Study discovers unexpected source of diabetic neuropathy pain

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Nearly half of all diabetics suffer from neuropathic pain, an intractable, agonizing and still mysterious companion of the disease. Now Yale researchers have identified an unexpected source of the pain and a potential target to alleviate it.

A team of researchers from Yale and the West Haven Veterans Affairs Medical Center describes in the May 15 issue of the Journal of Neuroscience how changes in the structure of dendritic spines – microscopic projections on the receiving branches of nerve cells – are associated with pain in laboratory rats with diabetes.

"How diabetes leads to neuropathic pain is still a mystery," said Andrew Tan, an associate research scientist in neurology at the Yale School of Medicine and lead author of the study. "An interesting line of study is based on the idea that neuropathic pain is due to faulty 'rewiring' of pain circuitry."

With a growing number of diabetics, the condition represents a huge unmet medical need. Once neuropathic pain is established, it is a lifelong condition.

"Here we reveal that these dendritic spines, first studied in memory circuit processing, also contribute to the sensation of pain in diabetes," Tan said. A single neuron may contain hundreds to thousands of dendritic spines.

The Yale team led by Tan and senior author Stephen G. Waxman, Bridget Marie Flaherty Professor of Neurology, professor of neurobiology and pharmacology, found abnormal dendritic spines were associated with the onset and maintenance of pain. They also found that a drug that interferes with formation of these spines reduced pain in lab animals, suggesting that targeting abnormal spines could be a therapeutic strategy.

Tan said that these dendritic spines in nerve cells seem to store memory of pain, just as they are crucial in memory and learning in the human brain.

"We have identified a single, key molecule that controls structural changes in these spines and hopefully we can develop therapeutic approaches that target that molecule and reduce diabetic pain," Waxman said.

Provided by Yale University

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