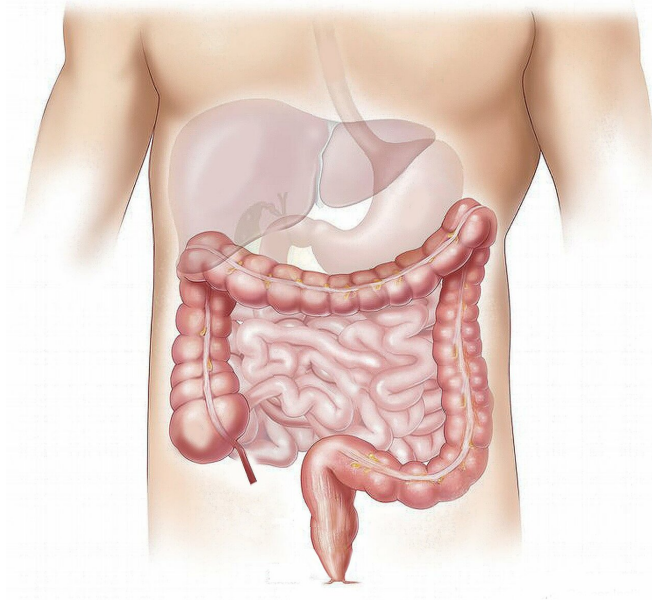


# Parkinson's disease may originate in the intestines

3 September 2019, by Mette Louise Ohana



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In 2003, a German neuropathologist proposed that Parkinson's disease, which attacks the brain, actually might originate from the gut of the patients. Researchers from Aarhus have now delivered decisive supportive evidence after seeing the disease migrate from the gut to the brain and heart of laboratory rats. The scientific journal *Acta Neuropathologica* has just published the results, which have grabbed the attention of neuroscientific researchers and doctors internationally.

## Harmful proteins on the move

Parkinson's disease is characterised by slowly destroying the [brain](#) due to the accumulation of the [protein](#) alpha-synuclein and the subsequent damage to nerve cells. The disease leads to shaking, muscle stiffness, and characteristic slow movements of sufferers. In the new research project, the researchers used genetically modified

laboratory rats which overexpress large amounts of the alpha-synuclein protein. These rats have an increased propensity to accumulate harmful varieties of alpha-synuclein protein and to develop symptoms similar to those seen in Parkinson's patients. The researchers initiated the process by injecting alpha-synuclein into the small intestines of the rats. According to professor Per Borghammer and postdoc Nathalie Van Den Berge, the experiment was intended to demonstrate that the protein would subsequently spread in a predictable fashion to the brain.

"After two months, we saw that the alpha-synuclein had travelled to the brain via the [peripheral nerves](#) with involvement of precisely those structures known to be affected in connection with Parkinson's disease in humans. After four months, the magnitude of the pathology was even greater. It was actually pretty striking to see how quickly it happened," says Per Borghammer, who is professor at the Department of Clinical Medicine at Aarhus University.

## Symptoms in the intestine twenty years before the diagnosis

Per Borghammer explains that patients with Parkinson's disease often already have significant damage to their [nervous system](#) at the time of diagnosis, but that it is actually possible to detect pathological alpha-synuclein in the gut up to twenty years before diagnosis.

"With this new study, we've uncovered exactly how the disease is likely to spread from the intestines of people. We probably cannot develop effective medical treatments that halts the disease without knowing where it starts and how it spreads—so this is an important step in our research," says Per Borghammer, adding:

"Parkinson's is a complex disease that we're still trying to understand. However, with this study and

a similar study in the USA that has recently arrived at the same result using mice, the suspicion that the [disease](#) begins in the gut of some patients has gained considerable support."

The research project at Aarhus University also showed that the harmful [alpha-synuclein](#) not only travel from the intestines to the brain, but also to the heart.

"For many years, we have known that Parkinson patients have extensive damage to the nervous system of the heart, and that the damage occurs early on. We've just never been able to understand why. The present study shows that the heart is damaged very fast, even though the pathology started in the [intestine](#), and we can continue to build on this knowledge in our coming research," says Per Borghammer.

**More information:** Nathalie Van Den Berge et al. Evidence for bidirectional and trans-synaptic parasympathetic and sympathetic propagation of alpha-synuclein in rats, *Acta Neuropathologica* (2019). [DOI: 10.1007/s00401-019-02040-w](https://doi.org/10.1007/s00401-019-02040-w)

Provided by Aarhus University

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