Cadherin-β-catenin Adhesion Complexes in Synaptic Development and Remodeling

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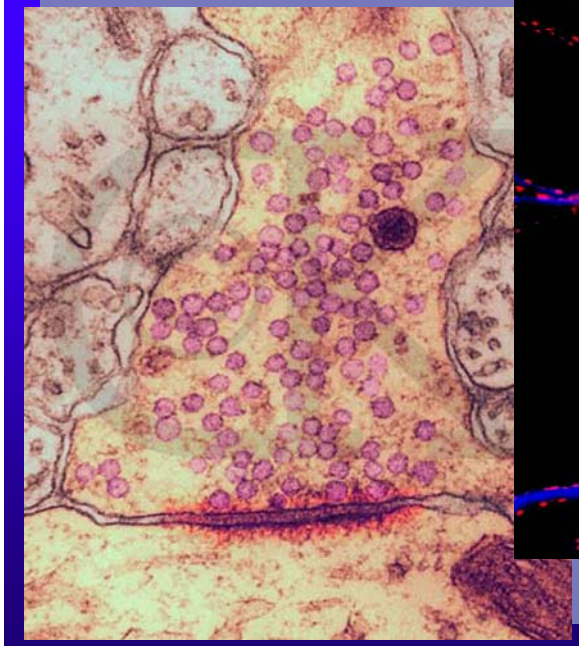
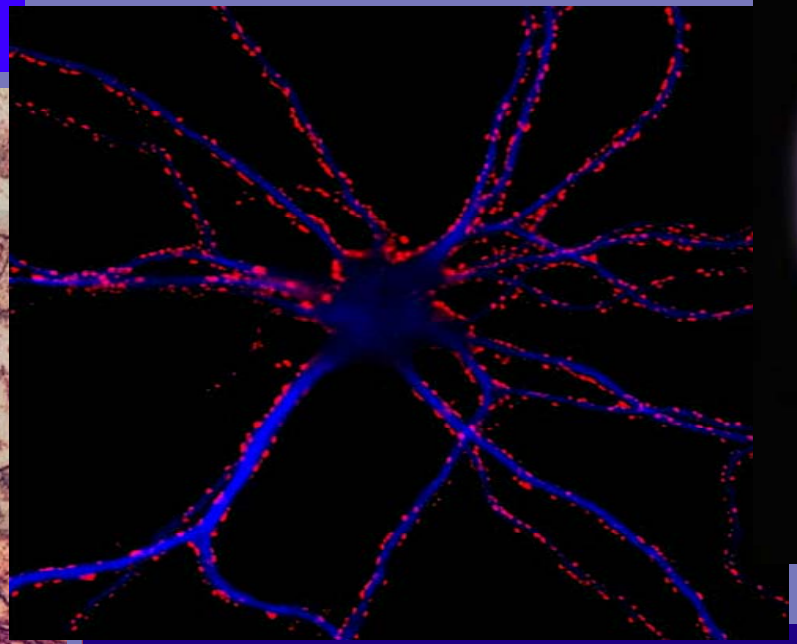
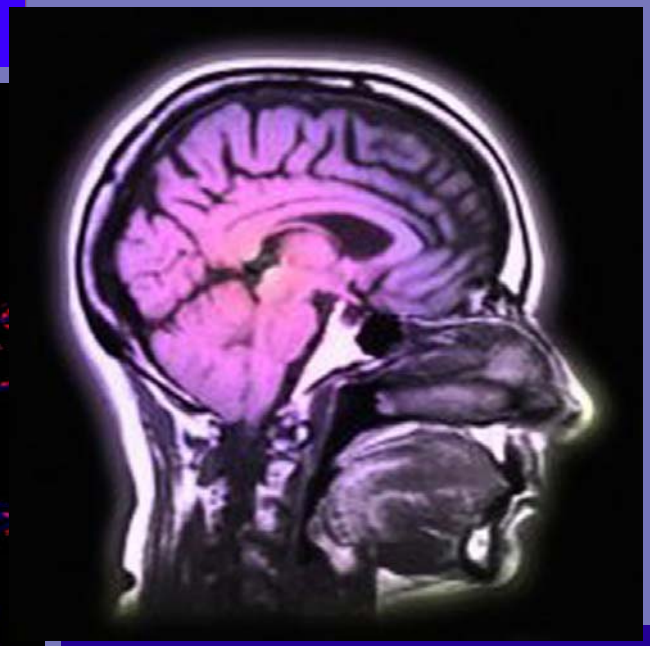
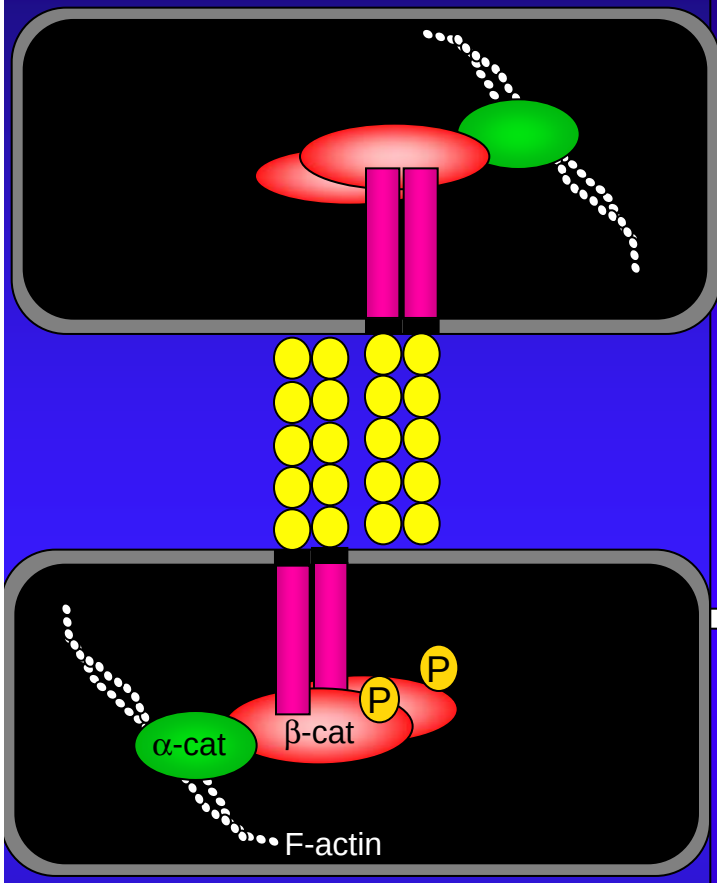
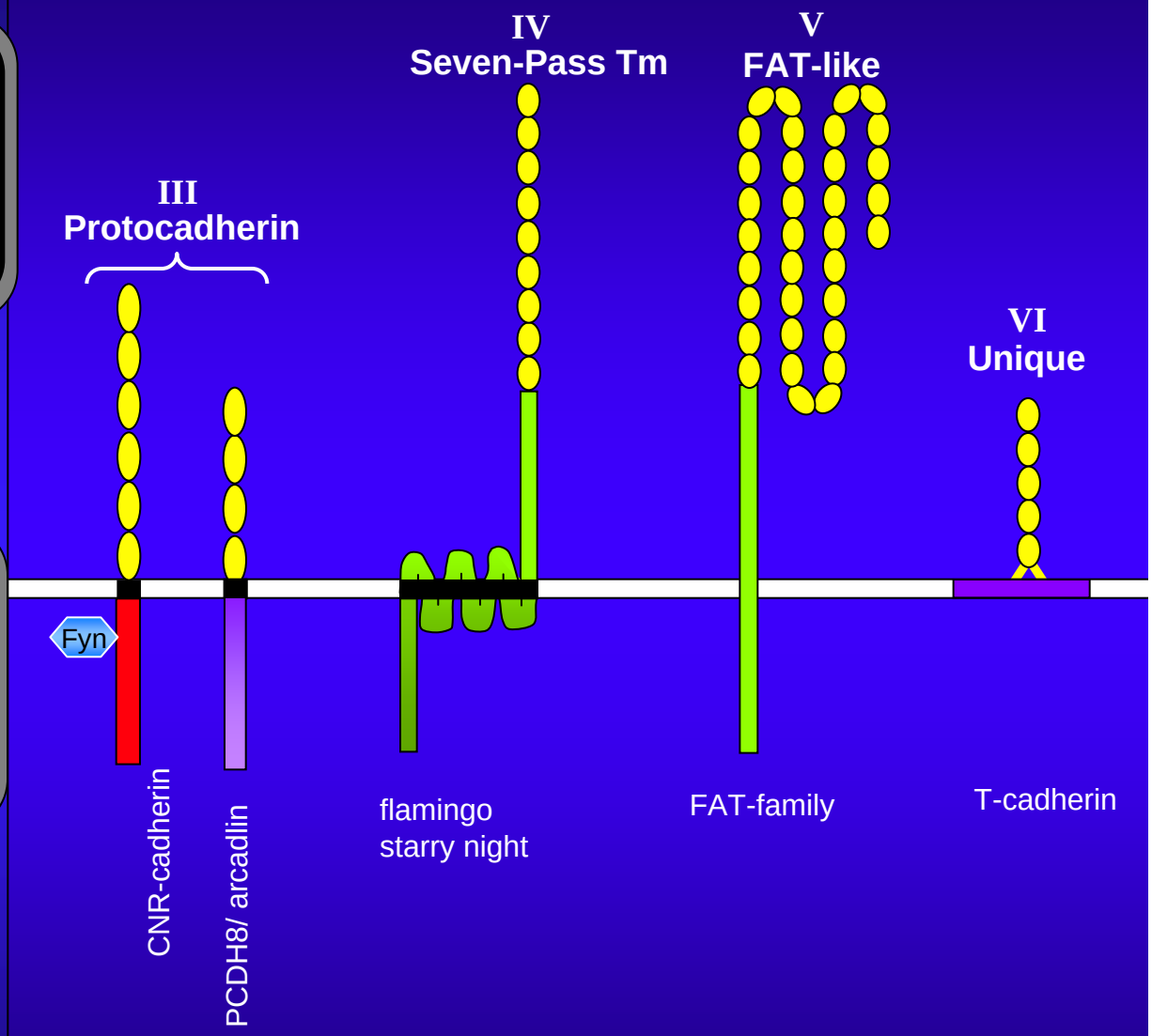






Cadherin Superfamily

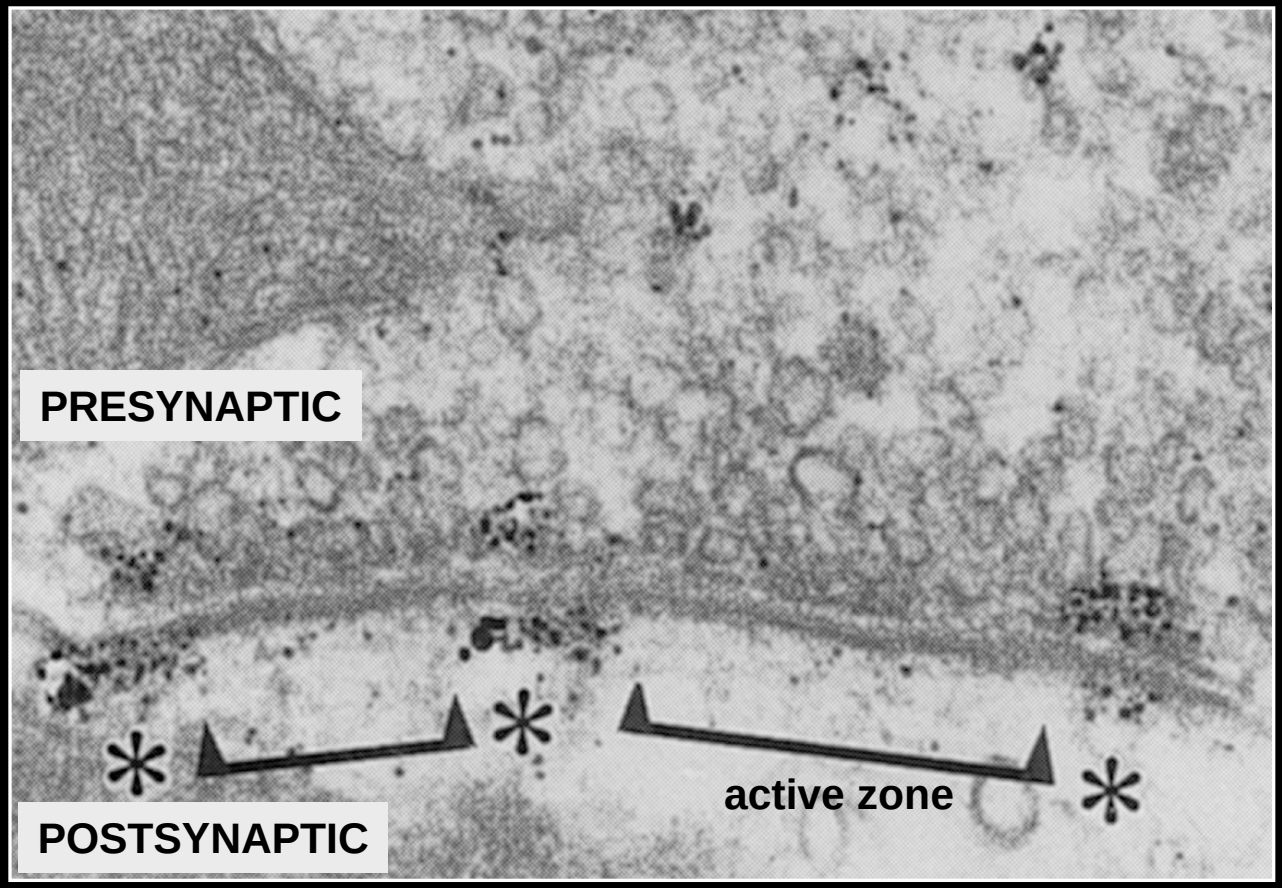




Type I:	Type II:
N-cad	VE-cad
E-cad	K-cad
P-cad	cad-8 to 12
R-cad	cad-18 to 20
H-cad	cad-24
C-cad	
DE-cad	

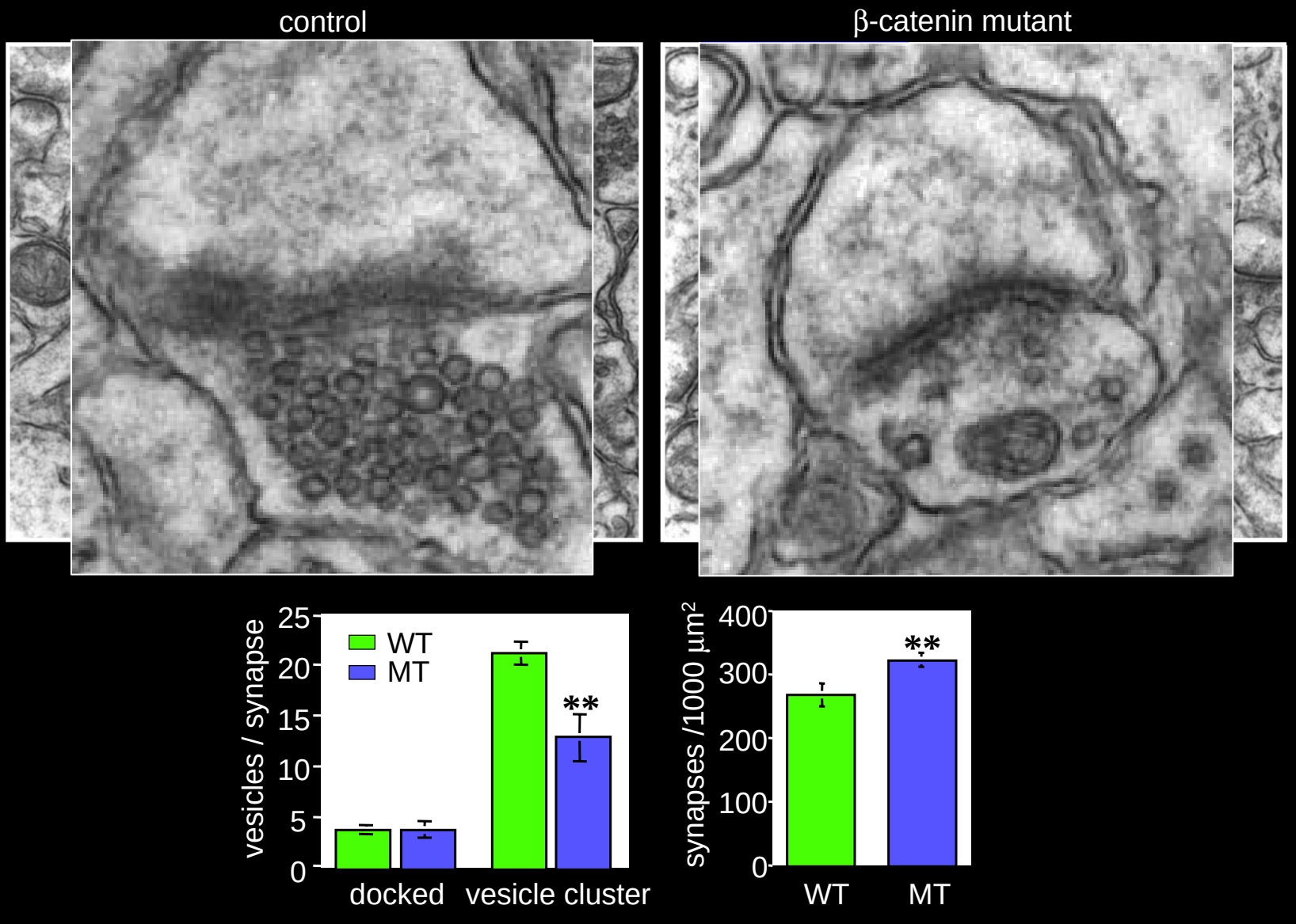
Adapted from : Angst et al., J.Cell Sci. 114:629

Synaptic localization of cadherin and catenin

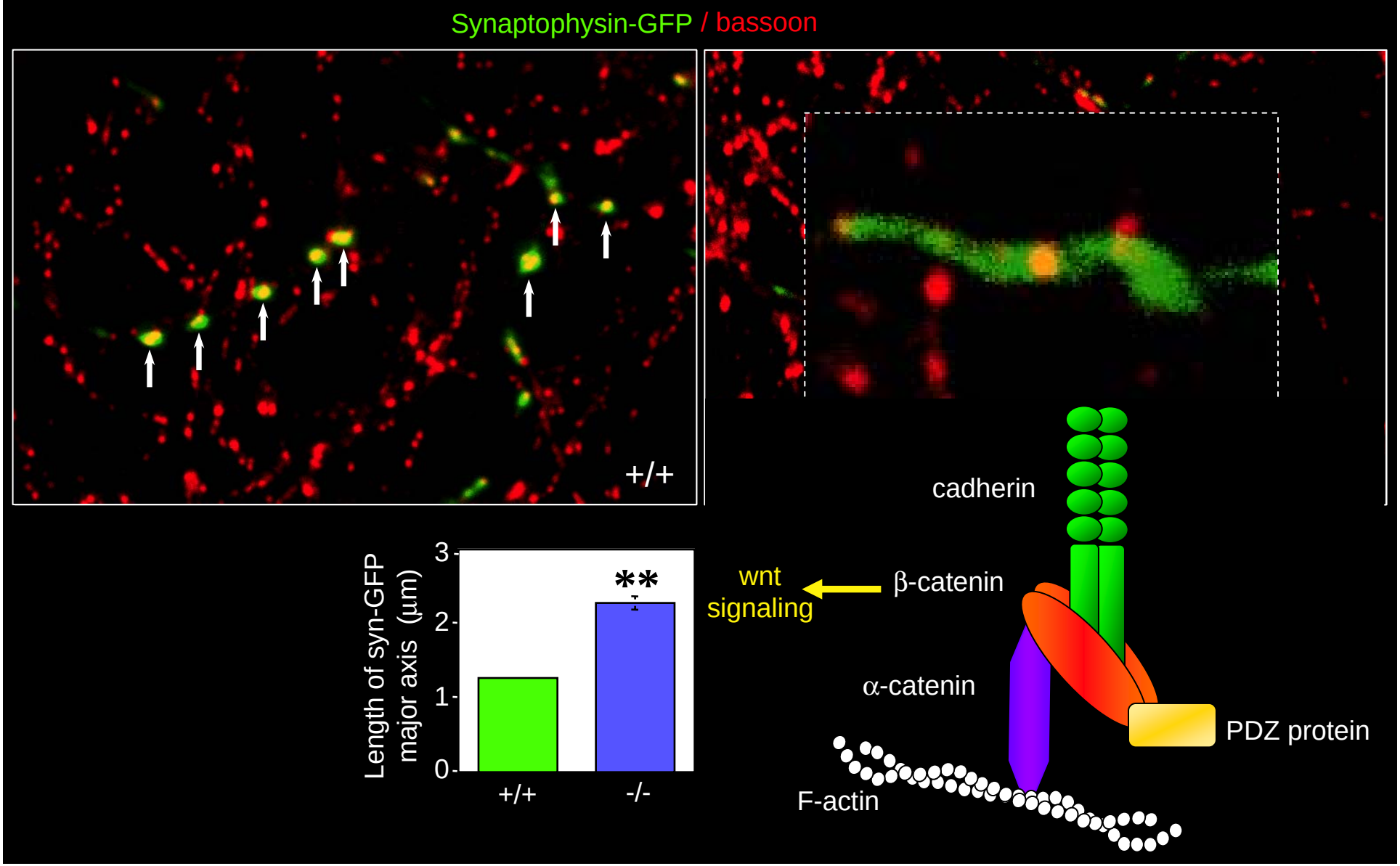


Uchida et al. 1996. JCB. 135:767-779

Synapse number and structure is altered in β-catenin mutant mice



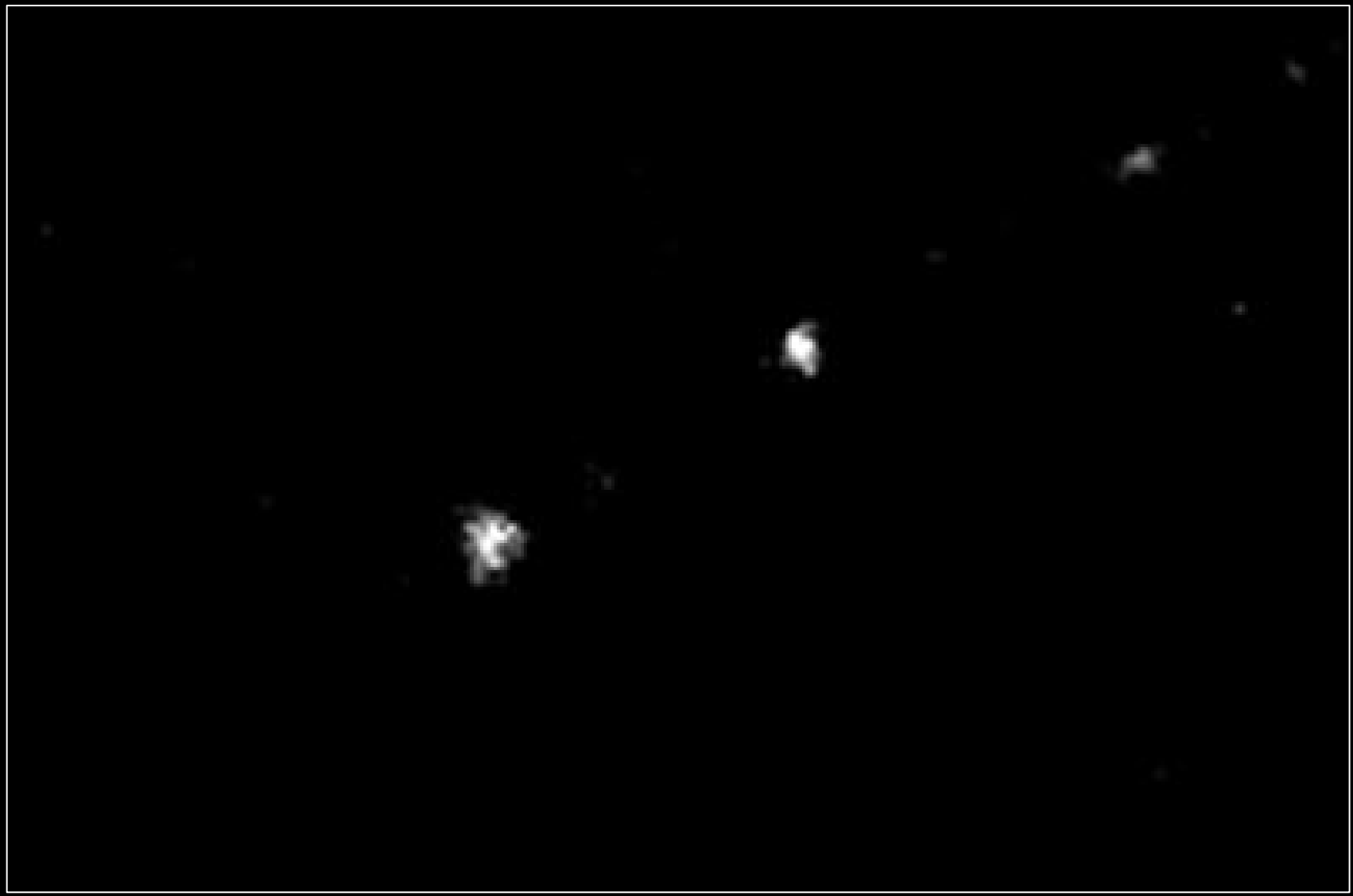
Synaptic vesicles are diffusely localized when β-catenin is ablated



What is the function of cadherin in synaptic plasticity?

- Does regulation of cadherin-β-catenin interactions affect synaptic remodeling and plasticity?
- What are the upstream regulators of cadherin-β-catenin interactions?

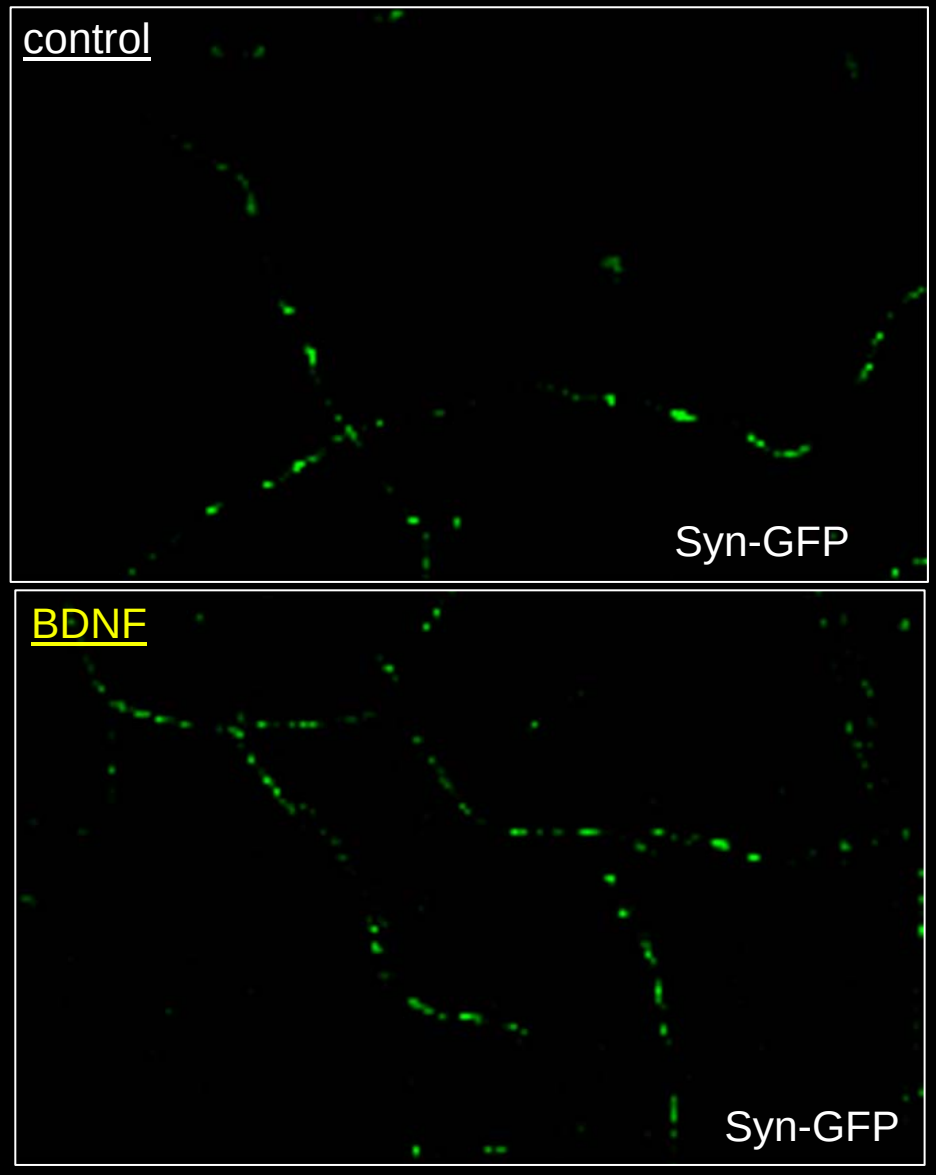
There is an Increase in SV Cluster Splitting Following BDNF Treatment



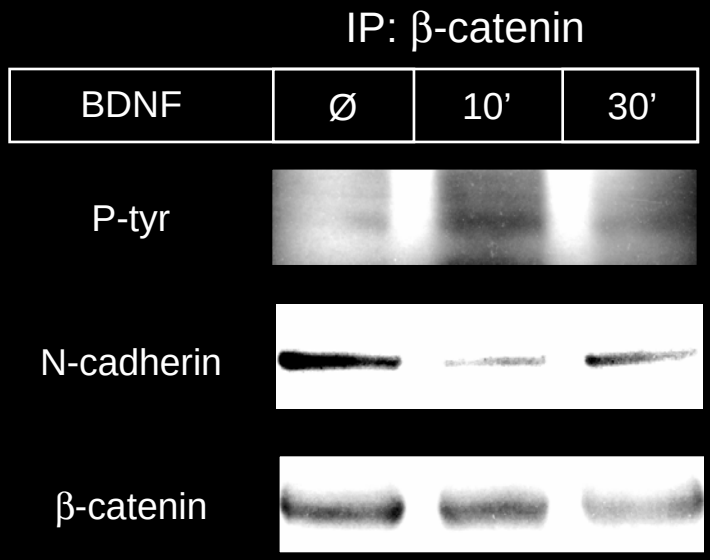
Rate : 1 frame/ 5 sec

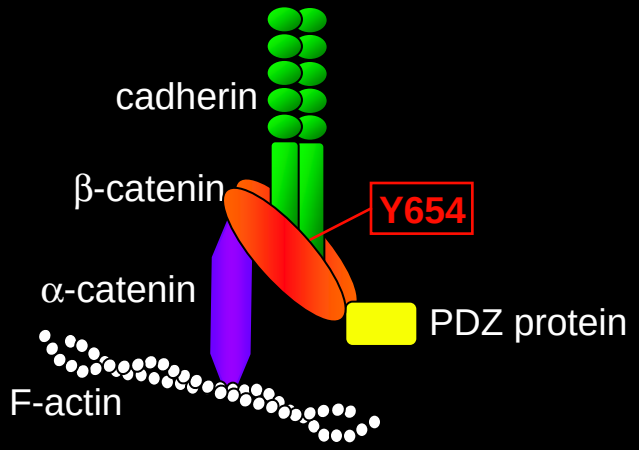
2 μm

BDNF increases the density of synaptophysin-GFP puncta

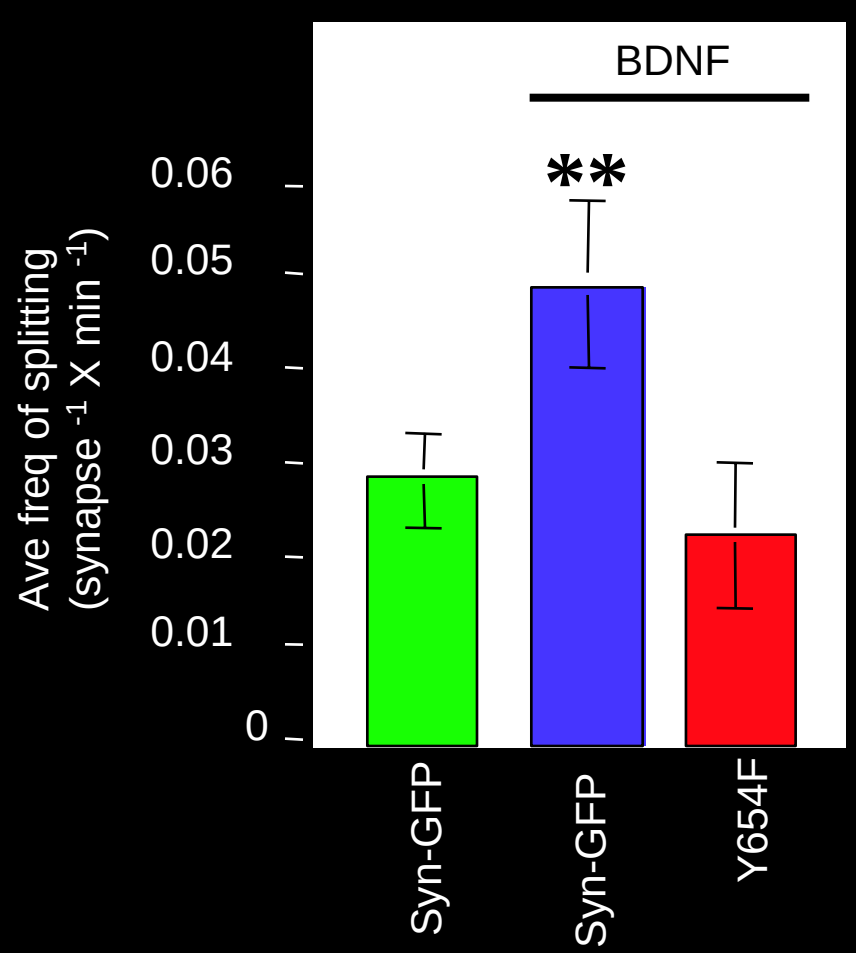


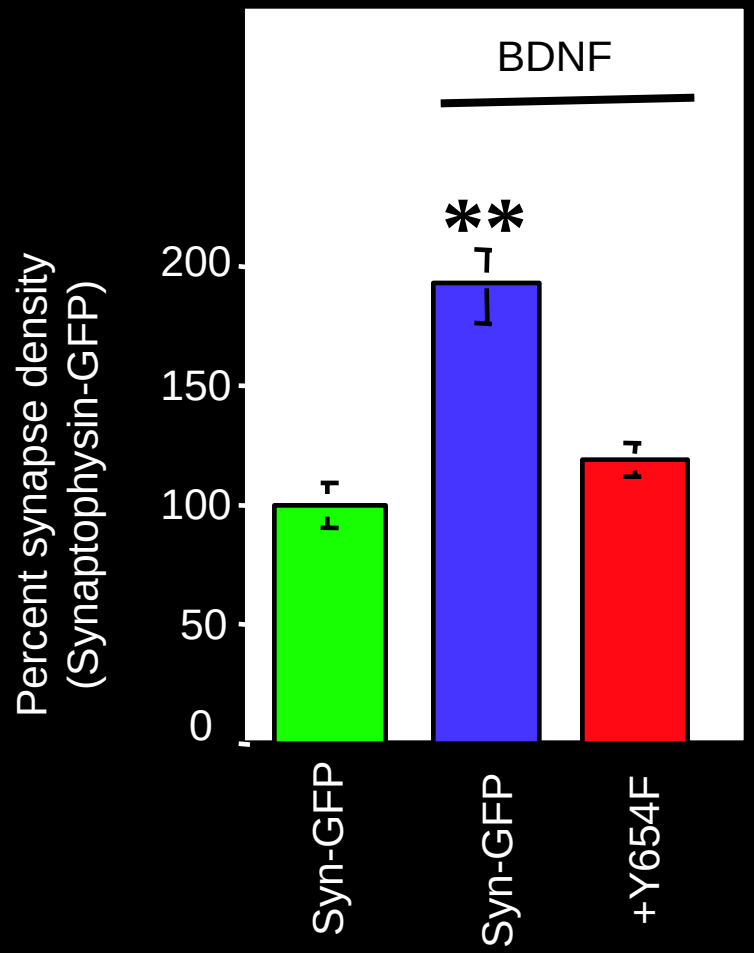
BDNF mediates cadherin-β-catenin uncoupling





BDNF increases the frequency of synaptic vesicle cluster “splitting” and the density of synapses by disrupting cadherin- β-catenin complexes





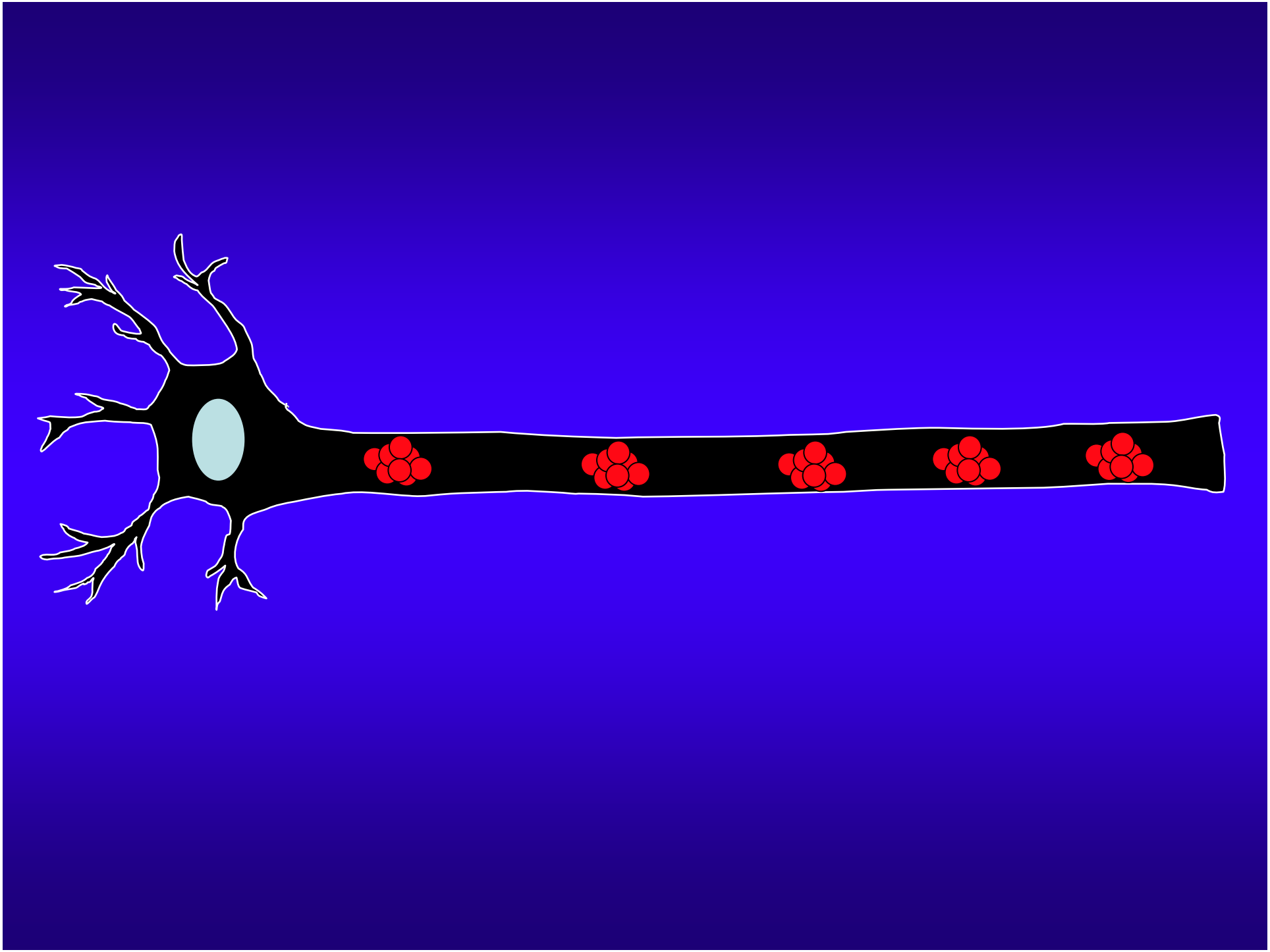
Conclusions:

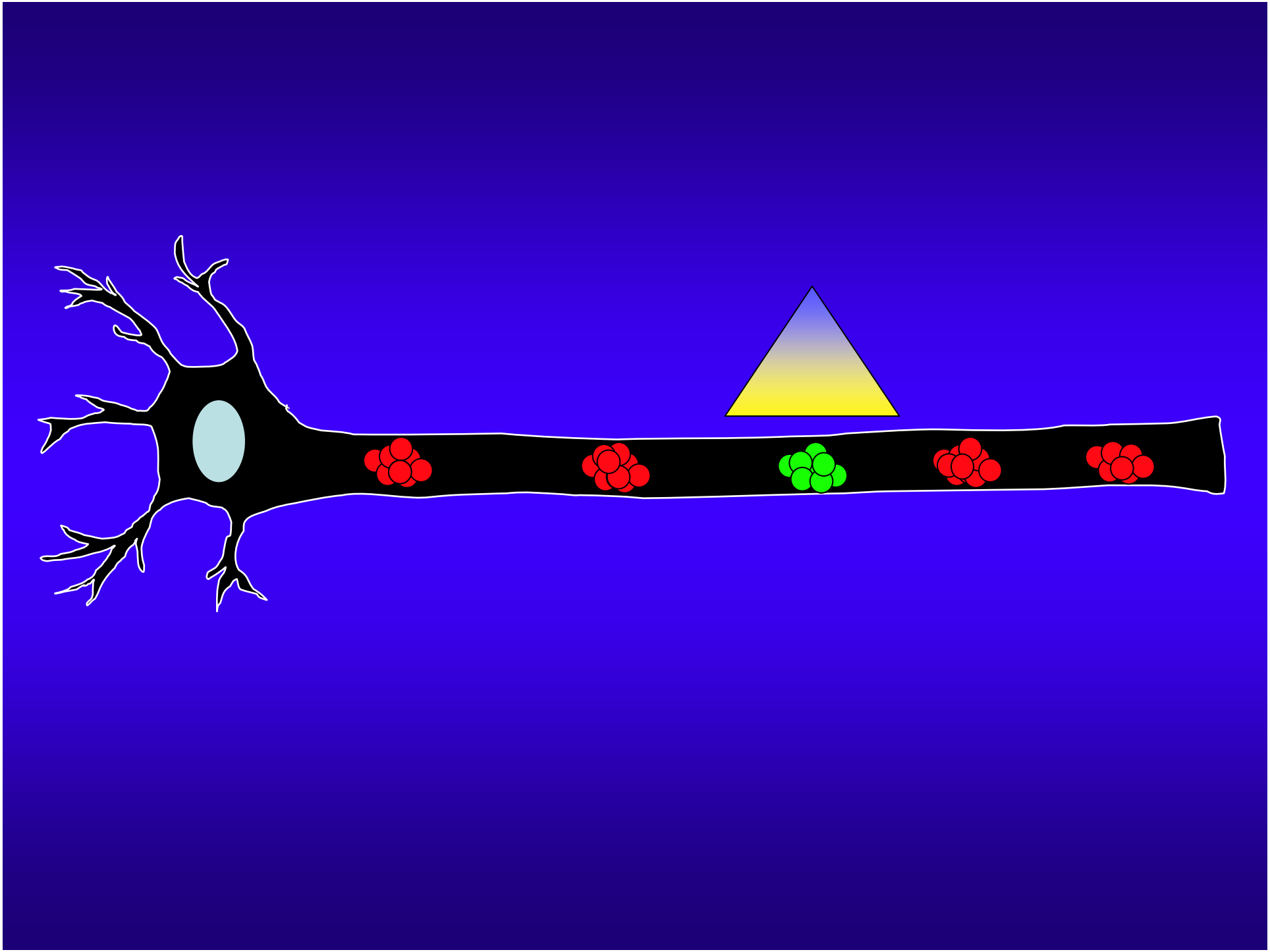
- Cadherin/ β-catenin adhesion complexes are important for localizing SVs to presynaptic compartments during development

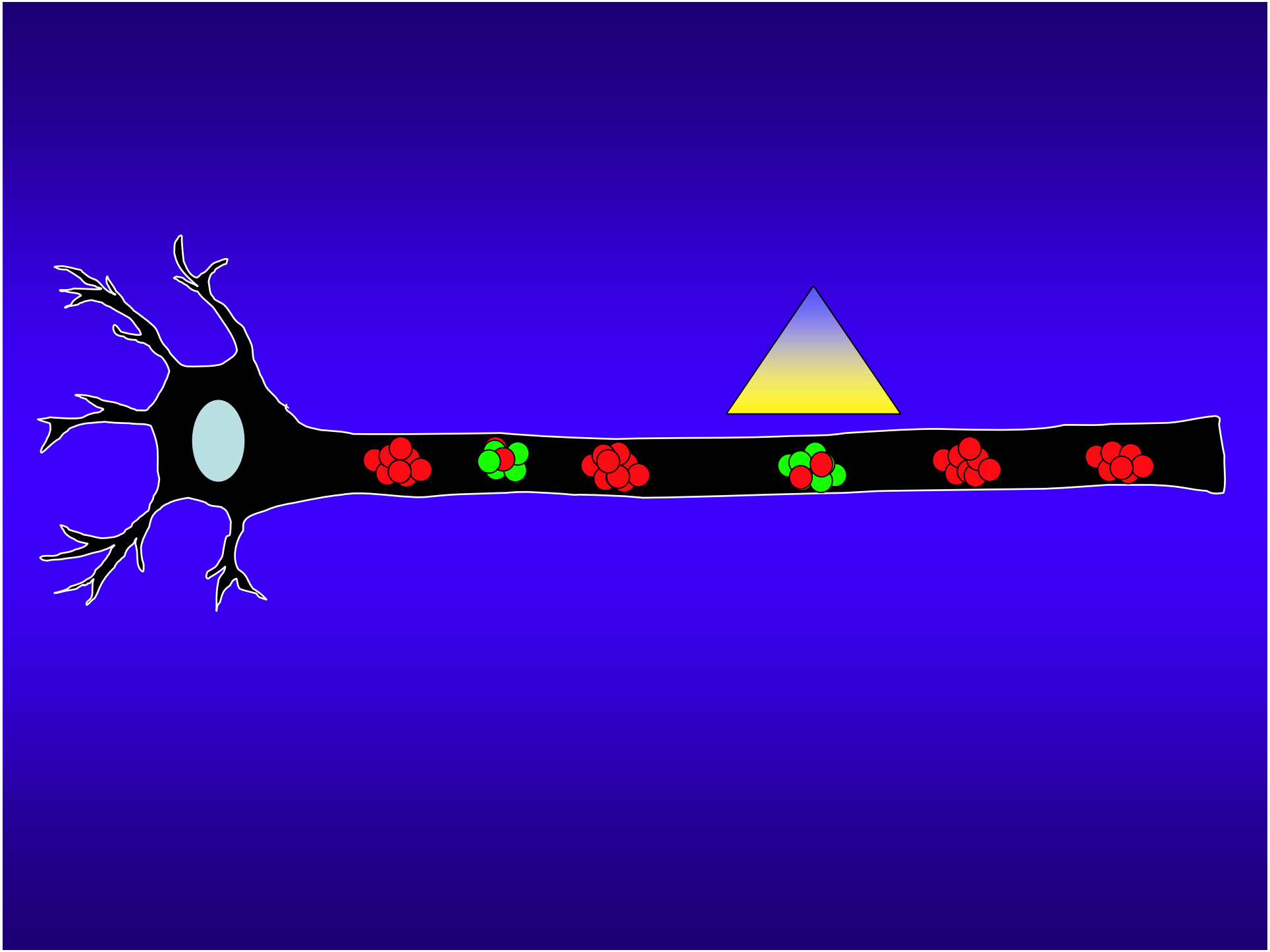
- Disruption of cadherin/ β-catenin adhesion complexes is important for the formation of new synapses

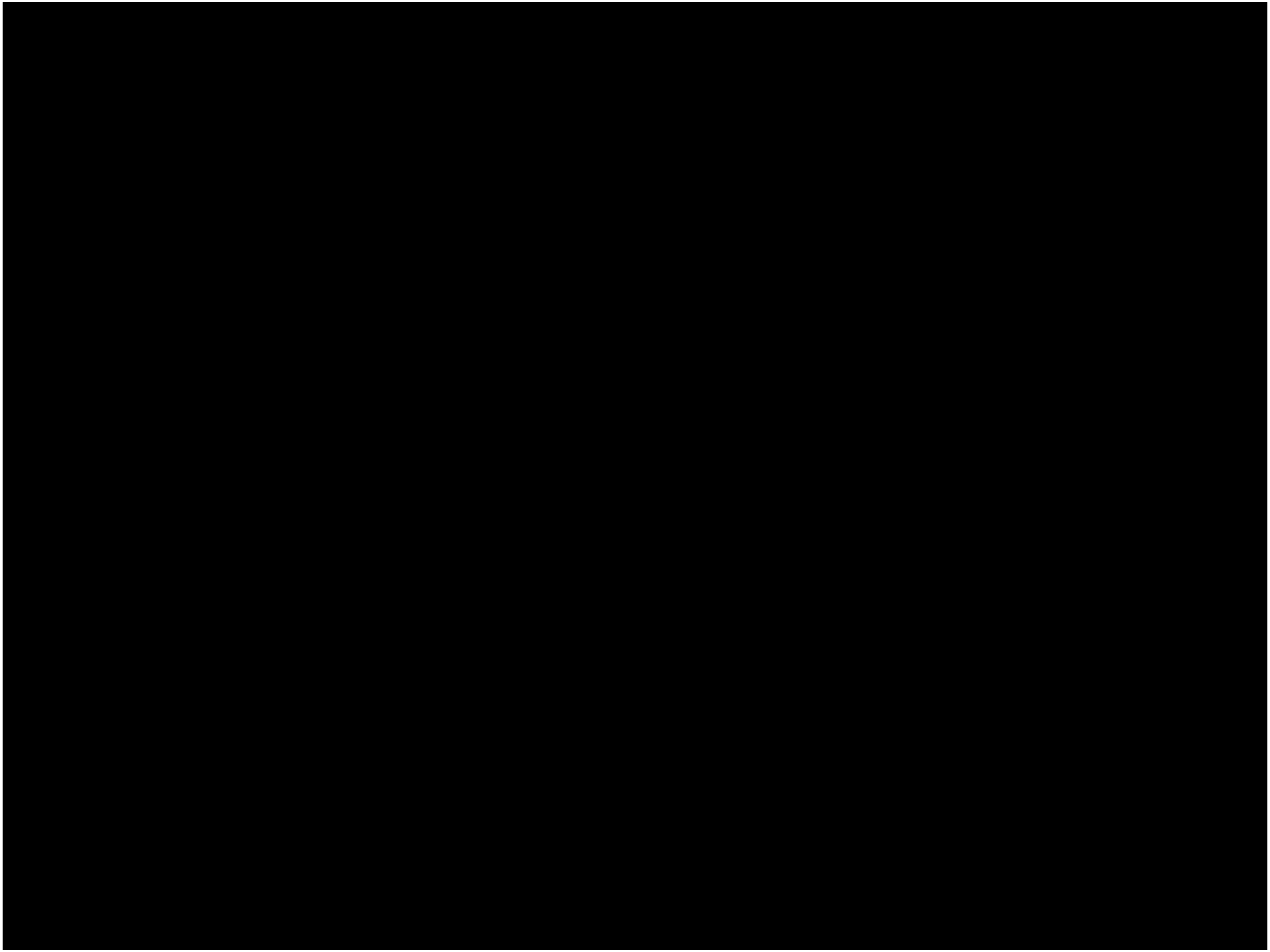
Hypothesis:

- Weakening of cadherin/ β-catenin complexes enhances synapse formation by increasing the mobility of SV clusters from existing synapses

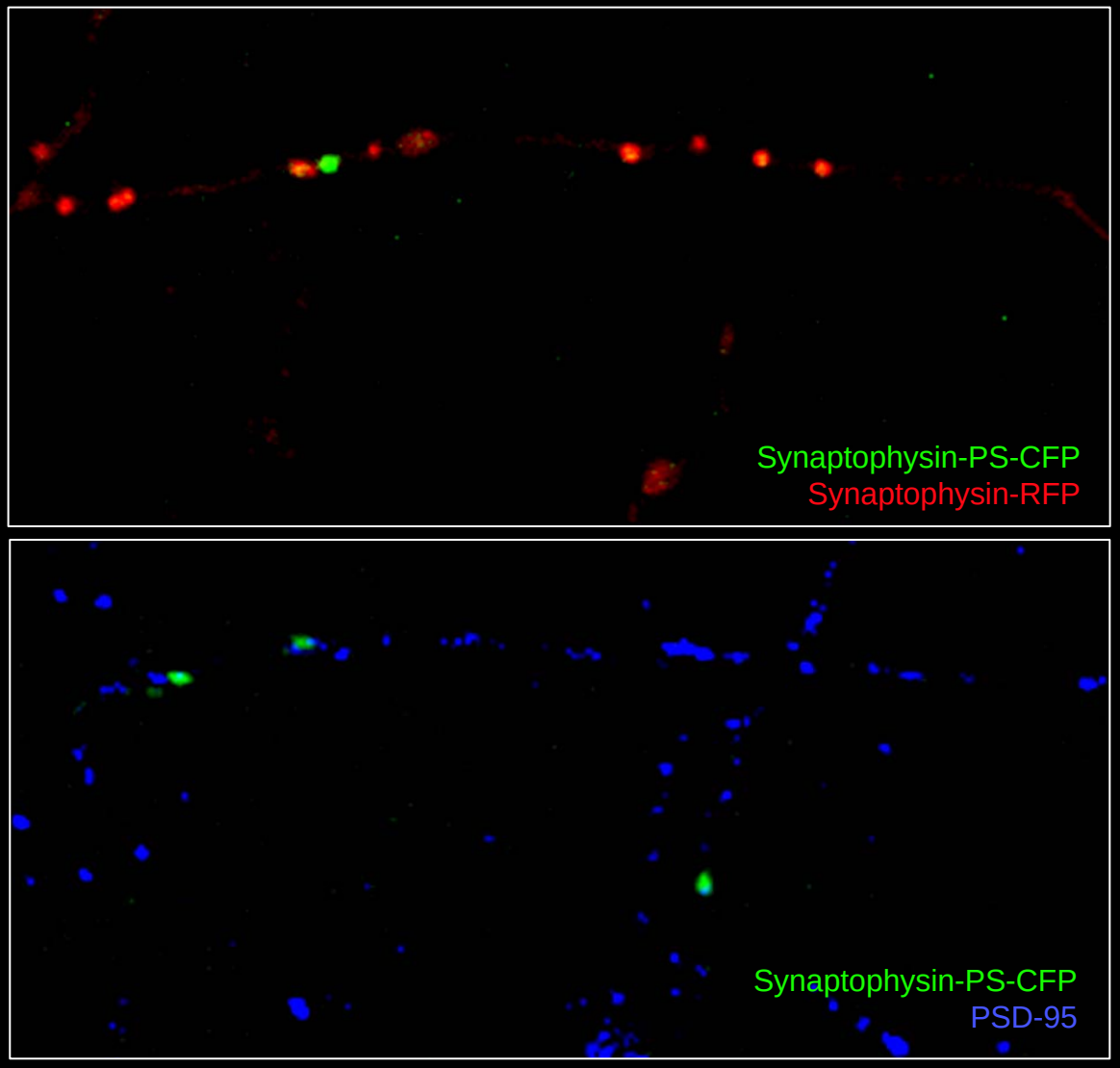








Synaptic vesicles associated with one synapse split to form new synapses and to associate with existing synapses



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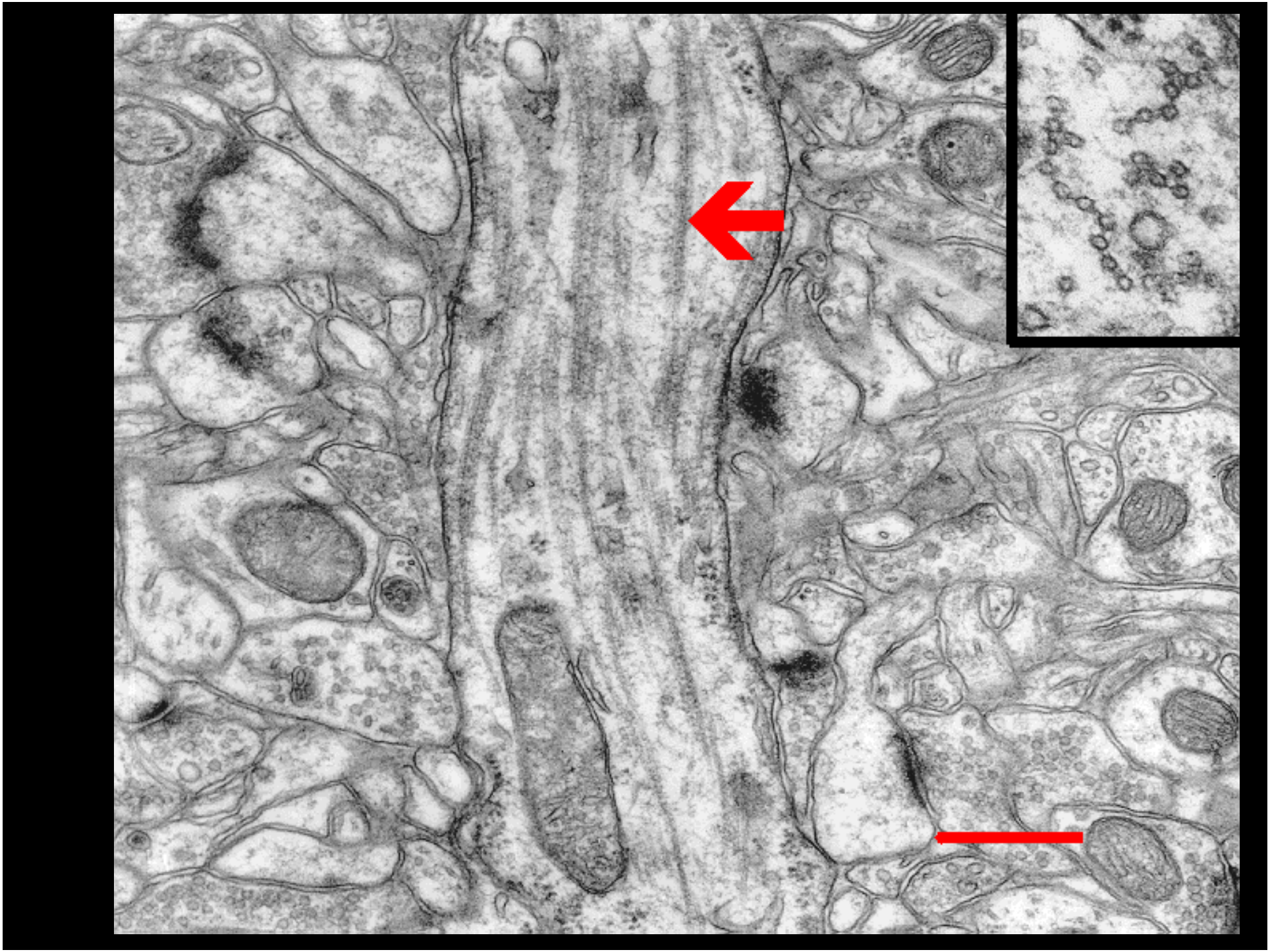

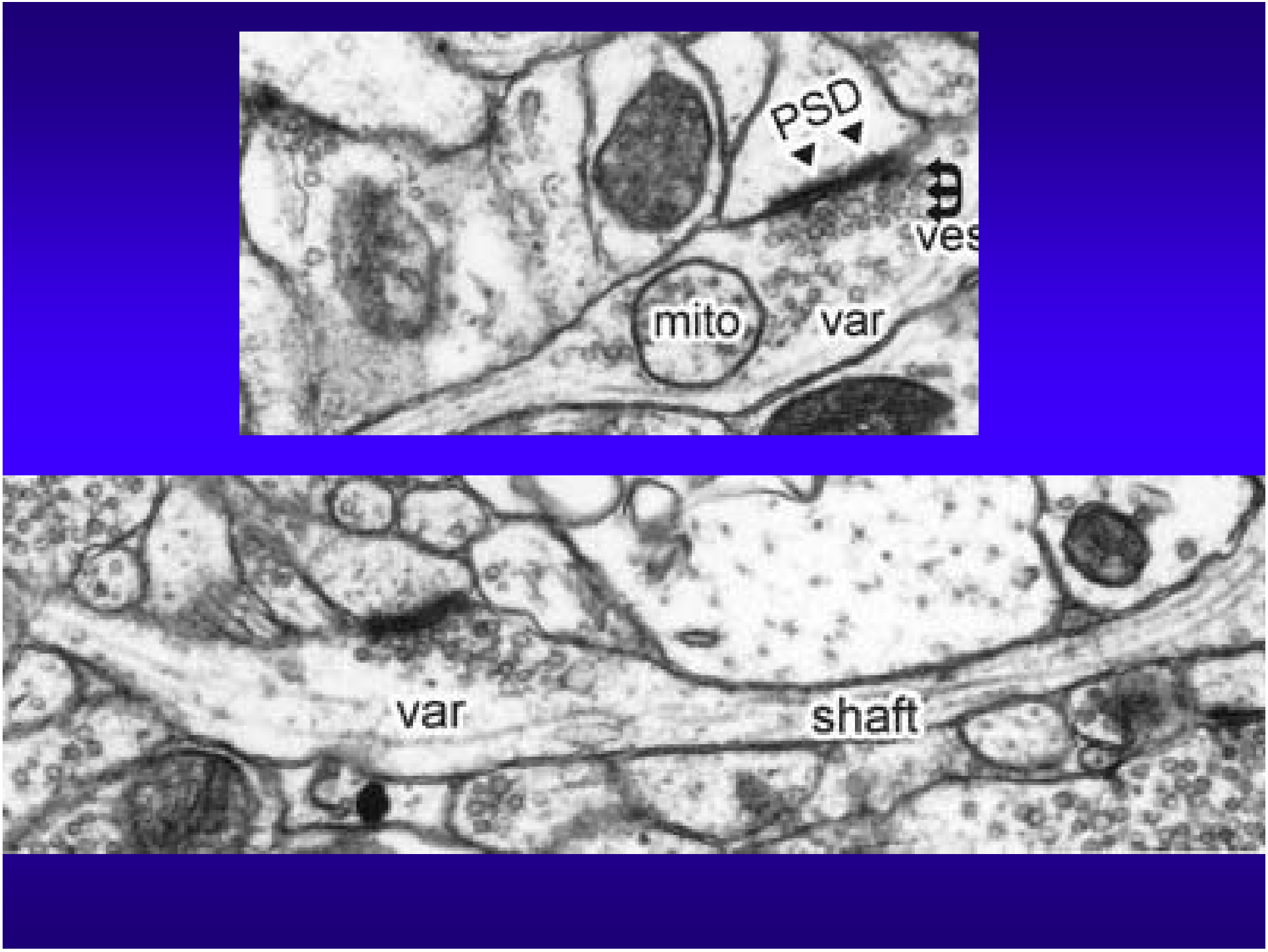
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