MedicalXpress

Imaging tool gives insight into origins of Alzheimer's

April 2 2014

Researchers at Lancaster University have invented a new imaging tool inspired by the humble sewing machine which is providing fresh insight into the origins of Alzheimer's and Parkinson's disease.

These diseases are caused by tiny toxic proteins too small to be studied with traditional optical microscopy.

Previously it was thought that Alzheimer's was caused by the accumulation of long 'amyloid' fibres at the centre of senile plaques in the brain, due to improper folding of a protein called amyloid-β.

But new research suggests that these fibres and plaques are actually the body's protective response to the presence of even smaller, more toxic structures made from amyloid-β called 'oligomers'.

Existing techniques are not sufficient to get a good look at these proteins; optical microscopy does not provide enough resolution at this scale, and electron microscopy gives the resolution but not the contrast.

To solve the problem, Physicist Dr Oleg Kolosov and his team at Lancaster have developed a new imaging technique - Ultrasonic Force Microscopy (UFM) - inspired by the motion of a sewing machine. Their work has been published in *Scientific Reports*.

Dr Kolosov said: "By using a vibrating scanner, which moves quickly up and down like the foot of a sewing machine needle, the friction between

the sample and the scanner was reduced – resulting in a better quality, and high contrast nanometre scale resolution image."

It is one of a new generation of tools being developed worldwide to bring the oligomers into focus, enabling medical researchers to understand how they behave.

At Lancaster, Claire Tinker used UFM to image these oligomers. To help see them more clearly she needed to increase the contrast of the image and used poly-L-lysine (PLL) which kept the proteins stuck to the slides as the vibrating scanner was passed over them.

Lancaster University Biomedical Scientist Professor David Allsop said: "These high quality images are vitally important if we are to understand the pathways involved in formation of these oligomers, and this new technique will now be used to test the effects of inhibitors of oligomer formation that we are developing as a possible new treatment for Alzheimer's disease."

The technique worked so well that the team now hopes to develop it so that oligomer formation can be monitored as they are made in real time.

This would give researchers a clearer understanding of the early phases of Alzheimer's and Parkinson's and could potentially be one way of developing a future test for these diseases.

More information: "Ultrasonic force microscopy for nanomechanical characterization of early and late-stage amyloid-β peptide aggregation." Claire Tinker-Mill, Jennifer Mayes, David Allsop & Oleg V. Kolosov. *Scientific Reports* 4, Article number: 4004. DOI: 10.1038/srep04004