

shown how their dynamic and quick response to injury is achieved.

Video images of mouse brains showed that within one minute of injury, branches of microglial cells appeared bulbous and enlarged. Over the next few minutes, the cells extended these branches toward the injured site. After about 30 minutes, the branches had fused into a spherical shield around the wound, containing it.

Surprisingly, the researchers also found that the molecule adenosine triphosphate (ATP), the main energy carrier in cells, acted as a mediator of microglial response to injury. The results of their experiments suggest that other cells in the brain, namely astrocytes, participate in recruiting microglial cells to the site of injury by releasing their own ATP. Astrocytes are the star-shaped members of the brain's glial cell family that support and influence neuronal activity.

"It is likely that astrocytes activate their neighbors to release more ATP, creating a chemical gradient that in turn attracts microglia toward the injury," says Dr. Gan. "It surprised us that astrocytes played this kind of role in amplifying the signal."

Dr. Gan's NYU collaborators on the microglial study were Michael Dustin, Ph.D., the Irene Diamond Associate Professor of Immunology and Associate Professor of Pathology, and Dan Littman, M.D., Ph.D., the Helen L. and Martin S. Kimmel Professor of Molecular Immunology at the Skirball Institute of Biomedical Medicine and Professor of Pathology and Microbiology. ■

— Vivien Marx

New Computer Program Uses Brain Scans to Assess Risk of Alzheimer's Disease

Unfortunately, Alzheimer's disease is often diagnosed when the disorder is already well advanced and there is little that can be done to stall its progression. Now a brain-scan-based computer program developed by School of Medicine researchers may make it possible to diagnose the disease years earlier.

According to a new study by the NYU team, the computer program identified which healthy individuals would develop Alzheimer's as much as nine years before symptoms of the disease appeared. The program reveals below-normal energy use in an area of the brain called the hippocampus, a sea-horse-shaped area of the brain associated with memory and learning. It diminishes in size as Alzheimer's disease progresses from mild cognitive impairment to full-blown dementia.

"This is the first demonstration that reduced metabolic activity in the hippocampus may be used to help predict future Alzheimer's disease," says Lisa Mosconi, Ph.D., a Research Scientist in the Department of Psychiatry, who developed the computer program. "Although our findings need to be replicated in other studies," she says, "our technique offers the possibility that we will be able to screen for Alzheimer's in individuals who aren't cognitively impaired."

Alzheimer's currently affects 4.5 million people in the United States, and it is expected to strike 14 million by 2050 as the population ages.

The technique grew out of years of research by Mony de Leon, Ed.D.,

Professor of Psychiatry and Director of the School's Center for Brain Health of the Silberstein Institute for Aging and Dementia. His group was the first to demonstrate with CT and later with MRI scans that the hippocampus shrinks as Alzheimer's disease progresses. However these scans do not provide a reliable way to accurately and quickly measure the hippocampus. The hippocampus is small and its size and shape are affected greatly in individuals with Alzheimer's, making it difficult to measure this region. The new computer program integrates MRI and PET scans, which measure energy use in the brain, to provide a way to accurately and quickly measure the hippocampus.

Dr. de Leon followed 53 normal subjects between the ages of 54 and 80 for at least nine years and in some cases for as long as 24 years as part of a longitudinal study. All subjects received two PET scans—one at baseline and a follow-up after three years. Thirty individuals had a second follow-up scan after another seven years. Altogether there were 136 PET scans.

Dr. Mosconi reanalyzed all 136 scans with the computer program and reported the results at a meeting of the Alzheimer's Association. Among those individuals who would later experience cognitive decline related to either mild cognitive impairment or to Alzheimer's, hippocampal glucose metabolism was significantly reduced 15 percent to 40 percent on the first scan, compared to controls. ■

— John Casey