Researchers publish MRI images of genes in action in the living brain

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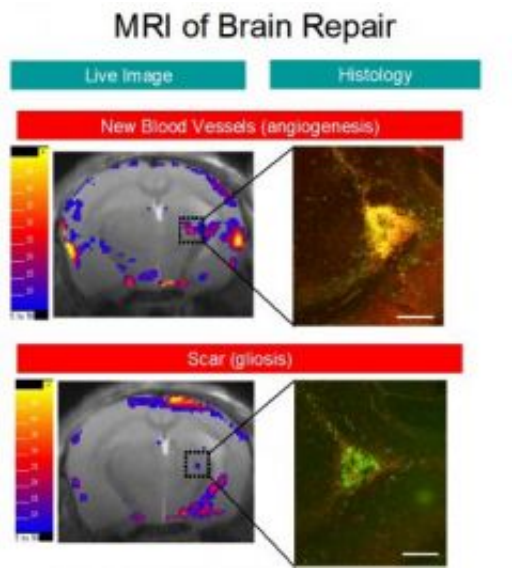

Probes administered by eye drop attach to special cells during repair and cause them to have different magnetic movement, or magnetic resonance, when viewed by a magnetic resonance imaging scanner. The images generated by the MRI scanner make it possible to see these repair processes in action. This method is the first to provide scientists, clinicians, teachers, and students a means to visualize the process of brain repair in live subjects. Image courtesy Philip Liu of Harvard Medical School

Biologists have just confirmed what poets have known for centuries: eyes really are windows of the soul—or at least of the brain. In a new study published in the April 2008 print issue of *The FASEB Journal*, Harvard researchers describe the development of gene probe eye drops

that—for the first time—make it possible to monitor and detect tissue repair in the brain of living organisms using MRI. Current methods involve a risky, invasive, and relatively slow process of penetrating the skull to extract tissue samples and then examining those samples in a laboratory.

“We hope our study provides a tool for better treatments of neurological diseases, diagnosis, prognosis during therapy, and improved delivery of therapeutic agents to the brain,” said Philip Liu of Harvard, one of the researchers involved in the study. Liu also said that more research is necessary to determine exactly how these gene probes reach brain tissue.

In this report, Harvard researchers describe how they link a relatively common MRI probe (superparamagnetic iron oxide nanoparticles) to a short DNA sequence that binds to proteins in cells responsible for brain tissue repair (glia and astrocytes). Then, researchers used the eye drops on mice with conditions that cause “leaks” in the blood-brain barrier. When the animals’ brains were scanned using MRI, brain repair activity was visible.

Glia and astrocytes help repair brain and nerve tissue, and have a role in numerous diseases and disorders that cause at least microscopic breaches in the blood-brain barrier, including traumatic brain injury, multiple sclerosis, stroke, cardiac arrest, and glioma, among others. Furthermore, the researchers believe that the probes may also help diagnose thinning of vascular walls in brains, which occurs as Alzheimer’s disease progresses.

“When people are sick, the last thing you want to do is puncture their skulls for a biopsy,” said Gerald Weissmann, MD, Editor-in-Chief of The FASEB Journal, “but sometimes this is unavoidable. These probes of genes in action go a long way toward ushering in an age where extracting brain tissue to identify a disease will seem as crude as when

doctors measured skulls to diagnose a mental disease."

Source: Federation of American Societies for Experimental Biology