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Role of the blood brain barrier in epilepsy and epileptic treatments

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There are approximately 400 known neurological disorders (including some which may be better classified as mental disorders). Some of these disorders may be due to a disruption or failure of the blood brain barrier (BBB) such as, importantly, epilepsy (a group of neurological disorders characterized by chronic or acute seizures caused by inflammation). Epileptic seizures are the result of excessive and abnormal nerve cell activity in the brain cortex. As of 2015, about 39 million people have epilepsy with nearly 80% of the cases occurring in the developing world and 125,000 having died of it. Common among older people, epilepsy will become more prevalent as a result of the growing aging population. The cause of most cases of epilepsy is still unknown through a process known as epileptogenesis. Nonetheless, there are both genetic and acquired causes, with interaction of these factors in many cases. To date, nearly all the genes discovered to be involved in human epilepsies encode subunits of ion channels, both voltage-gated and ligand-gated. Known genetic mutations are directly linked to a small proportion of cases. Established acquired causes include serious brain trauma, stroke, tumors, infective lesions, and birth defects. Seizures are controllable with medication in about 70% of cases. Inexpensive options are often available. In those whose seizures do not respond to medication, surgery, neurostimulation, or dietary changes may be considered. In its integral form, the BBB is a selective filter that allows passage of essential nutrients, water, some gases, lipid-soluble molecules, hydrophobic molecules (O₂, CO₂, hormones) and also allows transport of metabolic products to the brain (glucose with specific proteins). It restricts diffusion of microscopic objects (e.g. bacteria) and large hydrophilic molecules and prevents entry of polar and lipid-insoluble substances, and lipophilic neurotoxins. Of interest here are those epileptic treatments rendered possible by the delivery of therapeutic drugs through the disrupted blood brain barrier.

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