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Neural Lineage Markers

Anne Keller-Novak, Product Manager, Sigma® Life Science

The ever evolving field of stem cell research has been a highly fascinating yet contested area of study. Stem cell research holds promise for many areas such as developmental biology, therapeutic and regenerative medicine, and drug discovery. Potton et al. described stem cells as undifferentiated cells capable of a) proliferation, b) selfmaintenance, c) differentiation, and d) multipotency.[1] Stem cells provide a blank slate for researchers to better understand what internal and external factors drive these cells to differentiate and become committed to certain lineages or cell types.

Initially, scientists worked with two kinds of stem cells, embryonic stem cells (ESC) and adult or somatic stem cells. While ESC are pluripotent and stable cell lines have been generated for research use, controversy about their origin reduces their availability and desirability. Adult stem cells are not pluripotent, and hurdles remain in isolating and culturing them, although they may present advantages in applications involving transplantation. In 2006, Yamanaka opened another door in stem cell research by illustrating the concept of "reprogramming" cells through the generation of induced pluripotent stem cells (iPSC) using transcription factors in mouse fibroblasts.[2] More recently, the process has been augmented using small molecules to coax cells into certain lineages. For example, Ding et al. were able to develop a rapid and consistent method for converting human ESC to precursor neural stem cells (NSC) through the use of small molecules SB 431542 and CHIR99021.[3] In another example, Mak et al. used Dorsomorphin and SB 431542 to generate neural precursors from patient specific iPSC lines.[4] With additional manipulation using Sonic Hedgehog, they were able to successfully continue differentiation into dopaminergic neurons.

With this research, there comes a need for lineage markers to identify and sort certain populations of cells. Over time certain markers, or combinations thereof, have become established (http://stemcells.nih.gov/info/2001report/appendixE.asp).[5] However, as cellular subpopulations become identified and refined, new markers are always being identified. Sheikh et al. identified querkopf (QKF, aka MYST4, MORF, KAT6B) as a "stemness" marker in neural stem cells.[6] Querkopf, belonging to a subclass of histone acetyltransferases, has been shown to play an essential role in normal brain development, where over-expression leads to malignancy and loss of function leads to defects.[7] In the study, cells that expressed high levels of QKF generated all three neuronal cell types; astrocytes, oligodendrocytes,

and neurons. Furthermore, varying levels of QKF expression allowed isolation of specific cell populations, e.g. NSC, neuroblasts, ependymal cells, and transit amplifying cells.

Cusulin et al. utilized a multitude of neuronal markers, such as Nestin, MAP2, and CD11b, in their quest to better understand the role cell fusion may play upon transplantation of NSC(s) between mature neurons or microglial cells.[8] In addition, to the aforementioned markers, Sigma Life Science offers a wide array of neural lineage markers. Prestige Antibodies® powered by Atlas Antibodies are validated in neuro tissues and cell lines. IHC images from human cerebellum, hippocampus, lateral ventricle, and cerebral cortex tissues are available for each antibody, as well as in the following brain cell lines: D341 Med, SH-SY5Y, U-138 MG, U-87 MG. Glial tumor samples from up to 12 patients are also represented. In addition to the IHC images, each antibody is used for immunofluorescence (IF) staining in U-251 MG for subcellular localization information. A representation of products is provided in the table below.
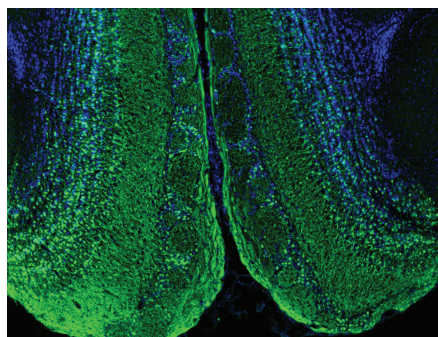
Secretagogin is a newly discovered EF-hand calcium binding protein strongly expressed in the mouse olfactory bulb. Here visualized using the Anti-SCGN antibody (**HPA006641**).

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Key Products

Cat. No.	Product Name	Subcategory	Gene ID (ENSEMBL)	Applications (human tissues)	Antigen seq identity to mouse / rat
HPA006641[9,10]	Anti-SCGN	calcium binding protein	ENSG00000079689	IHC	96 / 96%
HPA023099	Anti-CALB1 (CB)	calcium binding protein	ENSG00000104327	IHC,WB	98 / 99%
HPA007305	Anti-CALB2 (CR)	calcium binding protein	ENSG00000172137	IHC,WB,IF	98 / 98%
HPA007306	Anti-CALB2 (CR)	calcium binding protein	ENSG00000172137	IHC,WB,IF	100 / 100%
HPA030790	Anti-RBFOX3 (NeuN)	Neuron specific	ENSG00000167281	IHC,WB	93 / 94%
HPA023266	Anti-CNP	oligodendrocytes	ENSG00000173786	IHC,WB	90 / 90%
HPA023278	Anti-CNP	oligodendrocytes	ENSG00000173786	IHC,WB	81 / 84%
HPA023280	Anti-CNP	oligodendrocytes	ENSG00000173786	IHC,WB	76 / 77%
HPA023338	Anti-CNP	oligodendrocytes	ENSG00000173786	IHC,WB	87 / 88%
HPA000451	Anti-MKI67 (Ki67)	progenitors	ENSG00000148773	IHC,IF	66 / 67%
HPA001164	Anti-MKI67 (Ki67)	progenitors	ENSG00000148773	IHC,IF	68 / 68%
HPA005753	Anti-PBK	progenitors	ENSG00000168078	IHC,WB	91 / 94%
HPA021616	Anti-EZR	Astroglia	ENSG00000092820	IHC,WB,IF	93 / 93%
HPA008943	Anti-ICAM5	adhesion molecule	ENSG00000105376	IHC	74 / 74%
HPA009083	Anti-ICAM5	adhesion molecule	ENSG00000105376	IHC	85 / 86%
HPA008848	Anti-MCAM	adhesion molecule	ENSG00000076706	IHC	75 / 73%
HPA030900	Anti-NCAM2	adhesion molecule	ENSG00000154654	IHC	89 / 91%
HPA006680	Anti-NLGN1	adhesion molecule	ENSG00000169760	IHC	98 / 98%
HPA002274	Anti-ITGAM (CD11b)	microglia	ENSG00000169896	IHC,WB	67 / 68%
HPA008273	Anti-MAP2	cytoskeleton	ENSG00000078018	IHC	96 / 96%
HPA012828	Anti-MAP2	cytoskeleton	ENSG00000078018	IHC	91 / 89%
HPA039064	Anti-MAP1A	cytoskeleton	ENSG00000166963	IHC	60 / 52%
HPA001873	Anti-ACTN4	cytoskeleton	ENSG00000130402	IHC,WB	99 / 98%
HPA006035	Anti-ACTN1	cytoskeleton	ENSG00000072110	IHC,WB	98 / 99%
HPA008057	Anti-INA	cytoskeleton	ENSG00000148798	IHC	83 / 84%
HPA023138	Anti-NEFM	cytoskeleton	ENSG00000104722	IHC	98 / 98%
HPA001356	Anti-MYO5A	cytoskeleton	ENSG00000197535	IHC	99 / 98%
HPA022275	Anti-MAP1B	cytoskeleton	ENSG00000131711	IHC	85 / 86%
HPA024372	Anti-S100A8	macrophages	ENSG00000143546	HC,WB	56 / 60%
HPA006104	Anti-KAT6B (MYST4)	neural lineage unknown	ENSG0000287239	IHC, IF	100 / 100%
HPA026111	Anti-NES	neural progenitor	ENSG00000132688	IHC, IF	49/55%

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