Age no obstacle to nerve cell regeneration, researchers find

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In aging worms at least, it is insulin, not Father Time, that inhibits a motor neuron's ability to repair itself—a finding that suggests declines in nervous system health may not be inevitable.

All organisms show a declining ability to regenerate damaged nervous

systems with age, but the study appearing in the Feb. 5 issue of the journal *Neuron* suggests this deficit is not due to the ravages of time.

"The nervous system regulates its own response to age, separately from what happens in the rest of the body," said Marc Hammarlund, assistant professor of genetics and senior author of the new study. "By manipulating the insulin pathway, we can make animals that live longer but have nervous systems that age normally, or conversely, we can make animals that die at a normal age but have a young nervous system."

Alexandra Byrne, postdoctoral associate in genetics and lead author of the study, identified two genetic pathways that regulate insulin activity and are responsible for age-related declines in a worm's ability to regenerate neuronal axons, or connective branches. The team pinpointed two other pathways that also regulate a neuron's ability to regenerate, but that have no connection to the age of the worm.

The worm C. elegans is a well-established model to study the genetics of aging, and manipulation of the family of genes that regulate insulin activity has been shown to dramatically increase lifespan of the organism. The new study reveals that insulin signaling is also directly affecting the nervous system.

"We hope to understand how different pathways coordinately regulate neuronal aging, and more specifically, how to entice an aged neuron to regenerate after injury," Byrne said.

"The hope is to increase healthspan, not just lifespan," Hammarlund said.

Other Yale authors of the study are Trent Walradt, Kathryn E. Gardner, Austin Hubbert, and Valerie Reinke. The work was funded by the National Institutes of Health and the Ellison Medical Foundation.

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