

## Researchers find stroke damages blood-spinal cord barrier

June 13 2016

---



Micrograph showing cortical pseudolaminar necrosis, a finding seen in strokes on medical imaging and at autopsy. H&E-LFB stain. Credit: Nephron/Wikipedia

A team of researchers at the University of South Florida investigating the short and long-term effects of ischemic stroke in a rodent model has found that stroke can cause long-term damage to the blood-spinal cord barrier (BSCB), creating a "toxic environment" in the spinal cord that might leave stroke survivors susceptible to motor dysfunction and

disease pathology.

The paper describing their study was recently published online and will appear in an upcoming issue of *Journal of Neuropathology and Experimental Neurology*.

"This study, carried out using laboratory rats modeling [stroke](#), demonstrated that ischemic stroke - in both its subacute and chronic stages - damages the BSCB in a variety of ways, creating a toxic environment in the spinal cord that can lead to further disability and exacerbate disease pathology," said study lead author Dr. Svitlana Garbuzova-Davis, associate professor in USF's Center of Excellence for Aging and Brain Repair, Department of Neurosurgery and Brain Repair. "The aim of our study was to evaluate post-stroke BSCB condition that might lead to the development of more effective therapies for [stroke survivors](#)."

The BSCB provides a specialized protective 'microenvironment' for neural cells in the spinal cord. Substantial vascular damage is a major pathologic feature of both subacute and chronic stroke caused by an extended period of microvascular permeability after the BSCB loses integrity. Damage to the BSCB, explained the researchers, plays a fundamental role in the development of several pathological conditions, including abnormal motor function.

The researchers, who evaluated the BSCB in test animals at seven and 30 days after stroke modeling, found that ischemic stroke damaged the gray and white matter in the cervical spinal cord on both sides of the spinal column, based on analysis of electron microscope images. Among the effects were damage to neural cells called 'astrocytes,' loss of motor neurons, reduced integrity of a tight junction protein between barrier cells, and swollen axons with damaged myelin in ascending and descending tracts connecting to the brain.

They also found stroke-associated 'upregulation' of Beclin-1 in endothelial cells composing the BSCB. Beclin-1, explained the researchers, helps induce autophagy, an activity associated with removal of various intracellular components. They also observed a decrease in LC3B, an essential autophagy protein, at a later stage post-stroke. These observations of Beclin-1 and LC3B suggest an impaired post-stroke autophagy process in spinal cord capillaries, inducing endothelial cell degeneration.

These stroke-related alterations in the cervical spinal cord indicate pervasive and long-lasting BSCB damage that would severely affect spinal cord function, wrote the researchers, adding that the widespread microvascular impairment in the gray and white matter of the cervical [spinal cord](#) aggravated motor neuron deterioration and had the potential to cause motor dysfunction.

"Because our investigations on the post-stroke microvascular alterations, including BSCB damage, have just begun, many questions remain," said senior author Dr. Cesario Borlongan, professor and director of the USF Center of Excellence for Aging and Brain Repair. "Specifically, the protein expression responsible for endothelial cell degeneration and tight junction damage we identified in this study needs to be confirmed through further tests. Also, behavioral tests of motor function in post-stroke animals in correlation with BSCB damage are needed. These questions and others will be addressed in our future studies."

Dr. Paul R. Sanberg, Distinguished University Professor, a co-author of the paper, concluded that "these novel data showing BSCB [damage](#) in subacute and chronic [ischemic stroke](#) may lead to development of new therapeutic approaches for patients with ischemic cerebral infarction."

**More information:** Svitlana Garbuzova-Davis et al. Blood-Spinal Cord Barrier Alterations in Subacute and Chronic Stages of a Rat Model

of Focal Cerebral Ischemia, *Journal of Neuropathology & Experimental Neurology* (2016). [DOI: 10.1093/jnen/nlw040](https://doi.org/10.1093/jnen/nlw040)

Provided by University of South Florida

Citation: Researchers find stroke damages blood-spinal cord barrier (2016, June 13) retrieved 26 April 2024 from <https://medicalxpress.com/news/2016-06-blood-spinal-cord-barrier.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.