MedicalXpress

Head injury causes the immune system to attack the brain

October 20 2014

Scientists have uncovered a surprising way to reduce the brain damage caused by head injuries - stopping the body's immune system from killing brain cells. The study, published in the open access journal *Acta Neuropathologica Communications*, showed that in experiments on mice, an immune-based treatment reduced the size of brain lesions. The authors suggest that if the findings apply to humans, this could help prevent brain damage from accidents, and protect players of contact sports like American football, rugby and boxing.

To date, there are no effective treatments to prevent or reverse the damage sustained after brain injury. The researchers were testing the theory that blows to the head cause brain damage, in part, because of the breakdown of the blood-brain barrier, allowing the immune cells in the blood to come into contact with brain cells and destroy them. They hypothesized that mice missing a vital immune component would have less brain damage from trauma, and that a treatment which blocks a component of the immune system would prevent damage.

The component they were working on was CD74, which plays a crucial part in the immune system's response to disease-causing agents. CD74 is broken into products that fit into the groove of cell surface immune response proteins as part of the chain of events that activates T cells – immune cells that normally attack infected (or damaged) cells in the body. It was thought that these cells might also attack the brain cells if the blood-brain barrier is down. A treatment known as CAP stops the T-cells from being activated, by fitting into the activation site in the

proteins and blocking the interaction, meaning that the pathway cannot continue.

They tested this theory by a range of tests involving a total of 32 mice. The mice were divided into groups that had the different combinations of: CD74 deficient mice vs control mice; a sham brain injury or a real brain injury; and the CAP treatment or a saline injection as a control.

To test the hypothesis that the immune system causes brain damage after a trauma, the scientists compared the lesion size in CD74 deficient mice, vs control strain after a real brain trauma, with the saline injection. They found that the control mice with a fully working immune system had larger lesions, which suggests that the immune system is part of the reason for brain cells breaking down after a trauma.

To test whether the CAP treatment reduced brain damage after trauma, they compared control mice with a real brain injury that were given the CAP treatment against similar mice that were given the saline control. The mice that received the CAP treatment had smaller brain lesions, suggesting that it did reduce the damage caused by brain trauma. They found these lesions were as small as those in the CD74 deficient mice, further supporting the hypothesis that the treatment was successful because it stops the immune system from attacking the brain.

More information: *Acta Neuropathologica Communications* 2: 143 www.actaneurocomms.org/content/2/1/143

Provided by BioMed Central