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PACAP Enhances Barrier Properties of Cerebral Microvessels

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Abstract

Cerebral microvascular endothelial cells—coming in contact with pericytes and astrocytes—constitute the structural basis of the blood-brain barrier (BBB). The continuous belt of interendothelial tight junctions (TJs) and the presence of specific transport systems, enzymes, and receptors in the brain endothelium regulate the molecular and cellular traffic into the central nervous system. Pituitary adenylate cyclase-activating polypeptide (PACAP) is a neuropeptide having several cellular protective effects. However, little is known about the effects of PACAP on the cerebral endothelium and BBB functions. Here, we show that PACAP has no significant pro-survival role in cerebral microvascular endothelial cells; however, it improves the barrier properties of the brain endothelium. PACAP induces an increase in the transendothelial electrical resistance, which is the most important marker of the tightness of the TJs. Moreover, PACAP has a protective role against glucose deprivation- and oxidative stress-induced junctional damage in microvascular brain endothelial cells.

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