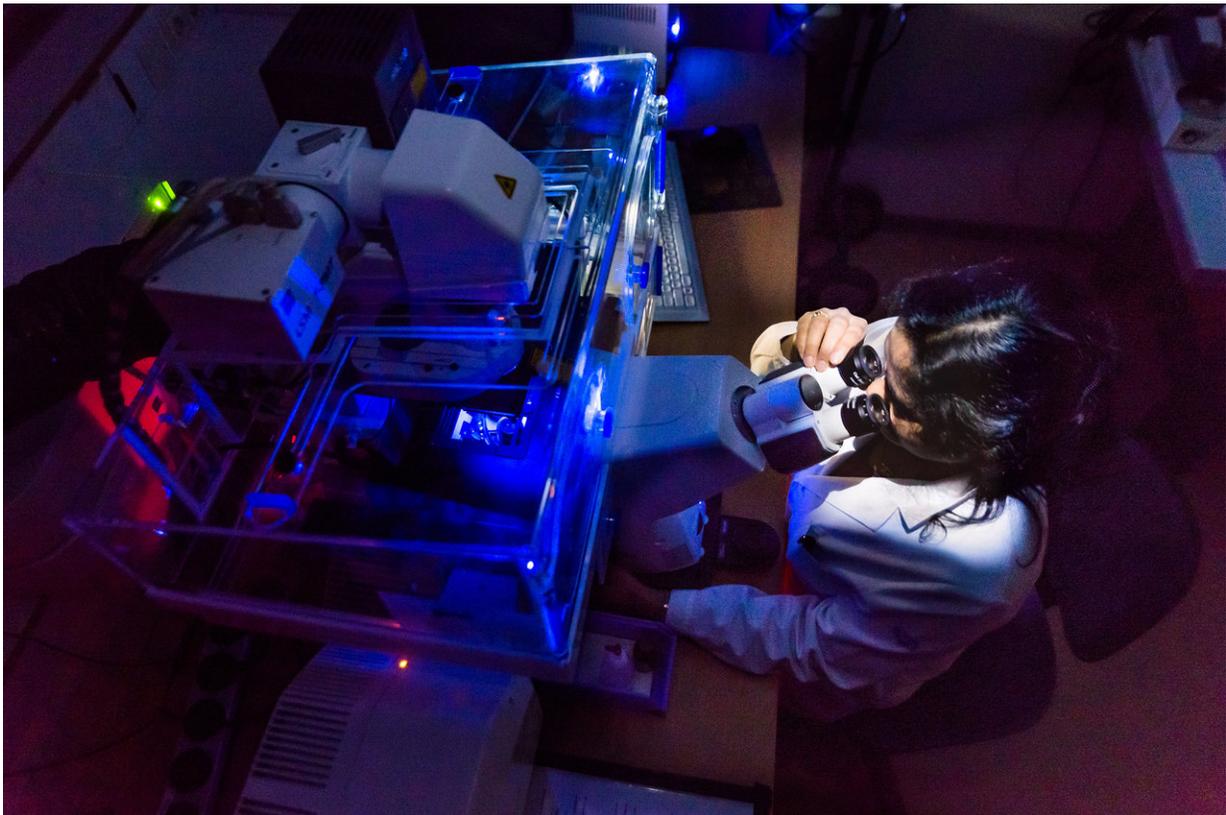


New mechanism by which Alzheimer's disease spreads through the brain discovered

June 14 2018



Researchers at Linköping University study how Alzheimer's disease spreads in the brain. Credit: Thor Balkhed/Linköping University

The waste-management system of the cell appears to play an important role in the spread of Alzheimer's disease in the brain. A new study has

focused on small, membrane-covered droplets known as exosomes. It was long believed that the main task of exosomes was to rid the cell of waste products. However, the understanding of exosomes has increased, and researchers now know that cells throughout the body use exosomes to transmit information. The exosomes can contain both proteins and genetic material, which other cells can absorb.

The Linköping researchers have shown in the new study that [exosomes](#) can also transport toxic aggregates of the protein [amyloid beta](#), and in this way, spread the [disease](#) to new neurons. Aggregated amyloid beta is one of the main findings in the brains of patients with Alzheimer's disease, the other being aggregates of the protein tau. As time passes, they form ever-increasing deposits in the brain, which coincides with the death of [nerve cells](#). The cognitive functions of a person with Alzheimer's disease gradually deteriorate as new parts of the brain are affected.

"The spread of the disease follows the way in which parts of the brain are anatomically connected. It seems reasonable to assume that the disease is spread through the connections in the brain, and there has long been speculation about how this spread takes place at the cellular level," says Martin Hallbeck, associate professor in the Department of Clinical and Experimental Medicine at Linköping University and senior consultant of clinical pathology at Linköping University Hospital.

In a collaboration with researchers at Uppsala University, he and his co-workers have investigated exosomes in [brain](#) tissue from deceased persons. The research team at Linköping University found more amyloid beta in exosomes from brains affected by Alzheimer's disease than in healthy controls. Furthermore, the researchers purified exosomes from the brains from people with Alzheimer's disease, and investigated whether they could be absorbed by cells cultured in the laboratory.



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"Interestingly, exosomes from patients were absorbed by cultured neurons, and subsequently passed on to new cells. The cells that absorbed exosomes that contained amyloid beta became diseased," says Martin Hallbeck.

The researchers treated the cultured neurons with various substances that prevent exosomes from being formed, released, or absorbed by other cells. They were able to reduce the spread of the aggregated amyloid beta between [cells](#) by disrupting the mechanism in these ways. The

methods used in these laboratory experiments are not yet suitable for treating patients, but the discovery is important in principle. "Our study demonstrates that it is possible to influence this pathway, and possibly develop drugs that could prevent the spreading. The findings also open up the possibility of diagnosing Alzheimer's disease in new ways, by measuring the exosomes," says Martin Hallbeck.

More information: Maitrayee Sardar Sinha et al, Alzheimer's disease pathology propagation by exosomes containing toxic amyloid-beta oligomers, *Acta Neuropathologica* (2018). [DOI: 10.1007/s00401-018-1868-1](https://doi.org/10.1007/s00401-018-1868-1)

Provided by Linköping University

Citation: New mechanism by which Alzheimer's disease spreads through the brain discovered (2018, June 14) retrieved 19 April 2024 from <https://medicalxpress.com/news/2018-06-mechanism-alzheimer-disease-brain.html>

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