Proteomic and immunofluorescent evidence for and against the astrocyte-to-neuron lactate shuttle

Dariusz Rakus
University of Wrocław, Poland

Lactate derived from astrocytic glycogen has been shown to play a decisive role in induction of neuronal plasticity by stimulating memory formation in hippocampi of young animals but inhibiting it in old animals. Pharmacological inhibition of glycogen turnover in young animals blocked the basal transmission and memory formation while it improved significantly the neuronal plasticity in hippocampi of aged animals. Here we show, using quantitative proteomics and immunofluorescent microscopy, that aging is associated with an increase of glycogen metabolism enzymes concentration and shift in their localization, from astrocytes to neurons. These changes are accompanied with reorganization of hippocampal energy metabolism which is manifested by elevated capacity of aging hippocampal neurons to oxidize glucose in glycolysis and decreased ability of their mitochondria to produce energy. Our observations suggest that astrocyte-to-neuron lactate shuttle may operate in young hippocampi, however, during aging, neurons became independent on astrocytic lactate and they may start to produce lactate from blood-derived glucose.

Biography

Dariusz Rakus is the Head of the Department of Molecular Physiology and Neurobiology, at University of Wroclaw. He has published more than 50 papers in reputed journals about multifunctional proteins in glycolysis and glyconeogenesis and in the field of physiology and biochemistry of muscle and brain and cancer tissues.

dariusz.rakus@uni.wroc.pl

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