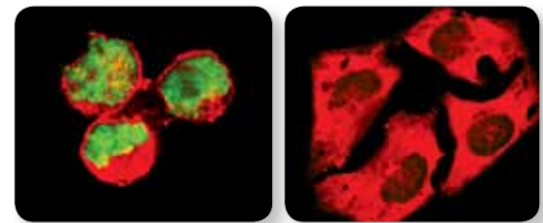
GATA-1 (D24E4) XP® Rabbit mAb #4589: Confocal IF analysis of K-562 (left) and HeLa cells (right) using #4589 (green) and S6 Ribosomal Protein (54D2) Mouse mAb #2317 (red).
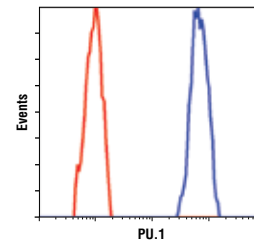

PU.1 (9G7) Rabbit mAb #2258: Flow cytometric analysis of THP-1 cells using #2258 (blue) compared to a nonspecific negative control antibody (red).

AML1

AML1 (also known as Runx1, CBFA2, and PEBP2αB) is a member of the core binding factor (CBF) family of transcription factors. It is required for normal development of all hematopoietic lineages. AML1 forms a heterodimeric DNA binding complex with its partner protein CBFβ and regulates the expression of cellular genes by binding to promoter and enhancer elements. AML1 is commonly translocated in hematopoietic cancers: chromosomal translocations include t(8;21) AML1-ETO, t(12;21)TEL-AML, and t(8;21) AML-M2. Phosphorylation of AML1 on several potential serine and threonine sites, including Ser249, is thought to occur in an Erk-dependent manner.
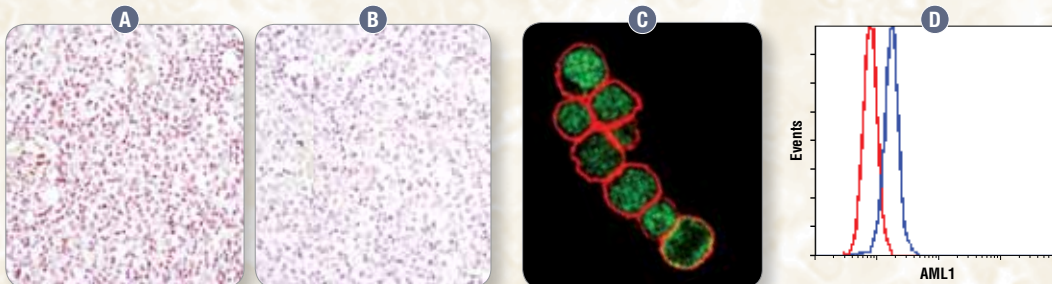
AML1 (D33G6) XP® Rabbit mAb #4336: IHC analysis of paraffin-embedded human non-Hodgkin's lymphoma using #4336 in the presence of control peptide (**A**) or antigen-specific peptide (**B**). Confocal IF analysis (**C**) of Jurkat cells using #4336 (green). Actin filaments were labeled with DY-554 phalloidin (red). Flow cytometric analysis (**D**) of Jurkat cells using #4336 (blue) compared to a nonspecific negative control antibody (red).

Cardiovascular Disease

Cardiovascular disease is one of the leading causes of death worldwide and encompasses disorders such as atherosclerosis, coronary artery disease, and stroke. Many of these disorders have underlying problems with inflammation and lipid metabolism. Cell Signaling Technology offers phospho-specific and total protein antibodies, cytokines and growth factors, kits, and related reagents for the study of signaling mechanisms related to the cardiovascular disease state.

Please visit www.cellsignal.com for a complete product listing or to order a copy of our Immunology and Inflammation or Cellular Metabolism Brochures.

Inflammation is a critical component of cardiovascular disease. During atherosclerosis, arterial plaque formation begins with accumulation of macrophages at sites within the vascular endothelium. NF-κB signaling in macrophages and endothelial cells promotes inflammation through expression of pro-inflammatory cytokines, matrix metalloproteinases (MMPs), and various adhesion molecules. Please see our website for a list of products specific to NF-κB and other signaling molecules related to inflammation.

Blood serum cholesterol and triglyceride levels are important indicators of risk for cardiovascular disease. These lipids are absorbed by macrophages at sites within the vascular endothelium, forming the basis for build up of fatty plaques that are the hallmark of atherosclerosis. Fatty plaques can become dislodged from their original site of synthesis, enter the bloodstream, and block blood flow in narrow vessels of the brain, resulting in stroke. One important regulator of lipid metabolism is AMPK. AMPK controls cholesterol synthesis through inhibition of the rate-limiting enzyme, HMG-CoA reductase. This is the same enzyme that is inhibited by the widely used class of lipid lowering drugs known as the statins. AMPK regulates triglyceride and VLDL synthesis through its effects on HNF-4 and fatty acid synthase. There is growing evidence that AMPK also plays a protective role in the heart during cardiac hypertrophy and ischemia. Please see our website for a list of products specific to AMPK and other regulators of lipid metabolism.
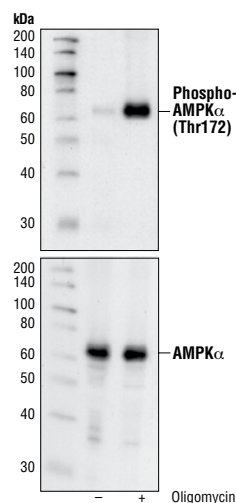

Phospho-AMPKα (Thr172) (40H9) Rabbit mAb #2535: Western blot analysis of extracts from C2C12 cells, untreated or oligomycin-treated (0.5 μM), using #2535 (upper) or AMPKα Antibody #2532 (lower).
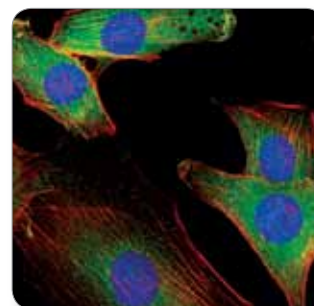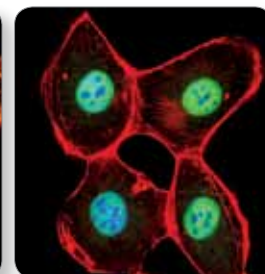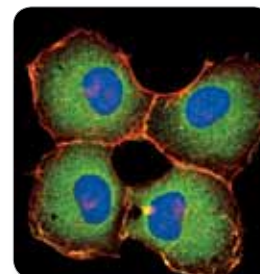

AMPKβ1/2 (57C12) Rabbit mAb #4150: Confocal IF analysis of C2C12 cells using #4150 (green). Actin filaments were labeled with Alexa Fluor® 555 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).
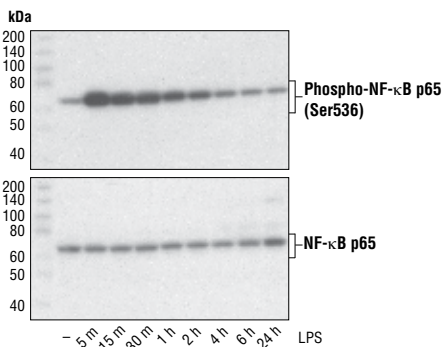
Phospho-NF-κB p65 (Ser536) (93H1) Rabbit mAb #3033: Western blot analysis of extracts from THP-1 cells, differentiated with TPA #4174, (80 nM, 24hr) and treated with 1 μg/ml LPS for the indicated times, using #3033 (upper) and NF-κB p65 (C22B4) Rabbit mAb #4764 (lower).
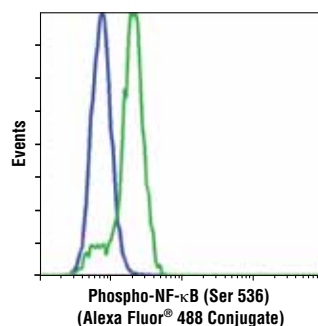
Phospho-NF-κB p65 (Ser536) (93H1) Rabbit mAb (Alexa Fluor® 488 Conjugate) #4886: Flow cytometric analysis of HeLa cells, untreated (blue) or treated with hTNF-α #8902 (green), using #4886.
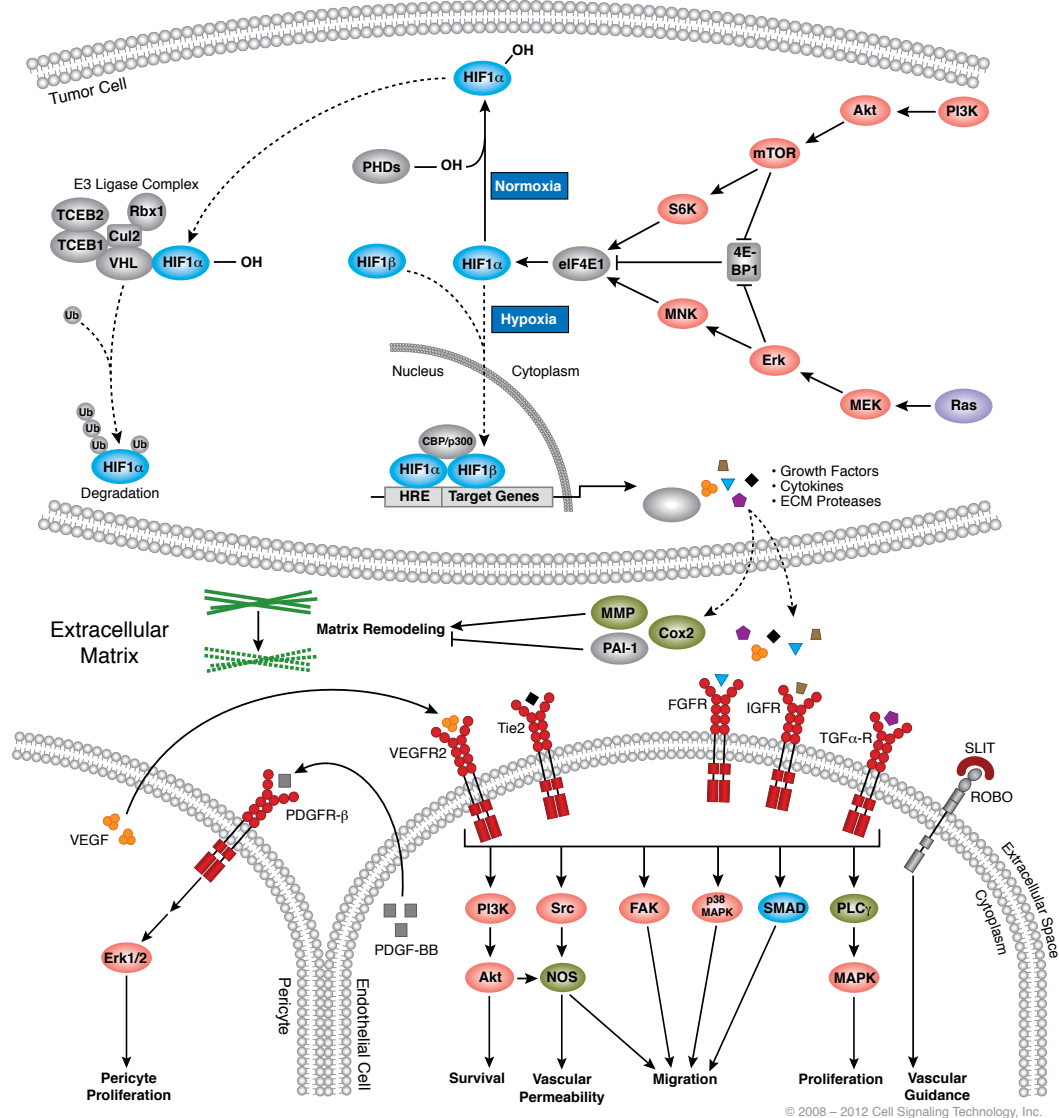

NF-κB p65 (D14E12) XP® Rabbit mAb #8242: Confocal IF analysis of HT-1080 cells, untreated (left) or treated with hTNF-α #8902 (20 ng/ml, 20 min) (right), using #8242 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

REACTIVITY KEY:

H human / **M** mouse / **R** rat / **Hm** hamster / **Mk** monkey / **C** chicken / **Mi** mink / **Dm** D. melanogaster / **X** Xenopus / **Z** zebra fish / **B** bovine / **Dg** dog / **Pg** pig / **Sc** S. cerevisiae / **All** all species expected / **( )** 100% sequence homology

13

Signaling Pathways

Angiogenesis

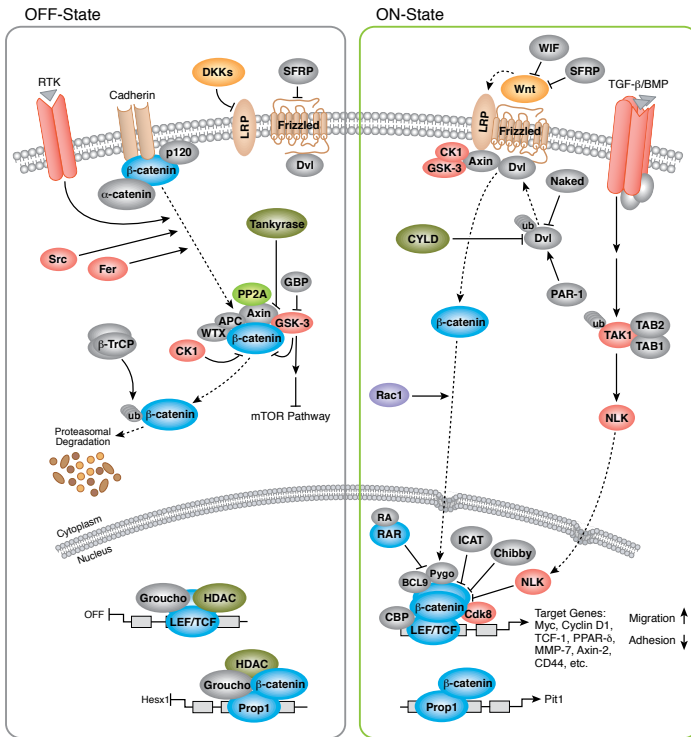© 2008 – 2012 Cell Signaling Technology, Inc.

Pathway Description: Angiogenesis results in the formation of new blood vessels, and can be induced by tumor growth, tissue wound, and inflammation. Rapid tumor cell growth creates intracellular hypoxia. Hypoxia-inducible factor (HIF) is a transcription factor that responds to changing intracellular oxygen concentration. Under typical oxygen levels (normoxia), HIF is hydroxylated and acetylated, modifications that target the transcription factor for VHL mediated ubiquitin degradation. During hypoxia, HIF accumulates and is transported to the nucleus where it induces expression of numerous target gene products. Secreted growth factors (such as VEGF, FGF, and TGF) induce signaling pathways (including PLCγ, PI3K, Src, Smad signaling) that result in endothelial cell proliferation, increased vascular permeability and cell migration. In addition to hypoxia, PI3K and Ras pathways can increase HIF expression by promoting HIF translation.

Pericytes are support cells that provide structural support for newly formed blood vessels, promote endothelial cell survival, guide sprouting vessels, and regulate vasoconstriction and dilation. This is done through a reciprocal signaling mechanism in which PDGF-BB secreted into the matrix by endothelial cells acts as a ligand for PDGF receptor-β located on the pericyte membrane. In return, pericytes produce and secrete VEGF that signals through the endothelial VEGF receptor.

Extracellular matrix proteases and regulators induce tissue matrix remodeling in preparation for migration of endothelial cells from existing vessels to form new tubing. Tissue wounding, ischemia, or inflammation recruit macrophages and bone marrow-derived inflammatory cells (BDMC) to wound areas, and secrete a similar panel of proteins to induce angiogenesis.

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Direct Stimulatory Modification
Direct Inhibitory Modification
Multistep Stimulatory Modification
Multistep Inhibitory Modification
Tentative Stimulatory Modification
Tentative Inhibitory Modification
Transcriptional Stimulatory Modification
Transcriptional Inhibitory Modification

Wnt/β-Catenin Signaling

OFF-State / ON-State

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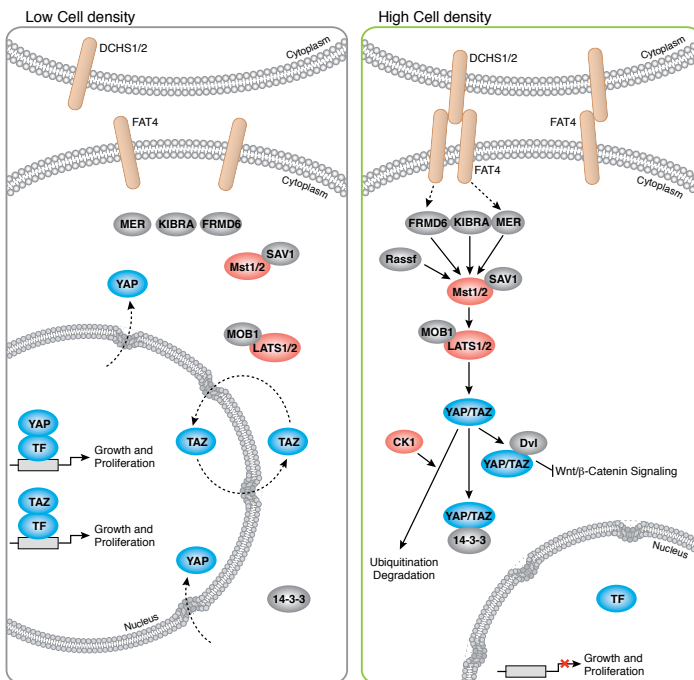
Pathway Description: The Wnt/β-Catenin pathway regulates cell fate decisions during development of vertebrates and invertebrates. The Wnt-ligand is a secreted glycoprotein that binds to Frizzled receptors, which triggers a cascade resulting in displacement of the multifunctional kinase GSK-3β from the APC/Axin/GSK-3β-complex. In the absence of Wnt-signal (Off-state), β-catenin, an integral cell-cell adhesion adaptor protein as well as transcriptional co-regulator, is targeted for degradation by the APC/Axin/GSK-3β-complex. Appropriate phosphorylation of β-catenin by coordinated action of CK1 and GSK-3β leads to its ubiquitination and proteasomal degradation through the β-TrCP/SKP complex. In the presence of Wnt binding (On-state), Dishevelled (Dvl) is activated by phosphorylation and poly-ubiquitination, which in turn recruits GSK-3β away from the degradation complex. This allows for stabilization of β-catenin levels, Rac1-dependent nuclear translocation and recruitment to the LEF/TCF DNA-binding factors where it acts as an activator for transcription by displacement of Groucho-HDAC co-repressors. Additionally, in complex with the homeodomain factor Prop1, β-catenin has also been shown to act in context-dependent activation as well as repression complexes. Importantly, point-mutations in β-catenin lead to its deregulated stabilization. APC and Axin mutations also have been documented in some tumors, underscoring the deregulation of this pathway in human cancer. During development, the Wnt/β-catenin pathway integrates signals from many other pathways including retinoic acid, FGF, TGF-β, and BMP in many different cell-types and tissues. In addition, GSK-3β is also involved in glycogen metabolism and other key pathways, which has made its inhibition relevant to diabetes and neurodegenerative disorders.

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Hippo Signaling

Low Cell density / High Cell density

Transcription Factors (TF) include: TEAD, TEF, RunX1, RunX2, p73 PPARγ and others

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Pathway Description: Hippo signaling is an evolutionarily conserved pathway that controls cell proliferation, apoptosis, and organ size in response to changing cell density levels. At relative low cell density, transcription co-activators YAP and TAZ bind transcription factors to induce expression of genes that favor cell growth and proliferation. Transcription factors activated following interaction with YAP and/or TAZ include TEAD, Runx2, p73, and TBX5. Interaction with p73 follows DNA damage and may promote apoptosis; most other activated transcription factors likely activate transcription of genes favoring cell growth and proliferation. As cell density increases, interaction between membrane-bound upstream hippo pathway regulators trigger activation of cytoplasmic kinases Mst1/2 and LATS1/2. Activated Mst kinase (the eponymous Hippo in Drosophila) associates with the adaptor WW45 and activates the downstream LATS kinase, which phosphorylates YAP and TAZ. Phosphorylation of these co-activators allows binding of the cytoplasmic anchor 14-3-3 protein. Prevented from entering the nucleus, YAP and TAZ can no longer help promote transcription of genes that favor increased cell growth and proliferation. Several parts of the pathway in mammalian cells remain unclear, but are suggested by better-characterized Drosophila counterparts. Cell surface protein interactions may involve Dachsous and Fat cadherins; the mechanism of Mst activation by upstream regulators Merlin and FRMD6 (Expanded in Drosophila) also remains unclear. Kinases PKA and PAK may inhibit Merlin while activated Fat receptor may inhibit cytoplasmic Dachsous.

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**GREECE: Bioline Scientific Douros
Bro – E. Demagos O.e.**
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Hong Kong: Gene Company Limited
Tel: (852) 2896-6283 / www.genehk.com

HUNGARY: Kvalitex Kft.
Tel: (36) 1340-4700 / www.kvalitex.hu

ICELAND: Groco ehf
Tel: +354-568-8533 / www.groco.is

INDIA: Labmate (Asia) Pvt Ltd.
Tel: 44 222 000 66 / www.labmateasia.com

INDONESIA: P T Research Biolabs
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E-mail: Indonesia@researchbiolabs.com

REPUBLIC OF IRELAND: Isis Ltd.
Tel: (1) 286 7777 / www.isisco.ie

ISRAEL: Eldan Electronic Instruments Co., Ltd
Tel: (3) 9371132 / www.eldan.biz

ITALY: Euroclone
Toll Free: 800-315911 / www.euroclonegroup.it

KOREA: Koram Biotech Corp.
Tel: (02) 556-0311 / www.korambiotech.com

MALAYSIA: Research Biolabs Sdn Bhd
Tel: 60358829588 / www.researchbiolabs.com

MEXICO: Quimica Valaner S.a. De C.v.
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NORWAY: BioNordika Norway AS
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SWITZERLAND: Bioconcept
Tel: (061) 486 80 80 / www.bioconcept.ch

TAIWAN: Taigen Bioscience Corp.
Tel: (02) 28802913 / www.taigen.com

THAILAND: Theera Trading Co. Ltd.
Tel: (02) 412-5672 / www.theetrad.com

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