Brain glucose metabolism

Brain glucose metabolism, including glycolysis, the pentose phosphate pathway, and glycogen turnover, produces ATP for energetic support and provides the precursors for the synthesis of biological macromolecules. Although glucose metabolism in neurons and astrocytes has been extensively studied, the glucose metabolism of microglia and oligodendrocytes, and their interactions with neurons and astrocytes, remain critical to understand brain function. Brain regions with heterogeneous cell composition and cell-type-specific profiles of glucose metabolism suggest that metabolic networks within the brain are complex. Signal transduction proteins including those in the Wnt, GSK-3β, PI3K-AKT, and AMPK pathways are involved in regulating these networks. Additionally, glycolytic enzymes and metabolites, such as hexokinase 2, acetyl-CoA, and enolase 2, are implicated in the modulation of cellular function, microglial activation, glycation, and acetylation of biomolecules. Given these extensive networks, glucose metabolism dysfunction in the whole brain or specific cell types is strongly associated with neurologic pathology including ischemic brain injury and neurodegenerative disorders [1].

1)
Zhang S, Lachance BB, Mattson MP, Jia X. Glucose metabolic crosstalk and regulation in brain function and diseases. Prog Neurobiol. 2021 Jun 9:102089. doi: 10.1016/j.pneurobio.2021.102089. Epub ahead of print. PMID: 34118354.

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