

Sameer B. Shah, Ph.D.

University of Maryland-College Park
College Park, Maryland

Mechanical Determinants of Axonal Transport and Amyloid Processing

2009 New Investigator Research Grant

Amyloid plaques are one of the characteristic features of Alzheimer pathology. In regions of the brain near amyloid plaques, nerve cells also exhibit characteristic pathologic features, notably swellings in long processes. These processes, known as axons or dendrites, normally transport nutrients and other cellular components along their lengths. The swellings that occur near amyloid plaques contain accumulations of these cellular components, suggesting that transport functions within the cells have become dysfunctional.

Several other conditions affecting the brain—including traumatic brain injury, diabetes and cerebrovascular angiopathy—induce similar pathologic features in nerve cells. These various conditions have at least one common effect: they cause changes in the osmotic or fluid mechanical pressures in the brain. Sameer B. Shah, Ph.D. and colleagues are studying how changes in the osmotic and fluid pressures in the brain affect the shape and function of nerve cells. They are especially interested in how these pressures affect the ability of nerve cells to transport nutrients along axons. Dr. Shah and colleagues also plan to examine whether osmotic and fluid pressures affect the production of beta-amyloid, the protein fragment that forms amyloid plaques. These studies will begin to examine the mechanisms of one of the fundamental features of Alzheimer pathology, advancing our understanding of the mechanisms of disease development and progression.