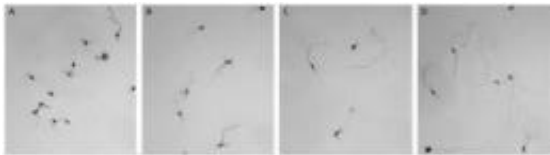


Living in the matrix: Sugar residues regulate growth and survival of nerve cells

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The motoneurons from the spinal cord were cultivated on various substrates for five days. Nerve cells on substrates with chondroitin sulfate sugar residues (B-D) form longer processes than nerve cells on a substrate without sugar residues (A). (Pictures by R. Conrad) Credit: RUB

Researchers in Bochum have found out that certain sugar residues in the spinal cord regulate the growth and survival of nerve cells which control the movement of muscles. "We hope that our findings can improve regenerative treatment of nerve injuries", explains Prof. Dr. Stefan Wiese from the Molecular Cell Biology study group (Faculty of Biology and Biotechnology). The researchers report on these sugar residues in the environment of the cells, which is called the extracellular matrix, in the *Journal of Neuroscience Research*.

Brain and spinal cord comprise more than just nerve cells. The extracellular matrix, a complex scaffold of proteins with sugar residues, surrounds the cells and influences their well-being. Prof. Wiese's team is interested in the interaction of the matrix with a specific kind of nerve cells, which transmit signals from the brain to muscles (motoneurons).

Because injured motoneurons lead to [paralysis](#), clinicians have great interest in being able to influence the growth of these cells. "If we had a medication that could change the extracellular matrix so that it favours the growth and survival of nerve cells, that would be a large step in the treatment of [nerve injuries](#) after accidents or also for the treatment of diseases such as [Multiple Sclerosis](#)", says Prof. Wiese.

Growing muscle-controlling nerve cells

In cooperation with Prof. Dr. Andreas Faissner (Chair of Cell Morphology & Molecular Neurobiology, Faculty of Biology and Biotechnology), Dr. Alice Klausmeyer from Prof. Wiese's team cultivated motoneurons from the [spinal cord](#) of mice on various kinds of extracellular matrix, from which the researchers experimentally removed certain sugar residues (chondroitin sulfates). By comparing the cell cultures with and without sugar residues, they were able to show that the residues control the growth and survival of the motoneurons.

Staining, counting and measuring

To express the growth of the cells in understandable figures, the cell biologists in Bochum measured the longest process of the motoneurons under a microscope and counted the number of processes which the cells had formed. With the help of the processes, the cells communicate and transmit signals across large distances. Some of the chondroitin sulfate sugar residues examined had a positive effect on the length and number of the processes, others had an inhibiting influence. The question of whether the growth of the [nerve cells](#) was supported or inhibited also depended on the kind of [extracellular matrix](#) with which a certain sugar residue was combined. Furthermore, the researchers stained for an enzyme in the motoneurons which is a marker for cell death. This analysis showed that the chondroitin sulfate sugar residues not only

regulate the growth of the motoneurons, but can also lead to survival of these cells. The experiments performed by Dr. Klausmeyer and her colleagues were supported, amongst other things, by the RUB Rector's Office programme for start-up funding of research projects of the next scientific generation.

Provided by Ruhr-University Bochum

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