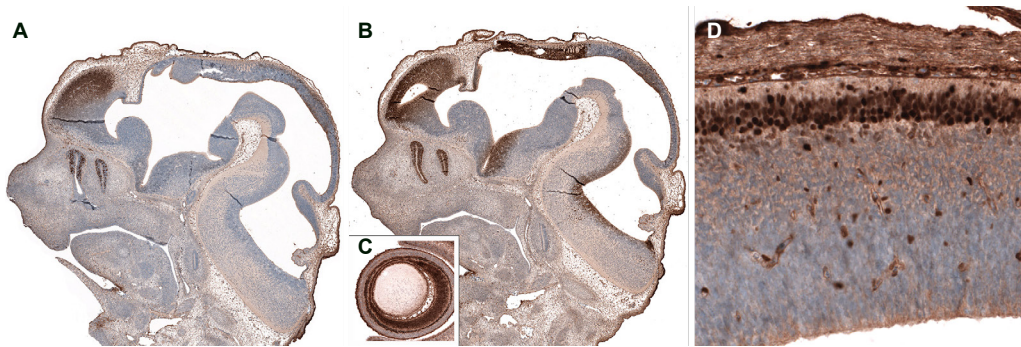# ATLAS ANTIBODIES

Cortical Layers

Cerebral cortex is the part of the human brain that undergoes the most profound evolutional changes and serves as a substrate for the higher cognitive functions. During embryonal development, six distinct layers are generated from the progenitors of the neocortical germinal zone. In the adult brain the different cortical layers are defined based on morphologically and functionally divergent neurons.

Figure 1.
Tissue expression of selected transcriptional factors involved in the development of cerebral cortex. (**A**):Immunohistochemical staining with Anti-LHX2 antibody (AMAb91404) shows strong immunoreactivity in the developing cortex and sensory organs of mouse embryo E11. (**B**):PAX6 expression is detected in both developing brain and sensory organs including eye (**C**) (AMAb91372). (**D**):MEF2C is primarily expressed in the upper layers of the developing cortex, as shown by the anti-MEF2C antibody (AMAb90728) in mouse embryo E14.
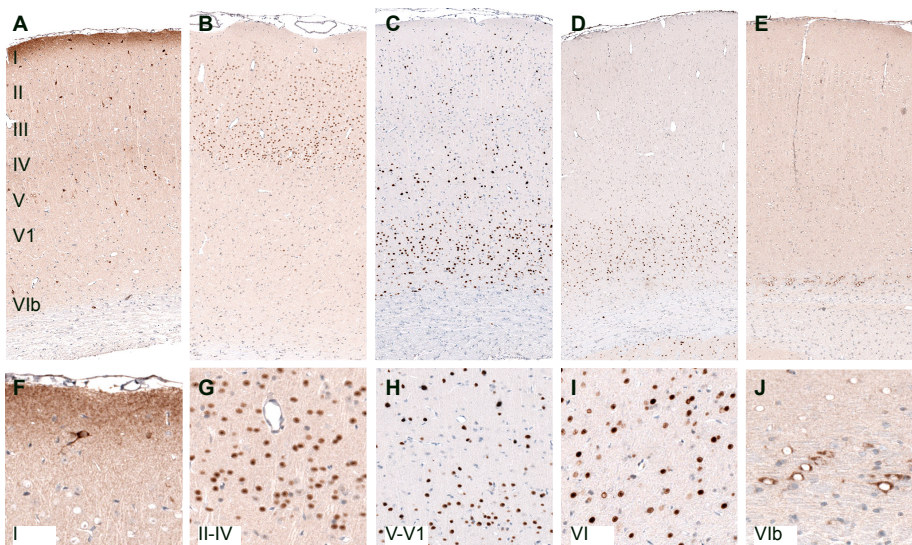
Development of the Cerebral Cortex

The six cortical layers are generated during embryonal development in a strictly regulated manner.

Following formation of the cortical plate, the deeper layers neurons are generated (including layers V and VI) and thereafter the upper layers neurons (layers II-IV). Glial cells, including astrocytes and oligodendrocytes, are then generated at the latest stages of cortical development.

The neocortical neurogenesis is dependent on several transcriptional factors. For instance, LHX2 and PAX6 together play a crucial role in the specification of neocortical progenitors which give rise to the projection neurons. MEF2C is another transcription factor essential for normal neural development and spatial distribution in the neocortex. Figure 1 shows expression profiles of LHX2, PAX6 and MEF2C in the developing mouse brain.

AAA POLYCLONALS
Designed by researchers, for researchers.

The antibodies developed and characterized within the Human Protein Atlas project are made available to the scientific community by Atlas Antibodies under the brand name Triple A Polyclonals.
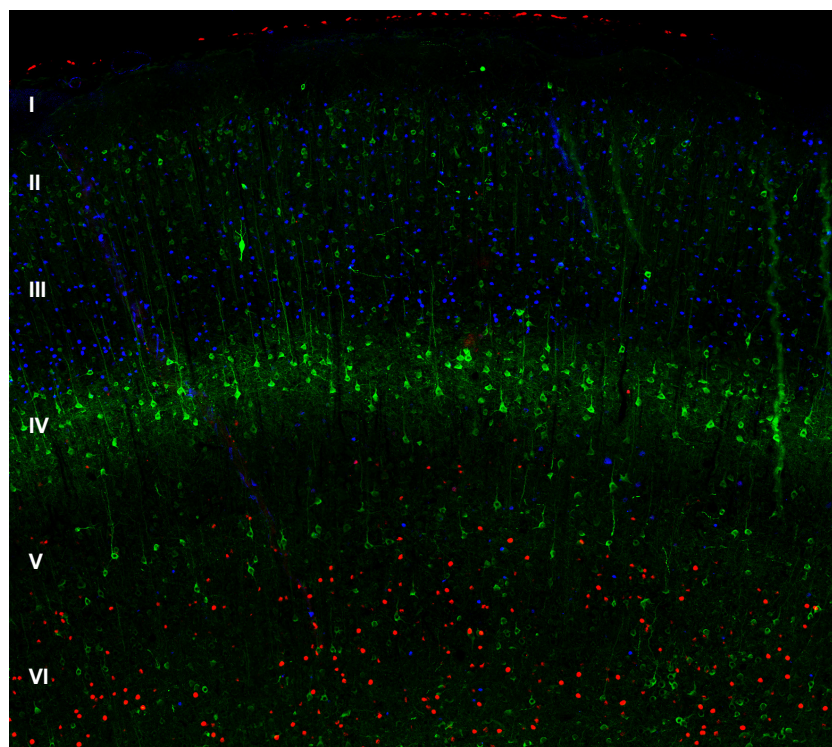
PrecisA Monoclonals are developed by Atlas Antibodies, based on the knowledge from the Human Protein Atlas with careful antigen design and extended validation of antibody performance. With precise epitope information offered, these precise, accurate and targeted antibodies are denoted PrecisA Monoclonals.

Figure 2.
Laminar distribution of protein expression profiles in the cerebral cortex of rat. RELN immunoreactivity is mainly detected in the neuropil of layer I (AMAb91365) (**A, F**). CUX1 expression is seen in layers II-IV (HPA003277) (**B, G**). BCL11B (CTIP2) is expressed primarily in layers V and VI (HPA049117) (**C, H**). Layer VI neurons show strong expression of FOXP2 (AMAb91362) (**D, I**). Finally, layer VIb can be identified by presence of CTGF immunoreactivity (AMAb91366) (**E, J**).

PrecisA MONOCLONALS
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Anatomic and Functional Diversity in Neurons of Different Layers

In the mature neocortex, neurons of different layers display anatomical and functional diversity, including cell morphology, physiological properties and anatomical connections. Neurons of layers II/III, along with a subset of neurons of layer V, contribute mostly to intracortical connections, including the callosal projections to the contralateral cerebral hemisphere. Layer V corticofugal neurons target the midbrain, hindbrain and spinal cord, while layer VI neurons project mainly to the thalamus. Protein expression profiles differ in neurons of various layers. For example, upper layers neurons can be identified by expression of CUX1 and POU3F2 (BRN2), the neurons of layer V – by expression of BCL11B (CTIP2) and neurons of layer VI – by FOXP2 expression. Laminar distribution of these and some other markers in rat neocortex is shown in Figure 2 and Figure 3.

Cortical layer markers provide a useful tool for studying the development, functional neuroanatomy and pathology of the cerebral cortex.

Figure 3.
Laminar structure of cerebral cortex of rat shown by multiplexed immunofluorescence with the Anti-CUX1 antibody (HPA003277, in blue), the Anti-NECAB1 (AMAb90800, in green) and the Anti-FOXP2 antibody (AMAb91362, in red). Note that CUX1 is mainly expressed in layers II-III, NECAB1 shows strongest expression in layer IV neurons, while FOXP2 is primarily present in layer VI neurons.

Table 1.
Selected Cortical Layer Marker antibodies available from Atlas Antibodies.

Cortical Layer	Product Name	Catalogue No	Clonality	Application	Sequence Identity (Mouse/Rat)
Layer 1	Anti-RELN	AMAb91365	Monoclonal	IHC	90%/94%
Layer 1	Anti-RELN	HPA046512	Polyclonal	ICC-IF	90%/94%
Layer 2/3	Anti-RASGRF2	HPA018679	Polyclonal	IHC	72%/71%
Layer 2/3	Anti-CALB1	HPA023099	Polyclonal	IHC*, WB, ICC-IF	98%/99%
Layer 2/3-4	Anti-CUX1	AMAb91352	Monoclonal	IHC, ICC-IF	72%/74%
Layer 2/3-4	Anti-CUX1	AMAb91353	Monoclonal	IHC, ICC-IF	72%/74%
Layer 2/3-4	Anti-CUX1	HPA003277	Polyclonal	IHC	72%/74%
Layers 2/3, 4 and 5b	Anti-POU3F2 (BRN2)	HPA056261	Polyclonal	ICC-IF	100%/100%
Layers 2/3, 4 and 5b	Anti-POU3F2 (BRN2)	AMAb91406	Monoclonal	IHC, WB, ICC-IF	100%/100%
Layers 2/3, 4 and 5b	Anti-POU3F2 (BRN2)	AMAb91407	Monoclonal	IHC, ICC-IF	100%/100%
Layer 2-4 (mainly 4)	Anti-NECAB1	AMAb90798	Monoclonal	IHC, WB	98%/98%
Layer 2-4 (mainly 4)	Anti-NECAB1	AMAb90800	Monoclonal	IHC, WB	98%/98%
Layer 2-4 (mainly 4)	Anti-NECAB1	AMAb90801	Monoclonal	IHC, WB	98%/98%
Layer 2-4 (mainly 4)	Anti-NECAB1	HPA023629	Polyclonal	IHC*, WB	98%/98%
Layer 2-4 (mainly 4)	Anti-NECAB1	HPA031262	Polyclonal	IHC*	97%/98%
Layer 5	Anti-PCP4	HPA005792	Polyclonal	IHC*	96%/96%
Layer 5	CNTN6	HPA016645	Polyclonal	IHC	86%/84%
Layers 5-6	Anti-BCL11B (CTIP2)	HPA049117	Polyclonal	IHC*, ICC-IF	96%/98%
Layer 6	Anti-FOXP2	AMAb91361	Monoclonal	IHC, ICC-IF	99%/97%
Layer 6	Anti-FOXP2	AMAb91362	Monoclonal	IHC, ICC-IF	99%/97%
Layer 6	Anti-FOXP2	HPA000382	Polyclonal	IHC	99%/97%
Layer 6	Anti-TLE4	HPA065357	Polyclonal	WB, ICC-IF	100%/100%
Layer 6b	Anti-CTGF	AMAb91366	Monoclonal	IHC, WB	96%/97%
Layer 6b	Anti-CTGF	HPA031075	Polyclonal	IHC, WB, ICC-IF	96%/97%

* Products with enhanced validation for indicated application