1. Record Nr. UNINA9910743252403321

The biology of glial cells: recent advances / / Ishan Patro [and three Titolo

others], editors

Pubbl/distr/stampa Singapore:,: Springer,, [2022]

©2022

981-16-8312-3 **ISBN**

981-16-8313-1

Descrizione fisica 1 online resource (763 pages)

Disciplina 612.82

Soggetti Central nervous system

Central nervous system - Abnormalities

Neuròglia

Sistema nerviós central Llibres electrònics

Lingua di pubblicazione Inglese

Formato Materiale a stampa

Livello bibliografico Monografia

Intro -- Foreword -- Preface -- About the Book -- Contents -- About Nota di contenuto

the Editors -- Abbreviations -- Glial Biology: A Historical Perspective --

1 Introduction -- 1.1 Astrocytes -- 1.2 Oligodendrocytes -- 1.3

Microglia -- 2 Biology of Glia: Part I-Astrocytes -- 2.1 History -- 2.2 Morphology -- 2.3 Functions -- Astrocyte Excitability -- Astrocyte-

Neuron Interaction -- Astrocytes and Synapses -- 2.4 Astrocytes and

Neurovascular Regulation -- 2.5 Astrocytes and Brain Energy Metabolism -- 2.6 Astrocytes and Non-Neural Cells: Glia-Glia

Interaction -- 2.7 Astrocytes and Neuroinflammation -- 2.8 Astrocytes

and Other Neuropathological Conditions -- 3 Biology of Glia: Part II-Microglia -- 3.1 History -- 3.2 Morphology -- 3.3 Distribution -- 3.4

Functions -- Microglia in Immune Regulation -- Role of Microglia in Neuroinflammation and Diverse Neuropathologies -- 4 Biology of Glia:

Part III-Oligodendrocytes -- 4.1 History -- 4.2 Origin and Development of Oligodendrocytes -- 4.3 Oligodendrocytes and Myelination -- 4.4

Non-Myelinating Functions of Oligodendrocytes and OPCs -- 4.5 Oligodendrocytes and CNS Pathology -- References -- Basic Biology of

Embryogenesis and Development of CNS -- 2.1 Development of Glial Cells -- 2.2 Synaptogenesis and Synapse Maintenance -- 3 Markers and Functions -- 3.1 Cell-Specific Markers -- Astrocytes -- 3.2 Functions -- Role of Astrocytes in Blood-Brain Barrier (BBB) -- Role of Astrocytes in Brain Functions -- Role of Astrocytes in Neuronal Functions and Communication -- 4 General Pathophysiology of Astrocytes -- 4.1 Reactive Astrogliosis -- 5 Conclusion -- References -- Oligodendrocyte: Structure. Function and Pathology -- 1 Oligodendrocytes -- 1.1 Myelination -- 1.2 Structure and Composition of Myelin -- Defects in Myelination and Neuropathologies. Primary Demyelinating Diseases -- Multiple Sclerosis -- Secondary Demyelinating Diseases -- Acute Disseminated Encephalomyelitis (ADEM) -- Neuromyelitis Optica (NMO)/Neuromyelitis Optica Spectrum Disorder (NMOSD) -- Leukodystrophies -- Demyelination Due to Mutations and Defects in Oligodendrocyte- and Myelin-Related Genes -- Mutations in Microglial and Astrocytic Genes and Leukodystrophies -- Viral Encephalopathies -- Vascular (Hypoxia/Ischaemia) --Metabolic/Nutritional -- Other Concerns for Demyelination --Remyelination Strategies -- References -- Oligodendroglial-Astroglial Cell-Cell Communication in the Central Nervous System -- 1 Introduction -- 2 The Myelin Sheath -- 3 Panglial Astro-Oligo Metabolic Coupling and Maintenance of CNS Homeostasis -- 4 Glial Biology in Neurodegeneration and Demyelination -- 5 The Biology of Gap Junctions -- 6 Properties of Gap Junctions: Synthesis, Oligomerization, Trafficking, and Degradation -- 7 Functional Importance of Astrocytic and Oligodendrocytic Gap Junctions -- 8 Conclusion -- 8.1 Gap Junctions as a Novel Target in Demyelinating Diseases -- References -- Oligodendroglial Gap Junction Communication in CNS Myelination and Demyelination -- 1 Gap Junctions in the Nervous System -- 2 Gap Junction Protein Mutations in Health and Disease -- 3 The Cx43/Cx47 Axis in CNS Myelination -- 4 Gap Junctions in Human CNS Demyelinating Disease Multiple Sclerosis -- 5 Remodeling of Gap Junction Proteins in Experimental Animal Models of Multiple Sclerosis -- 6 Alteration of Cx43/Cx47 Axis in Respect to Viral Model of Multiple Sclerosis -- References --Generation and Maturation of Macroglia in the Central Nervous System -- 1 Introduction -- 2 Astrocytogenesis -- 3 Differentiation and Specification of Astrocytes -- 4 Morphological and Functional Maturation of Astrocytes -- 4.1 Astrocyte Markers -- 5 Genesis of Oligodendroglia. 6 Specification of Oligodendrocyte Precursors (OPCs) -- 7 Oligodendrocyte Differentiation -- 8 OPCs' Migration, Maturation and Myelination -- References -- Origin and Development of Microglia -- 1 Introduction -- 2 Origin of Microglia -- 3 Early Specification and Differentiation of Microglia -- 3.1 Transcription Factors Required for Microglia Development and Homeostasis -- 3.2 Extrinsic Factors Required for Microglia Development and Homeostasis -- 4 Colonization, Distribution, and Terminal Differentiation of Microglia in Developing Brain Parenchyma -- 5 Microglial Markers to Study Their Phenotype, Distribution, and Functions -- 6 Perturbations in Microglial Development and Consequences -- 7 Perspectives -- References --Biology of Astrocytes in CNS Infection -- 1 Introduction -- 2 Reactive Astrogliosis -- 3 Subtypes of Astrocytes -- 4 A1 Subtype -- 5 A2 Subtype -- 6 Pathobiology of Astrocytes in Various CNS Infections --6.1 Viral Infections (Figs. 1, 2, 3, 4, 5, and 6) -- Herpesvirus Infections -- Flavivirus Infections -- Human Immunodeficiency Virus (HIV) --Progressive Multifocal Leukoencephalopathy (PML) -- 6.2 Bacterial

Astrocytes -- 1 Introduction -- 1.1 History -- 1.2 Classification -- 2

Infections (Figs. 7 and 8) -- Bacterial Meningitis -- Tubercular Meningitis (TBM) -- 6.3 Fungal Infections (Figs. 9 and 10) -- Cryptococcal Meningoencephalitis -- Aspergillosis -- 6.4 Parasitic Infections (Figs. 11, 12, and 13) -- Toxoplasma Encephalitis -- Cerebral Malaria (CM) -- Neurocysticercosis (NCC) -- 7 Conclusion -- References -- Role of Reactive Astrocytes in Alzheimer's Disease -- 1 Introduction -- 2 Astrocytes in AD -- 2.1 Types and Subtypes -- Physiological Subtypes -- Astrogliopathology -- Astrocyte Reactivity or Reactive Astrogliosis -- Astroglial Atrophy -- 2.2 Metabolic Balance and Imbalance Regulated by Astrocytes in AD -- Metabolic Dysregulation in AD -- Dysregulation in Astrocytic Metabolic Enzyme Activity.

Altered Insulin Metabolism -- 2.3 Reactive Astrocytes in Neuroinflammation in AD -- Importance of Neuroinflammation in AD -- Astrocytes Taking a Center Stage -- Blood-Brain Barrier in AD --Microglia-Astrocyte Cross Talk -- Astrocytic Neuroinflammatory Profile Correlates with AD Stage -- 2.4 Role of Astrocytes in Abeta Clearance and Production -- Abeta Uptake and Clearance -- Abeta Production and Astrocytes -- A Hypothesis for Astrocyte Function in Abeta Clearance or Its Production -- 2.5 Reactive Astrocytes in Tau Pathology -- 2.6 Role of Astrocytes in Modulating Synaptic Plasticity in AD --Physiological Role in Synaptic Health -- Reactive Astrocytes in Synaptic Dysfunction in AD -- 2.7 Role of Astrocytes in Neurotransmitter Recycling in AD -- Astrocytes in Glutamate Regulation in AD --Astrocytes in GABA Regulation in AD -- 2.8 Role of Astrocytes in Neuron Death and Survival in AD -- Reactive Astrocytes Mediating Neuron Death -- Reactive Astrocytes in Neuron Survival -- 2.9 Astrocytic Biomarkers in AD Patients -- 2.10 Astrocytes as Targets for Therapy in AD -- Astrocyte Subtype-Based Therapy --Neuroinflammatory Cytokines as Therapeutic Targets -- Targeting Metabolic Dysfunctions for Therapy -- Aquaporin as a Therapeutic Target -- 3 Conclusions -- References -- Role of Astrocyte Dysfunction in Parkinson's Disease Pathogenesis -- 1 Introduction --2 Astrocytes: Role as Forming the Niche for DA Neurons -- 3 Astrocytes and Their Heterogeneity and Region Specificity -- 4 PD-Related Genes Associated with Astrocytes (PARK-7, SNCA, LRRK2, PARK-2, PLA2G6, ATP13A2, GBA, PINK1) -- 5 Deleterious Astrocytic Changes in PD -- 6 Neuroprotective Role of Astrocytes in PD -- 7 Cell-Based Treatment Strategy to Target Astrocyte Regeneration and Replacement -- 8 Conclusions -- References. Astroglial Pathology in Major Depressive Disorders: Metabolic and

Molecular Aspects -- 1 Introduction -- 1.1 Major Depressive Disorders -- 2 Glial Contributions to Neural Functions -- 2.1 Astrocytes as an Integral Part of the Neurovascular Unit and Synapse -- 2.2 Astrocytes Contribute to Synapse Formation and Refinement -- 2.3 Astrocytes are Important Players in Neurological Disorders -- 3 Techniques to Study Energy Requirement for Neural Function -- 3.1 Positron Emission Tomography (PET) -- 3.2 13C Nuclear Magnetic Resonance --Measurement of Neurometabolic Activity -- Measurement of Astroglial Activity -- 4 Brain Energy Metabolism -- 4.1 Metabolic Activity of Neurons -- 4.2 Neurotransmitter Cycling -- 5 Neuronal Metabolic Activity in Depression -- 6 Neuron-Glia Communication in Depression -- 7 Glial Pathology in Major Depressive Disorder -- 7.1 Astrocytic Pathology in MDD -- Immunohistochemical Findings -- Studies Involving mRNA and Protein Level -- 7.2 Oligodendrocyte Pathology in MDD -- 7.3 Neuroinflammation in Major Depressive Disorder --Dysfunction in Hypothalamus-Pituitary-Adrenal (HPA) Axis --Dysfunction in Kynurenine Pathway -- Microglial Activation -- 8

Manipulation of Glial Function as a Therapeutic Strategy for Neuropsychiatric Disorders -- 8.1 Classical Antidepressants Modulate Astrocytic Activity -- 8.2 Atypical and Fast-Acting Antidepressants Modulate Astrocytic Activity -- 8.3 Epigenetic-Based Potential Antidepressive Molecules -- 8.4 Genetic Manipulation of Astrocytes -- 8.5 Exercise Modulates Astrocytic Function in Depressive Disorders -- 8.6 Optogenetic-Based Modulation of Astrocytic Functions -- 9 Limitations -- 10 Conclusion -- References -- Glia in Epilepsy: An Overview -- 1 Brief Introduction to Epilepsy -- 2 Reactive Gliosis in Epileptic Foci -- 3 Water and K+ Buffering -- 4 Glutamate Release and Metabolism.

5 Gliotransmission: Role of Ca2+ Signaling.