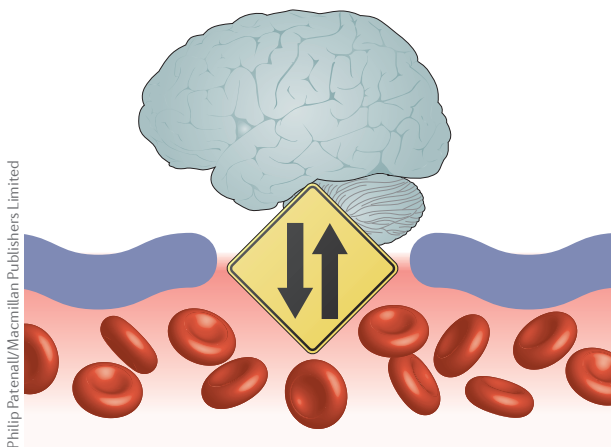



TRAUMATIC BRAIN INJURY

Evidence of blood–brain barrier disruption after concussion



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A study recently published in *Acta Neuropathologica* has found evidence of blood–brain barrier (BBB) disruption following concussion in a swine model. These findings provide useful insights into the pathophysiology of concussion and suggest new avenues for investigation and intervention.

“We previously found opening of the BBB in human survivors of severe traumatic brain injury (TBI),” comments study leader Douglas Smith. “In addition, we found a build-up of axonal proteins in the blood after concussion; an intact BBB would not allow this rapid passage of brain proteins into the blood, indicating that the BBB was disrupted.”

To further examine the integrity of the BBB after concussion, Smith and colleagues used a swine rotational acceleration model of TBI, in which the forces that were applied to the animals were calibrated to mimic concussion in humans. Brain tissue

“The swine model ... should enable more in-depth analysis of concussion-associated brain pathology”

was obtained at various time points after injury and was examined for signs of BBB disruption.

Immunohistochemistry revealed leakage of serum proteins, including fibrinogen and immunoglobulin G, into the brain parenchyma, indicating that the BBB had been breached. The brain tissue also displayed diffuse axonal injury, which showed substantial but incomplete overlap with the distribution of serum protein leakage.

The pathophysiology of concussion has proved challenging to study in humans: as the injury is non-lethal, post-mortem tissue is rarely available, so researchers have tended to rely on non-invasive techniques such as blood analysis and neuroimaging. The swine model that Smith and colleagues have developed should enable more in-depth analysis of concussion-associated brain pathology.

“This new study demonstrates that both diffuse axonal injury and BBB disruption are important coincident features of concussion,” concludes Smith. “The observation of BBB disruption may lead to additional diagnostic approaches to evaluate concussion and, potentially, to new treatments.”

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ORIGINAL ARTICLE Johnson, V. E. et al. Mechanical disruption of the blood–brain barrier following experimental concussion. *Acta Neuropathol.* <https://doi.org/10.1007/s00401-018-1824-0> (2018)

FURTHER READING Sweeney, M. D. et al. Blood–brain barrier breakdown in Alzheimer disease and other neurodegenerative disorders. *Nat. Rev. Neurol.* **14**, 133–150 (2018)