

JAPAN / SCIENCE & HEALTH

Scientists discover molecular process of normal brain aging



Medical brain scans under analysis. Associate professor Ken-ichiro Kuwako at Shimane University's School of Medicine, whose team has identified a set of proteins in mouse nerve cells that declines with age, hopes the research may ultimately offer potential for intervention in physiological aging of the human brain. | GETTY IMAGES

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A team of Japanese researchers say they've identified how a set of proteins in nerve cells declines with age, a discovery that may someday lead to a therapy to maintain brain health in later life.

In a study on mice published Friday in the EMBO Reports journal, a team led by associate professor Ken-ichiro Kuwako at Shimane University's School of Medicine said the protein group, known as the LINC complex, plays a key role in controlling neuron activity.

The researchers found that the ability of 3-month-old mice to produce key molecules that make up the nerve cells' LINC complex, such as Sun1 and Nesprin-1, was very high, but that it declined significantly by 12 months and even further after 20 months across many brain regions.

The LINC complex transmits mechanical forces from both inside and outside the cell to the nucleus, and is known to play a role in maintaining nuclear structure. A decrease in these proteins distorts this nuclear structure and shortens the length of an area called the axon initial segment (AIS), which acts as a switch to send electrical signals.

Since the AIS helps nerve cells respond to stimuli, dysfunctions of the AIS lead to the decline of brain functions, the scientists said.

When the researchers injected Sun1 into the nerve cells of aging mice, however, the nuclei's structure and their ability to respond to stimuli were maintained. Behavioral tests of aging mice also showed that their memory had improved after they were given Sun1, the researchers said.

While still a long way off, the research could lead to the development of therapies that curb the effects of brain aging, Kuwako said.

At present, little is known about the mechanism of normal brain aging, he added, despite recent progress in therapies for Alzheimer's disease, which target the abnormal buildup of amyloid-beta proteins in the brain.

"While research on age-related neurological diseases such as Alzheimer's disease is advancing, the molecular mechanisms underlying physiological brain aging, which is a process that occurs for everyone, remain largely unexplained," Kuwako said.

“We believe this study is important in that it shows the potential for intervention strategies based on molecular mechanisms to address physiological brain aging.”

But the research is still at a very early stage, he added, noting that it’s difficult to say how long it might take for it to result in practical applications for people.

“Since these findings are based on a mouse study, we need to carefully determine whether similar mechanisms also exist in humans,” he said.

KEYWORDS

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