

Neural Stem Cell Markers

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Neural Stem Cells

Neural stem cells (NSCs) offer a unique and powerful tool for basic research and regenerative medicine. Changes in the expression levels of specific molecules help to identify the presence of neural stem cells in studies focused on further differentiation toward specific neural lineages.

Commonly used markers for neural stem cells include Nestin and SOX2. Other protein markers, expressed at the cell surface are, for example, ABCG2, FGFR1 and Frizzled-9.

Neurons

The neurons (nerve cells) are electrically excitable cells that transmit and relay the nerve signal within the central nervous system and in the periphery.

The neurons communicate via synapses and fall into different functional categories based on their neurochemical properties.

Astrocytes

Astrocytes constitute the main glial cell population in the central nervous system. These cells are derived from heterogeneous populations of progenitor cells in the neuroepithelium of the developing central nervous system.

Astrocytes play a number of active roles in the brain, including the secretion or absorption of neural transmitters, ion homeostasis and maintenance of the blood–brain barrier.

Oligodendrocytes

Oligodendrocytes are glial cells within the CNS and spinal cord whose main function

is to form the insulating myelin sheaths around axons in the CNS. Furthermore, oligodendrocytes provide trophic support to neurons by the production of different growth factors like BDNF and GDNF.

See tables 1-4 for a list of selected NSC markers available from Atlas Antibodies.

Related Publications

Bond AM. (2015) Adult Mammalian Neural Stem Cells and Neurogenesis: Five Decades Later. *Cell Stem Cell*. 1;17(4):385-95

Casarosa S. et al. (2014) Neural stem cells: ready for therapeutic applications? *Mol Cell Ther*. 2: 31

Gage FH., Temple S. (2013) Neural Stem Cells: Generating and Regenerating the Brain. *Neuron* 80 (3):588-601

Jessell TM. et al. (2000) Principles of Neural Science, 4th Edition. New York:McGraw-Hill

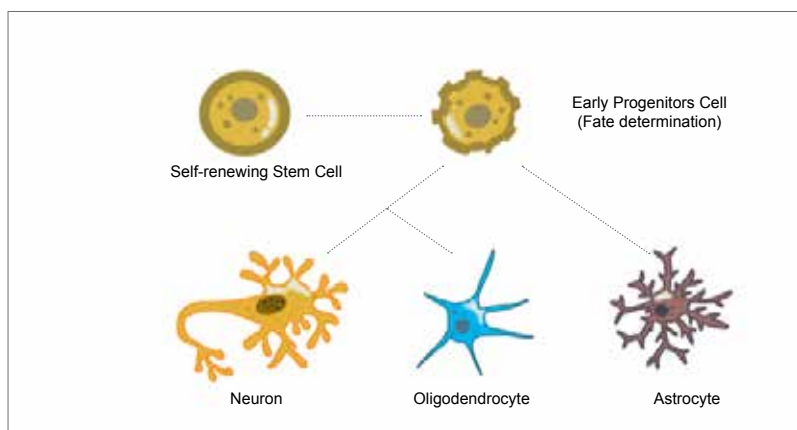
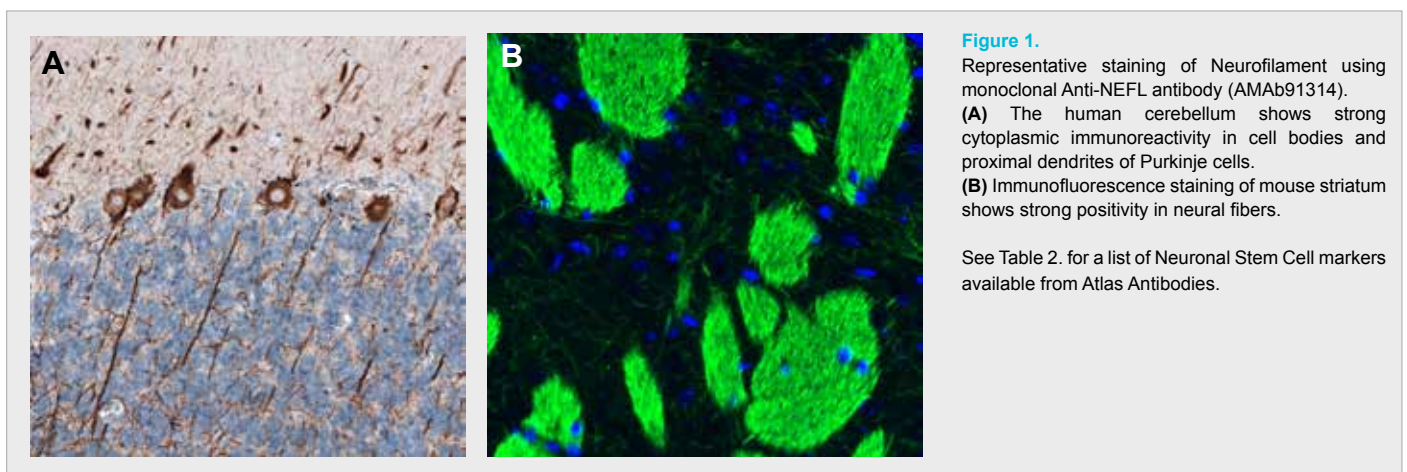


Figure 2. NSCs primarily differentiate into neurons, astrocytes, and oligodendrocytes, depending on environmental cues.

Atlas Antibodies offers a range of antibodies to detect the expression of neural stem cell markers.



Front Cover

Top left (NSC): Immunohistochemical staining of Reelin in the rat cerebral cortex using Anti-RELN antibody (AMAb91365). Bottom left (Astrocytes): Immunohistochemical staining of Aquaporin 4 in the human cerebral cortex using Anti-AQP4 Antibody (HPA014784). Top right (Neurons): Immunohistochemical staining of beta-3 Tubulin in mouse embryo E11 using Anti-TUBB3 antibody (AMAb91394). Bottom right (Oligodendrocytes): Immunohistochemical staining of Myelin Oligodendrocyte Glycoprotein in the human cerebral cortex using Anti-MOG Antibody (HPA021873).

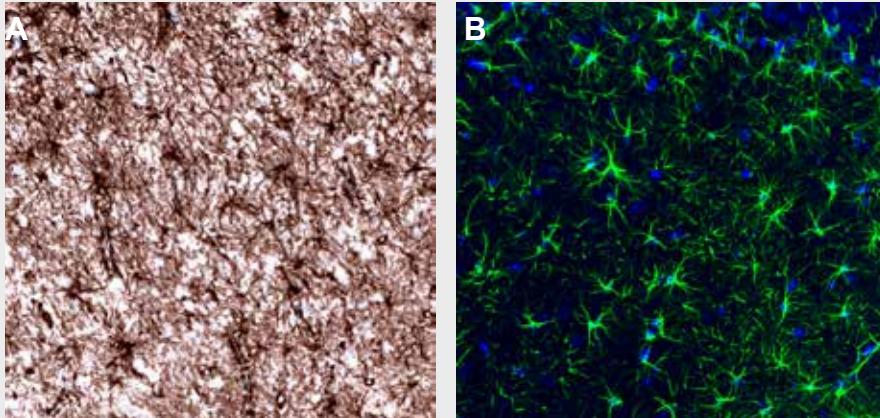


Figure 3.
Representative staining of Glial Fibrillary Acidic Protein, GFAP, using Anti-GFAP monoclonal antibody (AMAb91033).
(A) Immunohistochemical staining of the human cerebral cortex shows strong cytoplasmic positivity in astrocytes.
(B) Immunofluorescence staining of rat hippocampus shows strong positivity of the astrocytes.

See Table 3. for a list of Astroglial markers available from Atlas Antibodies.

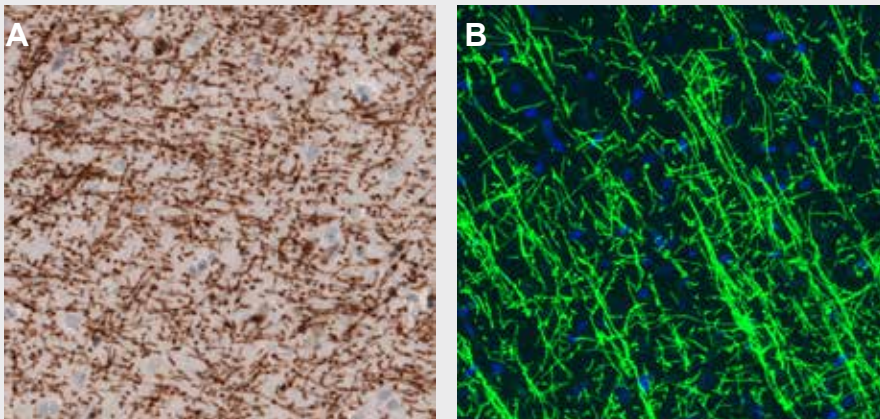


Figure 4.
Representative staining of Myelin Basic Protein using Anti-MBP monoclonal antibody (AMAb91063).
(A) Immunohistochemical staining of the human cerebral cortex shows strong immunoreactivity in myelinated fibers.
(B) Immunofluorescence staining in the rat cerebral cortex shows strong immunoreactivity in myelinated axons.

See Table 4. for a list of Oligodendroglial markers available from Atlas Antibodies.

NSCs in the Adult Mammalian Brain

Neural progenitor stem cells (NSCs) reside in the adult mammalian brain and contribute to brain plasticity throughout life¹.

When adult NSCs were initially discovered, it was assumed that their function was to provide a regenerative source for new neurons, and there were hopes that these NSCs might be involved in functional brain repair after injury.

Instead, cumulative evidence suggests that the primary function of endogenous adult NSCs is to confer an additional layer of plasticity to the brain via both direct and indirect mechanisms².

Adult somatic stem cells play a homeostatic role in maintaining tissue organization. Regulation of gene expression by transcription factors represents one fundamental mechanism that controls adult NSCs³.

Though apparently lacking synapses, NSCs express receptors and respond to a variety of neurotransmitters⁴.

There are two major neurogenic niches in the adult mammalian brain where endogenous NSCs reside, the subventricular zone (SVZ) lining the lateral ventricles and the subgranular zone (SGZ) within the dentate gyrus of the hippocampus.

The majority of adult NSCs communicate with other cells via gap junctions and direct cell-cell interactions⁵.

References

1. Kempermann G. and Gage FH. (1999) *Sci. Am.* 280: 48-53.
2. Christian KM. et al. (2014) *Annu. Rev. Neurosci.* 37: 243-262
3. Hsieh J. (2012) *Genes Dev.* 26: 1010-1021
4. Berg DA. et al. (2013) *Development.* 140: 2548-2561
5. Kunze A. et al. (2009) *PNAS, USA.* 106: 11336-11341



Triple A Polyclonals are rabbit polyclonal primary antibodies developed within the Human Protein Atlas project. IHC characterization data from 44 normal tissues and 20 cancers is available on the Human Protein Atlas portal.



PrecisA Monoclonals are mouse monoclonal primary antibodies developed against a number of carefully selected targets. Clones are selected to recognize only unique non-overlapping epitopes and isotypes.

Table 1. Neural Stem Cell (NSC) Markers available from Atlas Antibodies

Target	Catalog No	Clonality	Validated Application	Sequence Identity Mouse/Rat
BLBP/FABP7	AMAb90595	Monoclonal	IHC, WB	89%/90%
BMI	HPA030472	Polyclonal	IHC, WB*	95%/95%
CD133/PROML1	HPA004922	Polyclonal	IHC*	57%/60%
EGFR/ERBB1	AMAb90819	Monoclonal	WB	90%/91%
EGR1 / INGF1-A	HPA029937	Polyclonal	ICC-IF	93%/94%
PCGF5	HPA038349	Polyclonal	IHC, ICC-IF	95%/93%
REELIN/RELN	HPA046512	Polyclonal	ICC-IF	90%/94%
SLC1A3/GLAST	HPA037468	Polyclonal	IHC*	93%/93%
TLX/NR2E1	HPA055642	Polyclonal	IHC*	99%/99%

Table 2. Neuronal Stem Cell Markers available from Atlas Antibodies

Target	Catalog No	Clonality	Validated Application	Sequence Identity Mouse/Rat
BRN2/POU3F2	AMAb91406	Monoclonal	IHC, WB, ICC-IF	100%/100%
BRN2/POU3F2	HPA056261	Polyclonal	ICC-IF	100%/100%
FGFR1	HPA056402	Polyclonal	IHC, WB	94%/96%
FOXA2	HPA050505	Polyclonal	IHC*, ICC-IF	96%/82%
MAP2	AMAb91375	Monoclonal	IHC, WB, ICC-IF	91%/90%
NEFL	AMAb91314	Monoclonal	IHC, WB, ICC-IF	97%/99%
NURR1/NR4A2	HPA000543	Polyclonal	IHC, ICC-IF	100%/100%
PAX3	HPA063659	Polyclonal	IHC, ICC-IF	92%/92%
PAX3	HPA069000	Polyclonal	ICC-IF	98%/98%
PAX6	AMAb91372	Monoclonal	IHC, ICC-IF	100%/100%
S100B	AMAb91038	Monoclonal	IHC*, WB	99%/98%
SOX11	HPA000536	Polyclonal	IHC, WB	82%/82%
SOX21	AMAb91309	Monoclonal	IHC, WB	-
SOX21	HPA048337	Polyclonal	IHC	96%/37%
SOX21	HPA064084	Polyclonal	ICC-IF	96%/37%
SOX4	AMAb91378	Monoclonal	IHC, ICC-IF	-
SOX4	AMAb91380	Monoclonal	IHC, ICC-IF	-
TBR2/EOMES	HPA065458	Polyclonal	ICC-IF	96%/96%
TUBB3	AMAb91394	Monoclonal	IHC, WB, ICC-IF	-

Table 3. Astroglial Markers available from Atlas Antibodies

Target	Catalog No	Clonality	Validated Application	Sequence Identity Mouse/Rat
AQP4	AMAb90537	Monoclonal	IHC*, WB	93%/92%
AQP4	HPA014784	Polyclonal	IHC*, WB, ICC-IF	93%/92%
AQP9	HPA074762	Polyclonal	IHC*	55%/55%
CD44	HPA005785	Polyclonal	IHC*, WB*, ICC-IF	51%/47%
GFAP	AMAb91033	Monoclonal	IHC*, WB*	98%/100%
GFAP	HPA056030	Polyclonal	IHC*, WB, ICC-IF	98%/100%
GFAP	HPA063513	Polyclonal	IHC*	100%/98%

Table 4. Oligodendroglial Markers available from Atlas Antibodies

Target	Catalog No	Clonality	Validated Application	Sequence Identity Mouse/Rat
CD140/PDGFR α	HPA004947	Polyclonal	ICC-IF	-
MBP	HPA049222	Polyclonal	IHC, WB	97%/97%
OLIG2	HPA003254	Polyclonal	IHC*, WB	93%/94%
PROX1	HPA000842	Polyclonal	ICC-IF	100%/93%
PROX1	HPA001030	Polyclonal	ICC-IF	100%/99%
SOX10	AMAb91297	Monoclonal	IHC, ICC-IF	98%/98%
SOX8	HPA058665	Polyclonal	IHC*, ICC-IF	73%/70%

*Products with enhanced validation for indicated application

**Enhanced Validation**

In addition to the extensive validation and characterization always performed for our antibodies, we conduct application specific enhanced validation.

Enhanced validation offers increased security of antibody specificity in a defined context.

The enhanced validation follows the guidelines proposed by the International Working Group for Antibody Validation (IWGAV) and published in Nature Methods (Uhlen M. et al, 2016).

Enhanced validation consists of five conceptual pillars for antibody validation, to be used in an application-specific manner: genetic validation, orthogonal validation, validation by independent antibodies, recombinant expression validation and, migration capture MS validation.

To know more about enhanced validation visit our webpage: atlasantibodies.com

To know more about licensing of specific biomarkers and information about Atlas Antibodies' customized solutions send an email to: contact@atlasantibodies.com