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Axonal transport through signaling endosome and its roles in neurodegenerative disorders

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Long-distance axonal transport of ligand-receptor complexes from the site of endocytosis in the axon to somatodendrite acts as a signaling platform in neurons. However, the endosome-based transportations called "signaling endosomes" and its physiological significance remain to be elucidated. I discovered that retrograde axonal transport of semaphorin3A and its receptors by signaling endosomes regulates dendritic development, specifically enhances AMPA receptor GluA2 localization in dendrites. The retrograde signaling endosomes also induce anterograde delivery of nascent receptors. The axon-derived neurotrophin signaling endosomes are exocytosed to soma surface membrane where they promote anterograde transport of resident naïve receptors. As a positive feedback mechanism, this enhances the neuronal sensitivity to ligand in neurotrophin signaling. Taken together, these data suggest the antero- and retrograde communication via signaling endosomes plays critical roles in neuronal development. Since many neurodegenerative disorders are featured with impaired axonal transport, I start a project that investigates the role of signaling endosomes during the onset of these neurodegenerative disorders.