Blood protein triggers scars in the brain after injury

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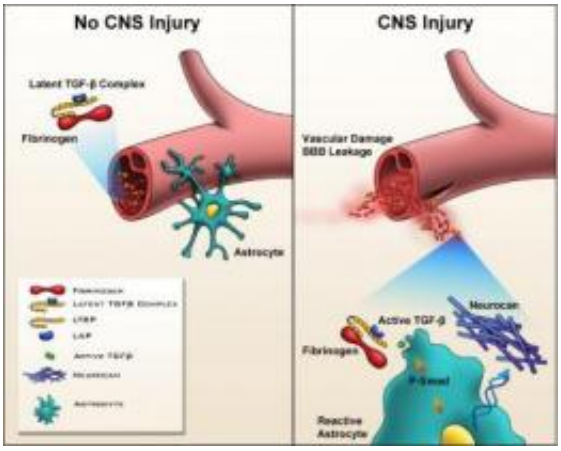

Proposed model for the role of the blood protein fibrinogen that triggers scar formation in the brain and spinal cord. Fibrinogen carries an inactive substance called TGF-B, which circulates in the bloodstream of an uninjured nervous system (left panel). When there's an injury and blood vessels leak, TGF-B interacts with local brain cells and sends signals that result in scar formation (right panel). Credit: Courtesy, with permission: Schachtrup et al. The Journal of Neuroscience 2010.

A protein called fibrinogen that is known to help form blood clots also triggers scar formation in the brain and spinal cord, according to new research in the April 28 issue of the *Journal of Neuroscience*. Researchers found that fibrinogen carries a dormant factor that activates when it enters the brain after an injury, prompting brain cells to form a scar. Scars in the brain or spinal cord can block connections between

nerve cells and often keep injury patients from reaching full recovery.

A fundamental question in studies of damage to the central nervous system has been the origin of the first signal for scar growth. In this study, a group of neuroscientists led by Katerina Akassoglou, PhD, of the Gladstone Institutes at the University of California, San Francisco, looked at molecules in the bloodstream.

"Our study shows that a blood clotting factor is an important player in glial scar formation," Akassoglou said. Current treatments to improve nerve cell regeneration after injury focus on minimizing existing scar tissue; this new result suggests that suppressing these blood proteins might be a way to stop scars from even forming, Akassoglou said.

After a traumatic injury in the nervous system, such as a stab wound or stroke, fibrinogen leaks from damaged blood vessels into the brain and scar tissue begins to form. This process cordons off the wounded area, but also prevents nerve cells from reconnecting and communicating with one another. Rewired nerve cells are essential if a patient is to regain normal function.

To determine what role fibrinogen plays in scar formation, the researchers used a mouse model of brain trauma. When fibrinogen was effectively removed from the blood stream, the mice had dramatically smaller scars after injury. The authors found that fibrinogen carries an inactive type of scar-inducing substance called TGF-ß that switches "on" when it encounters local cells in the brain. When the brain pathways associated with TGF-ß were blocked, scars didn't form.

"These new findings offer an entirely new avenue to explore potentially important therapeutic agents that interfere with this interesting function of fibrinogen," said Jerry Silver, PhD, of Case Western Reserve University, who was unaffiliated with the study. "This is the first time

that a major blood-associated trigger of reactive scar-forming cells has been reported in the literature."

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