Discovery of Nanosized Molecules That Might Inhibit Alzheimer’s and Parkinson’s Diseases

2021-07-04

Nanosized molecules of a particular chemical element can inhibit the formation of plaque in the brain tissues. This new discovery by researchers at Umeå University in collaboration with researchers in Croatia and Lithuania, provides renewed hope for novel treatments of, for instance, Alzheimer’s and Parkinson’s disease in the long run.

“This is indeed a very important step that may form the basis of new and efficient treatments of neurodegenerative diseases in the future,” says Professor Ludmilla Morozova-Roche at Umeå University.

When proteins misfold they form insoluble fibrils called amyloids, which are involved in several serious diseases such as Alzheimer’s and Parkinson’s, Corino de Andrade's and the mad cow disease. Amyloid aggregates kill neuronal cells and form amyloid plaques in the brain tissues.

What researchers in Umeå, Vilnius in Lithuania and Rijeka in Croatia have discovered is that a particular nanosized molecule can hinder the amyloid formation of pro-inflammatory protein S100A9. These molecules are able even to dissolve already pre-formed amyloids, which has been shown by using atomic force microscopy and fluorescence techniques. The molecules in question are nanosized polyoxoniobates, which is so-called polyoxometalate ions with a negative charge containing the chemical element niobium.

“Further research is needed before we can safely say that functioning treatments can be derived from this, but the results so far have proven very promising,” says Ludmilla Morozova-Roche.

The researchers have been working with two different polyoxoniobate molecules, Nb10 and TiNb9. Both turned out to inhibit SI00A9 amyloids by forming ionic interactions with the positively charged patches on the protein surface, which are critical for amyloid self-assembly. The polyoxoniobate molecules that have been studied are relatively chemically stable and water-soluble. The molecules are nanosized, which means that they are extremely small. These nanomolecules can also be of interest for other medical applications such as implants thanks to their high biocompatibility and stability.

At Umeå University, two research groups, from the Faculty of Medicine and the Department of Chemistry, have collaborated by addressing the issue from different angles and by applying a wide spectrum of biophysical and biochemical techniques and through molecular dynamics simulations.

The study has been published in the journal ACS Applied Materials and Interfaces.

Read the original article on Umeå University.