Stem cell derived neurons for research relevant to Alzheimer's and Niemann-Pick type C diseases

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Stem cell derived neurons may allow scientists to determine whether breakdowns in the transport of proteins, lipids and other materials within cells trigger the neuronal death and neurodegeneration that characterize Alzheimer's disease (AD) and the rarer but always fatal neurological disorder, Niemann-Pick Type C (NPC), according to a presentation that Lawrence B. Goldstein, Ph.D., of the University of California, San Diego, School of Medicine and Howard Hughes Medical Institute (HHMI) will give at the American Society for Cell Biology (ASCB) 49th Annual Meeting, Dec. 5-9, 2009 in San Diego.

In research using fruit flies, mice and human cell cultures as lab models, Goldstein pioneered the study of how early defects in the intracellular physical transport system may be the driving force behind severe neuronal dysfunction.

Using human embryonic stem cells (hESCs), Goldstein and his team have produced human neurons in which the NPC gene is switched off, providing the first close look at cellular transport in a human neuron lacking normal function of the gene.

With induced pluripotent stem cells (IPS), Goldstein has derived human neurons representing the genetic "familial" form of AD as well as the far more common "sporadic" AD.

By comparing the biochemical and cellular makeup of these two types of stem cell derived neurons, Goldstein hopes to reveal how their known genetic differences affect their transport of vital cellular cargoes and other cellular behaviors.

Such research "may yield an understanding of what components of sporadic disease are defined by genetic characteristics," said Goldstein, professor in the Department of Cellular & Molecular Medicine, an HHMI investigator and director of UC San Diego's Stem Cell Program.

AD is now the seventh leading cause of death in the U.S., according to the National Centers for Health Statistics. The National Niemann-Pick Disease Foundation reports that children born with NPC rarely survive beyond the age of 20.

Source: American Society for Cell Biology