

Gene therapy promotes nerve regeneration

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Researchers from the Netherlands Institute for Neuroscience (NIN) and the Leiden University Medical Center (LUMC) have shown that treatment using gene therapy leads to a faster recovery after nerve damage. By combining a surgical repair procedure with gene therapy, the survival of nerve cells and regeneration of nerve fibers over a long distance was stimulated for the first time. The discovery, published in the journal *Brain*, is an important step towards the development of a new treatment for people with nerve damage.

During birth or following a traffic accident, nerves in the neck can be torn out of the spinal cord. As a result, patients lose their [arm function](#), and are unable to perform daily activities such as drinking a cup of coffee. Currently, surgical repair is the only available treatment for patients suffering this kind of [nerve damage](#). "After surgery, nerve fibers have to bridge many centimeters before reaching the muscles and nerve cells from which new fibers need to regenerate are lost in [large numbers](#). Most regenerating nerve fiber do not reach the muscles. The recovery of arm function is therefore disappointing and incomplete," explains researcher Ruben Eggers of the NIN.

Combination of treatments

By combining neurosurgical repair with gene therapy in rats, many of the dying nerve cells can be rescued and nerve fiber growth in the direction of the muscle can be stimulated.

In this study, the researchers used regulatable gene therapy with a [growth factor](#) that could be switched on and off by using a widely used antibiotic. "Because we were able to switch off the gene therapy when the growth factor was no longer needed, the regeneration of new nerve fibers towards the muscles was improved considerably," says Ruben Eggers.

A stealth gene switch

To overcome the problem of the immune system

recognizing and removing the gene switch, the researchers developed a hidden version, a so-called 'stealth switch'. Professor Joost Verhaagen (NIN) explains: "The stealth gene switch is an important step forward towards the development of gene therapy for nerve damage. The use of a stealth switch improves the gene therapy rendering it even safer."

The [gene therapy](#) is not yet ready for use in patients. While the ability to switch off a therapeutic gene is a large step forward, the researchers still found small amounts of the active gene when the switch was turned off. Therefore, further research is needed to optimize this therapy.

Provided by Netherlands Institute for Neuroscience - KNAW

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