Nerve cells in the brain communicate with one another through specialized structures called synapses. When a nerve cell is activated, it releases packets of chemicals from the synapse; these chemicals bind to a nearby cell and activate or inhibit its activity. The packets of chemicals—called vesicles—are prepared and processed in the synapse so that they are ready to be released very rapidly, and used vesicles can be recycled and used again.

In animal models of Alzheimer’s disease, there is evidence that the disease causes reductions in the amount of chemicals released from synapses. One possible explanation for this reduction is that the cellular machinery for processing and recycling vesicles is damaged. Vitaly Klyachko, Ph.D. and colleagues plan to test this idea by using sophisticated imaging techniques to visualize the processing and recycling of synaptic vesicles. For these experiments, the researchers will study synapses in the brain of mice that have been genetically altered to express Alzheimer-like pathology. These studies will answer important questions about some of the fundamental mechanisms leading to brain dysfunction in Alzheimer’s disease.