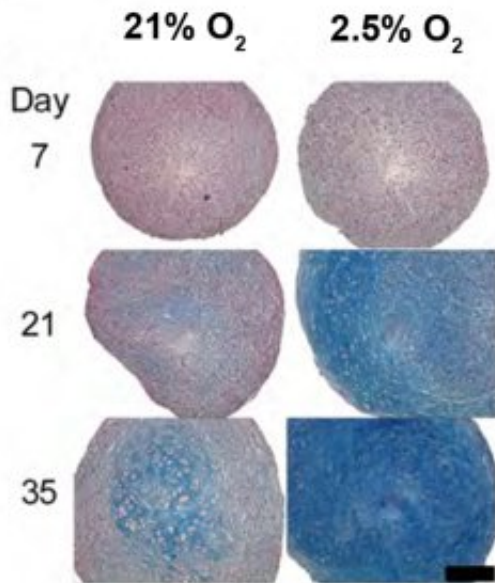


Better cartilage repairs using stem cells

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Under low oxygen tension (right), cartilage of a better quality is obtained.

Using adult stem cells is a good way of culturing better-quality cartilage to repair worn hips and knees. New cartilage that has good properties can be grown in particular by cultivating adult stem cells in combination with a small quantity of cells from the patient's own cartilage. In the long run this increases the likelihood of a cartilage implant being successful, provided it is carried out in time. These are the findings put forward by PhD student Nicole Georgi, who did her research at the University of Twente's MIRA Institute for Biomechanical Technology and Technical Medicine. She is to receive her PhD on March 22.

Over a million people in the Netherlands have pain in their [hips](#) or knees due to [osteoarthritis](#), i.e. wear and tear and damage to cartilage. In many cases a [prosthesis](#) is needed, as cartilage does not heal readily.

Experiments with implanting [cartilage cells](#) are taking place on a limited scale: these involve culturing a few cartilage cells from the patient outside the body so as to grow a quantity of tissue, which is then replaced to repair the damage. The results have been mixed: outside the body the cells are seen to lose some of their functionality, with the result that, once replaced in the body, the elastic matrix characteristic of cartilage is not formed properly, for example.

Combining cells

In her study Nicole Georgi examined alternatives with the aim of achieving better-quality cartilage after replacement in the body. She took [mesenchymal stem cells](#) (MSCs) isolated from bone marrow and let them grow into cartilage. She found that these [adult stem cells](#) are good at stimulating the formation of cartilaginous matrix. The quality of the cartilage thus formed can be improved considerably by growing the MSCs under very low oxygen tension. Cartilage is in a permanent state of low oxygen tension in the body, so this tissue is not perfused. Even better results can be achieved by combining the stem cells with a small number of chondrocytes (cells from cartilage). As a result the stem cells not only differentiate more readily into chondrocytes, they also stimulate the chondrocytes to form a better elastic matrix, as the correct proteins are produced.

A single operation

Georgi expects that it will eventually be possible to repair cartilage in a single operation by taking the required stem cells from the [bone marrow](#), combining them with chondrocytes and replacing the cell mixture in the

body straight away. The company CelCoTec is currently carrying out clinical trials to prove this concept. If the operation is to be successful, however, cartilage damage needs to be detected at an early stage: tests could be carried out for it as part of a physical examination.

More information: Nicole Georgi (1983, Schlema, Germany) is to defend her thesis 'Multiple Choice: Leveraging instructive culture models to improve cartilage tissue engineering' on 22 March 2013. Her supervisor is Prof. Clemens van Blitterswijk and her co-supervisor Prof. Marcel Karperien.

Provided by University of Twente

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