

Antibodies and Kits
for the Study of
**Stem Cell
& Lineage
Markers**



Cell Signaling

TECHNOLOGY®

XP[®] Monoclonal Antibodies for Stem Cell and Lineage Markers

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 all approved 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.

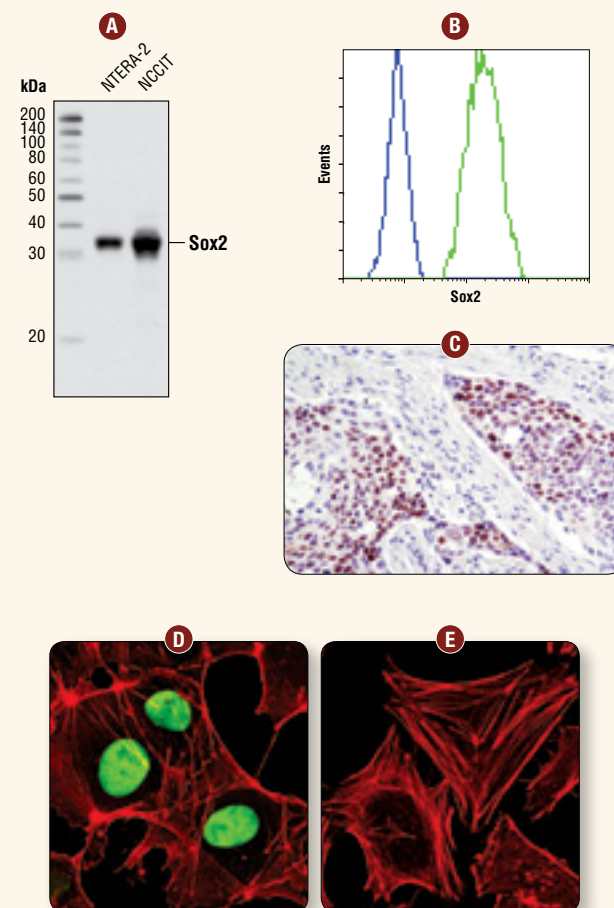
+eXceptional stability and reproducibility

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.

Sox2 (D6D9) XP[®] Rabbit mAb #3579 is an example of an antibody with superior performance in a wide range of tested applications.

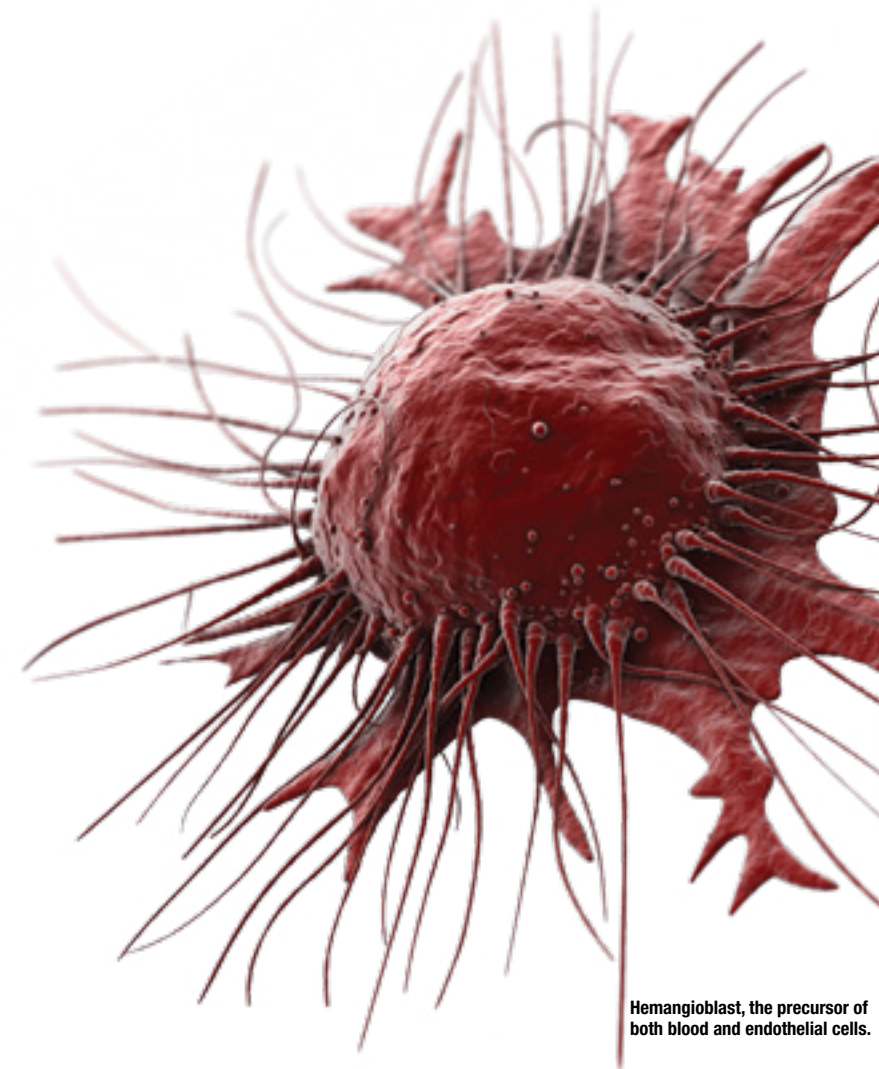


Sox2 (D6D9) XP[®] Rabbit mAb #3579: (A) Western blot analysis of extracts from NTERA-2 and NCCIT cells using #3579. (B) Flow cytometric analysis of HeLa (blue) and NTERA-2 (green) cells using #3579. (C) IHC analysis of paraffin-embedded human squamous cell carcinoma of the esophagus using #3579. (D) Confocal IF analysis of NTERA-2 (D) and HeLa (E) cells using #3579 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Antibodies and Kits for the Study of Stem Cells

Cell Signaling Technology provides the highest quality activation state and total protein antibodies for stem cell research. CST[™] antibodies have been extensively validated by our in-house clinical applications group in applications including immunofluorescence, immunohistochemistry, chromatin immunoprecipitation (ChIP), ELISA, flow cytometry, and drug discovery technologies. Moreover, technical support is provided by the same scientists who develop and produce the antibodies and know them best.

Please check out our **Stem Cell Pluripotency and Differentiation Tutorial** "The Study of Stem Cells" on our website at www.cellsignal.com/stem-cell-tutorial



Hemangioblast, the precursor of both blood and endothelial cells.

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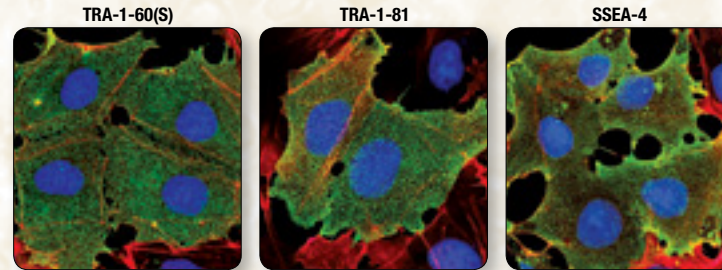
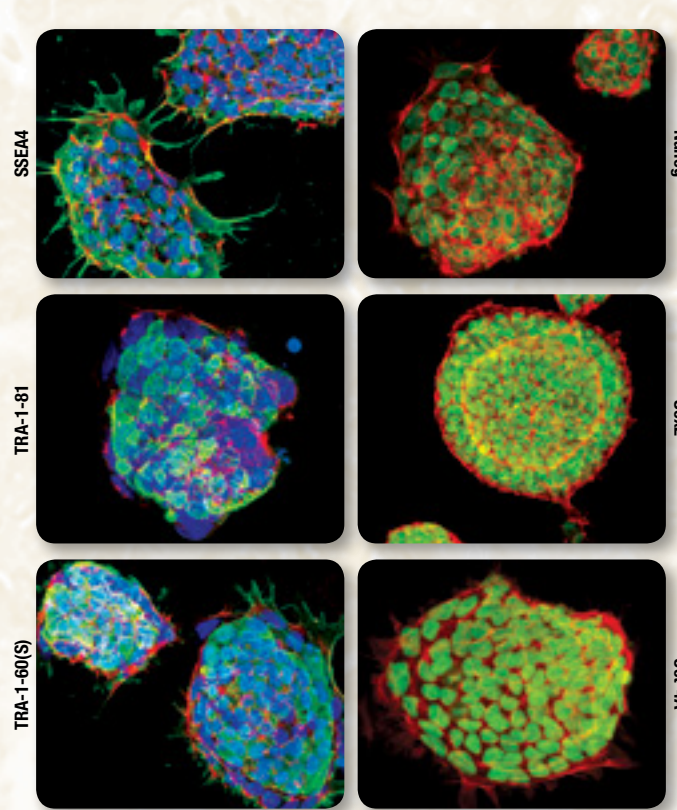
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Visit our website for more experimental details, additional information, and a complete list of available XP[®] monoclonal antibodies.

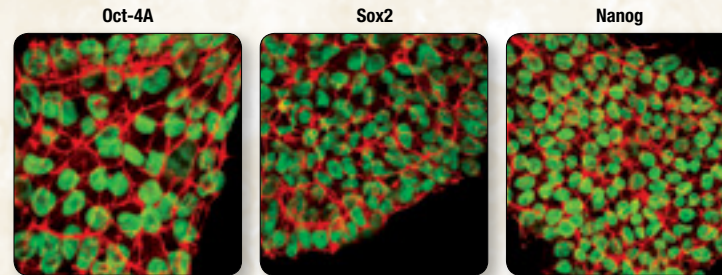
StemLight™ Pluripotency Kits

The StemLight™ Pluripotency Antibody Kit #9656 contains antibodies against a selection of stem cell markers. The kit can be used to analyze the pluripotent or undifferentiated status of human embryonic stem cells or induced pluripotent stem (iPS) cells. Loss of marker expression indicates loss of pluripotency or differentiation of the culture. CST also offers a number of other StemLight™ Kits to specifically measure expression of transcription factors, surface markers, or iPS reprogramming factors. All kit components are pre-optimized for parallel use in immunofluorescence.

	Applications	Reactivity
#9656 StemLight™ Pluripotency Antibody Kit	IF-IC	H
NEW #9094 StemLight™ Pluripotency Surface Marker Antibody Kit	IF-IC	H
NEW #9093 StemLight™ Pluripotency Transcription Factor Antibody Kit	IF-IC	H
NEW #9092 StemLight™ iPS Cell Reprogramming Antibody Kit	IF-IC	H

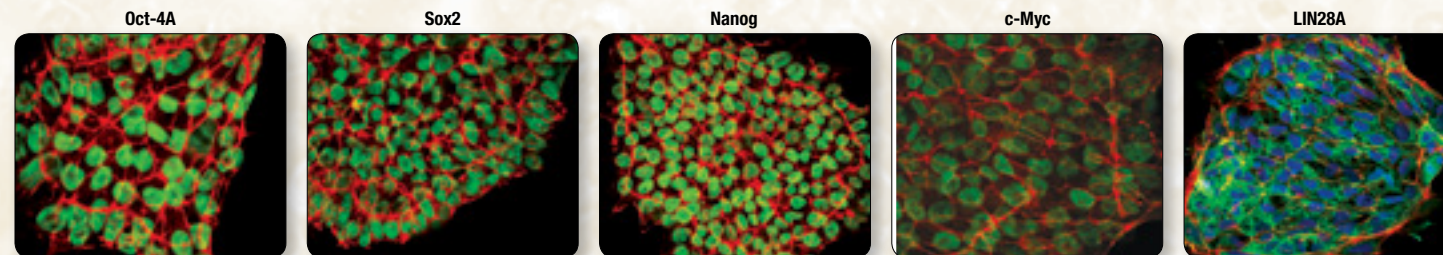


StemLight™ Pluripotency Surface Marker Antibody Kit #9094: Confocal IF analysis of NTERA-2 cells using TRA-1-60(S) (TRA-1-60(S) Mouse mAb #4746, TRA-1-81 (TRA-1-81) Mouse mAb #4745, and SSEA4 (MC813) Mouse mAb #4755. Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



StemLight™ Pluripotency Transcription Factor Antibody Kit #9093: Confocal IF analysis of iPS cells using Oct-4A (C30A3) Rabbit mAb #2840, Sox2 (D6D9) XP® Rabbit mAb #3579, and Nanog (D73G4) XP® Rabbit mAb #4903 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

StemLight™ Pluripotency Antibody Kit #9656: Projected confocal z-stacks of human iPS cells using antibodies from the StemLight™ Pluripotency Kit, all labeled in green. Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

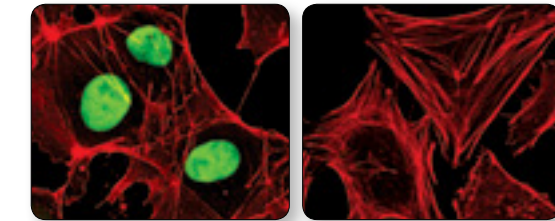
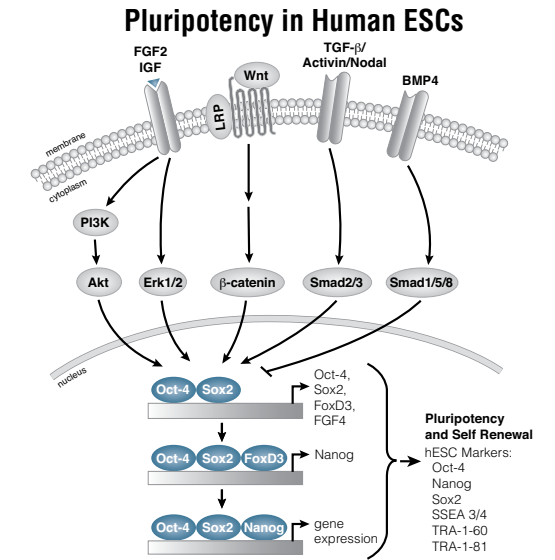


StemLight™ iPS Cell Reprogramming Antibody Kit #9092: Confocal IF analysis of iPS cells using Oct-4A (C30A3) Rabbit mAb #2840, Sox2 (D6D9) XP® Rabbit mAb #3579, Nanog (D73G4) XP® Rabbit mAb #4903, c-Myc (D84C12) XP® Rabbit mAb #5605, and LIN28A (D84C11) XP® Rabbit mAb #3695 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

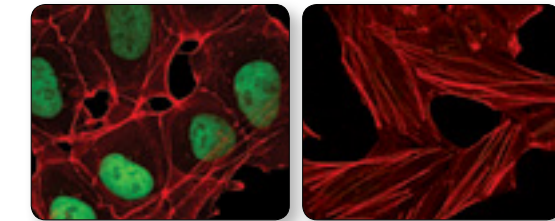
Please visit www.cellsignal.com for a complete product listing.

Embryonic Stem Cell Markers

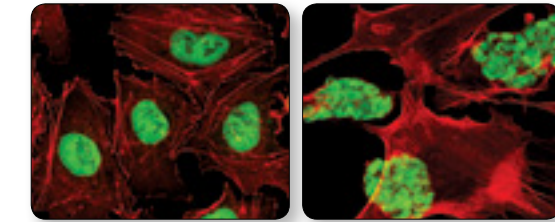
Blastocyst	Applications	Reactivity
#3195 E-Cadherin (24E10) Rabbit mAb	W, IHC-P, IHC-F, IF-IC, F	H, M, (Dg)
#3199 E-Cadherin (24E10) Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, IF-P, F	H, M, (Dg)
#4295 E-Cadherin (24E10) Rabbit mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H, M, (Dg)
NEW #5296 E-Cadherin (32A8) Mouse mAb	W, IP	H
#4193 Cripto (D81B12) Rabbit mAb (Human Specific)	W, IP	H
#2020 Cripto Antibody (Human Specific)	W, IP	H
#2818 Cripto Antibody (Mouse Specific)	W, IP, IF-IC	M
#2019 FoxD3 (D20A9) Rabbit mAb	W	H
#3795 Frizzled5 Antibody	W, IP	H
NEW #5417 GDNF Antibody	W	H, M, R
NEW #5269 HMG2 Antibody	W, IP	H, M, R
#3750 Integrin α6 Antibody	W	H, M, R, Mk
#4706 Integrin β1 Antibody	W	H, M, R, Mk
#4420 NAC1 Antibody (Human Preferred)	W	H, (Mk)
#4183 NAC1 Antibody (Rodent Preferred)	W	M, R, (H)
#4903 Nanog (D73G4) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, (Mk)
NEW #5448 Nanog (D73G4) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (Mk)
#5232 Nanog (D73G4) XP® Rabbit mAb (ChIP Formulated)	ChIP	H
#3580 Nanog Antibody	W, IF-IC, F, ChIP	H
#4893 Nanog (1E6C4) Mouse mAb	W, IHC-P, IF-IC, F	H
#4428 Oct-1 Antibody	W	H
#2840 Oct-4A (C30A3) Rabbit mAb	W, IF-IC, F	H, M
#5177 Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, M
#5263 Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, M
#5677 Oct-4A (C30A3C1) Rabbit mAb (ChIP Formulated)	ChIP	H, M
#2890 Oct-4A (C52G3) Rabbit mAb	W, IHC-P, IF-IC, F, ChIP	H
#2788 Oct-4 (V241) Antibody	W	H, M, (Mk)
#2750 Oct-4 Antibody	W, IHC-P, IF-IC, F, ChIP	H, (Mk)
#4286 Oct-4 (9B7) Mouse mAb	W, IP	H, M
NEW #5339 Smad2 (D43B4) XP® Rabbit mAb	W, IP, IF-IC, F, ChIP	H, M, R, Mk
#3122 Smad2 (86F7) Rabbit mAb	W, IP, IF-IC	H, Mk
#3103 Smad2 (L16D3) Mouse mAb	W	H, M, R, Mk
#3579 Sox2 (D6D9) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, (Mk, B, Dg)
NEW #5049 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
NEW #5179 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H, (Mk, B, Dg)
NEW #5067 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
#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)
NEW #4900 Sox2 (L1D6A2) Mouse mAb	W, IF-IC, F	H, M, (R, B, Dg)
NEW #4195 Sox2 (L73B4) Mouse mAb	W	H, M, (Mk, B, Dg)
#4744 SSEA1 (MC480) Mouse mAb	IHC-P, IF-IC, F	M
#4755 SSEA4 (MC813) Mouse mAb	IF-IC, F	H
NEW #5835 SSEA4 (MC813) Mouse mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H
NEW #5836 SSEA4 (MC813) Mouse mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H
#4904 Stat3 (79D7) Rabbit mAb	W, IP, IHC-P, ChIP	H, M, R, Mk
#9132 Stat3 Antibody	W, IP, IHC-P, ChIP	H, M, R, (B)
#9139 Stat3 (124H6) Mouse mAb	W, IP, IHC-P, IF-IC, F, ChIP	H, M, R, Mk



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

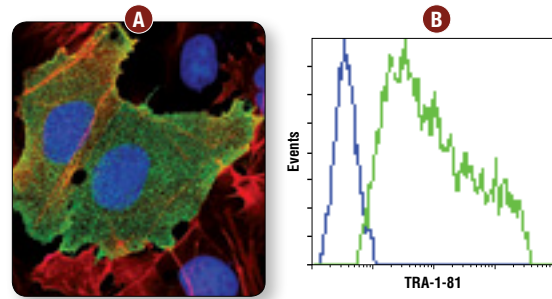


Nanog (D73G4) XP® Rabbit mAb #4903: Confocal IF analysis of NTERA-2 (left) and HeLa (right) cells using #4903 (green). Actin filaments were labeled with DY-554 phalloidin (red).



Oct-4A (C30A3) Rabbit mAb #2840: Confocal IF analysis of NTERA-2 (left) and mouse embryonic stem cells growing on mouse embryonic fibroblast (MEF) feeder cells (right) using #2840 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Embryonic Stem Cell Markers



TRA-1-81 (TRA-1-81) Mouse mAb #4745: Confocal IF analysis of NTERA-2 cells (A) using #4745 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye). Flow cytometric analysis (B) of unpermeabilized Jurkat cells (blue) and unpermeabilized NCCIT cells (green) using #4745.

Blastocyst

	Applications	Reactivity
#3737 SUZ12 (D39F6) XP® Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#2883 TCF3 (D15G11) Rabbit mAb	W, IP	H, Mk
#4746 TRA-1-60(S) (TRA-1-60(S)) Mouse mAb	W, IHC-P, IF-IC, F	H
#4745 TRA-1-81 (TRA-1-81) Mouse mAb	IHC-P, IF-IC, F	H
#3909 UTF1 Antibody	W	M, R, (H)
NEW #5419 ZFX (L28B6) Mouse mAb	W	H

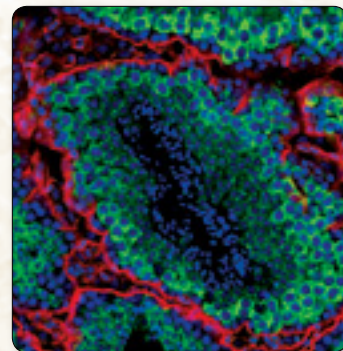
Trophoectoderm

#3977 Cdx2 Antibody	W, IP, IHC-P, IF-IC, F	H, M, R
#4540 EOMES Antibody	W	M, (H, R, Mk)

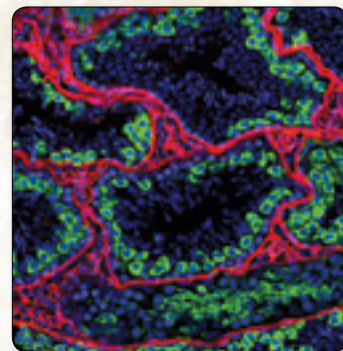
Primordial Germ Cells

After implantation into the uterine wall, cells of the inner cell mass of the blastocyst are now called the epiblast and begin differentiation along two main lineages. One lineage will develop into the primary germ layers: ectoderm, mesoderm, and endoderm. The second lineage will develop into primordial germ cells (PGCs). PGCs continue the differentiation process and eventually become germ cells of the gonad. These cells go through meiosis and mitosis to become mature egg and sperm.

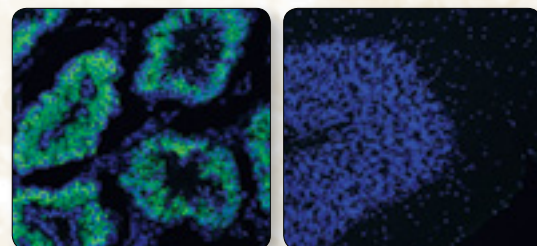
	Applications	Reactivity
#9115 Blimp-1/PRDI-BF1 (C14A4) Rabbit mAb	W, IP, IF-IC	H, M, (Mk)
NEW #8042 DAZL Antibody	W, IP	H, M, R, (Mk)
NEW #8227 DDX4 Antibody	W, IF-F	H, M, R, (Mk)
NEW #5555 DDX4 (2F9H5) Mouse mAb	W, IP	H
NEW #5417 GCNF Antibody	W	H, M, R
NEW #5940 Mili (D14F5) XP® Rabbit mAb	W, IP, IHC-P, IF-F	M
#2071 Mili Antibody	W, IP, IHC-P, IF-F	M
#2025 Miwi (D478) Antibody	W	M
#2079 Miwi (G82) Antibody	W, IP, IHC-P, IF-F	M
#2840 Oct-4A (C30A3) Rabbit mAb	W, IF-IC, F	H, M
#5177 Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, M
#5263 Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, M
#5677 Oct-4A (C30A3C1) Rabbit mAb (ChIP Formulated)	ChIP	H, M
#2890 Oct-4A (C52G3) Rabbit mAb	W, IHC-P, IF-IC, F, ChIP	H
#2788 Oct-4 (V241) Antibody	W	H, M, (Mk)
#2750 Oct-4 Antibody	W, IHC-P, IF-IC, F, ChIP	H, (Mk)
NEW #4286 Oct-4 (9B7) Mouse mAb	W, IP	H, M
#4744 SSEA1 (MC480) Mouse mAb	IHC-P, IF-IC, F	M
NEW #4755 SSEA4 (MC813) Mouse mAb	IF-IC, F	H
NEW #5835 SSEA4 (MC813) Mouse mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H
NEW #5836 SSEA4 (MC813) Mouse mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H
NEW #5868 TIF1β (4E1) Mouse mAb	W, IF-IC	H
#3909 UTF1 Antibody	W	M, R, (H)



Miwi (G82) Antibody #2079: Confocal IF analysis of mouse testis using #2079 (green) and Pan-Keratin (C11) Mouse mAb #4545 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



Mili (D14F5) XP® Rabbit mAb #5940: Confocal IF analysis of mouse testis using #5940 (green) and Pan-Keratin (C11) Mouse mAb #4545 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

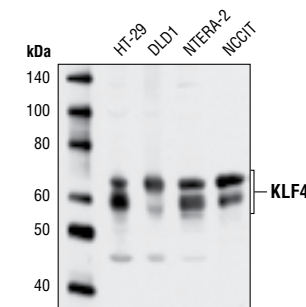


DDX4 Antibody #8227: Confocal IF analysis of mouse testes (left) and mouse brain (right) using #8227 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

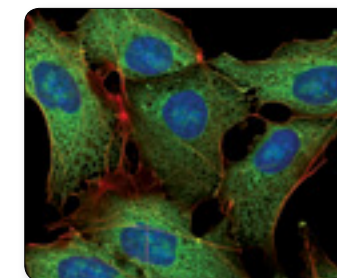
Induced Pluripotency (iPS)

Induced pluripotent stem cells (iPS cells or iPSCs) are a type of pluripotent stem cell derived from a non-pluripotent somatic cell by overexpression of a set of proteins. These iPS cells have been shown to share many properties with ES cells, including epigenetic marks and the expression of stem cell genes.

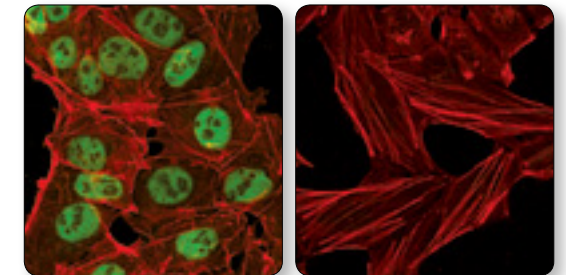
	Applications	Reactivity
NEW #9092 StemLight™ iPS Cell Reprogramming Antibody Kit	IF-IC	H
#4038 KLF4 Antibody	W	H, M, (Mk)
#3695 LIN28A (D84C11) XP® Rabbit mAb	W, IF-IC, F	H, (R, Mk)
#3978 LIN28A (A177) Antibody	W, IP, IHC-P, IF-IC, F	H, M, (Mk)
#3979 LIN28A (P22) Antibody	W	H, (Mk)
#5930 LIN28A (6D1F9) Mouse mAb	W, IF-IC	H
#4196 LIN28B Antibody	W, IP	H
NEW #5422 LIN28B Antibody (Mouse Preferred)	W	M, (R)
#5605 c-Myc (D84C12) XP® Rabbit mAb	W, IP, IF-IC, F	H, M, R, (Mk, Dg, Pg)
#9402 c-Myc Antibody	W, IP, ChIP	H, M, R, Pg
#4903 Nanog (D73G4) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, (Mk)
NEW #5448 Nanog (D73G4) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (Mk)
#5232 Nanog (D73G4) XP® Rabbit mAb (ChIP Formulated)	ChIP	H
#3580 Nanog Antibody	W, IF-IC, F, ChIP	H
#4893 Nanog (1E6C4) Mouse mAb	W, IHC-P, IF-IC, F	H
#2840 Oct-4A (C30A3) Rabbit mAb	W, IF-IC, F	H, M
#5177 Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, M
#5263 Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, M
#5677 Oct-4A (C30A3C1) Rabbit mAb (ChIP Formulated)	ChIP	H, M
#2890 Oct-4A (C52G3) Rabbit mAb	W, IHC-P, IF-IC, F, ChIP	H
#2788 Oct-4 (V241) Antibody	W	H, M, (Mk)
#2750 Oct-4 Antibody	W, IHC-P, IF-IC, F, ChIP	H, (Mk)
#4286 Oct-4 (9B7) Mouse mAb	W, IP	H, M
#3579 Sox2 (D6D9) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, (Mk, B, Dg)
NEW #5049 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
NEW #5179 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H, (Mk, B, Dg)
NEW #5067 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
#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)
NEW #4900 Sox2 (L1D6A2) Mouse mAb	W, IF-IC, F	H, M, (R, B, Dg)
NEW #4195 Sox2 (L73B4) Mouse mAb	W	H, M, (Mk, B, Dg)



KLF4 Antibody #4038: Western blot analysis of extracts from various cell lines using #4038.



LIN28A (D84C11) XP® Rabbit mAb #3695: Confocal IF analysis of NTERA-2 cells using #3695 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



Nanog (1E6C4) Mouse mAb #4893: Confocal IF analysis of NTERA-2 (left) and HeLa (right) cells using #4893 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Various combinations of the following genes have been used to obtain the induced pluripotent state in human somatic cells (PMID:18029452, 18035408):

Oct-4: Transcription factor expressed in undifferentiated pluripotent embryonic stem cells and germ cells during normal development. Together with Sox2 and Nanog, is necessary for the maintenance of pluripotent potential.

Sox2: Transcription factor expressed in undifferentiated pluripotent embryonic stem cells and germ cells during development. Together with Oct-4 and Nanog, is necessary for the maintenance of pluripotent potential.

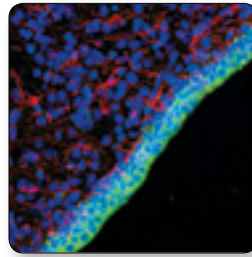
Nanog: Homeodomain-containing transcription factor essential for maintenance of pluripotency and self renewal in embryonic stem cells. Expression is controlled by a network of factors including Sox2 and the key pluripotency regulator Oct-4.

LIN28: Conserved RNA binding protein and stem cell marker; inhibitor of microRNA processing in embryonic stem (ES) and carcinoma (EC) cells. Overexpression of LIN28A, in conjunction with Oct4, Sox2, and Nanog, can reprogram human fibroblasts to pluripotent, ES-like cells.

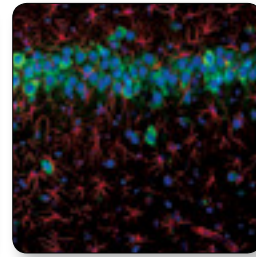
Myc family: Proto-oncogenes, including c-myc, used for generation of human and mouse ES cells.

KLF4: Zinc-finger-containing transcription factor Krüppel-like factor 4 (KLF4); used for generation of human and mouse ES cells.

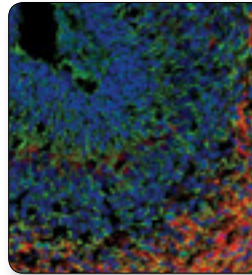
Ectoderm



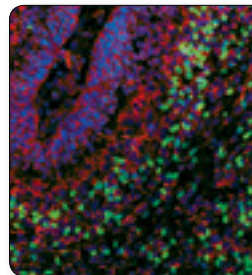
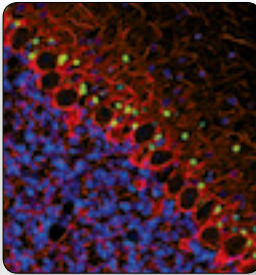
Musashi-1 (D46A8) XP® Rabbit mAb #5663: Confocal IF analysis of P4 rat brain using #5663 (green) and Nestin (Rat-401) Mouse mAb #4760 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



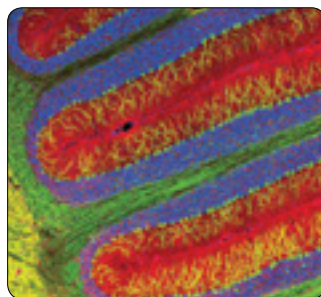
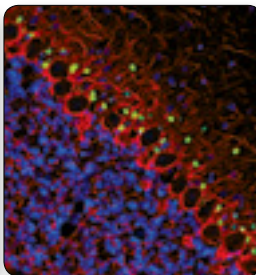
GFAP (GA5) Mouse mAb #3670: Confocal IF analysis of rat hippocampus using #3670 (red), Phospho-S6 Ribosomal Protein (Ser235/236) (2F9) Rabbit mAb (Alexa Fluor® 488 Conjugate) #4854 (green), and CREB (48H2) Rabbit mAb #9197 (blue).



Nestin (Rat-401) Mouse mAb #4760: Confocal IF analysis of P1 rat brain (left) and adult rat brain (right) using #4760 (green) and Neurofilament-L (DA2) Mouse mAb #2835 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



SOX1 Antibody #4194: Confocal IF analysis of postnatal day 1 (left) and adult rat brain (right) using #4194 (green) and Neurofilament-L (DA2) Mouse mAb #2835 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



β3-Tubulin (D71G9) XP® Rabbit mAb #5568: Confocal IF analysis of mouse cerebellum using #5568 (green) and Tau (Tau46) Mouse mAb #4019 (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Neural Stem Cell

	Applications	Reactivity
#4477 ABCG2 Antibody	W	H, M, R, (Mk, X, B, Dg)
#3508 Brg1 (A52) Antibody	W, IF-IC	H, M, Mk, (R)
#3514 Brg1 (P680) Antibody	W	H, M, R, Mk
#4540 EOMES Antibody	W	M, (H, R, Mk)
#2894 FGF Receptor 4 Antibody	W	M, (H)
NEW #5417 GCFN Antibody	W	H, M, R
NEW #5269 HMG2 Antibody	W, IP	H, M, R
#3431 Id2 (D39E8) Rabbit mAb	W, IP	H, M, Mk
#2088 LEDGF (C57G11) Rabbit mAb	W, IHC-P, IF-IC, F	H, M, R, (Mk)
#4787 Msx1 (G116) Antibody	W	H
#5378 Msx1 (P5) Antibody	W	H, (Mk)
NEW #5663 Musashi-1 (D46A8) XP® Rabbit mAb	W, IF-F	H, M, R
#2154 Musashi Antibody	W, IF-F	H, M, R, (Z)
#4420 NAC1 Antibody (Human Preferred)	W	H, (Mk)
#4183 NAC1 Antibody (Rodent Preferred)	W	M, R, (H)
#4760 Nestin (Rat-401) Mouse mAb	IHC-P, IF-F	R
#2833 NeuroD Antibody	W, IP	H, (M, R)
#4201 p75NTR (D8A8) Rabbit mAb	W, IP	H, M, R
#2693 p75NTR Antibody	W	H, R, (M)
#4194 Sox1 Antibody	W, IF-F	M, R, (H)
#3579 Sox2 (D6D9) XP® Rabbit mAb	W, IHC-P, IF-IC, F	H, (Mk, B, Dg)
NEW #5049 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 488 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
NEW #5179 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 555 Conjugate)	IF-IC	H, (Mk, B, Dg)
NEW #5067 Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate)	IF-IC, F	H, (Mk, B, Dg)
#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)
NEW #4900 Sox2 (L1D6A2) Mouse mAb	W, IF-IC, F	H, M, (R, B, Dg)
NEW #4195 Sox2 (L73B4) Mouse mAb	W	H, M, (Mk, B, Dg)
NEW #5666 β3-Tubulin (D65A4) XP® Rabbit mAb	W, IP, IHC-P	H, M, R
NEW #5568 β3-Tubulin (D71G9) XP® Rabbit mAb	W, IP, IF-F	H, M, R
#4466 β3-Tubulin (TU-20) Mouse mAb	W, IHC-P, IF-F	H, M, R
#3390 Vimentin (5G3F10) Mouse mAb	W	H, Mk

Neural Crest

#2019 FoxD3 (D20A9) Rabbit mAb	W	H
#4600 Integrin α4 Antibody	W, IP	H
#4787 Msx1 (G116) Antibody	W	H
#5378 Msx1 (P5) Antibody	W	H, (Mk)
#4147 Cleaved Notch1 (Val1744) (D3B8) Rabbit mAb	W, IP	H, M, R
#2421 Cleaved Notch1 (Val1744) Antibody	W, IP	H, M, R, Mk
NEW #4380 Notch1 (D6F11) XP® Rabbit mAb	W, IF-IC, F	H, M, R
#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)
#3447 Notch1 (5B5) Rat mAb	W, IP	H, M, R, B
NEW #4530 Notch2 (D67C8) XP® Rabbit mAb	W, IP, IF-IC	H, R
NEW #5732 Notch2 (D76A6) XP® Rabbit mAb	W, IP, IF-IC, F	H, M, R
#2420 Notch2 (8A1) Rabbit mAb	W, IP	H
#4744 SSEA1 (MC480) Mouse mAb	IHC-P, IF-IC, F	M

Neurogenesis

#3670 GFAP (GA5) Mouse mAb	W, IP, IHC-P, IF-F	H, M, R
#3655 GFAP (GA5) Mouse mAb (Alexa Fluor® 488 Conjugate)	IF-F	H, M, R
#3656 GFAP (GA5) Mouse mAb (Alexa Fluor® 555 Conjugate)	IF-F	H, M, R
#3657 GFAP (GA5) Mouse mAb (Alexa Fluor® 647 Conjugate)	IF-F	H, M, R
#4542 MAP2 Antibody	W, IF-F, IF-IC	H, M, R, Mk
#2274 MELK Antibody	W, IP	H, M, Dm
#2837 Neurofilament-L (C28E10) Rabbit mAb	W, IHC-P, IF-F	H, M, R
#2835 Neurofilament-L (DA2) Mouse mAb	W, IHC-P, IF-F	H, M, R
#2838 Neurofilament-M (RMO 14.9) Mouse mAb	W, IP, IHC-P, IF-IC	H, M, R

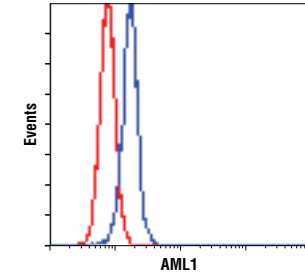
Mesoderm: Hematopoietic Lineage

Hemangioblast

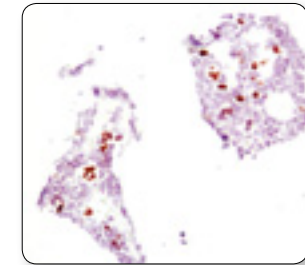
	Applications	Reactivity
#4336 AML1 (D33G6) XP® Rabbit mAb	W, IP, IHC-P, IF-IC, F	H
#4334 AML1 Antibody	W, IF-IC, F	H, Mk
NEW #8229 AML1 Antibody (Mouse Preferred)	W	H, M, (R, Mk)
#3569 CD34 (IC0115) Mouse mAb	IHC-P, F	H
#4589 GATA-1 (D24E4) XP® Rabbit mAb	W, IP, IF-IC, F	H
#3535 GATA-1 (D52H6) XP® Rabbit 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, F	H, M
NEW #3627 VEGF Receptor 2 (55B11) Rabbit mAb (Alexa Fluor® 488 Conjugate)	F	H, M
NEW #3628 VEGF Receptor 2 (55B11) Rabbit mAb (Alexa Fluor® 647 Conjugate)	F	H, M
NEW #5168 VEGF Receptor 2 (55B11) Rabbit mAb (Sepharose Bead Conjugate)	IP	H, M
#2472 VEGF Receptor 2 Antibody	W	H, M, (R)

Hematopoietic Stem Cell

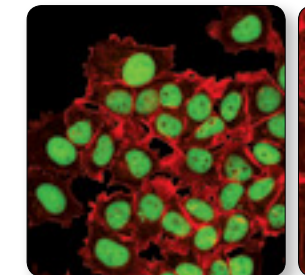
#4477 ABCG2 Antibody	W	H, M, R, (Mk, X, B, Dg)
#4336 AML1 (D33G6) XP® Rabbit mAb	W, IP, IHC-P, IF-IC, F	H
#4334 AML1 Antibody	W, IF-IC, F	H, Mk
NEW #8229 AML1 Antibody (Mouse Preferred)	W	H, M, (R, Mk)
NEW #6964 Bmi1 (D20B7) XP® Rabbit mAb	W, IP, IF-IC, ChIP	H, Mk
NEW #5856 Bmi1 (D42B3) Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#2830 Bmi1 Antibody	W	H, Mk, (B)
NEW #5855 Bmi1 (DC9) Mouse mAb	W	H, M, R, Mk
#3569 CD34 (IC0115) Mouse mAb	IHC-P, F	H
#4115 CDCP1 Antibody	W, IP, IF-IC	H
#4540 EOMES Antibody	W	M, (H, R, Mk)
#4589 GATA-1 (D24E4) XP® Rabbit mAb	W, IP, IF-IC, F	H
#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
NEW #5852 GATA-3 (D13C9) XP® Rabbit mAb	W, IF-IC, F	H, (Mk)
NEW #5849 GFI1b (D3G2) Rabbit mAb	W	H, M, R, Mk
#3074 c-Kit (D13A2) XP® Rabbit mAb	W, IP, IF-IC	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
NEW #5419 ZFX (L28B6) Mouse mAb	W	H



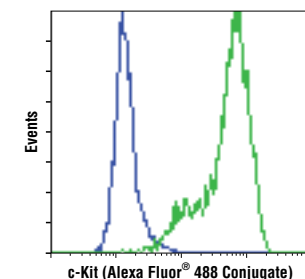
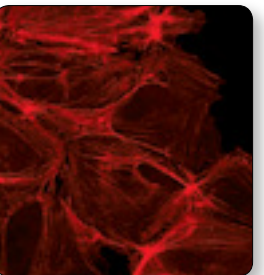
AML1 (D33G6) XP® Rabbit mAb #4336: Flow cytometric analysis of Jurkat cells using #4336 (blue) compared to a nonspecific negative control antibody (red).



GATA-1 (D52H6) XP® Rabbit mAb #3535: IHC analysis of formalin-fixed, paraffin-embedded undecalcified mouse bone using #3535. Note staining of cells in the marrow.

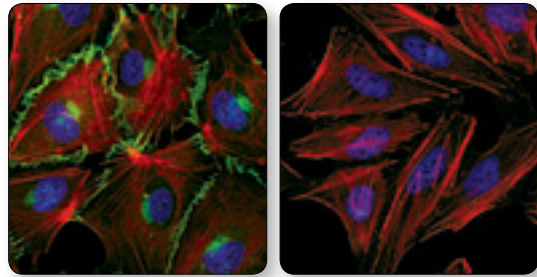


GATA-3 (D13C9) XP® Rabbit mAb #5852: Confocal IF analysis of MCF7 (left) and HUVE (right) cells using #5852 (green). Actin filaments were labeled with DY-554 phalloidin (red).



c-Kit (Ab81) Mouse mAb (Alexa Fluor® 488 Conjugate) #3310: Flow cytometric analysis of Jurkat (blue) and H526 (green) cells using #3310.

Mesoderm: Hematopoietic Lineage



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

Angioblast

	Applications	Reactivity
#2500 VE-Cadherin (D87F2) XP® Rabbit mAb	W, IP, IF-IC	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, F	H, M
NEW #3627 VEGF Receptor 2 (55B11) Rabbit mAb (Alexa Fluor® 488 Conjugate)	F	H, M
NEW #3628 VEGF Receptor 2 (55B11) Rabbit mAb (Alexa Fluor® 647 Conjugate)	F	H, M
NEW #5168 VEGF Receptor 2 (55B11) Rabbit mAb (Sepharose Bead Conjugate)	IP	H, M
#2472 VEGF Receptor 2 Antibody	W	H, M, (R)

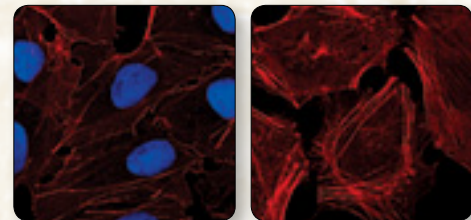
Endothelial Cell

	Applications	Reactivity
#2500 VE-Cadherin (D87F2) XP® Rabbit mAb	W, IP, IF-IC	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

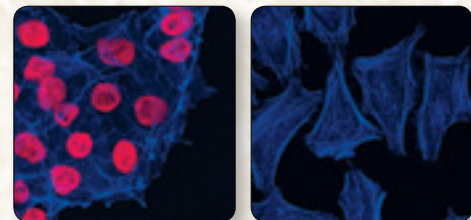
Unparalleled Product Quality, Validation, and Technical Support

Alexa Fluor® Conjugated Antibodies

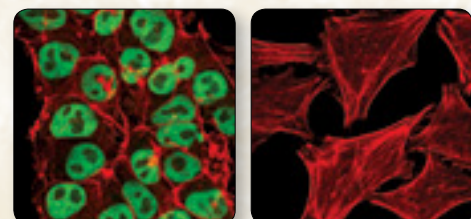
The superior brightness and photostability of Alexa Fluor® dyes combined with the highest quality antibodies from Cell Signaling Technology results in the brightest signal with the lowest background. All Alexa Fluor® conjugates recommended for immunofluorescence (IF) are validated by our in-house IF specialists. Visit www.cellsignal.com to view a complete list of all available Alexa Fluor® conjugated antibodies.



Nanog (D73G4) XP® Rabbit mAb (Alexa Fluor® 647 Conjugate) #5448: Confocal IF analysis of NTERA-2 (left) and HeLa (right) cells using #5448 (red). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



Sox2 (D6D9) XP® Rabbit mAb (Alexa Fluor® 555 Conjugate) #5179: Confocal IF analysis of NTERA-2 (left) and HeLa (right) cells using #5179 (red). Actin filaments were labeled with Alexa Fluor® 647 phalloidin (blue).



Oct-4A (C30A3) Rabbit mAb (Alexa Fluor® 488 Conjugate) #5177: Confocal IF analysis of NTERA-2 (left) and HeLa (right) cells using #5177 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Alexa Fluor® Conjugated Secondary Antibodies

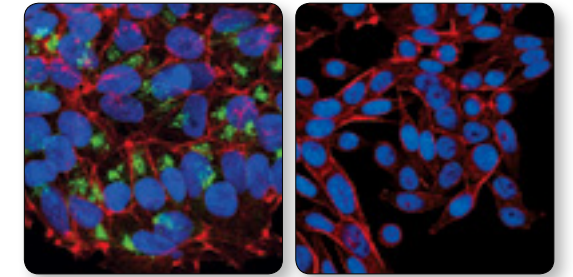
Alexa Fluor® conjugated secondary antibodies offer improved fluorescence intensity, sensitivity, and photostability, as well as stability over a wide pH range. These secondary antibodies are conjugated to Alexa Fluor® 488, 555, or 647 under optimal conditions and are tested in-house on human and mouse cell lines and tissue samples. Both the anti-mouse and anti-rabbit secondary antibodies are made with F(ab)₂ fragments, eliminating non-specific binding through F_c receptors present on the cell.

#4408 Anti-mouse IgG (H+L), F(ab) ₂ Fragment (Alexa Fluor® 488 Conjugate)
#4409 Anti-mouse IgG (H+L), F(ab) ₂ Fragment (Alexa Fluor® 555 Conjugate)
#4410 Anti-mouse IgG (H+L), F(ab) ₂ Fragment (Alexa Fluor® 647 Conjugate)
#4412 Anti-rabbit IgG (H+L), F(ab) ₂ Fragment (Alexa Fluor® 488 Conjugate)
#4413 Anti-rabbit IgG (H+L), F(ab) ₂ Fragment (Alexa Fluor® 555 Conjugate)
#4414 Anti-rabbit IgG (H+L), F(ab) ₂ Fragment (Alexa Fluor® 647 Conjugate)
#4416 Anti-rat IgG (H+L), (Alexa Fluor® 488 Conjugate)
#4417 Anti-rat IgG (H+L), (Alexa Fluor® 555 Conjugate)
#4418 Anti-rat IgG (H+L), (Alexa Fluor® 647 Conjugate)

Mesoderm: Mesenchymal Lineage

Mesenchymal Stem Cell

	Applications	Reactivity
#3290 Endoglin Antibody (Mouse Specific)	W	M
NEW #5269 HMG2 Antibody	W, IP	H, M, R
#3431 Id2 (D39E8) Rabbit mAb	W, IP	H, M, Mk
#3074 c-Kit (D13A2) XP® Rabbit mAb	W, IP, IF-IC	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
#4787 Msx1 (G116) Antibody	W	H
#5378 Msx1 (P5) Antibody	W	H, (Mk)
NEW #5420 SPARC Antibody	W, IP, IF-IC	H, M, Mk
#4883 TAZ (V386) Antibody	W	H, M, R
#2149 TAZ Antibody	W	H



SPARC Antibody #5420: Confocal IF analysis of NTERA-2 (left) and SW620 (right) cells using #5420 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Osteo- and Chondrogenesis

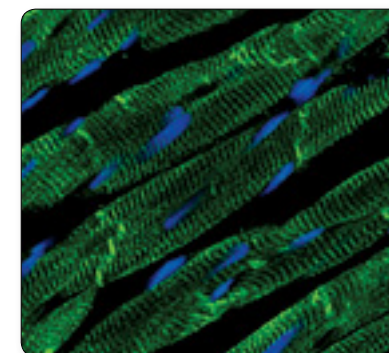
NEW #4442 OB-Cadherin (P707) Antibody	W, IP, IF-IC	H, M, R, (Mk)
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Adipogenesis

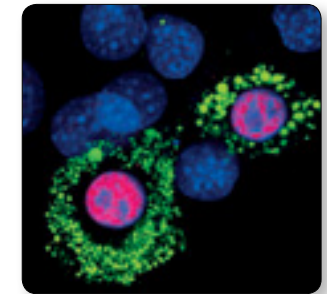
#2789 Adiponectin (C45B10) Rabbit mAb	W	M, R, (H)
#2295 C/EBPα Antibody	W, IF-IC	H, M, R
#2843 C/EBPα (p42) Antibody	W	H, (M, R)
#3087 C/EBPβ (LAP) Antibody	W	H, M, (R)
#3082 C/EBPβ Antibody	W	R
#2120 FABP4 Antibody	W	M
#2213 Glut4 (1F8) Mouse mAb	W	M, R
#2443 PPARγ (81B8) Rabbit mAb	W, IP, IF-IC	H, M, (R)
#2435 PPARγ (C26H12) Rabbit mAb	W, IHC-P, IF-IC	H, M, (R)
#2430 PPARγ (D69) Antibody	W, IP	H, M, (R)

Myogenesis

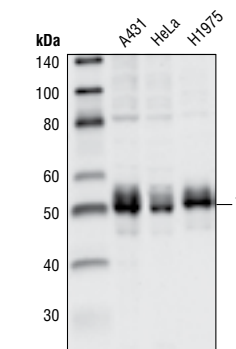
NEW #5332 Desmin (D93F5) XP® Rabbit mAb #5332	W, IF-F, IF-IC	H, M, R, (Mk)
#4024 Desmin Antibody	W, IF-F	M, R, (H, Mk)
#3672 Myosin Light Chain 2 Antibody	W	H, M, R, (C, B, Pg)
#4002 Troponin I Antibody	W	M, (H, R, Pg)



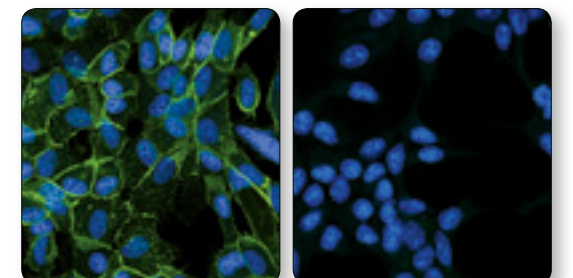
Desmin Antibody #4024: Confocal IF analysis of rat heart using #4024 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



PPARγ (C26H12) Rabbit mAb #2435: Confocal IF analysis of 3T3-L1 cells using #2435 (red) showing nuclear localization in differentiated cells. Lipid droplets have been labeled with BODIPY® 493/503 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

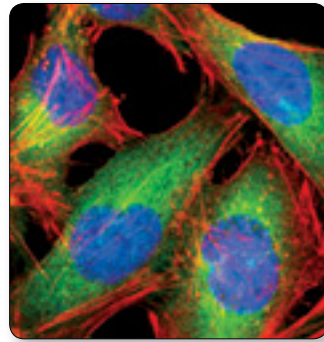


TAZ Antibody #2149: Western blot analysis of extracts of A431, HeLa, and H1975 cells using #2149.

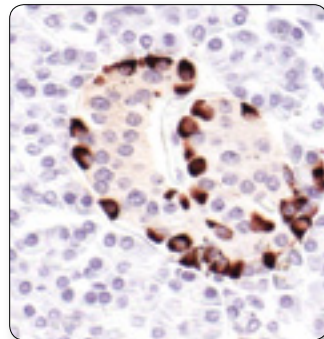


OB-Cadherin (P707) Antibody #4442: Confocal IF analysis of PC-3 (left) and LNCaP (right) cells using #4442 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

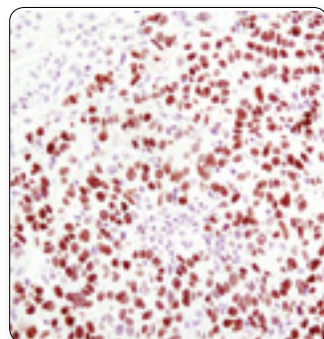
Endoderm



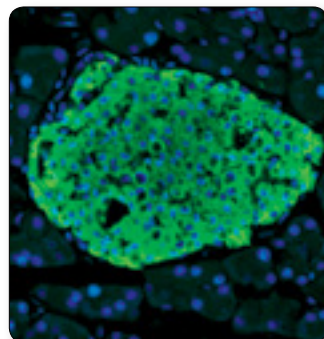
Fatty Acid Synthase (C20G5) Rabbit mAb #3180: Confocal IF analysis of HeLa cells using #3180 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).



Glucagon Antibody #2760: IHC analysis of paraffin-embedded human pancreas, showing staining of a cells, using #2760.



HNF4a (C11F12) Rabbit mAb #3113: IHC analysis of paraffin-embedded human hepatocellular carcinoma using #3113.



C-Peptide Antibody #4593: Confocal IF analysis of mouse pancreas using #4593 (green). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Endodermal Progenitor

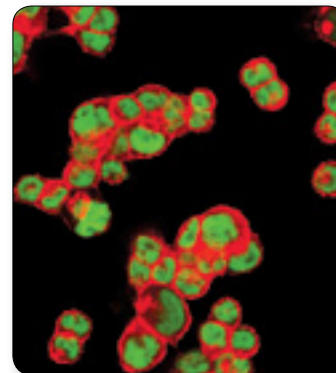
	Applications	Reactivity
NEW #5851 GATA-6 (D61E4) XP® Rabbit mAb	W, IF-IC	H
#4253 GATA-6 (A549) Antibody	W	H
NEW #5868 TIF1β (4E1) Mouse mAb	W, IF-IC	H

Hepatogenesis

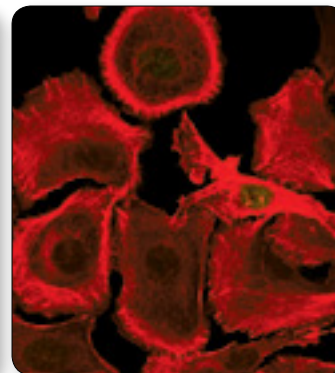
	Applications	Reactivity
#3903 AFP (3H8) Mouse mAb	W, IF-IC	H, M
#2137 AFP Antibody	W, IP	H, M
#4929 Albumin Antibody	W	H
#3087 C/EBPβ (LAP) Antibody	W	H, M, (R)
#3082 C/EBPβ Antibody	W	R
#3180 Fatty Acid Synthase (C20G5) Rabbit mAb	W, IP, IHC-P, IHC-F, IF-IC	H, M, R, (B)
#3189 Fatty Acid Synthase Antibody	W	H, M
#3886 Glycogen Synthase (15B1) Rabbit mAb	W, IP, IHC-P	H, M, R
#3893 Glycogen Synthase Antibody	W, IP, F	H, M, R
#3143 FoxA2/HNF3β Antibody	W, IP, IF-IC	H, (M, R)
#3113 HNF4a (C11F12) Rabbit mAb	W, IHC-P, IF-IC	H
#3117 HNF4a (G162) Antibody	W	H
#4706 Integrin β1 Antibody	W	H, M, R, Mk
#4560 Met Antibody	W, IP	H, M, Mk
#3127 Met (25H2) Mouse mAb	W, IP	H, M, R, Mk
#3148 Met (L41G3) Mouse mAb	W, IP	H, Mk
NEW #5086 Met (L41G3) Mouse mAb (Biotinylated)	W	H, Mk

Pancreatic Cell

	Applications	Reactivity
#2760 Glucagon Antibody	IHC-P, IHC-F, IF-F	H, M, R
#3014 Insulin (C27C9) Rabbit mAb	IHC-P, IF-F, IF-IC, F	H, M, R
#4590 Insulin Antibody	IHC-P, IF-F, IF-IC, F	H, M, R
#4593 C-Peptide Antibody	IHC-P, IHC-F, IF-F, IF-IC	H, M, R
#2833 NeuroD Antibody	W, IP	H, (M, R)



GATA-6 (D61E4) XP® Rabbit mAb #5851: Confocal IF analysis of KM12 (left) and SK-OV-3 (right) cells using #5851 (green). Actin filaments were labeled with DY-554 phalloidin (red).



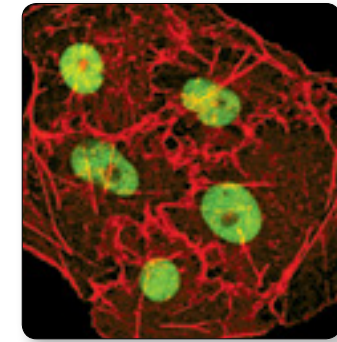
Epigenetic Regulators and Marks

DNA Methylation

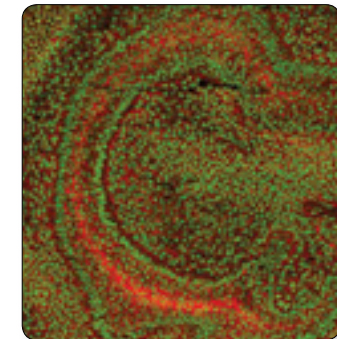
	Applications	Reactivity
#5032 DNMT1 (D63A6) XP® Rabbit mAb	W, IF-IC	H, M, R, Mk, (B)
#5119 DNMT1 (D59A4) Rabbit mAb	W, IP	H, M, R, Mk, (B)
#3598 DNMT3A (D23G1) Rabbit mAb	W, IP	H, M, R, Mk, (B)
#2160 DNMT3A Antibody	W, IP	H, M, R, Mk, (B)
#2161 DNMT3B Antibody	W, IP	H, M, R, Mk, (Z)

Histone Modifications

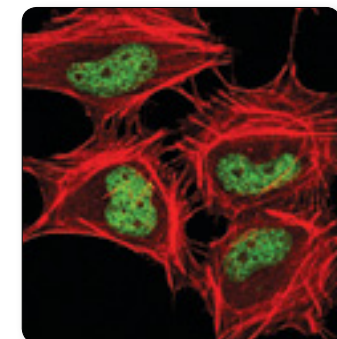
	Applications	Reactivity
NEW #5326 Mono-Methyl-Histone H3 (Lys4) (D1A9) XP® Rabbit mAb	W, IF-IC, ChIP	H, M, R, Mk
#9723 Mono-Methyl-Histone H3 (Lys4) Antibody	W, IP, IF-IC	H, M, R, Mk, (X, Z)
#9725 Di-Methyl-Histone H3 (Lys4) (C64G9) Rabbit mAb	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk
#9726 Di-Methyl-Histone H3 (Lys4) Antibody	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk, (X, Z)
#9751 Tri-Methyl-Histone H3 (Lys4) (C42D8) Rabbit mAb	W, IHC-P, IF-IC, ChIP	H, M, R, Mk, Dm, Sc, (X, Z)
#9727 Tri-Methyl-Histone H3 (Lys4) Antibody	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk, (X, Z)
#4473 Pan-Methyl-Histone H3 (Lys9) (D54) XP® Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk, (C, Dm, X, Z, B, Pg, Sc)
#4069 Pan-Methyl-Histone H3 (Lys9) Antibody	W, IP, IF-IC, ChIP	H, M, R, Mk, Z
#4658 Di-Methyl-Histone H3 (Lys9) (D85B4) XP® Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk, (Dm, X, Z, B, Pg, Sc)
#9753 Di-Methyl-Histone H3 (Lys9) Antibody	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk, Dm, Sc
NEW #5327 Di/Tri-Methyl-Histone H3 (Lys9) (6F12) Mouse mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#9754 Tri-Methyl-Histone H3 (Lys9) Antibody	W, IF-IC, ChIP	H, M, R, Mk, (Dm, Pg)
#9728 Di-Methyl-Histone H3 (Lys27) (D18C8) XP® Rabbit mAb	W, IF-IC, ChIP	H, M, R, Mk
#9755 Di-Methyl-Histone H3 (Lys27) Antibody	W, IP, IF-IC	H, M, R, Mk
#9733 Tri-Methyl-Histone H3 (Lys27) (C36B11) Rabbit mAb	W, IHC-P, IF-IC, ChIP	H, M, R, Mk, (X, Z)
#9756 Tri-Methyl-Histone H3 (Lys27) Antibody	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk, (X)



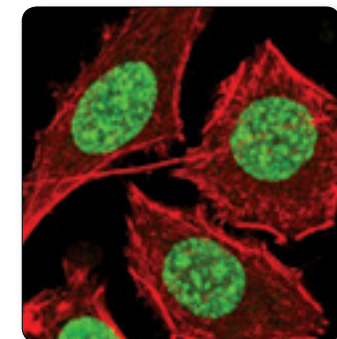
DNMT1 (D63A6) XP® Rabbit mAb #5032: Confocal IF analysis of COS-7 cells using #5032 (green). Actin filaments were labeled using DY-554 phalloidin (red).



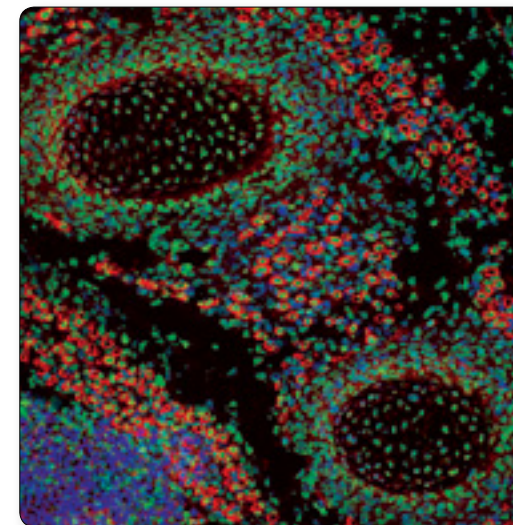
Tri-Methyl-Histone H3 (Lys4) (C42D8) Rabbit mAb #9751: Confocal IF analysis of the nasal cavity in an E14.5 mouse embryo using #9751 (green). Actin filaments were labeled with DY-554 phalloidin (red).



Tri-Methyl-Histone H3 (Lys27) (C36B11) Rabbit mAb #9733: Confocal IF analysis of HeLa cells using #9733 (green). Actin filaments were labeled with DY-554 phalloidin (red).

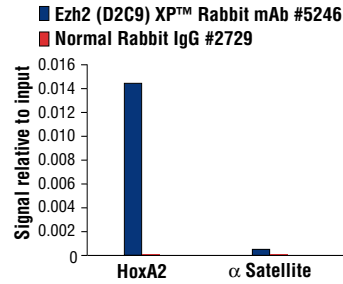


Tri-Methyl-Histone H3 (Lys9) Antibody #9754: Confocal IF analysis of PC-3 cells using #9754 (green). Actin filaments were labeled with DY-554 phalloidin (red).

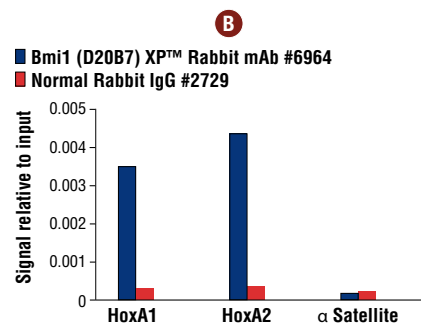
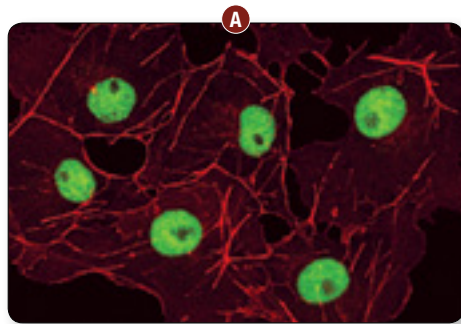


Tri-Methyl-Histone H3 (Lys27) Antibody #9756: Confocal IF analysis of tissue surrounding the cartilage primordium of ribs two and three in an E14.5 mouse embryo using #9756 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5® #4084 (fluorescent DNA dye).

Epigenetic Regulators and Marks



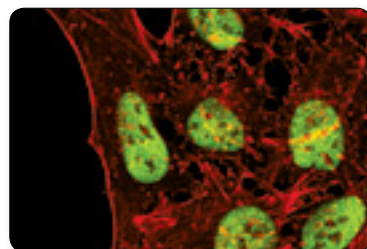
Ezh2 (D2C9) XP[®] Rabbit mAb #5246: Chromatin immunoprecipitations were performed with cross-linked chromatin from 4 x 10⁶ NCCIT cells and either 5 μl of #5246 or 2 μl of Normal Rabbit IgG #2729 using SimpleChIP[®] Enzymatic Chromatin IP Kit (Magnetic Beads) #9003. The enriched DNA was quantified by real-time PCR using SimpleChIP[®] Human HoxA2 Promoter Primers #5517 and SimpleChIP[®] Human α Satellite Repeat Primers #4486. The amount of immunoprecipitated DNA in each sample is represented as signal relative to the total amount of input chromatin, which is equivalent to one.



Bmi1 (D20B7) XP[®] Rabbit mAb #6964: (A) Confocal IF analysis of COS-7 cells using #6964 (green). Actin filaments were labeled with DY-554 phalloidin (red). (B) Chromatin immunoprecipitations were performed with cross-linked chromatin from 4 x 10⁶ NCCIT cells and either 10 μl of #6964 or 2 μl of Normal Rabbit IgG #2729 using SimpleChIP[®] Enzymatic Chromatin IP Kit (Magnetic Beads) #9003. The enriched DNA was quantified by real-time PCR using human HoxA1 intron 1 primers, SimpleChIP[®] Human HoxA2 Promoter Primers #5517, and SimpleChIP[®] Human α Satellite Repeat Primers #4486. The amount of immunoprecipitated DNA in each sample is represented as signal relative to the total amount of input chromatin, which is equivalent to one.

Histone Modifying Enzymes

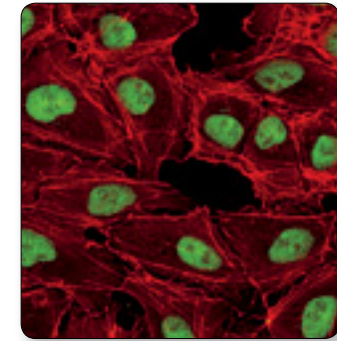
	Applications	Reactivity
NEW #5019 ASH2L (D93F6) XP[®] Rabbit mAb	W, IP, IF-IC	H, M, R, Mk, (Dm)
NEW #6964 Bmi1 (D20B7) XP[®] Rabbit mAb	W, IF-IC, ChIP	H, Mk
NEW #5856 Bmi1 (D42B3) Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#2830 Bmi1 Antibody	W	H, Mk, (B)
NEW #5855 Bmi1 (DC9) Mouse mAb	W	H, M, R, Mk
#3508 Brg1 (A52) Antibody	W, IF-IC	H, M, Mk, (R)
#3514 Brg1 (P680) Antibody	W	H, M, R, Mk
#4771 Acetyl-CBP (Lys1535)/p300 (Lys1499) Antibody	W, IP, ChIP	H, M, R, Mk
NEW #5157 CLOCK (D45B10) Rabbit mAb	W, IP	H, M, R, Mk
#3417 CTCF (D1A7) XP[®] Rabbit mAb	W, IP, IF-IC, ChIP	H, R, Mk, (B)
#3418 CTCF (D31H2) XP[®] Rabbit mAb	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk, (B)
#2899 CTCF Antibody	W, IP, IF-IC, ChIP	H, M, R, Mk
#2196 ESET (C1C12) Rabbit mAb	W, IP, IF-IC	H, Mk
NEW #5246 Ezh2 (D2C9) XP[®] Rabbit mAb	W, IP, IHC-P, IF-IC, ChIP	H, M, R, Mk
NEW #4905 Ezh2 Antibody	W, IP, ChIP	H, M, R, Pg
#3147 Ezh2 (AC22) Mouse mAb	W, IF-IC	H, M, R, Mk
#3306 G9a/EHMT2 (C6H3) Rabbit mAb	W, IF-IC	H, M, R, Mk, (B, Pg)
#3305 GCN5L2 (C26A10) Rabbit mAb	W, IP, IF-IC	H, M, R, Mk, (B)
#2062 Histone Deacetylase 1 (HDAC1) Antibody	W	H, M, R, Mk
#5356 HDAC1 (10E2) Mouse mAb	W, IP, IF-IC	H, M, R, Mk
#2540 HDAC2 Antibody	W, IF-IC	H, M, R, Mk
#2545 HDAC2 Antibody (IP Preferred)	W, IP	H, M, Mk
NEW #5113 HDAC2 (3F3) Mouse mAb	W, IP, IF-IC	H, M, R, Mk
#3815 Phospho-HDAC3 (Ser424) Antibody	W, IP, IHC-P, IF-IC	H, M, R, (Mk, C, X)
#2632 Histone Deacetylase 3 (HDAC3) Antibody	W	H, M, R, Mk
#3949 HDAC3 (7G6C5) Mouse mAb	W, IP, IF-IC	H, M, R, Mk
#3443 Phospho-HDAC4 (Ser246)/HDAC5 (Ser259)/HDAC7 (Ser155) (D27B5) Rabbit mAb	W, IP	H, M
#3424 Phospho-HDAC4 (Ser632)/HDAC5 (Ser498)/HDAC7 (Ser486) Antibody	W, IP	H, M
#2072 Histone Deacetylase 4 (HDAC4) Antibody	W	H, M, R, Mk
NEW #5392 HDAC4 (4A3) Mouse mAb	W, IP	H, M, R, Mk
#2082 Histone Deacetylase 5 (HDAC5) Antibody	W, IP, IHC-P	H, M, R, Mk
#2882 Histone Deacetylase 7 (HDAC7) Antibody	W	H, M, R, Mk
#2623 HP1α (C7F11) Rabbit mAb	W, IP, IHC-P, IF-IC	H, M, R, Mk
#2616 HP1α Antibody	W, IP, IHC-P, IF-IC, F	H, M, R, Mk, (B)
#2613 HP1β Antibody	W	H, M, R, Mk, (B)
#2600 Phospho-HP1γ (Ser83) Antibody	W, IP, IF-IC	H, M, R, Mk, (Dm, B)
#2619 HP1γ Antibody	W, IP, IF-IC, F	H, M, R, Mk
#3876 JARID1A (D28B10) XP[®] Rabbit mAb	W, IP, IF-IC	H, M, (R, B)
#3273 JARID1B Antibody	W, IP	H, Mk



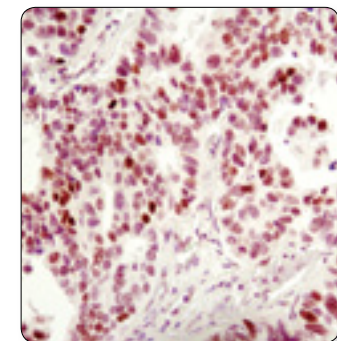
ASH2L (D93F6) XP[®] Rabbit mAb #5019: Confocal IF analysis of HeLa cells using #5019 (green). Actin filaments were labeled with DY-554 phalloidin (red).

Histone Modifying Enzymes

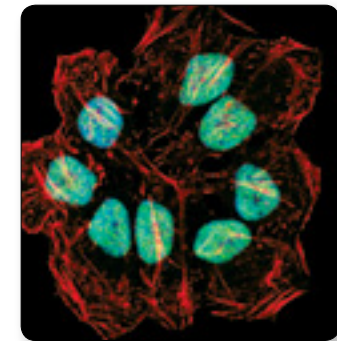
	Applications	Reactivity
NEW #5361 JARID1C (D29B9) Rabbit mAb	W, IP	H, M, (Mk, Pg)
#3314 JMJD1B (C69G2) Rabbit mAb	W, IP, IF-IC	H, Mk
#3100 JMJD1B (C6D12) Rabbit mAb	W, IP, IHC-P	H, Mk
#2621 JMJD1B/JHDM2B Antibody	W, IP, IF-IC	H, M, R, Mk
NEW #5377 JMJD1B (6A1-1F5) Mouse mAb	W, IP, IF-IC	H, M, R, Mk
#3393 JMJD2A (C70G6) Rabbit mAb	W, IP, IF-IC	H, M, R, (Mk)
NEW #5328 JMJD2A (C37E5) Rabbit mAb	W, IP, IHC-P, IF-IC	H, M, R, Mk
#2898 JMJD2B Antibody	W, IP	H, (Mk)
#3457 JMJD3 Antibody	W	H, M, (Mk)
#2184 LSD1 (C69G12) Rabbit mAb	W, IP, IHC-P, IHC-F, IF-IC	H, M, R, Mk
#2139 LSD1 Antibody	W, IP, IHC-P, IF-IC, F	H, M, R, Mk
#4064 LSD1 (1B2E5) Mouse mAb	W	H, M, R, Mk
#4218 LSD1 (1E5-H2) Mouse mAb	W, IP	H, Mk
#3896 MBD3 Antibody	W	H, M, R, Mk
#3456 MeCP2 (D4F3) XP[®] Rabbit mAb	W, IP, IHC-P, IF-IC	H, M, R, Mk
#2018 MEP50 (D56B8) Rabbit mAb	W, IP	H, M, R, Mk
#2828 MEP50 (P328) Antibody	W, IP	H
#2823 MEP50 Antibody	W, IP, IF-IC	H
NEW #5647 MTA1 (D40D1) XP[®] Rabbit mAb	W, IHC-P	H, M, R, Mk
NEW #5646 MTA1 (D17G10) Rabbit mAb	W, IP	H, M, R, Mk
NEW #5948 NCoR1 Antibody	W	H, M, R, Mk
#3378 PCAF (C14G9) Rabbit mAb	W, IP, ChIP	H, M, R, Mk, (B)
#2449 PRMT1 (A33) Antibody	W, IP, IF-IC	H, M, R, Mk, (B)
#2453 PRMT1 (F339) Antibody	W	H, M, R, Mk, (B)
#3379 PRMT4/CARM1 (C31G9) Rabbit mAb	W, IP, IF-IC	H, M, R, Mk
#4438 PRMT4/CARM1 Antibody	W, IP	H, M, R, Mk
#2252 PRMT5/Skb1Hs Methyltransferase Antibody	W, IP	H, M, R, Mk
#4633 RBAP46/RBAP48 Antibody	W	H, M, R, Mk, (C)
#4522 RBAP46 Antibody	W	H, M, R, Mk, (B)
#6882 RBAP46 (V415) Antibody	W, IP, IF-IC	H, M, R, Mk, (Pg)
#2820 Ring1A Antibody	W	H, M, R, Mk
NEW #5694 RING1B (D22F2) XP[®] Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#2825 SET7/SET9 (C24B1) Rabbit mAb	W	H, M, R, Mk
#2813 SET7/SET9 Antibody	W, IF-IC	H, M, R, Mk
#2996 SET8 (C18B7) Rabbit mAb	W, IF-IC	H, M, R, Mk, (B, Pg)
#2327 Phospho-SirT1 (Ser27) Antibody	W	H
#2314 Phospho-SirT1 (Ser47) Antibody	W, IP, IF-IC, F	H
#2496 SirT1 (C14H4) Rabbit mAb	W, IP	H
#3931 SirT1 (D60E1) Rabbit mAb (Mouse Specific)	W, IP	M
#2493 SirT1 (D739) Antibody	W, IP, IF-IC	H, Mk
#2310 SirT1 Antibody	W	H
#2028 SirT1 Antibody (Mouse Specific)	W, IP, IF-IC	M
#2627 SirT3 (C73E3) Rabbit mAb	W, IP, IHC-P	H, R, Mk
NEW #5490 SirT3 (D22A3) Rabbit mAb	W, IP	H, M, R
#2590 SirT6 Antibody	W, IP, IF-IC	H
#2991 SUV39H1 Histone Methyltransferase Antibody	W	H, M
#3737 SUZ12 (D39F6) XP[®] Rabbit mAb	W, IP, IF-IC, ChIP	H, M, R, Mk
#3966 TRRAP (D2966) Antibody	W, IP, IF-IC	H, M, R, Mk
#3967 TRRAP (P2032) Antibody	W, IP	H, M, Mk



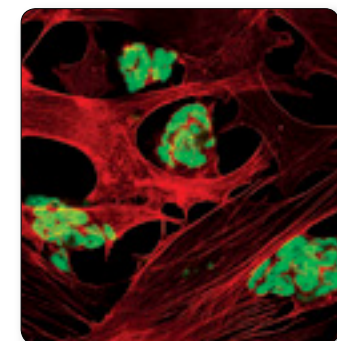
JARID1A (D28B10) XP[®] Rabbit mAb #3876: Confocal IF analysis of NTERA-2 cells using #3876 (green). Actin filaments were labeled with DY-554 phalloidin (red).



MeCP2 (D4F3) XP[®] Rabbit mAb #3456: IHC analysis of paraffin-embedded human lung carcinoma using #3456.



RING1B (D22F2) XP[®] Rabbit mAb #5694: Confocal IF analysis of HeLa cells using #5694 (green). Actin filaments were labeled with DY-554 phalloidin (red). Blue pseudocolor = DRAQ5[®] #4084 (fluorescent DNA dye).



SUZ12 (D39F6) XP[®] Rabbit mAb #3737: Confocal IF analysis of mouse embryonic stem cells growing on mouse embryonic fibroblast (MEF) feeder cells using #3737 (green). Actin filaments were labeled with DY-554 phalloidin (red).

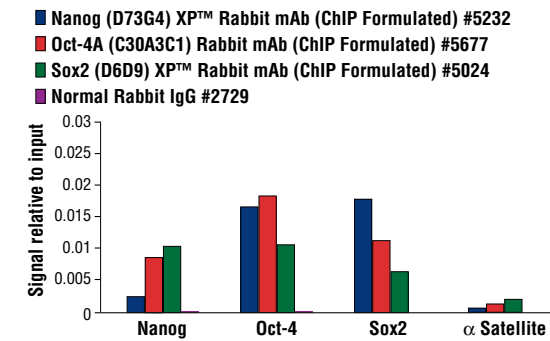
SimpleChIP® Assay Kits

The chromatin immunoprecipitation (ChIP) assay is a powerful and versatile technique used for probing protein-DNA interactions within the natural chromatin context of the cell. Cell Signaling Technology® (CST) has extended its expertise in antibody validation to provide you with antibodies, kits, and reagents for ChIP that can be used in the study of stem cells.

New SimpleChIP® Assay Kits combine several ChIP-validated antibodies with control PCR primer mixes that serve as markers for pluripotency or epigenetic status. Our rigorous quality control and in-house testing ensure the antibodies included in the kits meet the highest standards for quality, validation, and lot-to-lot consistency. The kits provide all reagents necessary to perform 10 ChIP assays and subsequent real-time PCR reactions. Pre-selected positive and negative primer sets are included in each kit, providing proven and appropriate controls for your experiments.

SimpleChIP® Assay Kits

- NEW #8980 SimpleChIP® Stem Cell Master Regulator Assay Kit**
- NEW #8982 SimpleChIP® Human Bivalent Promoter Assay Kit**
- NEW #8981 SimpleChIP® Mouse Bivalent Promoter Assay Kit**

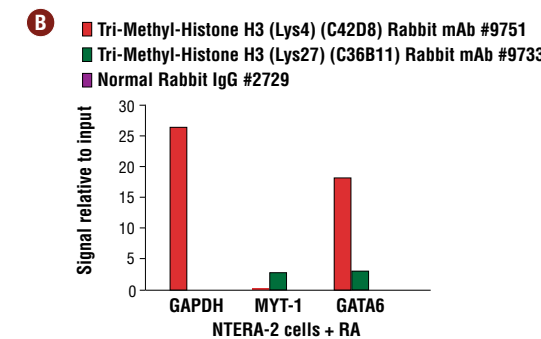
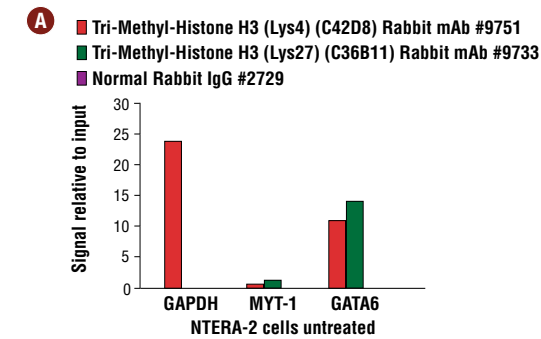


SimpleChIP® Stem Cell Master Regulator Assay Kit #8980: Chromatin immunoprecipitations were performed with cross-linked chromatin from 4 x 10⁶ NCCIT cells and 10 μl of Nanog, Oct-4 and Sox2 antibodies, or 2 μl of Normal Rabbit IgG, using SimpleChIP® Enzymatic Chromatin IP Kit (Magnetic Beads) #9003. The enriched DNA was quantified by real-time PCR using human Nanog promoter primers, SimpleChIP® Human Oct-4 Promoter Primers #4641, SimpleChIP® Human Sox2 Promoter Primers #4649, and SimpleChIP® Human α-Satellite Repeat Primers #4486. The amount of immunoprecipitated DNA in each sample is represented as signal relative to the total amount of input chromatin, which is equivalent to one.

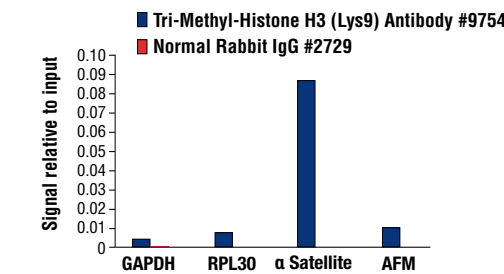
ChIP-validated Antibodies and Primer Pairs

Antibody	Reactivity	Positive Control Primers	Negative Control Primers
#6964 Bmi1 (D20B7) XP® Rabbit mAb	H, Mk	#5517 H	#4486 H
#5856 Bmi1 (D42B3) Rabbit mAb	H, M, R, Mk	#5517 H	#4486 H
#4771 Acetyl-CBP (Lys1535)/p300 (Lys1499) Antibody	H, M, R, Mk	#4829 H	#4486 H
#3417 CTCF (D1A7) XP® Rabbit mAb	H, R, Mk, (B)	#5172 H	#4486 H
#3418 CTCF (D31H2) XP® Rabbit mAb	H, M, R, Mk, (B)	#5172 H	#4486 H
#2899 CTCF Antibody	H, M, R, Mk	#5172 H	#4486 H
#5246 Ezh2 (D2C9) XP® Rabbit mAb	H, M, R, Mk	#5517 H	#4486 H
#4905 Ezh2 Antibody	H, M, R, Pg	#5517 H	#4486 H
#5326 Mono-Methyl-Histone H3 (Lys4) (D1A9) XP® Rabbit mAb	H, M, R, Mk	#5047 H	#5037 H
#9725 Di-Methyl-Histone H3 (Lys4) (C64G9) Rabbit mAb	H, M, R, Mk	#7014 H, #7015 M	#4490 H, #4486 H
#9726 Di-Methyl-Histone H3 (Lys4) Antibody	H, M, R, Mk, (X, Z)	#7014 H, #7015 M	#4490 H, #4486 H
#9751 Tri-Methyl-Histone H3 (Lys4) (C42D8) Rabbit mAb	H, M, R, Mk, Dm, Sc, (X, Z)	#5516 H, #7014 H, #7015 M	#4490 H, #4486 H
#9727 Tri-Methyl-Histone H3 (Lys4) Antibody	H, M, R, Mk, (X, Z)	#5516 H, #7014 H, #7015 M	#4490 H, #4486 H
#4473 Pan-Methyl-Histone H3 (Lys9) (D54) XP® Rabbit mAb	H, M, R, Mk, (C, Dm, X, Z, B, Pg, Sc)	#5098 H, #5077 H, #4486 H	#7014 H, #4471 H
#4069 Pan-Methyl-Histone H3 (Lys9) Antibody	H, M, R, Mk, Z	#5098 H, #5077 H, #4486 H	#7014 H, #4471 H
#4658 Di-Methyl-Histone H3 (Lys9) (D85B4) XP® Rabbit mAb	H, M, R, Mk, (Dm, X, Z, B, Pg, Sc)	#5098 H, #4486 H	#7014 H, #4471 H

Antibody	Reactivity	Positive Control Primers	Negative Control Primers
#9753 Di-Methyl-Histone H3 (Lys9) Antibody	H, M, R, Mk, Dm, Sc	#5098 H, #4486 H	#5516 H, #7014 H
#5327 Di/Tri-Methyl-Histone H3 (Lys9) (6F12) Mouse mAb	H, M, R, Mk	#4486 H, #5098 H	#5516 H
#9754 Tri-Methyl-Histone H3 (Lys9) Antibody	H, M, R, Mk, (Dm, Pg)	#4486 H, #5077 H, #5098 H	#5516 H, #7014 H
#9728 Di-Methyl-Histone H3 (Lys27) (D18C8) XP® Rabbit mAb	H, M, R, Mk	#4490 H, #5098 H	#5516 H, #7014 H
#9733 Tri-Methyl-Histone H3 (Lys27) (C36B11) Rabbit mAb	H, M, R, Mk, (X, Z)	#4490 H, #4493 H	#7014 H
#9756 Tri-Methyl-Histone H3 (Lys27) Antibody	H, M, R, Mk, (X)	#4493 H, #4490 H	#5516 H, #7014 H
#9402 c-Myc Antibody	H, M, R, Pg	#4779 H	#4486 H
#5232 Nanog (D73G4) XP® Rabbit mAb (ChIP Formulated)	H	#4641 H, #4649 H	#4486 H
#3580 Nanog Antibody	H	#4641 H, #4649 H	#4486 H
#5677 Oct-4A (C30A3C1) Rabbit mAb (ChIP Formulated)	H, M	#4641 H, #4649 H, #4653 M, #4659 M	#4486 H, #7015 M
#2890 Oct-4A (C52G3) Rabbit mAb	H	#4641 H, #4649 H	#4486 H
#2750 Oct-4 Antibody	H, (Mk)	#4641 H, #4649 H	#4486 H
#3378 PCAF (C14G9) Rabbit mAb	H, M, R, Mk, (B)	#4829 H	#4486 H
#5694 RING1B (D22F2) XP® Rabbit mAb	H, M, R, Mk	#5517 H	#4486 H
#5024 Sox2 (D6D9) XP® Rabbit mAb (ChIP Formulated)	H, (Mk, B, Dg)	#4641 H, #4649 H	#4486 H
#2748 Sox2 Antibody	H, M, (R, Mk, B, Dg)	#4641 H, #4649 H, #4653 M, #4659 M	#4486 H, #7015 M
#3737 SUZ12 (D39F6) XP® Rabbit mAb	H, M, R, Mk	#4493 H	#4486 H



SimpleChIP® Human Bivalent Promoter Assay Kit #8982: NTERA-2 cells were either untreated (A) or treated for 15 days with retinoic acid (RA) to induce differentiation along the neuronal lineage (B). Chromatin immunoprecipitations were then performed with cross-linked chromatin from 4 x 10⁶ cells and Tri-Methyl-Histone H3 (Lys4) (C42D8) Rabbit mAb #9751, Tri-Methyl-Histone H3 (Lys27) (C36B11) Rabbit mAb #9733, or 2 μl of Normal Rabbit IgG, using SimpleChIP® Enzymatic Chromatin IP Kit (Magnetic Beads) #9003. The enriched DNA was quantified by real-time PCR using SimpleChIP® Human GAPDH Exon 1 Primers #5516, SimpleChIP® Human MYT-1 Exon 1 Primers #4493, and SimpleChIP® Human GATA6 Promoter Primers #5550. The amount of immunoprecipitated DNA in each sample is normalized for enrichment of total histone H3 and represented as signal relative to the total amount of input chromatin, which is equivalent to one. Note the loss of tri-methyl histone H3 Lys27 on the GATA6 promoter as it is activated during NTERA-2 cell differentiation.



Tri-Methyl-Histone H3 (Lys9) Antibody #9754: Chromatin immunoprecipitations were performed with cross-linked chromatin from 4 x 10⁶ HeLa cells and either 20 μl of #9754 or 2 μl Normal Rabbit IgG #2729, using SimpleChIP® Enzymatic Chromatin IP Kit (Magnetic Beads) #9003. The enriched DNA was quantified by real-time PCR using SimpleChIP® Human GAPDH Exon 1 Primers #5516, SimpleChIP® Human RPL30 Exon 3 Primers #7014, SimpleChIP® Human α-Satellite Repeat Primers #4486, and SimpleChIP® Human AFM Intron 1 Primers #5098. The amount of immunoprecipitated DNA in each sample is represented as signal relative to the total amount of input chromatin, which is equivalent to one.

Cancer Stem Cell Markers

Tumors contain a small percentage of cells with the ability to self renew and differentiate. These cells are known as cancer stem cells and their ability to replicate continuously is responsible for tumorigenicity and perhaps resistance to chemotherapy. Use of specific cell markers can help identify cancer stem cells in many forms of cancer. The list of known cancer stem cell markers is continually growing. A few examples are shown below.

Androgen Receptor: AR belongs to the nuclear receptor superfamily and plays a crucial role in several stages of male development and the progression of prostate cancer.

β-Catenin: β-catenin is a key downstream effector in the Wnt signaling pathway that is found to be a marker for prostate cancer.

Bmi1: Bmi is a member of the polycomb group (PcG) of proteins that cooperate to maintain long-term gene silencing through epigenetic chromatin modifications. Bmi is a marker for leukemia.

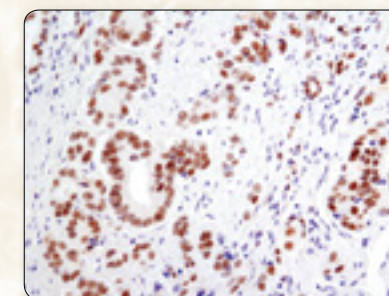
CD44: CD44 is a type I transmembrane glycoprotein that is a marker for breast, prostate, SCLC, and head and neck cancers.

EpCAM: EpCAM is a transmembrane glycoprotein involved in cell adhesion that is a marker for colorectal and bladder cancers.

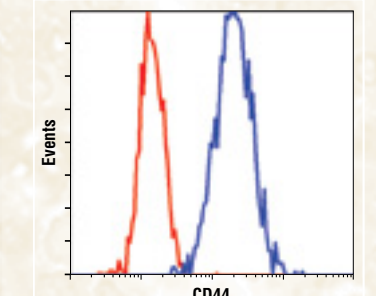
Nanog: Nanog serves as a marker for bone sarcomas, seminoma, and embryonal carcinoma.

Oct-4: Oct-4 serves as a marker for bone sarcomas, seminoma, and bladder cancer.

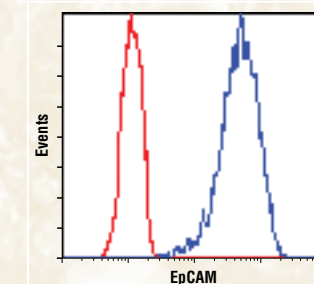
Sox2: Sox2 is a marker for esophageal squamous cell carcinomas.



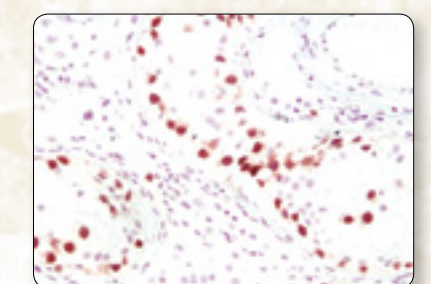
Androgen Receptor (D6F11) XP® Rabbit mAb #5153: IHC analysis of paraffin-embedded human prostate carcinoma using #5153.



CD44 (156-3C11) Mouse mAb #3570: Flow cytometric analysis of HeLa cells using #3570 (blue) compared to a nonspecific negative control antibody (red).



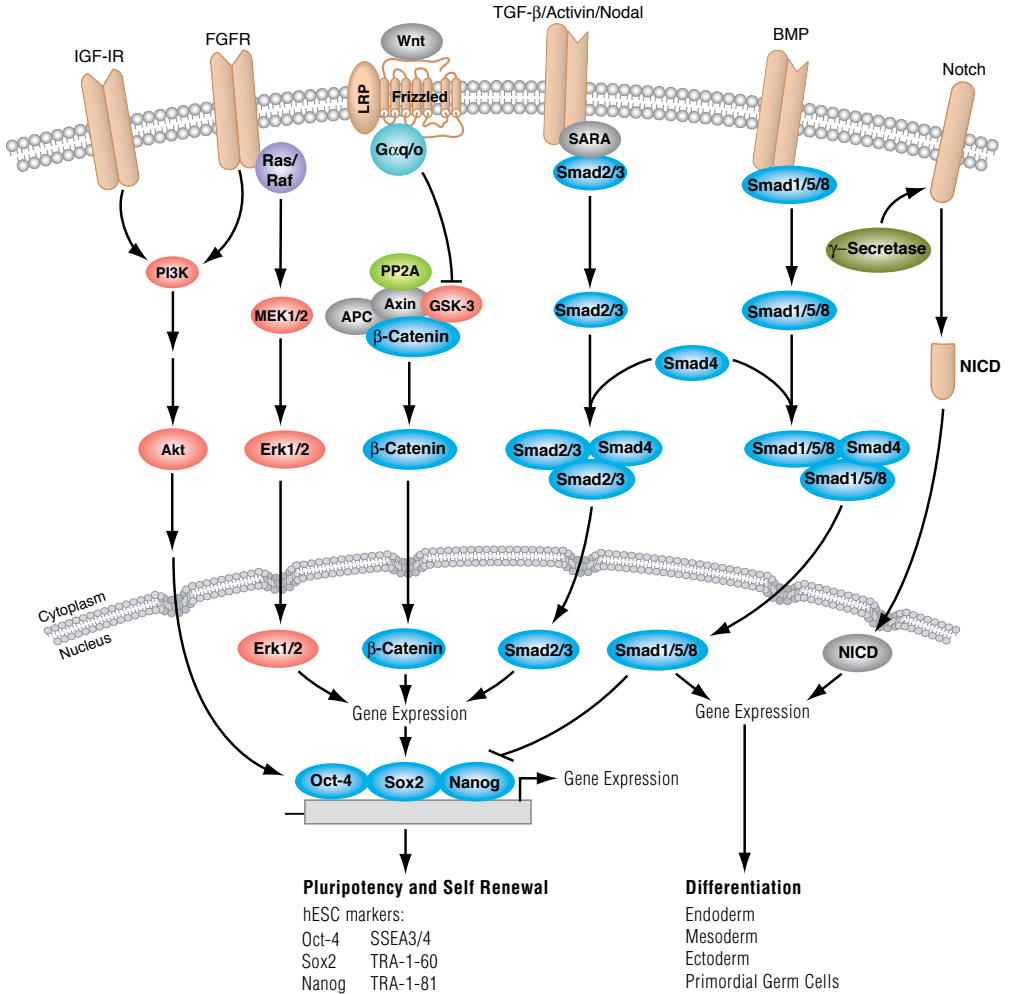
EpCAM (VU1D9) Mouse mAb #2929: Flow cytometric analysis of unpermeabilized HT-29 cells using #2929 (blue) compared to a nonspecific negative control antibody (red).



Oct-4A (C52G3) Rabbit mAb #2890: IHC analysis of paraffin-embedded human seminoma, showing nuclear localization, using #2890.

Signaling Pathways

ESC Pluripotency and Differentiation

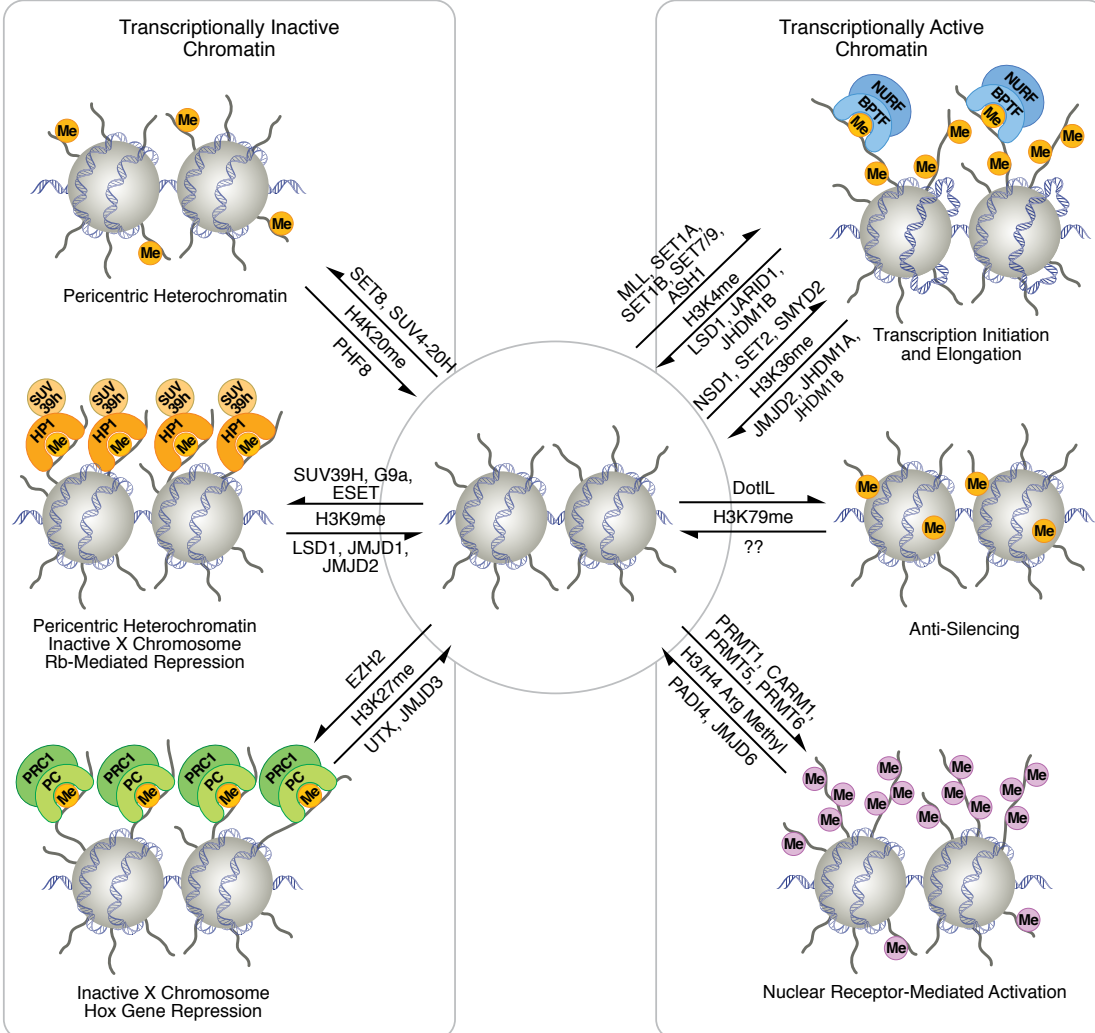


Pathway Description: Two distinguishing characteristics of embryonic stem cells (ESCs) are pluripotency and their ability to self renew. These traits, which allow ESCs to grow into any cell type in the body and to divide continuously in the undifferentiated state, are regulated by a number of cell signaling pathways. In human ESCs (hESCs), the predominant signaling pathways involved in pluripotency and self renewal are TGF- β , which signals through Smad2/3/4, and FGFR, which activates the MAPK and Akt pathways. The Wnt pathway also promotes pluripotency through activation of β -catenin. Signaling through these pathways results in the expression and activation of three key transcription factors: Oct-4, Sox2, and Nanog. These transcription factors activate gene expression of ESC specific genes, regulate their own expression, and also serve as hESCs markers. Other markers used to identify hESCs are the cell surface glycolipid SSEA3/4, and glycoproteins TRA-1-60 and TRA-1-81. Loss of pluripotency results in differentiation into primordial germ cells or one of the three primary germ layers: endoderm, mesoderm, or ectoderm. One of the primary signaling pathways responsible for this process is the BMP pathway, which uses Smad1/5/8 to promote differentiation by both inhibiting expression of Nanog, as well as activating the expression of differentiation-specific genes. Notch also plays a role in this process through the notch intracellular domain (NICD). As differentiation continues, cells from each primary germ layer further differentiate along lineage-specific pathways.

Selected Reviews:
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Histone Methylation



Pathway Description: The nucleosome, made up of four histone proteins (H2A, H2B, H3, and H4), is the primary building block of chromatin. Originally thought to function as a static scaffold for DNA packaging, histones have more recently been shown to be dynamic proteins, undergoing multiple types of post-translational modifications. Two such modifications, methylation of arginine and lysine residues, are major determinants for formation of active and inactive regions of the genome. Arginine methylation of histones H3 (Arg2, 17, 26) and H4 (Arg3) promotes transcriptional activation and is mediated by a family of protein arginine methyltransferases (PRMTs), including the co-activators PRMT1 and CARM1 (PRMT4). In contrast, a more diverse set of histone lysine methyltransferases has been identified, all but one of which contain a conserved catalytic SET domain originally identified in the *Drosophila* Su[var]3-9, Enhancer of zeste, and Trithorax proteins. Lysine methylation has been implicated in both transcriptional activation (H3 Lys4, 36, 79) and silencing (H3 Lys9, 27, H4 Lys20).

Unlike acetylation, methylation does not alter the charge of arginine and lysine residues and is unlikely to directly modulate nucleosomal interactions required for chromatin folding. While the mechanisms by which arginine methylation regulates transcription are unknown, lysine methylation coordinates the recruitment of chromatin modifying enzymes. Chromodomains (HP1, PRC1), PHD fingers (BPTF, ING2), Tudor domains (53BP1), and WD-40 domains (WDR5) are among a growing list of methyl-lysine binding modules found in histone acetyltransferases, deacetylases, methylases and ATP-dependent chromatin remodeling enzymes. Lysine methylation provides a binding surface for these enzymes, which then regulate chromatin condensation and nucleosome mobility in order to maintain local regions of active or inactive chromatin. In addition, lysine methylation can block binding of proteins that interact with

unmethylated histones or directly inhibit catalysis of other regulatory modifications on neighboring residues. The presence of methyl-lysine binding modules in the DNA repair protein 53BP1 suggests roles for lysine methylation in other cellular processes.

Histone methylation is crucial for proper programming of the genome during development, and misregulation of the methylation machinery can lead to diseased states such as cancer. Until recently, methylation was believed to be an irreversible, stable epigenetic mark that is propagated through multiple cell divisions, maintaining a gene in an active or inactive state. While there is no argument that methylation is a stable mark, recent identification of histone demethylases such as LSD1/AOF2, JMJD1, JMJD2, and JHD1M1 has shown that methylation is reversible and provides a rationale for how genomes might be reprogrammed during differentiation of individual cell lineages.

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