Raising eyebrows on neuroinflammation: Study finds novel role for 'skin plumping' molecule

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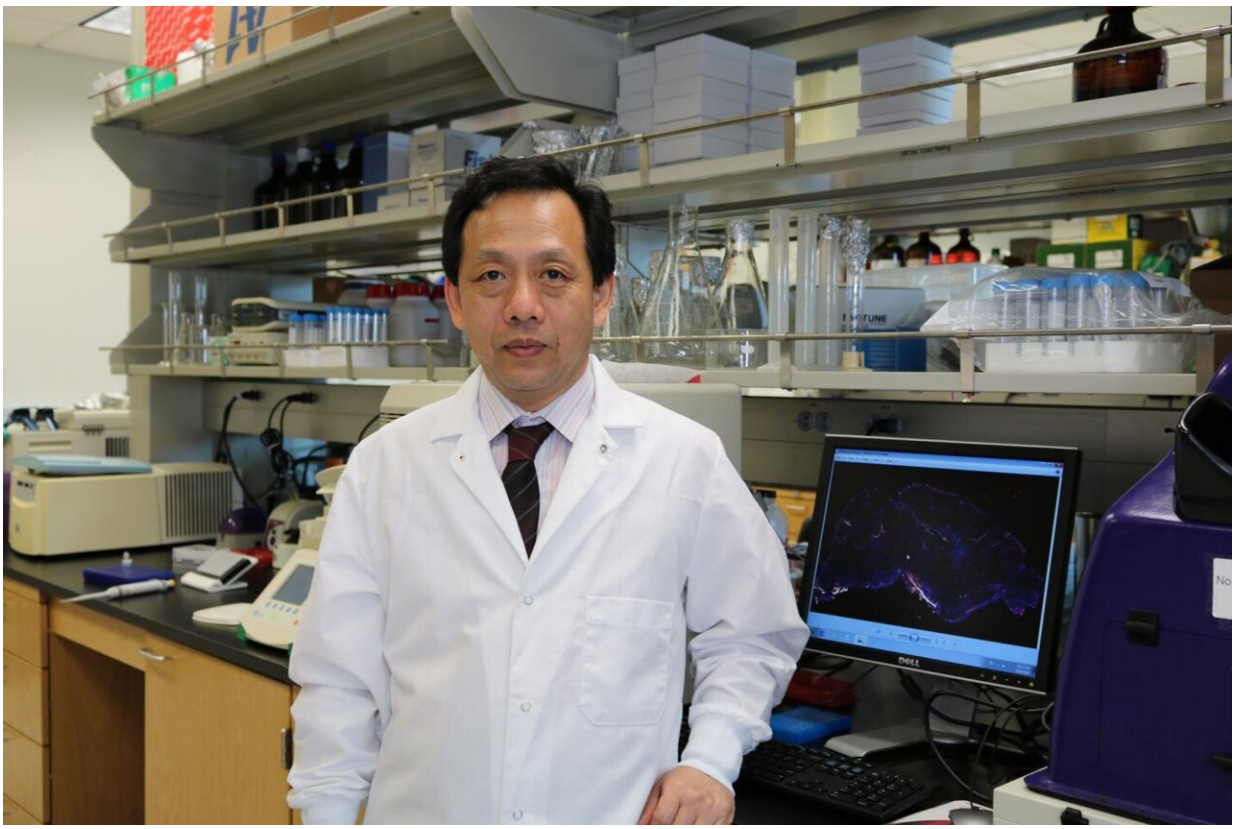

Ning Quan, Ph.D., lead author, a professor of biomedical science in FAU's Schmidt College of Medicine, and a member of FAU's I-BRAIN. Credit: Florida Atlantic University

This clear, gooey substance, which is naturally produced by the human body, has been popularized by cosmetic and skin care products that promote healthier, plumper and more supple skin. Also recognized for its abilities to speed up wound healing, reduce joint pain from osteoarthritis, and relieve dry eye and discomfort, a neuroscientist at Florida Atlantic University's Brain Institute (I-BRAIN) and Schmidt College of Medicine, has discovered a novel mechanism and role in the brain for hyaluronic acid.

In a study published in the journal *Brain, Behavior and Immunity*, Ning Quan, Ph.D., lead author, a professor of biomedical science in FAU's Schmidt College of Medicine and a member of I-BRAIN, and collaborators, have discovered that hyaluronic acid may be the key in how an immune signal moves from the blood stream to the brain, activating the brain's resident immune cells, the microglia.

This unsuspected molecule may be the main signal passed between these cells, and this new discovery could lead to novel opportunities to shut down brain inflammatory responses. Findings from this study have important implications for better treatments for stroke, neurodegenerative diseases, as well as head injuries.

"We normally think of hyaluronic acid with respect to cartilage formation and also for its role in many processes including cancer progression and metastasis," said Quan. "However, what we have uncovered in our study is a completely unique role for this molecule. We have been able to document a connection between the blood cells and the brain cells, showing that the activating signal passed between these cells is hyaluronic acid."

Quan and collaborators from the Sichuan University, The Ohio State University, and the University of Illinois Urbana-Champaign, demonstrate that inflammation in the central nervous system is

oftentimes quenched or restricted, as neurons are extremely vulnerable to inflammation-caused damages. However, this inflammation can be aberrantly amplified through endothelial cell-microglia crosstalk when the brain constantly receives inflammatory signals. Quan's work identified hyaluronic acid as the key signal released by endothelial cells to stimulate microglia and promote oxidative damage.

"To prevent the inflammation from being intensified in the brain, you have to stop the communication between the two cell types," said Xiaoyu Liu, Ph.D., another corresponding author of the study in FAU's Schmidt College of Medicine and I-BRAIN. "We found ascorbyl palmitate, also known as 'Vitamin C Ester,' to be quite effective in inhibiting microglia and reducing the production of inflammatory hyaluronic acid."

In the past, Vitamin C Ester has been widely used as a source of vitamin C and an antioxidant food additive. Now, this latest discovery suggests a novel function of Vitamin C Ester: treating central nervous system inflammation.

"As the newest addition to our Department of Biomedical Science, Dr. Quan's work already is making an important impact on our mission to advance understanding of human health and disease," said Janet Robishaw, Ph.D., senior associate dean for research and chair of the Department of Biomedical Science in FAU's Schmidt College of Medicine. "Long known as a popular skin and joint supplement, this discovery identifies a novel role for hyaluronic acid to potentially treat conditions caused by inflammation in the central nervous system."

Inflammation can occur in the central nervous system as a result of head trauma or stroke, or as part of a systemic immune response. Inflammation within the central nervous system has been associated with chronic neurodegenerative diseases including Alzheimer's disease, Parkinson's disease and multiple sclerosis.

"Neurological disorders such as Parkinson's disease and Alzheimer's disease impact all races, genders, and geographical backgrounds," said Randy Blakely, Ph.D., executive director of FAU's I-BRAIN. "Findings from this study may thus have global implications for how we treat neurodegeneration arising from traumatic brain injuries and brain changes associated with aging and dementia. This exceptional research by Dr. Quan and his colleagues is a testament to the cutting-edge work that is being conducted by our Brain Institute members and the research faculty in FAU's Schmidt College of Medicine."

Provided by Florida Atlantic University