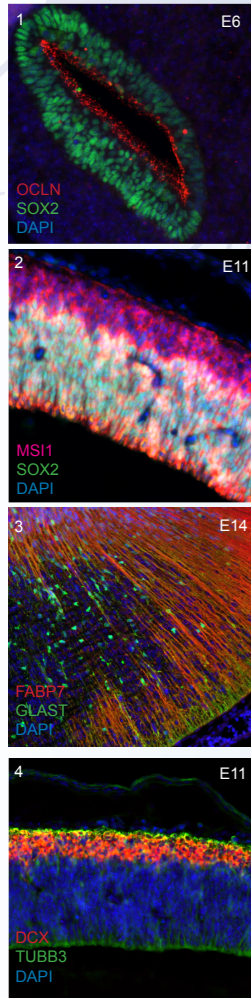


OVERVIEW OF NEURAL LINEAGE DEVELOPMENT MARKERS



LINEAGES ARE THE PATHWAYS OF DEVELOPMENT AND DIFFERENTIATION OF NEURONS AND GLIAL CELLS IN THE CENTRAL NERVOUS SYSTEM. THEY ARE DEFINED BY THE TEMPORAL AND SPATIAL RELATIONSHIP BETWEEN THE PROGENITORS, EARLY NEURONAL PRECURSORS, AND THE MATURE NEURONS THAT RESULT FROM THEM.

NEURONAL LINEAGES CAN BE STUDIED IN THE CONTEXT OF CELL FATE DETERMINATION AND THE PROCESSES OF DEVELOPMENT, SUCH AS MIGRATION, AXON GUIDANCE, AND SYNAPTogenesis.

A BETTER COMPREHENSION OF NEURONAL LINEAGES IS ESSENTIAL TO OUR UNDERSTANDING OF THE NERVOUS SYSTEM AND HOW IT DEVELOPS AND FUNCTIONS IN HEALTH AND DISEASE.

FOR EXAMPLE, ELUCIDATING THE FULL POTENTIAL OF PROGENITOR CELLS IN THE EMBRYO AND THE ADULT AND UNDERSTANDING THE FACTORS THAT GUIDE THE PRODUCTION OF SPECIFIC CELL TYPES WILL BE ESSENTIAL FOR POTENTIAL TREATMENTS OF NEURODEGENERATIVE DISEASES THROUGH CELL REPLACEMENT STRATEGIES.

ATLAS ANTIBODIES MANUFACTURES PRIMARY POLYCLONAL AND MONOCLONAL ANTIBODIES TARGETING RELEVANT MARKERS IN THE NEURAL LINEAGE DEVELOPMENT PATHWAYS.

FIGURES

- 1. NEUROEPITHELIAL CELLS IN THE NEURAL TUBE**
ANTI-SOX2 MONOCLONAL (IgG1, AMAB91307)
ANTI-OCLN MONOCLONAL (IgG2a, AMAB90889)
- 2. NEURAL PROGENITORS IN THE DEVELOPING CEREBRAL CORTEX OF MOUSE EMBRYO E11**
ANTI-SOX2 MONOCLONAL (IgG1, AMAB91307)
ANTI-MS1 (MUSASHI-1) POLYCLONAL (HPA074923)
- 3. RADIAL GLIA IN DEVELOPING BRAINSTEM**
ANTI-FABP7 (BLBP) MONOCLONAL (IgG1, AMAB90595)
ANTI-GLAST (SLC1A3) POLYCLONAL (HPA037467)
- 4-5. IMMATURE NEURONS IN THE DEVELOPING TELENCEPHALON/CEREBRAL CORTEX OF MOUSE EMBRYO**
ANTI-TUBB3 MONOCLONAL (IgG1, AMAB91394)
ANTI-DCX POLYCLONAL (HPA036121)
- 6. DIFFERENTIATED NEURONS IN THE ADULT MOUSE CEREBRAL CORTEX**
ANTI-MAP2 POLYCLONAL (HPA012828)
ANTI-RBFOX3 MONOCLONAL (IgG2b, AMAB91748)
ANTI-NEFM MONOCLONAL (IgG1, AMAB91027)

EXPLORE MARKERS



INTERMEDIATE PROGENITORS
EOMES/TBR2
HASH1/Ascl1

RESTRICTED PROGENITORS
IMMATURE NEURONAL CELLS
DCX
TUBB3
NES
NEUROD1
TBR1

DIFFERENTIATED NEURONS
RBFOX3/NeuN
MAP2
NEFM
SYN
PSD95/DLG4

GLUTAMATERGIC NEURONS
SLC17A7/VGLUT1
VGLUT2
GRIN1/NMDAR1
GRIN2B/NMDAR2B
GLS

GABAERGIC NEURONS
SLC6A1/GAT1
GABBR1
GABBR2
GAD2/GAD65
GAD1/GAD67

DOPAMINERGIC NEURONS
TH
DAT
FOXA2
NR4A2/Nurr1
LMX1B

SEROTONERGIC NEURONS
Pet1
SLC6A4/SERT1
TPH1
TPH2

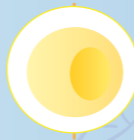
CHOLINERGIC NEURONS
CHAT
ACHE

NEURON-RELATED DISEASES
ALZHEIMER'S DISEASE
ATTENTION DEFICITS
AUTISM
COGNITIVE DEFICITS / DEMENTIA
FRONTOTEMPORAL DEMENTIA
HUNTINGTON'S DISEASE
PARKINSON'S DISEASE
TOURETTE SYNDROME
DEPRESSION / SCHIZOPHRENIA / ANXIETY

MOTOR NEURON-RELATED DISEASES
AMYOTROPHIC LATERAL SCLEROSIS
MULTIPLE SCLEROSIS
PROGRESSIVE BULBAR PALSY
PRIMARY LATERAL SCLEROSIS
PROGRESSIVE MUSCULAR ATROPHY
SPINAL MUSCULAR ATROPHY
KENNEDY'S DISEASE
POST-POLIO SYNDROME

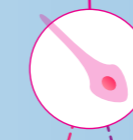
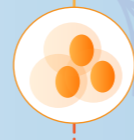
GLIA-RELATED DISEASES
ALZHEIMER'S DISEASE
AMYOTROPHIC LATERAL SCLEROSIS
AUTISM
EPILEPSY
FRONTOTEMPORAL DEMENTIA
GLIOBLASTOMA
PARKINSON'S DISEASE

NEUROEPITHELIAL CELLS (OR NEURAL STEM CELLS)

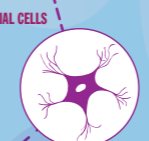
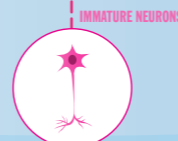


INTERMEDIATE PROGENITORS

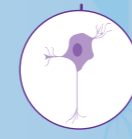
RADIAL GLIAL CELLS



RESTRICTED PROGENITORS



MATURE DIFFERENTIATED CELLS



NEURONS

MOTOR NEURONS

ASTROCYTES TYPE 2

OLIGODENDROCYTES

RELATED DISEASES AT-A-GLANCE

NEUROEPITHELIAL CELLS
E-CADHERIN/CDH1
C21ORF33/HES1
NESTIN
NOTCH1
OCCLUDIN
SOX2

RADIAL GLIAL CELLS
FABP7/BLBP
GFAP
SLC1A3/GLAST
C21ORF33/HES1
HES5
PAX6
SOX2
VIMENTIN

RESTRICTED PROGENITORS
IMMATURE GLIAL CELLS
CD3
PDGFR ALPHA
NG2

DIFFERENTIATED GLIAL CELLS
ASTROCYTES TYPE 2
AQP4
GFAP
SLC1A3/GLAST
SLC1A2/GLT-1
S100 BETA
ALDH1L1
VIMENTIN

MATURE OLIGODENDROCYTES
MBP
MOG
OLIG 1
OLIG 2
OLIG 3
OSP
SOX10

MOTOR NEURONS
Isl1
Isl2
Olig2

NEUROEPITHELIAL STEM CELLS

NEUROEPITHELIAL CELLS OR NEURAL STEM (NSCs) ARE SELF-REGENERATING MULTIPOTENTIAL CELLS.

THEY ARE THE PRIMARY PROGENITORS THAT GIVE RISE TO NEURONS AND GLIA IN THE EMBRYONIC, NEONATAL AND ADULT BRAIN ESSENTIAL COMPONENTS OF THE HUMAN CENTRAL NERVOUS SYSTEM.

RADIAL GLIAL CELLS

RADIAL GLIAL CELLS, OR RADIAL GLIAL PROGENITOR CELLS (RGP), ARE BIPOLAR-SHAPED PROGENITOR CELLS THAT ARE RESPONSIBLE FOR PRODUCING ALL OF THE NEURONS IN THE CEREBRAL CORTEX. RGP'S ALSO PRODUCE CERTAIN LINEAGES OF GLIA, INCLUDING ASTROCYTES AND OLIGODENDROCYTES.

RADIAL GLIA ARE NOW RECOGNIZED AS KEY PROGENITOR CELLS IN THE DEVELOPING NERVOUS SYSTEM.

DURING THE LATE STAGES OF NEUROGENESIS, RADIAL GLIAL CELLS DIVIDE ASYMMETRICALLY IN THE VENTRICULAR ZONE, GENERATING A NEW RADIAL GLIAL CELL, AS WELL AS A POSTMITOTIC NEURON OR AN INTERMEDIATE PROGENITOR (IPC) DAUGHTER CELL. INTERMEDIATE PROGENITOR CELLS THEN DIVIDE SYMMETRICALLY IN THE SUBVENTRICULAR ZONE TO GENERATE NEURONS.

INTERMEDIATE PROGENITORS

INTERMEDIATE PROGENITOR CELLS (IPCs) ARE MULTIPOLAR CELLS PRODUCED BY RADIAL GLIAL CELLS WHO HAVE UNDERGONE ASYMMETRIC DIVISION.

IPCS CAN PRODUCE NEURON CELLS VIA NEUROGENESIS. IN MAMMALS, NEURAL STEM CELLS ARE THE PRIMARY PROGENITORS DURING EMBRYOGENESIS WHEREAS INTERMEDIATE PROGENITOR CELLS ARE THE SECONDARY PROGENITORS.

STEM CELLS AND PROGENITOR CELLS CAN DIFFERENTIATE INTO A SPECIFIC CELL TYPE. HOWEVER, STEM CELLS ARE LESS SPECIFIED THAN PROGENITOR CELLS. PROGENITOR CELLS CAN ONLY DIFFERENTIATE INTO THEIR "TARGET" CELL TYPE.

ANOTHER DISSIMILARITY BETWEEN STEM CELLS AND PROGENITOR CELLS IS THAT STEM CELLS CAN REPLICATE INDEFINITELY, WHEREAS PROGENITOR CELLS CAN DIVIDE ONLY A LIMITED NUMBER OF TIMES.

RESTRICTED PROGENITORS

RESTRICTED PROGENITOR CELLS FURTHER DIFFERENTIATE TO CREATE SPECIALIZED CELL TYPES SUCH AS NEURONS, MOTOR NEURONS AND GLIAL CELLS.

DIFFERENTIATED CELLS

MATURE CELLS (NEURONS, MOTOR NEURONS AND GLIAL CELLS) ARE TERMINALLY DIFFERENTIATED CELLS THAT CAN NO LONGER DIVIDE. THEY PROMOTE SURVIVAL AT ALL COST BY EMPLOYING MULTIPLE STRATEGIES TO PREVENT CELL DEATH BY APOPTOSIS. THIS DRAMATIC SHIFT FROM PERMITTING CELL DEATH TO ENSURING CELLULAR SURVIVAL IS CRITICAL, AS THESE POST-MITOTIC CELLS MUST PROVIDE NEURONAL CIRCUITRY FOR AN ORGANISM'S ENTIRE LIFETIME.

ASTROCYTES ARE THE MOST ABUNDANT CELL TYPE IN THE CENTRAL NERVOUS SYSTEM, PROVIDING CRITICAL ROLES IN THE OVERALL MAINTENANCE AND HOMEOSTASIS. TYPE 1 ASTROCYTES HAVE A FIBROBLAST-LIKE MORPHOLOGY WHILE TYPE 2 ASTROCYTES HAVE A NEURON-LIKE MORPHOLOGY.

OLIGODENDROCYTES ARE THE MYELINATING CELLS OF THE CENTRAL NERVOUS SYSTEM.

MOTOR NEURONS ARE LOCATED WITHIN THE SPINAL CORD AND THE BRAIN. THEY COME IN TWO MAIN SUBTYPES, NAMELY THE UPPER MOTOR NEURONS AND THE LOWER MOTOR NEURONS. THE UPPER MOTOR NEURONS ORIGINATE IN THE BRAIN AND TRAVEL DOWNWARD TO CONNECT WITH THE LOWER MOTOR NEURONS.

DISEASES AT-A-GLANCE

NEURODEGENERATIVE DISEASES AFFECT ADULT NEURONAL POPULATIONS WHEN THE SURVIVAL MECHANISMS IN MATURE NEURONS ARE LIKELY TO BE EITHER REVERSED OR CIRCUMVENTED.

DOPAMINERGIC, GABAERGIC, AND CHOLINERGIC MARKERS OF NEURONAL CELL PHENOTYPE ARE OF PARTICULAR INTEREST IN UNDERSTANDING PATHOLOGY OF CLINICAL DISEASE BECAUSE THE SELECTIVE DEGENERATION OF THESE FUNCTIONAL NEURONS IS ASSOCIATED WITH THE PATHOGENESIS OF NEURODEGENERATIVE DISORDERS.

FOR INSTANCE, PARKINSON'S DISEASE IS CHARACTERIZED BY THE DEGENERATION OF MIDBRAIN DOPAMINERGIC NEURONS IN THE SUBSTANTIA NIGRA OF THE BRAIN. ALZHEIMER'S DISEASE INVOLVES A LOSS OF FOREBRAIN CHOLINERGIC NEURONS; CORTICAL GABAERGIC NEURONS ARE DEGENERATED IN SCHIZOPHRENIA; CHOLINE ACETYLTRANSFERASE (CHAT) IMMUNOREACTIVITY IS USED TO DETECT COGNITIVE DECLINE IN SEVERAL NEURODEGENERATIVE DISORDERS.