The blood-brain barrier: A misunderstood key to finding life-saving cures to brain disease

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An international team of scientists that includes a Saint Louis University researcher suggest several strategies to propel research for treatments of brain diseases that include multiple sclerosis, Alzheimer's disease, obesity and stroke in the January issue of the *Lancet Neurology*.

Their review article, which focuses on surmounting obstacles posed by the blood-brain barrier (BBB), is available in an early online edition of the prestigious medical journal on Dec. 17.

The blood-brain barrier is a gate-keeping system of cells that protects the brain from toxins and lets in nutrients. Because it passes no judgment on which foreign substances are there to treat diseases and which are penetrating the brain to do harm, it locks all of them out. That makes getting drugs into the brain where they can do their work in treating brain diseases difficult.

"A big part of our work is raising the awareness about the blood-brain barrier as an intimate part of the disease process," said William A. Banks, M.D., professor of geriatrics and pharmacological and physiological science at Saint Louis University School of Medicine, and a member of the research team.

"You can't get drugs into the brain or understand brain disease without understanding the blood-brain barrier, which is among our most

significant recommendations for future research."

The blood-brain barrier is woefully misunderstood, said Banks, who also is a staff physician at Veterans Affairs Medical Center in St. Louis.

"The general theme of our review article is the blood-brain barrier is not a brick wall but a regulating interface between the brain and the rest of the body. Look at the brain as an island, where all raw materials have to be imported. The blood-brain barrier is the shipping and communications system that connects the island (the brain) to the rest of the world (the body)."

Sometimes the blood-brain barrier lets in things that it shouldn't and doesn't let out things that it should. Learning more about the secrets of the blood-brain barrier system is critical in understanding Alzheimer's disease, for instance, because the BBB makes it difficult to target medication where it's needed in the brain and won't allow toxic amyloid beta proteins, believed to cause Alzheimer's, to drain out of the brain.

Much of Banks' work focuses on the function of the blood-brain barrier in regulating the immune system, the body's natural defense in fighting disease. The cells that make up the blood-brain barrier help the brain and immune system communicate, he explained.

The crash of that communication system can impact diseases including Alzheimer's disease, stroke and multiple sclerosis. In the Lancet Neurology article, Banks and his colleagues called for more research to better understand how the blood-brain barrier relates to immune cells.

The article also recommended wider use of state-of-the-art imaging to examine how the blood-brain barrier and the rest of central nervous system interact, particularly in patients who have spinal cord injuries, head trauma and stroke.

Changes to the blood-brain barrier could give important clues about injuries to the central nervous system and the growth of tumors.

The review also called for investigators from various disciplines and who work in different institutions and laboratories to collaborate on blood-brain barrier research to take research from an animal model to patient clinical trials.

Source: Saint Louis University