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Mitochondrial function regulator cyclophilin d plays a critical role in hypoxic preconditioning

Abstract:

The energy supply for the brain, an organ with high energy consumption and high oxygen demand, mainly comes from mitochondria. Therefore, the function of mitochondria is crucial for maintaining normal brain cell function. Under hypoxic precondition (HP), although the opening of mitochondrial membrane permeability transport pores regulated by cyclophilin D (CypD) affects cell survival, the mechanism of action of CypD under HP is still unclear. This study used animal and cell models to investigate the role of CypD during hypoxia, especially during HP. The results showed that treating primary cultured neural cells from mouse cerebral cortex with hypoxia inducers resulted in rapid nuclear translocation of Nrf-2 and fewer apoptotic cells in Ppif gene knockout (Ppif -/-) neuronal cells when compared with cells isolated from wild-type mice. During the process of HP, compared with the control group mice, Ppif -/- mice exhibit significantly increased hypoxia tolerance, enhanced antioxidant stress resistance, rapid nuclear translocation of HIF-1α, NF-κB, and PKC, improved mitochondrial function, reduced number of apoptotic cells, and activation of MAPKs signaling pathways. All these results demonstrate that CypD plays a crucial role in the survival of neuronal cells during hypoxia and HP. Future research on how to effectively regulate the expression level and function of CypD may provide new research ideas for the treatment of hypoxia and hypoxia-related diseases.

Biography

Yanying Liu is a professor currently teaching Medical Pathogenic Microbiology and Parasitology, Immunology, and Biochemistry at the Qingdao Huanghai University in China. She received her Ph.D. in Neurobiology from the Capital Medical University (China) in 2006. In the past decade or so, she has worked as a postdoc or research staff scientist engaged in scientific research related to neuroscience at SUNY Upstate Medical University or the University of South Dakota in the USA. Dr. Liu's research is related to several areas: Alzheimer's disease, Huntington's disease, stroke, and stem cells. Her current research interests are the mechanism of the aging process, brain hypoxia, and stroke.