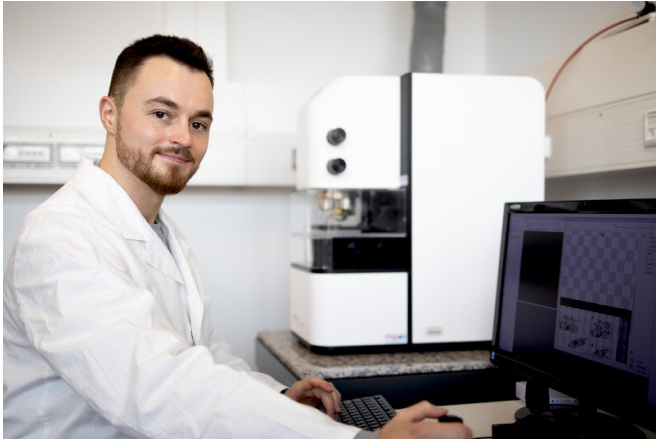


Development of plaques in Alzheimer's disease resolved

21 December 2020



Dominik Röhr researches proteins that are altered in Alzheimer's disease. Credit: Michael Schwettmann

A team of researchers from Ruhr-Universität Bochum (RUB) and Vrije Universiteit Amsterdam (VU) has determined the development stages of A β fibrils and has thus been able to understand the development of plaques. The researchers report in the academic journal *Acta Neuropathologica Communications* on 11 December 2020.

Joining forces

The team from the Centre for Protein Diagnostics (Prodi) at RUB is working with the Vrije Universiteit Medical Center (VUmc) in order to pool expertise in protein and dementia research. Medical experts such as Baayla Boon from VUmc attends to patients with dementia in the clinic and examines the post mortem [brain](#) tissue, which is diligently collected by the Netherlands Brain Bank (NBB). Razor-thin slices are cut from the brain for examination. "Such slices of tissue allow us to look deep within the convolutions of the brain," says Baayla's supervisor Professor Annemieke Rozemuller, Head of Neuropathology at VUmc.

The groups exchange samples and findings at regular meetings. In Bochum, protein researchers led by Professor Klaus Gerwert, Head of Biophysics and Founding Director of Prodi at RUB, examine the brain tissue. The plaques contained in this are illuminated with [infrared light](#) in special microscopes. "This allows us to determine the folding of biomarker proteins in the tissue," says Dominik Röhr from Prodi.

A new timeline for plaques

The formation of A β fibrils is well known from laboratory experiments. First, A β folds like a sheet of paper to form so-called β -sheets. These clump together into [small groups](#), which are known as oligomers. Over time, the β -sheets come together like a deck of cards to form fibrils. The Bochum-based researchers led by Klaus Gerwert utilize this process as an internal clock for plaques. Newly developed plaques contain many oligomers. Over the course of plaque development, fibrils are continuously formed. The researchers thereby concluded that plaques pass through different stages during their development. "It has not been possible to directly observe the development of plaques so far. By combining methods from medicine and physics, new possibilities are now opening up," says Klaus Gerwert, delighted.

On the left is a fully developed [plaque](#) of brown-stained A β . On the right, the structure of A β determined by infrared microscopy is shown. In core are fibrils (red), around are mainly oligomers (blue).

A β is the focus in the fight against Alzheimer's disease. A central approach in the search for a cure is dissolving the plaques in the patients' brains. "Early diagnosis of Alzheimer's disease is crucial to prevent A β from causing irreparable damage in the brain," says Dominik Röhr. Promising medications are currently undergoing approval testing. These include the antibody aducanumab, which can break

down plaques in the brain. The new findings from infrared microscopy indicate that the [development](#) of plaques could be stopped at an early stage by preventing the formation of oligomers. These are considered to be particularly harmful to the brain. The toxic effect of A β could thus be minimized with suitable drugs.

More information: Dominik Röhr et al, Label-free vibrational imaging of different A β plaque types in Alzheimer's disease reveals sequential events in plaque development, *Acta Neuropathologica Communications* (2020). [DOI: 10.1186/s40478-020-01091-5](#)

Provided by Ruhr-Universitaet-Bochum

APA citation: Development of plaques in Alzheimer's disease resolved (2020, December 21) retrieved 28 April 2021 from <https://medicalxpress.com/news/2020-12-plaques-alzheimer-disease.html>

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