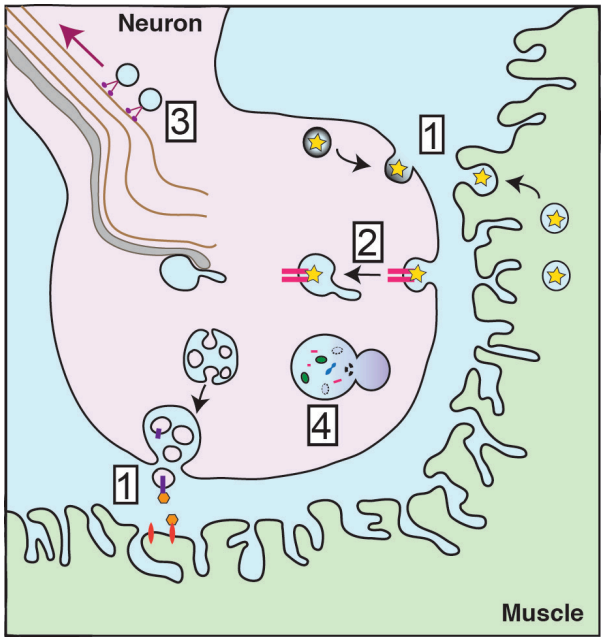
Brandeis Blazeman Fellow Publishes Review Article on Transport of Growth Signals

By M. Deshpande and A. Rodal, 4/7/2016

One of the early events in the course of ALS is loss of connections between neurons and muscles. Previous evidence suggests that this occurs when motor neurons fail to respond to growth and survival signals secreted by the muscle. Dr. Mugdha Deshpande, the Blazeman Foundation Postdoctoral Fellow for ALS Research, has been working to understand how this growth and survival signaling goes awry in ALS, in Dr. Avital Rodal's lab at Brandeis University. In order to study how these signaling pathways contribute to diseases like ALS, it is essential to understand how the connections between neurons and muscles are shaped. Many insights about how neurons respond to growth signals have come decades of research in simple animals like fruit flies. In her experiments, Dr. Deshpande uses fruit flies expressing a human gene involved in ALS to study how defective growth signals between neuron and muscles can be re-routed to improve motor function. The wealth of data and tools available in fruit flies makes them a great experimental system in which to study these questions. With support from the Blazeman Foundation, Dr. Deshpande and Dr. Rodal have recently published a review article in the journal 'Traffic', summarizing current the state of research about how growth signals between neurons and muscles are regulated by the route they take within the neuron, and how these processes are affected in neurological diseases such as ALS. This article provides a roadmap of recent findings and techniques, and identifies open questions and avenues to study the transport of growth and survival signals in the context of human diseases.



Regulating the traffic of growth signals in neurons:

(1) Growth signals (yellow stars and orange hexagons) are released either as free molecules or in membrane-bound packets by both neurons and muscles. (2) They bind their respective receptors (pink bars) and are taken up by the cell. (3) The packets containing signals bound to their receptors travel inside the neuron to different destinations. (4) These signals are degraded inside dedicated compartments. All these mechanisms controlling how the signal travels within neurons and muscles contribute to the health of their connections and growth and survival of the neuron.