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UCF Alzheimer's discovery could lead to long-sought preventive treatment

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Despite a massive global research effort, many basics of Alzheimer's disease onset remain elusive. This has hampered development of treatments effective during the earliest stages of the disease, when prevention is most likely.

But a new discovery by University of Central Florida researchers has revealed a previously unknown mechanism that may drive the early brain function deterioration of Alzheimer's victims, thus opening a new exploratory path in the quest for an Alzheimer's cure.

The research, which will be published Friday, Jan. 8, in the peer-reviewed science and medicine journal *PLoS ONE,* also demonstrates how the unique application of an existing cell research technique could accelerate the discovery of treatments to exploit the new findings.

Researchers have known for years that a substance called amyloid-beta gums up brain cells when it becomes too concentrated, because it forms damaging deposits on the cells known as plaques. These prevent normal electrical signal generation in the cells, eventually killing them. That drives the memory loss and other problems that plague Alzheimer's sufferers.

Most Alzheimer's studies have focused on brain cells already damaged by amyloid-beta or the effects of high concentration of amyloid-beta. The University of Central Florida team, led by James Hickman, head of the UCF NanoScience Technology Center's Hybrid Systems Laboratory,

instead explored impacts of very low amyloid-beta concentrations on healthy cells in an effort to mimic the earlier stages of Alzheimer's. The results were shocking.

Squelching the Signals

The UCF team found that over time, though there are no outward signs of damage, exposure to moderate amyloid-beta concentrations somehow prevents electrical signals from traveling normally through the cells. Because the effect is seen in otherwise healthy cells, Hickman believes the team may have uncovered a critical process in the progression of Alzheimer's that could occur before a person shows any known signs of brain impairment.

"What we're claiming is that before you have any behavioral clues, these electrical transmission problems may be occurring," he says.

If this proves true, then the team has opened a promising potential path to an Alzheimer's treatment that could block the onset of the mild cognitive impairment associated with early Alzheimer's. In contrast, all currently available treatments manage symptoms of Alzheimer's after they first appear -- when it is likely too late for prevention.

"I think it's a very important paper," says Dave Morgan, an Alzheimer's expert at the University of South Florida not involved in the research, "This opens up a whole series of important questions, and answering them may lead to alternative drugs or other agents to benefit Alzheimer's patients."

Accelerating Challenging Brain Studies

Kucku Varghese, a former graduate student in the Hickman lab now at

the University of Florida, first demonstrated amyloid-beta's effects at low concentrations on healthy cells using a common cell research method that is laborious and unsuitable for long-term experiments. But the Hickman team quickly moved to more advanced experiments using microelectrode arrays (MEA) to study the new finding. MEA studies use cultures of neurons on plates embedded with tiny electrodes that can send and measure electrical signals through nearby cells without damaging them, allowing extended experimentation.

Hickman hopes to use MEAs and other tools to pinpoint the physiological and chemical changes within the brain cells that cause the loss of signal generation in healthy cells. Mechanisms responsible for the changes could offer potential targets for drugs, which pharmaceutical companies could search for using the MEA techniques demonstrated, and the mechanisms might provide a measurable target for early diagnosis of Alzheimer's.

"We're trying to find a marker that will lead to detection and treatment while slowing down Alzheimer's progression and can really make a difference by delaying or even preventing onset of the disease," says Hickman.

Provided by University of Central Florida

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