Molecules involved in Alzheimer's have a role in weakening of connections between neurons

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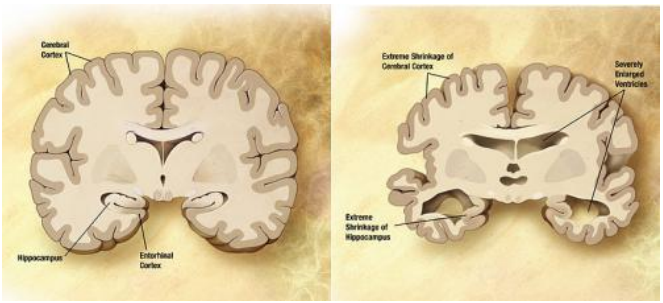

Diagram of the brain of a person with Alzheimer's Disease. Credit: Wikipedia/public domain.

Alzheimer's disease is the most common form of dementia, affecting over 44 million people worldwide. Inside the brain, Alzheimer's disease is characterized by loss of neurons, and presence of abnormal tangles and plaques in the brain. Dr. Graham Collingridge, recently recruited from Bristol (U.K.) to the University of Toronto, has found that molecules that are strongly associated with Alzheimer's disease are important players in a process called long-term depression (LTD). LTD is a process through which the strength of synapses, the connections between neurons, is selectively reduced. Dr. Collingridge's recent research suggests improperly regulated LTD could cause the degeneration of the connections between neurons that is a core feature of Alzheimer's and other neurodegenerative diseases.

"Recently, we have found that tau has a key physiological role in the process of LTD", explains Dr. Collingdridge. "Tau aggregates to form the hall-mark tangles of Alzheimer's disease and serves as the best marker of disease progression. Our finding that tau has a normal function at synapses adds considerable weight to the argument that Alzheimer's disease is triggered by a mis-regulation of a normal synaptic mechanism. We have also recently identified a novel and very rapid synaptic action of Abeta, a protein fragment that forms the senile plaques and is strongly implicated in the aetiology of Alzheimer's disease."

Learning and memory involve modifications in the distribution and strength of synapses, which are the points of connection between neurons. The two most studied forms of such modification are long-term potentiation, which is a strengthening of a synapse, by an increase in the transmission of signals through a synapse, and long-term depression, which is a weakening of the synapse. These modifications, also called synaptic plasticity, are a major process used for information storage in the brain and spinal cord.

Over the past decade, researchers have realized that aberrant synaptic plasticity may lie at the heart of many brain disorders. Dr. Collingridge's research, which focuses on a brain region called the hippocampus, which is important for memory storage, helps identify they key players in LTD. Once identified, these become potential therapeutic targets, as new drugs could be designed specifically to activate or inhibit them.

"Over the last few years we, and others, have identified many of the molecules involved in LTD. Potentially targeting these could provide novel approaches for the treatment of Alzheimer's disease and other neurodegenerative conditions" says Collingdridge.

Alzheimer is an incurable and chronic disease, and current treatments bring only modest improvements to symptoms, and do not work for all patients. A better understanding of the process affected in the brain will lead to identification of new drug targets,

and potentially, life-changing preventive therapies or treatments.

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