For the brain to stay online, it needs quick delivery of oxygen and energy. Now, neuroscientists have identified the brain cells that order blood supply for humming parts of the brain. Understanding the link between brain activity and changes in blood flow is crucial to further improve clinical brain scans, such as functional magnetic resonance imaging (MRI), which chart changes in brain activity via measurements of blood flow.

Once dismissed as mere scaffolding in the brain, starlike cells called astrocytes are stepping into the limelight. Astrocytes are far more abundant than the electrically powered neurons, and each one features entangled fingerlike processes connected to more than a thousand nerve cells. Positioned close to the neuronal chat sites, the synapses, astrocytes sense neuronal activity and can even influence it, a fact that researchers have come to appreciate in recent years. Astrocytes are also hooked up to the fine network of capillaries that feed neurons, but their interaction with blood vessels has remained mysterious.

Now neuroscientist Giorgio Carmignoto and colleagues from the University of Padova in Italy show astrocytes in the role of dispatchers monitoring neuronal activity and triggering increases in blood flow when it rises. When the researchers stimulated neurons in slices of rat brain, the intracellular chatter of astrocytes increased and a few seconds later, nearby blood vessels expanded. Even tickling a single astrocyte with an electrode caused blood vessels to expand. Further evidence: A drug that prevents astrocytes from responding to bustling neurons also foiled the expansion of blood vessels, the team reports online 25 November in Nature Neuroscience. The researchers conclude that astrocytes must release something that relaxes the smooth muscles that keep brain capillaries constricted.

"These results are really stepping us forward in understanding the relation between brain function and blood flow," says neuroscientist Phil Haydon at the University of Pennsylvania School of Medicine. Not only do they give a first insight into the cellular mechanism regulating blood distribution in the brain, he says, they also reveal the basic process that’s depicted as brain activity by routine brain scans.

--CHRISTIAN HEUSS

Superstars. Astrocytes tell blood vessels to loosen up when neurons need more fuel.
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