# Products for Induced Pluripotent Stem (iPS) Cell Research





## Induced Pluripotent Stem (iPS) Cells

iPS cells are generated from somatic cells cultured in vitro and transduced with expression vectors encoding transcription factors associated with pluripotency. For most cell types four factors (c-Myc, Oct-3/4, SOX2, and KLF4) are used, although an alternate list (Oct-3/4, SOX2, Nanog, and LIN-28) or all six factors combined have been used successfully. Expression of these exogenous factors triggers a gradual process of reprogramming whereby markers of the differentiated phenotype are silenced and markers of the pluripotent state are induced in some cells. The resulting colonies of iPS cells very closely resemble embryonic (ES) cells as assessed by gene expression, behavior in teratoma and chimera assays, and epigenetic status. Although questions remain about the exact relationship between iPS and ES cells, both are believed to be valuable tools for drug discovery and testing, as well as stem cell therapies and regenerative medicine.



> Stem cell therapies

> Regenerative medicine

#### PLURIPOTENT STEM CELL CULTURE REAGENTS

PRODUCT	DESCRIPTION	CATALOG #	SIZE
Irradiated Mouse Embryonic Fibroblasts	Tested for the ability to support the expansion of the BG01V human embryonic stem cell line in the undifferentiated state based on the expression of Oct-3/4, and SSEA-4.	PSC001	5 Vials 6 x 10⁰ cells/vial
Mouse Embryonic Fibroblast Conditioned Media	Tested for its ability to support the expansion of the BG01V human embryonic stem cell line in the undifferentiated state based on the expression of Oct-3/4, and SSEA-4.	AR005	100 mL
Human Feeder Cell Conditioned Media	Tested for the ability to support the expansion of the BG01V human embryonic stem cell line in the undifferentiated state based on the expression of Oct-3/4, and SSEA-4.	AR007	100 mL
Recombinant human FGF basic 146 aa	<i>E. coli</i> -derived, tested for its ability to stimulate fibroblast proliferation.	233-FB	25 μg: 1 mg
Recombinant human FGF basic 145 aa	<i>E. coli</i> -derived, Tissue Culture grade, tested for its ability to support the expansion of stem cells.	4114-TC	1 mg
Recombinant human FGF basic 146 aa, Animal Free	<i>E. coli</i> -derived, tested for its ability to stimulate fibroblast proliferation.	AFL233	1 mg





Embryonic Fibroblast (MEF) Conditioned Medium Retain Markers of Pluripotency. Human embryonic stem cells were cultured with recombinant human FGF basic (Catalog # 233-FB) in the presence (A) or absence (B) of MEF-conditioned medium (Catalog # AR005). SSEA-4 and Oct-3/4 were detected using antihuman SSEA-4 monoclonal antibody (Catalog MAB1435; red) and anti-human Oct-3/4 polyclonal antibody (Catalog # AF1759; green). Cells were counterstained with DAPI (blue). Image courtesy of Dr. Frank Soldner of the National Institutes of Health

Embryonic Stem Cells Cultured with Mouse



Podocalyxin-positive Human BG01V Embryonic Stem Cells on Irradiated Mouse Embryonic Firoblasts (iMEFS). The pluripotency marker podocalyxin is detected specifically in BG01V human embryonic stem cells cultured on iMEFs (Catalog # PSC001) using mouse antihuman Podocalyxin monoclonal antibody (Catalog # MAB1658). The cells were stained with the anti-mouse NorthernLights<sup>™</sup>-557 secondary antibody (Catalog # NL007; red) and counterstained with DAPI (blue)

### **Characterizing iPS Cell Differentiation**

#### **HIGH PERFORMANCE ANTIBODIES**

R&D Systems offers a large panel of high quality antibodies for assessing pluripotency markers on stem cells by ICC and flow cytometry.

AN	ANTIBODIES ARE AVAILABLE FOR THE FOLLOWING MOLECULES					
AB	CG2	DPPA5/ESG1	GDF-3	Nanog	SOX2	STAT3
Alk	aline Phosphatase	FGF-4	Integrin β1/CD29	0ct-3/4	SPARC	SUZ1Z
E-C	adherin	Frizzled-5	KLF4	Podocalyxin/PODXL	SSEA-1	TRA-1-60 (R)
CCF	34	sFRP-2	Lefty	Rex-1	SSEA-3	UTF1
Crij	pto	GCNF/NR6A1	LIN-28	Smad2	SSEA-4	



Analysis of Oct-3/4 and SSEA-1 Expression in Human iPS Cells. Assessment of Oct-3/4 and SSEA-1 expression in human fibroblast-derived iPS cells were assessed by flow cytometry using APC-conjugated anti-human/mouse Oct-3/4 monoclonal antibody (Catalog # IC1759A) and PerCP-conjugated anti-human/mouse SSEA-1 monoclonal antibody (Catalog # FAB2155C). The quadrants were set based on isotype controls.

#### ANTIBODY KITS

Antibody kits offer an economical way to purchase multiple antibodies. 4-Color Flow Cytometry kits allow for the simultaneous analysis of multiple pluripotent markers.

KIT	ANTIBODIES	CATALOG #
Human Embryonic Stem Cell Marker Antibody Panel	Alkaline Phosphatase, Nanog, Oct-3/4, SSEA-1, SSEA-4	SC008
Human Embryonic Stem Cell Marker Antibody Panel Plus	CD9, SOX2, Nanog, Oct-3/4, Podocalyxin, SSEA-4, E-Cadherin, SSEA-1	SC009
Human/Mouse Embryonic Stem Cell 4-Color Flow Cytometry Kit	SSEA-1-PerCP, SSEA-4-Fluorescein, Oct-3/4-APC, SOX2-PE	FMC001



An Embryoid Body Derived from Human Embryonic Stem Cells Stained for Pluripotency Markers. Cells were stained using antibodies from the Human Embryonic Stem Cell Marker Antibody Panel (Catalog # SC008) for Nanog (red; A) and the nuclei counterstained with DAPI (blue; A) or for Oct-3/4 (green; B). Merge of images in (A) and (B) shows the overlap of the 3 fluorochromes (white; C). Images courtesy of Dr. Ronald McKay, NINDS.

Proteome Profiler is a registered trademark of R&D Systems.

NorthernLights is a registered trademark of R&D Systems.

www.RnDSystems.com

#### PROTEOME PROFILER™ HUMAN PLURIPOTENT STEM CELL ANTIBODY ARRAY

The Human Pluripotent Stem Cell Antibody Array is a rapid, sensitive, and economical tool to simultaneously detect the relative expression of 15 stem cell markers in a single sample. No specialized equipment is necessary.



Mesendoderm Differentiated



Stem Cell Marker Profile of Differentiated BG01V Human Embryonic Stem Cells. Extracts were prepared from BG01V embryonic stem cells undifferentiated or grown in the presence of recombinant mouse Wnt-3a (Catalog # 1324-WN) and recombinant human/mouse/rat Activin A (Catalog # 338-AC) for two days. Changes in the relative levels of differentiation markers were assessed using the Proteome Profiler Human Pluripotent Stem Cell Array (Catalog # ARY010).

## Analytes

•			
$\alpha$ -Fetoprotein	E-Cadherin	S0X17	Snail
0ct-3/4	GATA-4	0tx2	VEGF R2/KDR
Nanog	HNF-3 <sup>β</sup> /FoxA2	TP63/TP73L	HCG
SOX2	PDX-1/IPF1	Goosecoid	

#### PLURIPOTENT STEM CELL ASSESSMENT PRIMER PAIR PANELS

R&D Systems Human (Catalog # SC012) and Mouse/Rat (Catalog # SC015) Pluripotent Stem Cell Assessment Primer Pair Panels profile the mRNA transcripts of fourteen genes that are frequently used as markers for molecular characterization of undifferentiated and early lineagecommitted human pluripotent stem cells.



PCR Products Obtained from Various Embryonic Tissue Types. PCR products amplified by primer sets specific for 14 different markers of stem cell pluripotency and lineage commitment were visualized by gel electrophoresis. cDNAs used for amplification were derived from a variety of embryonic tissues. Markers in lanes 3-6 are expressed in undifferentiated ES cells, lanes 6-9 ectodermal lineage, lanes 10-14 endodermal lineage, lane 15 mesodermal lineage, and lane 16 contains a marker for germ cells. Lanes 2, 17, and 18 show controls.



USA & Canada R&D Systems, Inc. 614 McKinley Place NE, Minneapolis, MN 55413 Tel: (800) 343-7475 (612) 379-2956 Fax: (612) 656-4400 info@RnDSystems.com

Change Service Requested

Printed on recyclable paper 10% post consumer waste.

R&D Systems is a registered trademark of TECHNE Corporation.

### Differentiation of iPS Cells

#### **GROWTH FACTORS**

R&D Systems offers high quality recombinant growth factors with high levels of specific activity and purity for stem cell maintenance and differentiation.

Activins	EGF	GDFs	TGF-βs	Wnts
BMPs	FGFs	Sonic Hedgehog	VEGF	

#### **FUNCTIONAL IDENTIFICATION & DIFFERENTIATION KITS**

R&D Systems supplies specialized kits that include supplements to promote differentiation and antibody panels for phenotyping.

PRODUCT	KIT CONTENTS (1 KIT)	CATALOG #
Human/Mouse Dopaminergic Neuron Differentiation Kit	ITS Media Supplement, N-2 Plus Media Supplement, FGF basic, FGF-8b, Fibronectin, Shh-N.	SCOO1B
Mouse Oligodendrocyte Differentiation Kit	ITS Media Supplement, N-2 Plus Media Supplement, EGF, FGF basic, Fibronectin, PDGF-AA.	SC004
Human Neural Stem Cell Functional Identification Kit*	Neural Stem Cell Maintenance Supplement, Neural Differentiation Supplement, Fibronectin, Anti-Neuron-Specific $\beta$ -III Tubulin, Anti-GFAP, Anti-Nestin, Anti-O4.	SC011
Mouse/Rat Neural Stem Cell Functional Identification Kit*	Neural Stem Cell Maintenance Supplement, Neural Differentiation Supplement, Fibronectin, Anti-Neuron-Specific $\beta$ -III Tubulin, Anti-GFAP, Anti-Nestin, Anti-O4.	SC013
Human Mesenchymal Stem Cell Functional Identification Kit	Adipogenic Supplement, Chondrogenic Supplement, ITS Supplement, Osteogenic Supplement, Anti-Aggrecan, Anti-Osteocalcin, Anti-FABP-4.	SC006
Mouse Mesenchymal Stem Cell Functional Identification Kit	Adipogenic Supplement, Chondrogenic Supplement, ITS Supplement, Osteogenic Supplement, Anti-Collagen II, Anti-Osteopontin, Anti-FABP-4.	SC010

\* Sold under license from StemCells California, Inc. U.S. Patent Nos. 5,750,376; 5,851,832; 5,980,885; 5,968,829; 5,981,165; 6,071,889; 6,093,531; 6,103,530; 6,165,783; 6,238,922.



Marker Expression in Differentiating Cortical Stem Cells. Neural progenitors were labeled with anti-rat Nestin polyclonal antibody (Catalog # AF2736) and stained with Northern-Lights-493 anti-goat secondary antibody (Catalog # NL003; green). Differentiated neurons were labeled with neuron-specific mouse anti- $\beta$ -III tubulin monoclonal antiblody (Catalog # MAB1195) and stained using Northern-Lights-557 anti-mouse secondary antibody (Catalog # NL007; red). The nuclei were stained with DAPI (blue).



FABP4 in differentiated human mesenchymal stem cells. FABP4 was detected in differentiated human mesenchymal stem cells using goat antihuman FABP4 polyclonal antibody (Catalog # AF3150). Cells were stained using R&D Systems NorthernLights-557 donkey anti-goat IgG secondary antibody (Catalog # NL001; red) and counterstained with DAPI (blue).