# Scientists move closer to creating cartilage from stem cells

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Scientists have succeeded in producing cartilage formed from embryonic stem cells that could in future be used to treat the painful joint condition osteoarthritis.

In research funded by Arthritis Research UK, Professor Sue Kimber and her team in the Faculty of Life Sciences at The University of Manchester have developed a protocol under strict laboratory conditions to grow and transform embryonic stem cells into cartilage cells (also known as chondrocytes).

Professor Kimber said: "This work represents an important step forward in treating cartilage damage by using embryonic stem cells to form new tissue, although it's still in its early experimental stages."

Their research was published in *Stem Cells Translational Medicine*.

During the study, the team analysed the ability of embryonic stems cells to become precursor cartilage cells. They were then implanted into cartilage defects in the knee joints of rats.

After four weeks cartilage was partially repaired and following 12 weeks a smooth surface, which appeared similar to normal cartilage, was observed. Further study of this newly regenerated cartilage showed that cartilage cells from embryonic stem cells were still present and active within the tissue.

Developing and testing this protocol in rats is the first step in generating the information needed to run a study in people with arthritis. Before this will be possible more data will need to be collected to check that this protocol is effective and that there are no toxic side-effects.

But researchers say that this study is very promising as not only did this protocol generate new, healthy-looking cartilage but also importantly there were no signs of any side-effects such as growing abnormal or disorganised, joint tissue or tumours. Further work will build on this finding and demonstrate that this could be a safe and effective treatment for people with joint damage.

Chondrocytes created from adult stem cells are currently being experimentally used but as they cannot be currently be produced in large amounts, the procedure is expensive.

With their huge capacity to proliferate, embryonic stem cells, which can be manipulated to form almost any type of mature cell, offer the possibility of high-volume production of cartilage cells. Their use would also be cheaper and applicable to a greater number of arthritis patients, the researchers claim.

"We've shown that the protocol we've developed has strong potential for developing large numbers of chondrogenic cells appropriate for clinical use," added Prof Kimber. "These results thus mark an important step forward in supporting further development toward clinical translation."

Osteoarthritis affects more than eight million people in the UK, and is a major cause of disability. It and occurs when cartilage at the ends of bones wears away causing joint pain and stiffness.

Director of research at Arthritis Research UK Dr Stephen Simpson added: "Current treatments of osteoarthritis are restricted to relieving painful symptoms, with no effective therapies to delay or reverse cartilage degeneration. Joint replacements are successful in older patients but not young people, or athletes who've suffered a sports injury.

"Embryonic stem cells offer an alternative source of cartilage cells to adult stem cells, and we're excited about the immense potential of Professor Kimber's work and the impact it could have for people with osteoarthritis."

Provided by University of Manchester