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12:00 pm – 13:00 pm
MSB 310

Physiology and pathophysiology of astroglia

The integration and information processing in the brain occurs through close interactions of two cellular circuits represented by neuronal networks embedded into internally connected astroglial syncytia. Our understanding of glial function changed dramatically over last two decades. This change concerns the whole concept of how the brain is organized, and how the development, life and death of neural circuits are controlled. There is compelling evidence demonstrating that these are the astrocytes that are creating the compartmentalisation in the CNS, and these are the astrocytes that are able to integrate neurones, synapses, and brain capillaries into individual and relatively independent units. Astrocytes are fundamental element of the brain 'active milieu' that unifies all components of nervous tissue into a dynamic information processing system.

The common and prevailing set of neurological thoughts considers neurones as the primary substrate of pathological progression. This "neurone-centric" concept, however, is changing. It has become universally acknowledged that the homeostasis of the nervous tissue is regulated by a complex fabric of neuroglial cells. Astroglia in particular represent a main element in the maintenance of homeostasis and providing defence to the brain. Consequently, dysfunction of astrocytes underlies many, if not all, neurological, neuropsychiatric and neurodegenerative disorders. Astroglipathology is manifested by diametrically opposing morpho-functional changes in astrocytes, i.e. their hypertrophy along with reactivity or astrodegeneration with atrophy and asthenia. These complex plastic changes underlie pathophysiology of all neurological disorders including genetic (e.g. Alexander disease, which is a primary sporadic astroglipathy), environmentally caused (e.g. obesity or hepatic encephalopathy), neurodevelopmental (e.g. different forms of autistic spectrum disorder) or neurodegenerative (e.g. amyotrophic lateral sclerosis, Alzheimer's and Parkinson diseases).