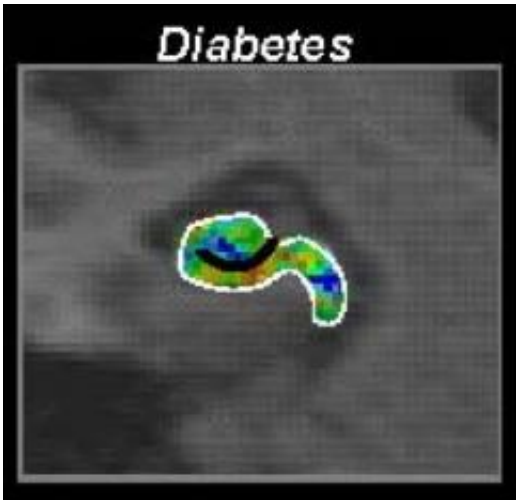
Researchers link blood sugar to normal cognitive aging

December 30 2008



Cerebral blood volume (CBV) maps are shown for a subject with diabetes. Maps are color-coded with warmer colors indicating greater CBV or activity. Credit: Columbia University Medical Center

Maintaining blood sugar levels, even in the absence of disease, may be an important strategy for preserving cognitive health, suggests a study published by researchers at Columbia University Medical Center (CUMC). The study appeared in the December issue of *Annals of Neurology*.

Senior moments, also dubbed by New York Times Op-Ed columnist David Brooks as being "hippocampically challenged," are a normal part of aging. Such lapses in memory, according to this new research, could

be blamed, at least in part, on rising blood glucose levels as we age. The findings suggest that exercising to improve blood sugar levels could be a way for some people to stave off the normal cognitive decline that comes with age.

"This is news even for people without diabetes since blood glucose levels tend to rise as we grow older. Whether through physical exercise, diet or drugs, our research suggests that improving glucose metabolism could help some of us avert the cognitive slide that occurs in many of us as we age," reported lead investigator Scott A. Small, M.D., associate professor of neurology in the Sergievsky Center and in the Taub Institute for Research on Alzheimer's Disease and the Aging Brain at Columbia University Medical Center.

Although it is widely known that the early stages of Alzheimer's disease cause damage to the hippocampus, the area of the brain essential for memory and learning, studies have suggested that it is also vulnerable to normal aging. Until now, the underlying causes of age-related hippocampal dysfunction have remained largely unknown.

Previously, using high-resolution brain imaging, Dr. Small and his colleagues discovered that decreasing brain function in one area of the hippocampus, called the dentate gyrus, is a main contributor of normal decline in memory as we age.

In this new study, funded by the National Institute on Aging (NIA), the American Diabetes Association and the McKnight Brain Research Foundation, the researchers mapped out the specific areas of the hippocampus impacted by late-life diseases like diabetes and stroke.

"This research used imaging in both human volunteers and in animal models to help us better understand the basic mechanisms behind hippocampal dysfunction in the aged," said Dr. Marcelle Morrison-

Bogorad, NIA Division of Neuroscience director. "While more research is needed into the complex interaction of late-life disease and how it may affect the hippocampus, this new study is part of an ongoing effort to identify specific areas where interventions might preserve cognitive health."

This new study looked at measures that typically change during aging, like rising blood sugar, body mass index, cholesterol and insulin levels. The research found that decreasing activity in the dentate gyrus only correlated with levels of blood glucose.

"Showing for the first time that blood glucose selectively targets the dentate gyrus is not only our most conclusive finding, but it is the most important for 'normal' aging- that is hippocampal dysfunction that occurs in the absence of any disease states. There have been many proposed reasons for age-related hippocampal decline; this new study suggests that we may now know one of them," said Dr. Small.

Additional animal studies helped confirm the relationship between glucose and dentate gyrus activity; the researchers found the same association in aging rhesus monkeys and in mice.

"Beyond the obvious conclusion that preventing late-life disease would benefit the aging hippocampus, our findings suggest that maintaining blood sugar levels, even in the absence of diabetes, could help maintain aspects of cognitive health. More specifically, our findings predict that any intervention that causes a decrease in blood glucose should increase dentate gyrus function and would therefore be cognitively beneficial," said Dr. Small.

The new findings also suggest that one way in which physical exercise could improve memory is via lowering glucose levels. Dr. Small's previous imaging studies in humans and in mice have documented that

among all hippocampal subregions, physical exercise causes an improvement in dentate gyrus function.

"By improving glucose metabolism, physical exercise also reduces blood glucose. It is therefore possible that the cognitive enhancing effects of physical exercise are mediated, at least in part, by the beneficial effect of lower glucose on the dentate gyrus. Whether with physical exercise, diet or through the development of potential pharmacological interventions, our research suggests that improving glucose metabolism could be a clinically viable approach for improving the cognitive slide that occurs in many of us as we age," concluded Dr. Small.

With increasing longevity and the aging of the baby boom population, cognitive decline has emerged as a major health care crisis and concern.

Source: Columbia University Medical Center