Neurological diseases share common blood-brain barrier defects

Study identifies genes involved in blood-brain barrier problems seen in stroke, epilepsy, multiple sclerosis, amyotrophic lateral sclerosis (ALS) and traumatic brain injury

Boston (March 30, 2015) – Although stroke, epilepsy, multiple sclerosis, amyotrophic lateral sclerosis (ALS) and traumatic brain injury each affect the central nervous system differently, a new study finds that they share common defects in the blood-brain barrier that can be traced to a single set of genes. The findings could yield new approaches for treating brain diseases.

To protect the brain from harm, endothelial cells lining the blood vessels around the brain form a barrier that lets only very specific molecules move from the blood to the brain. In people with certain diseases or brain injuries, the barrier doesn’t work properly and can allow dangerous molecules or pathogens into the brain.

“Our goal is to identify the mechanisms that lead to this disruption of the blood-brain barrier in stroke, multiple sclerosis, epilepsy, ALS and traumatic brain injury,” said Richard Daneman, Ph.D., fellow at the University of California – San Diego, and leader of the research team. “For these diseases, the blood-brain barrier dysfunction is a significant contributor to symptoms and disease progression, so if we can stop the endothelial cells from going down this path, we could possibly limit the progression and the severity of these diseases.”

Daneman is member of the American Association of Anatomists (AAA) and was awarded the 2015 AAA Morphological Sciences Award in recognition of his research. He will present this research at the AAA Annual Meeting during Experimental Biology 2015.

To identify molecular pathways and genes that are important for blood-brain barrier dysfunction, Daneman developed a way to isolate blood-brain barrier endothelial cells and compare gene expression in cells from healthy brain tissue to cells from the brains of mouse models of stroke, multiple sclerosis, epilepsy, traumatic brain injury and ALS.

“Even though the diseases we looked at all have different triggers, we see very similar genes changing in all the different diseases within the brain endothelial cells,” said Daneman. “The fact that we found a common pathway means we could potentially find a single therapeutic target that could stop these different neurological diseases from occurring or progressing.”
To learn more about the exact function of genes they identified as involved in blood-brain barrier dysfunction, the researchers plan to create genetically modified mice with brain endothelial cells that either overexpress or lack a given gene. “If we can develop methods to stop these genes from being turned on, we may be able to limit the blood-brain barrier dysfunction,” Daneman said.

Richard Daneman will present the findings during the Experimental Biology 2015 meeting on Monday, March 30 from 5:00 – 5:30 p.m. at the Morphological Sciences Award Hybrid Symposia in room 105, Boston Convention and Exhibition Center.

The study was funded by grants from the Takeda New Frontiers Science, the American Heart Association and the National Multiple Sclerosis Society.

Image available.

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**About the American Association of Anatomists (AAA)**

AAA is the professional home for an international community of biomedical researchers and educators focusing on anatomical form and function. Founded in 1888, the society advances the three-dimensional understanding of structure as it relates to development and function, from molecule to organism. [www.anatomy.org](http://www.anatomy.org)

**About Experimental Biology 2015**

Experimental Biology is an annual meeting comprised of more than 14,000 scientists and exhibitors from six sponsoring societies and multiple guest societies. With a mission to share the newest scientific concepts and research findings shaping clinical advances, the meeting offers an unparalleled opportunity for exchange among scientists from across the United States and the world who represent dozens of scientific areas, from laboratory to translational to clinical research. [www.experimentalbiology.org](http://www.experimentalbiology.org)

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