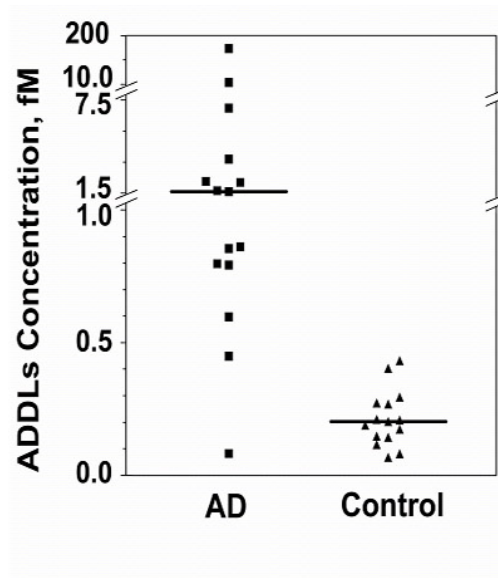
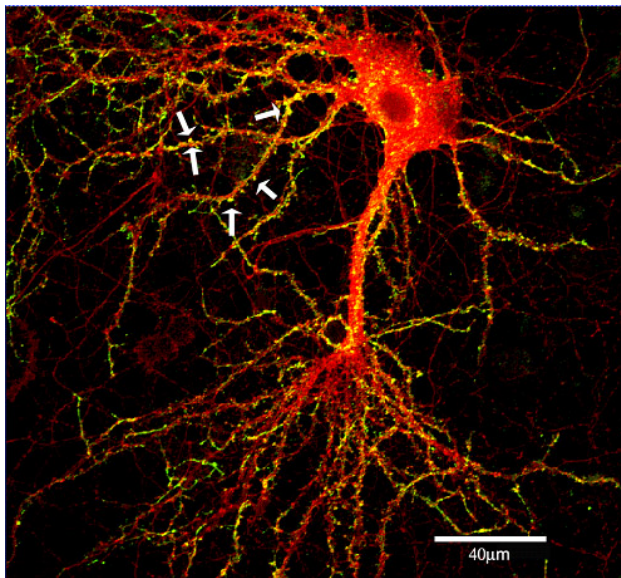


4.2.5 NANOTECHNOLOGY TOWARDS CLINICAL DIAGNOSIS OF ALZHEIMER'S DISEASE

D. Georganopoulou, L. Chang, J.-M. Nam, C. S. Thaxton, E. J. Mufson, W. L. Klein, C. A. Mirkin, "Nanoparticle-Based Detection in Cerebral Spinal Fluid of a Soluble Pathogenic Biomarker for Alzheimer's Disease," *Proc. Natl. Acad. Sci. U.S.A.*, **2005**, *102*, 2273-2276.

Alzheimer's disease (AD) afflicts more than 4 million Americans at a cost to the US economy of more than \$100 billion annually. The aging population makes AD one of the fastest-growing diseases in the United States. This group previously linked a novel protein neurotoxin (the "ADDL") to AD memory loss, leading them to a prediction that ADDLs could serve as a biomarker for AD diagnosis. Two ultra sensitive nanotechnology assays (the Localized Surface Plasmon Resonance Biosensor, see section 3.2.1 and the bio-barcode assay) were developed and tested for the ability to detect ADDLs in cerebrospinal fluid (CSF), a possibility not accessible to conventional technology. Both methods showed ADDLs in CSF and established that AD patients had significantly higher ADDL levels than their non-AD counterparts. Although at present AD has no cure and no definitive clinical diagnostic, the results here strongly indicate the potential of developing nano techniques into clinical diagnostics for Alzheimer's disease, for screening compounds that could provide leads as therapeutic drugs, and for testing the efficacy of AD therapeutics in future drug trials.



Immuno-fluorescence microscopy image (left) of cultured human neurons, afflicted with synthetic ADDL and visualized with ADDL-specific antibodies carrying a fluorescent tag. Determination of ADDL concentration (right) in the cerebrospinal fluid (CSF) extracted via a spinal tap from 30 human subjects, using the bio-barcode assay. The control set is clearly lower than the patients diagnosed with Alzheimer's disease with neuropsychological tests.