

What makes an axon an axon?

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Inside every axon is a dendrite waiting to get out. Hedstrom et al. converted mature axons into dendrites by banishing a protein crucial for neuron development. The results suggest that this transformation could occur after nerve cell damage.

The study, to be published in the Nov. 17 issue of the *Journal of Cell Biology*, will be available online Nov. 10.

At the junction between the axon and the cell body is the axon initial segment (AIS), which sparks action potentials. Researchers also suspect that the AIS enables an axon to maintain its identity. Although scientists have teased out some of the molecular events that determine whether a neuron outgrowth will become an axon or a dendrite, they know little about what keeps these structures distinct.

In cultured neurons, Hedstrom et al. used RNAi to cut production of ankyrinG, a protein that helps spur formation of the AIS. Loss of ankyrinG caused the AIS to disappear. For example, sodium channels that normally crowd the AIS's plasma membrane dispersed. When ankyrinG was absent the erstwhile axons began to resemble dendrites, sprouting spines and developing excitatory synapses. Characteristic molecules from the cell body and dendrites, such as the microtubule polymerizing protein MAP2, also infiltrated the axons.

The AIS appears to serve as a filter that screens out dendritic proteins, Hedstrom et al. conclude. How the structure bars some proteins from the axon is still uncertain. Injuries and diseases can transform dendrites into

axons. The findings raise the possibility that these insults could cause the reverse transformation by changing the amount of ankyrinG and altering the AIS.

Source: Rockefeller University

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