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Key brain receptor sheds light on neurological conditions, researchers say

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Researchers at the University of Colorado Anschutz Medical Campus have found that a key receptor in the brain, once thought to only strengthen synapses, can also weaken them, offering new insights into the mechanisms driving depression, drug addiction and even Alzheimer's disease.

Weakening or strengthening a synapse can have major implications both good and bad. Strengthening can sometimes be beneficial in treating Alzheimer's while at the same time causing drug addiction and contributing to Post Traumatic Stress Disorder (PTSD) in other cases.

For years, scientists believed that a special calcium permeable subtype of AMPA-type glutamate receptor only strengthened synapses, which send signals between brain cells. But Professor Mark Dell'Acqua, vice-chair of the Dept. of Pharmacology at the University of Colorado School of Medicine, and his team of researchers found that it also weakened synapses.

"It is a major and unexpected finding," Dell'Acqua said. "If these receptors go to synapses for a short time they can promote weakening of those synapses. But if they stick around longer they can strengthen those synapses. In both cases, that strengthening or weakening can be undesirable if it goes too far in either direction such as in PTSD and drug addiction versus Alzheimer's."

Researcher hope that drugs could be manufactured to strengthen or

weaken these synapses, depending on the condition being treated.

"Our study broadens our knowledge of the role these calcium permeable AMPA receptors plays in weakening synapses," Dell'Acqua said. "We are also exploring how these same signaling mechanisms may be relevant to what happens to synapses in Alzheimer's disease. In that case, synapses may be weakened too much."

Dell'Acqua said tracking calcium permeable AMPA receptor activity "is important for understanding basic synaptic processes that underlie normal learning and memory and are altered by diseases impacting brain function."

The discovery, he said, has implications for our understanding of autism, Alzheimer's, epilepsy, Down syndrome, schizophrenia, PTSD and drug addiction. And it offers new avenues to pursue in treating those conditions.

The study was published in the latest edition of the journal *Neuron*.

Provided by University of Colorado Anschutz Medical Campus

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