Dean M. Hartley, Ph.D.
Rush University Medical Center
Chicago, Illinois

Hyperexcited Neuro-networks Drive the Progression of Alzheimer's Disease

2009 Investigator-Initiated Research Grant

Patients with Alzheimer's disease exhibit a characteristic pattern of brain pathology, which starts in a region of the brain known as the association area of the neocortex. The nerve cells in this area send nerve fibers to brain regions that are usually the next to be affected by disease, and this chain of events proceeds in a similar manner to cause disease in other brain regions. This observation suggests that damage to the nerve cells in one region is transmitted to other regions through abnormal increases in brain activity. This possibility is supported by the observation that brain seizures become much more common during the early phases of Alzheimer's disease.

Dean M. Hartley, Ph.D. and colleagues have proposed to study the activity of neuronal networks during the early stages of disease onset in mice that have been genetically altered to express Alzheimer-like pathology. They plan to examine the activity of nerve cells in the neocortex as the disease is beginning to affect this region of the brain. The researchers will determine if disease pathology causes an abnormal increase in brain activity (hyperexcitability) in the neocortex. They will then examine whether such activity leads to the development of disease characteristics in areas to which these nerve cells send signals. These studies will help to address the important question of whether disease pathology itself affects multiple regions of the brain, or whether damage to one area can cause hyperexcitability leading to damage in other brain regions.