TOOLBOX

Researchers watch as proteins travel to neuronal junctions

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Using high-resolution microscopy, researchers can watch as signaling complexes assemble at **synapses**, or neuronal junctions, in zebrafish embryos, according to a study published 17 April in *Cell Reports*[1].

The researchers used the technique to show that the components of a complex that releases chemical messengers at synapses each travel separately to the tips of neurons.

Studies in the past few years have found that many autism-linked genes code for proteins that function at the synapse. As many as a thousand different proteins are active there. The new method may allow researchers to track whether autism-linked mutations alter the transport of these proteins along neurons on the way to the synapse.

The study focuses on proteins called synapsins, which bind to bubbles of chemical messengers at synapses and help release their contents on command. Some studies have suggested that synapsins travel to the synapse **while bound to these bubbles**, whereas others show that they may be transported separately.

In the new study, researchers engineered zebrafish that express fluorescent versions of synapsin 1 and one of two other proteins from the signaling complexes. They then photographed a live zebrafish embryo for up to one hour, taking photographs every 30 seconds. Each protein was labeled with either red or green, allowing the researchers to distinguish them in the same image.

The small dots of fluorescence seen in the images are likely to be clumps of these proteins traveling together; many move during the imaging sequence. By documenting the distance traveled by each dot and comparing it with that traveled by other dots, the researchers were able to estimate the relative speed of each of the three proteins.

Each protein travels at a different speed and pauses its movement independently of the others, suggesting that the three travel independently to the synapse, the study found. By later labeling a

protein found at synapses, the researchers also showed that the proteins arrive at the synapse at different times.

References:

1: Easley-Neal C. *et al. Cell Rep.* **3**, 1199-1212 (2013) **PubMed**