An MBoC Favorite: Axonal membrane proteins are transported in distinct carriers: a two-color video microscopy study in cultured hippocampal neurons

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In celebration of MBoC’s first 20 years, members of the Editorial Board, members of the ASCB Council, and others comment on their favorite MBoC papers from the past two decades.

Neuronal cell bodies supply the axon and nerve terminal with organelle precursors, such as synaptic vesicle precursors, by means of membrane-bound carriers propelled by motors mounted on cytoskeletal tracks. Several neurodegenerative diseases, such as Charcot-Marie-Tooth type 2 disease and hereditary spastic paraplegia, involve the defective delivery of organelles from the cell body and impaired bidirectional trafficking in long axons. The diversity of causative genetic mutations affecting, for example, endosome traffic proteins, such as the WASH complex, molecular motors and their cargo adaptors, and the shared clinical features of axonal degeneration suggest a corresponding diversity of precursor organelles that traffic in axons. In 2000, Kaether et al. were among the first to show that more than one type of precursor organelle is delivered to nerve terminals (Kaether et al., 2000). This seminal study directly demonstrated the sorting and bidirectional transport of two fluorescent-tagged axonal membrane proteins, amyloid precursor protein and synaptophysin, into different membrane-bound carriers in hippocampal neurons. These carriers possess morphological features and transport speeds that clearly differentiate them. Thus, diverse precursor carriers share a common function of providing axonal and synaptic compartments with their constituents.

REFERENCE

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