

From connective tissue to bones

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Cartilage, bones and the internal walls of blood vessels can be created by using common connective tissue cells from human skin. Researchers in reconstructive plastic surgery at Linköping University have successfully manipulated these tissue cells to take on different shapes depending on the medium they have been cultivated in.

“This means that it will be much easier to produce autologous tissue, which is tissue created from the patient’s own body”, says Gunnar Kratz, Professor of Experimental [Plastic Surgery](#) and team leader for the research group.

The results of the group’s research are now published in three simultaneous scientific articles.

Bone, cartilage and [blood vessels](#) are important components in reconstructive surgery, where damaged tissue needs to be recreated. Minor fractures can heal spontaneously but for major bone damage and cartilage injuries there is the need to transplant tissue from other parts of the patient’s body.

Different strategies have been attempted to instead grow autologous tissue from [stem cells](#), for example those present in bone marrow. These cells, however, can be difficult to harvest, cultivate and store. Compared to these cells connective [tissue cells](#) from human skin has great advantages. A small biopsy is often enough to collect a sufficient amount of cells.

“They are the ‘weed’ cells of the body, very easy to collect and cultivate into the cell type required. They are also very suitable to use to create a personal cell bank”, Gunnar Kratz says.

Together with his colleagues he has developed a technique to grow bone-, cartilage- and endothelial-like cells from connective tissue cells. Endothelial cells are the building blocks for the inner walls of blood vessels. The technique has been used to create whole tissue in gelatine scaffolds and currently preparations are underway to transplant these complete tissue pieces into laboratory animals.

In the studies the researchers collected connective tissue cells from healthy skin left over from breast and stomach plastic surgery and used fat stem cells to provide a comparison. To ensure that the transformation was not a result of the fusion of different cells, connective tissue cells from one cloned cell were also used.

The cell cultures were cultivated in four different environments optimised for bone, cartilage, fat and endothelium. After two to four weeks the connective tissue cells had produced cartilage and bone mass to a greater extent than the fat stem cells had. The cells showed several functions normally only present in the genuine cell type. They could also be used to build three dimensional tissues, to create capillary networks etc.

The studies are the first in the world where the results have been able to show connective tissue cells from [human skin](#) transformed into other so called phenotypes and creating other types of tissue.

“The dream is to be able to manipulate connective tissue cells in the human body to develop into specific cell types, for example to create bone cells for broken bones”, says Gunnar Kratz.

Provided by Linköping Universitet

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