

Researchers use nasal lining to breach blood-brain barrier

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Neurodegenerative and central nervous system (CNS) diseases represent a major public health issue affecting at least 20 million children and adults in the United States alone. Multiple drugs exist to treat and potentially cure these debilitating diseases, but 98 percent of all potential pharmaceutical agents are prevented from reaching the CNS directly due to the blood-brain barrier.

Using mucosa, or the lining of the nose, researchers in the department of Otolaryngology and Laryngology at the Massachusetts Eye and Ear/Harvard Medical School and the Biomedical Engineering Department of Boston University have demonstrated what may be the first known method to permanently bypass the [blood-brain barrier](#), thus opening the door to new treatment options for those with neurodegenerative and CNS disease. Their study is published on *PLOS ONE*.

Many attempts have been made to deliver drugs across the blood-brain barrier using methods such as osmotic disruption and implantation of catheters into the brain, however these methods are temporary and prone to infection and dislodgement.

"As an endoscopic [skull base](#) surgeon, I and many other researchers have helped to develop methods to reconstruct large defects between the nose and brain using the patient's own mucosa or nasal lining," said Benjamin S. Bleier, M.D., [Otolaryngologist](#) at Mass. Eye and Ear and HMS Assistant Professor.

Study co-author Xue Han, Ph.D., an assistant professor of Biomedical Engineering at Boston University, said, "The development of this model enables us to perform critical preclinical testing of novel therapies for neurological and psychiatric diseases."

Inspired by recent advances in human endoscopic transnasal skull based surgical techniques, the investigators went to work to develop an [animal model](#) of this technique and use it to evaluate transmucosal permeability for the purpose of direct drug delivery to the brain.

In this study using a mouse model, researchers describe a novel method of creating a semi-permeable window in the blood-brain barrier using purely autologous tissues to allow for higher molecular weight drug delivery to the CNS. They demonstrated for the first time that these membranes are capable of delivering molecules to the brain which are up to 1,000-times larger than those excluded by the blood-brain barrier.

"Since this is a proven surgical technique which is known to be safe and well tolerated, this data suggests that these membranes may represent the first known method to permanently bypass the blood-brain barrier using the patient's own tissue," Dr. Bleier said. "This method may open the door for the development of a variety of new therapies for neurodegenerative and CNS disease.

Future studies will be directed towards developing clinical trials to test this method in patients who have already undergone these endoscopic surgeries."

Provided by Massachusetts Eye and Ear Infirmary

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