Health & Medicine

Wise Blood

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Columbia researchers led by Elizabeth M. C. Hillman have achieved a major breakthrough in understanding how blood flow is regulated in the brain — a discovery that they say could open new avenues of inquiry into how the brain develops, succumbs to disease, and deteriorates in old age.

Their findings, published in the *Journal of the American Heart Association* in June, show that vascular endothelial cells, which form the inner lining of blood vessels, transmit signals throughout the brain's circulatory infrastructure, telling vessels to dilate whenever a burst of neuronal activity requires the delivery of fresh blood to a certain area of the brain. Scientists already knew that endothelial cells regulate blood flow in other parts of the body, but until now they doubted that the same mechanism was operating in the brain; many scientists suspected that star-shaped brain cells called astrocytes told vessels when to dilate.

"While our study cannot rule out the possibility that astrocytes contribute to the regulation of blood flow in the brain in some way, it certainly demonstrates that the vascular endothelium plays a critical role in the process," says Hillman, who is an associate professor of biomedical engineering and of radiology.

Hillman and her students, who specialize in building microscopes that can peer into the living brain, made their discovery using a special dye that, when exposed to blue light, disrupts endothelial cells' ability to send signals. Once endothelial cells were damaged in the living rat brain, the vessels no longer dilated in response to neuronal activity.

The researchers soon plan to investigate whether vascular problems in the brain may contribute to the onset of childhood developmental disorders or conditions such as Alzheimer's disease. Says Hillman: "Our latest finding gives us a new way of thinking about brain disease — that some conditions assumed to be caused by faulty neurons could actually be problems with faulty blood vessels."