

Old cells repair damage in the brains of multiple sclerosis patients

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Demyelination by MS. The CD68 colored tissue shows several macrophages in the area of the lesion. Original scale 1:100. Credit: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/) Marvin 101/Wikipedia

A new study shows that there is a very limited regeneration of cells in the brains of patients diagnosed with multiple sclerosis (MS). These findings underline the importance of treating MS at an early stage of

disease progression, when the affected cells can repair the damage, as they are not replaced by new ones. The results are published in the journal *Nature* by researchers from Karolinska Institutet and Uppsala University in Sweden.

Nerve [cells](#) in the brain communicate with one another through [nerve fibres](#) that form complex networks. Many nerve fibres are insulated by a casing of myelin, which contributes to the high-speed transmission of nerve impulses. Myelin is not formed by the [nerve cells](#) but by another type of cell called oligodendrocytes.

MS is a disease caused by the body's immune system attacking the myelin and oligodendrocytes. This leads to deteriorated transmission of signals in the nerve fibres and can entail nerve cell death, a combination that causes serious neurological impairments and in severe cases the patient's death.

The disease progression in MS usually fluctuates between periods of deterioration and periods of remission. Studies in mice have shown that damaged myelin can be reformed, and that this requires generation of new oligodendrocytes that make the myelin. It has been assumed that periods of remission in MS patients are caused by newly formed oligodendrocytes replacing the lost myelin.

But in this study, a research group has been able to show that there is no regeneration of oligodendrocytes in MS patients in those areas where the myelin seems to have been reformed. Instead, it appears as if old oligodendrocytes that have survived the attack from the immune defence are able to form new [myelin](#).

"We were highly surprised that humans proved to be so different from the animals that have been studied. In humans, there is very limited regeneration of oligodendrocytes, but they seem to have a greater

capacity to contribute to repair," says Jonas Frisé, Professor at the Department of Cell and Molecular Biology at Karolinska Institutet, who led the study.

These new findings indicate the importance of treating MS aggressively at an early stage of the [disease progression](#), in order to prevent the loss of oligodendrocytes.

"Since few oligodendrocytes are formed, it is important to save the ones you have as they can repair the damage caused by the disease," says Jonas Frisé.

To determine the age of the oligodendrocytes in the MS patients, the researchers measured the amount of the isotope carbon-14 from [nuclear detonations](#) during the cold war, which was stored in the cells' genome, i.e. the DNA. Since the detonations ceased, there has been a gradual decrease of carbon-14, which acts as a type of date mark for when the cells were formed. This method of determining the age of a cell was developed by Jonas Frisé's team in the early 2000s.

Another paper is published simultaneously in *Nature*, from Associate Professor Gonçalo Castelo-Branco's group also at Karolinska Institutet, arriving at overlapping conclusions, with a different methodology,

More information: Dynamics of oligodendrocyte generation in multiple sclerosis, *Nature* (2019). [DOI: 10.1038/s41586-018-0842-3](https://doi.org/10.1038/s41586-018-0842-3) , www.nature.com/articles/s41586-018-0842-3

Ana Mendanha Falcão et al. Disease-specific oligodendrocyte lineage cells arise in multiple sclerosis, *Nature Medicine* (2018). [DOI: 10.1038/s41591-018-0236-y](https://doi.org/10.1038/s41591-018-0236-y)

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