

Healthcare industry BW

Parkinson's disease: vitamin B₃ has a positive effect on nerve cells

Parkinson's disease is one of the most common neurodegenerative diseases in the world. There are around 4.1 million sufferers worldwide. It is characterised by motor impairments that result from the death of certain nerve cells in the brain. Therapies are not yet available. However, researchers at the University of Tübingen have now discovered that vitamin B₃ has a positive effect on damaged nerve cells and can boost their energy metabolism. Vitamin B₃ application will now be examined to determine whether it could be a new therapeutic approach for treating Parkinson's.

Parkinson's is the second most common neurodegenerative disease after Alzheimer's. The disease affects around two percent of people over 60 worldwide, and the numbers are rising. Between 250,000 and 280,000 people have the disease in Germany alone*. Typical symptoms of this still incurable disease include motor impairments such as unsteady hands, stiff muscles and slow movements. The disease is caused by the loss of dopamine-containing nerve cells in a certain brain region called the black substance (substantia nigra). Little is yet known why these nerve cells die.

Damaged mitochondria lead to Parkinson's



Junior professor Dr. Dr. Michela Deleidi at the University of Tübingen is researching how Parkinson's disease develops and what treatment options could become available in the future.
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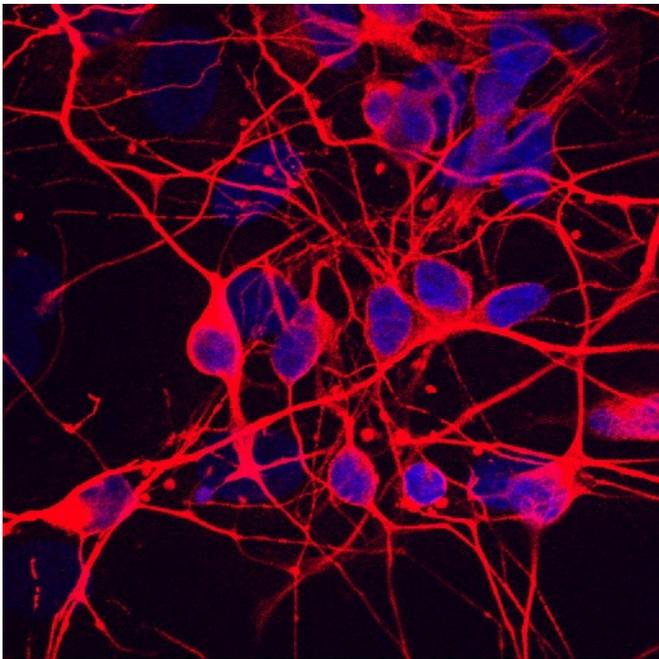
For many years, junior professor Dr. Dr. Michela Deleidi and her research group at the Hertie Institute for Clinical Brain Research and the University of Tübingen have been studying how Parkinson's disease develops. "Some time ago, we came up with the idea that the disease is caused by damaged nerve cells with a dysfunctional energy metabolism, and hence damaged mitochondria," explains Deleidi. "And indeed, in one of our studies we found that the mitochondria in the affected nerve cells of Parkinson's patients did not work properly. So we then decided to look for a way to repair and improve mitochondrial function."

In search of a "mitochondrial rescue", as Deleidi calls it, the researchers came across vitamin B₃. "It has long been known that vitamin B₃ plays a role in central metabolic processes, and some studies have shown that the vitamin plays a role in maintaining healthy mitochondria," says the neurologist. "So it was natural for us to look at the vitamin and its potential role in the treatment of Parkinson's."

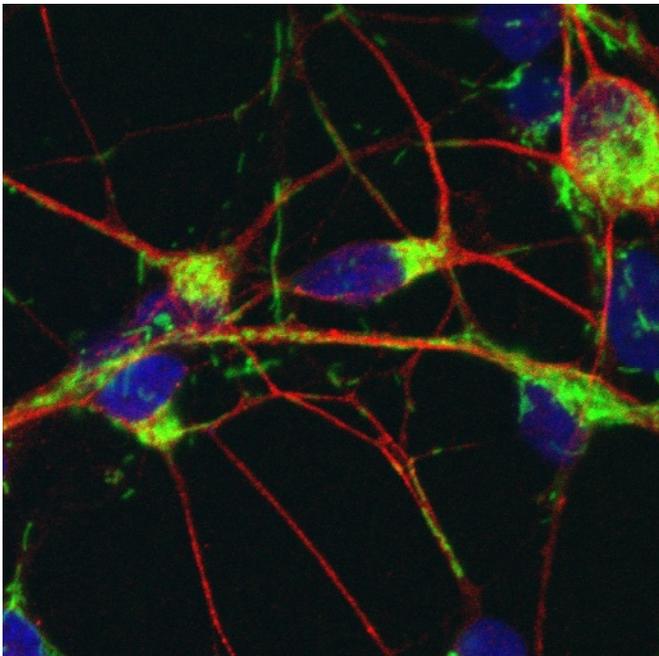
Vitamin B₃ can save nerve cells

The scientists took skin cell samples from patients with Parkinson's, i.e. patients that carried a defect in the so-called GBA gene, in order to find out whether damaged mitochondria cause Parkinson's disease. A mutation in this gene is one of the major risk factors for Parkinson's disease. After removal, the cells were converted into stem cells using special genetic manipulation techniques. The skin cells were subsequently converted into nerve cells using protocols that were developed specifically for this purpose. "All artificial nerve cells had a characteristic mutation in the GBA gene, which is the most frequent risk gene for Parkinson's," says Deleidi. "And we were able to show that the mitochondria and energy metabolism of these cells were impaired."

The scientists from Tübingen subsequently treated the damaged cells with a vitamin B₃ variant. "And fortunately, we were able to eliminate most of the cells' abnormalities," said the junior professor. "In the flies that we were using as models of ageing, we even found that the sought-after compound is a true anti-ageing product." The researchers, who are part of an international research consortium, took flies of the genus *Drosophila* that had a defective GBA gene and hence problems moving around, and fed them the vitamin B₃ variant to boost the formation of new mitochondria. "And here too, we were able to show that the vitamin considerably improved neuronal functions and behaviour," says Deleidi.



Microscope image of nerve cells generated from stem cells of Parkinson's patients.
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Microscope image of nerve cells (red) with green mitochondria and blue cell nuclei.
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Nicotinamide riboside improves cellular energy production

The researchers did not use vitamin B3 – the nicotinamide – for the investigations, but a variant of the vitamin called nicotinamide riboside. The latter is a precursor of the coenzyme NAD (nicotinamide adenine dinucleotide), which plays an important role in many metabolic processes involved in cellular energy production. "We now know that the administration of the vitamin B3 variant nicotinamide riboside leads to the elevation of the intracellular NAD level and hence to a considerable improvement of many biological processes, including mitochondrial function and cellular energy generation," said the researcher. "Our experiments suggest that the loss of mitochondria does indeed play a significant role in the development of Parkinson's disease."

Vitamin B₃ - a universal anti-ageing product?

Administering nicotinamide riboside may be a new starting point for treating Parkinson's. "At present, several clinical trials involving healthy volunteers and people with other mitochondrial diseases are underway. "The goal is to find out how the vitamin B3 variant works," says Deleidi. "While we are waiting for these results to be available we will continue characterising the substance and its metabolism in greater detail. Previous studies indicate that the vitamin B3 variant does not lead to serious adverse effects. However, the dosage will have to be very high because the drug needs to be taken orally. I am often asked by patients if they can start taking the substance. But I think that we need more results before giving the go-ahead for this."

The researchers are already working with ChromaDex on the optimisation of nicotinamide riboside. ChromaDex is an American company that specialises in phytochemicals and has already supplied the Tübingen researchers with nicotinamide riboside for a recently completed study. "In addition to our previous findings, the study shows that our approach is not only specifically directed at Parkinson's disease, but generally at the age-related degradation of metabolic processes in the human body, which includes Alzheimer's, muscle loss and eye problems," says Deleidi. "And the sooner you can do something about this, the better. If the outcome of the clinical trials is positive, vitamin B3 would really have what it takes to become the new "anti-ageing pill".

