
Contents

Complex Patterns and Simple Architects: Molecular Guidance Cues for Developing Axonal Pathways in the Telencephalon

M. Judaš, N.J. Milošević, M.-R. Rašin, M. Heffer-Lauc, I. Kostović

1	Introduction	1
2	The Four Major Classes of Axonal Guidance Cues Are Netrins, Semaphorins, Slits, and Ephrins	1
2.1	Netrins Usually Function as Chemoattractants and Bind to Deleted in Colorectal Cancer and Neogenin ..	2
2.2	Semaphorins Act as Chemorepellents for Most and Chemoattractants for Some Axons and Bind to Neuropilins, Plexins, and L1	3
2.3	Slits Are Midline Repellents That Bind to Robo Receptors	4
2.4	Ephrins and Eph Receptor Tyrosine Kinases Are Involved in Bidirectional Signaling	4
3	Axonal Guidance Cues Display a Characteristic Spatio-Temporal Pattern of Expression in Embryonic and Fetal Zones of the Telencephalon	5
3.1	Proliferative Zones: The Ventricular Zone, the Subventricular Zone, and the Ganglionic Eminence ...	6
3.2	The Intermediate Zone: The Zone of Neuronal Migration and Axonal Growth	7
3.3	The Subplate Zone and Marginal Zone: Sites of the Earliest Synaptogenesis Between “Waiting” Axons and Transient Fetal Populations of Cells	7
3.4	The Cortical Plate: The Primordium of Future Cortical Layers II–VI	8
4	Guidance Cues Have Complementary and/or Overlapping Roles in the Establishment of Specific Axonal Pathways ...	10
4.1	Commisural Pathways: The Corpus Callosum, the Anterior Commissure, and the Hippocampal Commissure	10

4.2	Thalamocortical and Corticothalamic Pathways	12
4.3	Corticofugal Pathways	15
4.4	Ascending Monoaminergic Pathways	17
4.5	Guidance Cues in Developing Afferent, Efferent and Intrinsic Pathways of the Hippocampal Formation ...	18
4.6	Guidance Cues in the Developing Olfactory System	19
5	Early Genes Involved in Regionalization and Areal Specification of the Cerebral Cortex Can Regulate the Pattern of Expression of Axonal Guidance Cues	20
6	Discussion and Conclusions	21
	References	25

Phosphorylation Pattern of tau Associated with Distinct Changes of the Growth Cone Cytoskeleton

G. Šimić, A. Diana, P.R. Hof

1	Historical Note	33
2	Neuronal Cytoskeleton and Microtubule-Associated Proteins	33
3	Neuronal Growth Cone Composition and Translocation	35
4	tau Gene Organization and Regulation	36
5	Structure of tau Proteins	36
6	Post-Translational Modifications of tau Proteins	37
7	Subcellular Localization of tau	39
8	The Role of tau Phosphorylation in Establishment of Axonal Polarity	40
9	The Role of tau Phosphorylation in Axonal Outgrowth and Morphology	41
	References	42

Developmental Expression and Possible Roles of Gangliosides in Brain Development

H. Rösner

1	Introduction	49
2	Gangliosides and Brain Development	51
2.1	Neural Induction and Tube Formation	52
2.2	Proliferation of Neural and Glial Progenitor Cells	55
2.3	Neurogenesis and Neuron Migration	57
2.4	Outgrowth of Axons and Fibre Tract Mapping, Dendritogenesis, Synaptogenesis and Apoptosis	61
2.5	Myelination	62
2.6	Structural and Functional Maturation	63

2.7	Aging and Neural Degeneration	65
3	Possible Functional Roles of Gangliosides in the Developing Nervous System	65
	References	67

Mannose-Binding Lectins in Cerebrum Development

J.-P. Zanetta

1	Introduction	75
2	Evidence for the Presence of Central Nervous System Mannose-Binding Lectins	78
2.1	Ontogenetic Variations of Glycoconjugates During Central Nervous System Development	78
3	Degradation of the Accumulated Axonal Mannose-Rich Glycoproteins in the Target Neurones	79
4	Evidence for the Presence of Mannose-Binding Lectins in the Cerebrum	80
5	The Cerebellar Soluble Lectins	82
5.1	Lectin Cerebellar Soluble Lectins and Contact Guidance of Neurone Migration	82
5.2	Lectin Cerebellar Soluble Lectin and Myelination Processes	84
6	The Lectin R1	86
6.1	Interleukin-2 and Oligodendrocyte Proliferation	89
7	Conclusions and Perspective	90
	References	91

Functional Role of Gangliosides in Neuronal Motility

R. Mendez-Otero, L.A. Cavalcante

1	Introduction	97
2	Gangliosides and Cell Motility	100
3	Gangliosides and Glial Guided Radial Migration	105
4	Gangliosides and Tangential Migration	108
5	Gangliosides and Neurite Outgrowth	111
6	Conclusion and Perspectives	115
	References	117

Myelin Molecules Limiting Nervous System Plasticity

R.L. Schnaar

1	Introduction	125
2	Nogo	126

3	Myelin-Associated Glycoprotein	130
4	Chondroitin Sulfate Proteoglycans	134
5	Myelin Vaccine	134
6	Signaling Pathways in the Inhibition of Nerve Regeneration	135
7	Concluding Remarks	137
	References	137
	Subject Index	143



<http://www.springer.com/978-3-540-00117-1>

Guidance Cues in the Developing Brain

Kostovic, I. (Ed.)

2003, XII, 145 p., Hardcover

ISBN: 978-3-540-00117-1