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PROTECTION OF BRAIN ENDOTHELIAL CELLS AS A
THERAPEUTIC TARGET IN BRAIN DISEASES

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Blood–brain barrier (BBB) provides a special compartment necessary for proper functioning of the CNS by controlling cellular and molecular trafficking between the blood and the nervous system and also performs metabolic and detoxifying functions to protect the CNS. Growing evidence supports the crucial role of BBB disruption in the early stages of various brain disorders, and BBB emerges as a therapeutic target for neurological diseases

Vascular inflammation and oxidative stress are central pathways in CNS diseases such as epilepsy, stroke or dementias. In our experiments, we tested four clinically used drugs, the anti-inflammatory simvastatin and dexamethasone, the free radical scavenger edaravone, and the histone deacetylase inhibitor suberoylanilide hydroxamic acid (SAHA) to protect the BBB against injury.

Simvastatin, edaravone and dexamethasone protected against the reduced cell viability, increased permeability and the morphological changes in cellular junctions caused by kainate, an exogenous excitotoxin. Dexamethasone attenuated the elevated nitric oxide production and decreased the inducible nitric oxide synthase mRNA expression increased by kainate treatment. Furthermore, edaravone was protective in carbonyl stress induced barrier damage by methylglyoxal. After oxygen-glucose deprivation and during reperfusion, SAHA treatment was able to protect BBB functions by increasing resistance, and reducing the permeability of the BBB, and decreased the expression of genes involved in inflammatory processes and cell proliferation and increased the expression of the genes of glycocalyx enzymes.

Our results demonstrated that protecting BBB functions as a therapeutic target in brain disorders may lead to the development of new approaches for the treatment of CNS diseases.

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