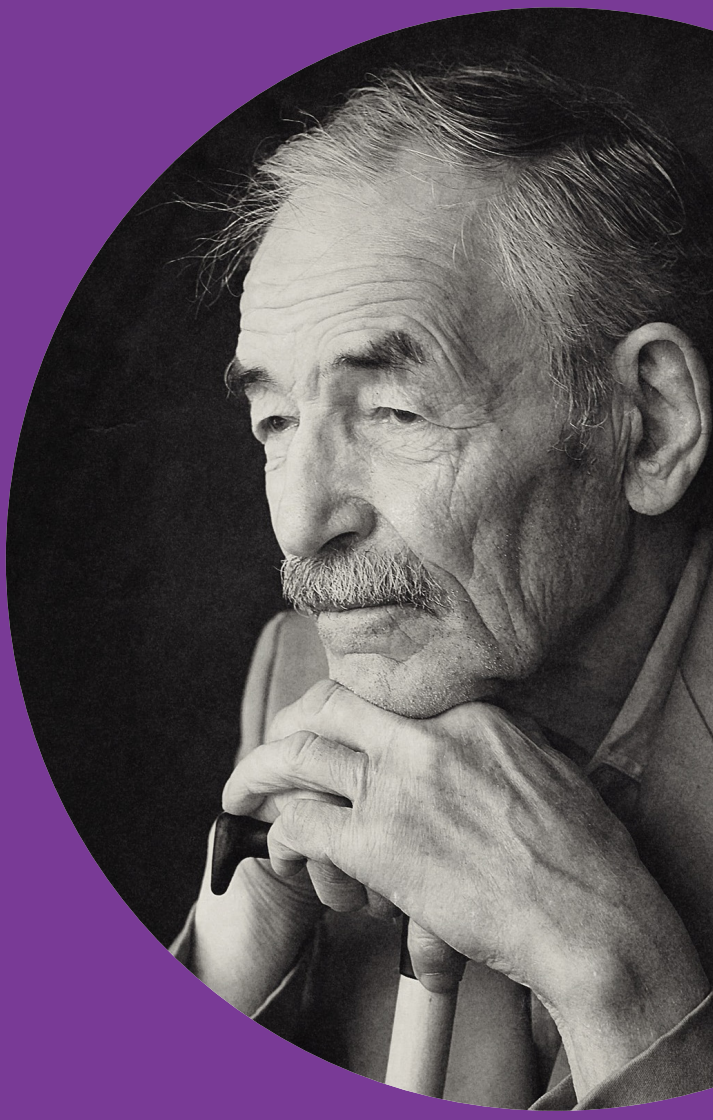
diamond

Healthcare

CASE STUDY

Keele University research provides iron clue in Alzheimer's Disease



By 2021, a million people in the UK will have dementia and yet the cause of the condition is still unknown. Alzheimer's disease (AD) is a fatal age-related neurodegenerative disorder characterised by extensive neuronal loss in the higher brain centres, resulting in cognitive decline, memory loss and psychosis. It has been suggested that areas of AD pathology are corresponding to the increased concentrations of brain iron and the toxic form of iron builds up in the same location as the brain lesions caused by Alzheimer's disease.

Keele University

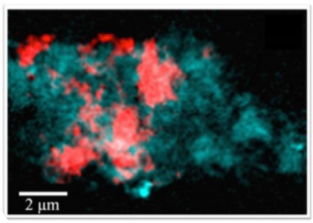
The Challenge

Researchers wanted to understand how and why the build-up of toxic iron is occurring; and whether it's a cause or a symptom of the brain cell damage in Alzheimer's patients.

It was crucial to study interactions of cells with a peptide known as beta-amyloid that makes up the Alzheimer's lesions and follow the iron oxidation state in this process.

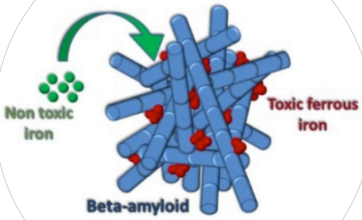
The Solution

X-ray Absorption Spectroscopy (XAS) and X-ray magnetic circular dichroism (XMCD) have been applied to simultaneously probe chemical and magnetic changes of ferrihydrite after it had interacted with beta-amyloid peptide. It can been proven that the peptide that makes up Alzheimer's lesions is capable of forming redox-active iron (II) minerals, and subsequently it was shown to form an antiferromagnetically ordered Fe (II) phase, that could cause a damage to brain cells.



The Benefits

This discovery shed light upon the processes of AD pathogenesis, while providing potential targets for future therapies. These studies could also lead to developments in using magnetic resonance imaging (MRI) to detect early stages of the disease by mapping altered patterns of iron in the brain.



"Our observations suggest an origin for the toxic iron; that it may well be made toxic by the lesions themselves. This could open up new avenues of research into treatments to stop the build-up of this neurotoxic substance, potentially limiting the damage done by Alzheimer's. Understanding how this toxic iron forms could also tell us where to look for early stages of the disease in MRI scans, perhaps even before irreversible brain damage occurs. It's at an early stage but these promising results seem to be another piece of the jigsaw to fully understand Alzheimer's."

Dr Neil Telling, University of Keele

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