Astrocytes: More than just glue

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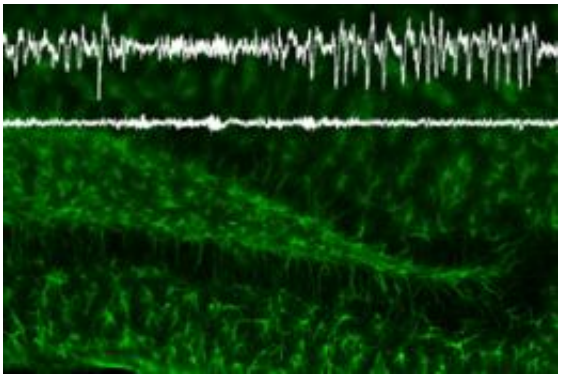

Glial cells (green) prevent a damaging, rhythmic build up of electrical activity in the nerve cells (upper curve): Activated glial cells cause the activity pattern to remain more even (lower curve; Image: Kirsch/University of Freiburg)

Epileptic fits are like thunderstorms raging in the brain: Nerve cells excite each other in an uncontrolled way so that strong, rhythmic electrical discharges sweep over whole brain regions. In the wake of such a seizure, the nerve cells are severely affected, and permanent damage is possible. The glia, a class of cells that surround the neurons in the brain, was long suspected to contribute to the damaging effects of epilepsy. Quite the opposite is the case, as the team of Prof. Dr. Carola Haas from the Bernstein Center and Dr. Matthias Kirsch from the Institute of Anatomy and Cell Biology at the University of Freiburg shows for the first time.

In the journal Experimental Neurology, the scientists report the

beneficial effects of so-called astrocytes, a certain type of glial cells. They get their name from the Greek word for glue, as it was long thought that these cells simply hold the nerve cells together and provided them with nutrients. In the case of epilepsy, the prevalent opinion was that their reaction to a seizure would actually damage the brain. The researchers from Freiburg disagree. In fact, they say, astrocytes help to reduce long-term damage brought upon by epileptic fits.

The team discovered the positive effects of astrocytes in mice, in which epileptic states can be selectively triggered. If the scientists injected mice with a specific protein to activate the astrocytes prior to an epilepsy-inducing insult, fewer nerve cells died in the wake of the seizure. Other pathological changes that would usually occur in the brain were likewise significantly reduced. The astrocytes' protective effect lasted for many days after their activation. When the researchers measured the rodents' brain activity, they likewise found fewer signs that are typical for a brain suffering from epilepsy. However, the authors report that the astrocytes had to be already activated before seizures were elicited. Activating them afterwards, on the other hand, did not lead to a protective effect.

Further studies will have to demonstrate that astrocytes have this protective influence all over the brain. According to Haas, who is also a member of Freiburg's new cluster of excellence BrainLinks-BrainTools, their findings suggest that a timely activation of astrocytes could offer an effective protection from long-term damage to the brain.

More information: Matthias Bechstein, Ute Häussler, Matthias Neef, Hans-Dieter Hofmann, Matthias Kirsch, Carola A. Haas (2012) CNTF-mediated preactivation of astrocytes attenuates neuronal damage and epileptiform activity in experimental epilepsy. *Experimental Neurology* 236 (1), 141-150. www.sciencedirect.com/science/ … ii/S0014488612001616

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