

International scientists tackle obstacles to treating brain disorders

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A research team led by scientists at the University of Minnesota Medical School and Oregon Health & Science University have outlined the challenges and made suggestions on how to advance research and improve treatments for brain disorders.

The review article is published in the January 2008 issue of the *Lancet Neurology*.

Many neurological disorders are difficult to treat because of a natural barrier in the brain. The blood-brain barrier is a specialized system of cells that acts as a gatekeeper for the brain, blocking harmful substances from entering while allowing in necessary nutrients. The barrier is necessary to keep the brain and nervous system healthy. However, it also causes problems in medication delivery because it treats medications as the enemy, preventing the therapeutic agents from doing their job.

“In order to develop new and innovative treatments for diseases such as stroke, Alzheimer’s disease, and multiple sclerosis, researchers have to find ways to overcome the blood-brain barrier,” said Lester Drewes, Ph.D., professor of biochemistry and molecular biology at the University of Minnesota Medical School, Duluth campus. “The review has resulted in a number of recommendations to establish and fund research centers that will focus on overcoming these barriers.” Drewes is the founding president of the International Brain Barriers Society, a forum for scientists to share their research and fast track discoveries related to the blood-brain barrier. He and 14 other scientists wrote the review.

Edward Neuwelt, M.D., a professor of neurology and neurological surgery in the OHSU School of Medicine and a physician at the Portland Veterans Affairs Medical Center, is among the most active scientists in the international community studying the blood-brain barrier. Neuwelt also was a major participant in the review.

“The blood-brain barrier is the Achille’s heel for treating virtually all neurological disorders,” said Neuwelt, director of OHSU’s Blood-Brain Barrier Program. “However, like the Great Wall of China, there are portals in the barrier that, with proper research, offer a way through.” Neuwelt studies ways to open the blood-brain barrier. Other investigators are studying a Trojan horse approach in which therapeutic agents are attached to parts of proteins, such as insulin, that normally cross the barrier.

The researchers examined six topic areas surrounding brain barriers that need to be addressed in order to advance scientific understanding and ultimately improve patient care: Inflammation, injury, tumors, neurodegeneration, specialized barriers, and delivery.

When the brain is injured, as in the case of a stroke, the blood-brain barrier is altered near the site of injury. Changes in the barrier have an effect on how the injury progresses and how much neural tissue is damaged. The researchers suggest that better imaging techniques must be developed to better view the barrier near the injury site.

Improved imaging will also help in furthering research into the effect of brain barriers on tumors. Current imaging techniques do not accurately show the tumor’s size, location, type, and response to therapy.

In the study of neurodegenerative diseases, such as Parkinson’s, the researchers said often brain barrier is overlooked or only viewed as a barrier to drug delivery. The article suggests that brain barriers play a

larger role in the progression of degenerative disease, and that researchers should focus on how the changes in the barriers relate to brain degeneration during the aging process.

In addition to the blood-brain barrier, there are other more specialized barriers in the brain that function in different ways. The scientists suggest that more research needs to be done on how these barriers act alone and in concert with other barriers. Currently there are only limited experimental models of these specialized barriers, and thus little is understood about how they function.

Drug delivery to the brain is extremely complicated. Researchers estimate that very little of therapeutic drugs make it beyond the blood-brain barrier and because of this, progress developing therapies for brain disease is very slow.

The researchers suggest more interdisciplinary research into drug delivery options that would bring together biologists, pharmaceutical scientists, and bioengineers.

Source: University of Minnesota

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