UNIVERSITÉ DE GENÈVE

PRESS RELEASE

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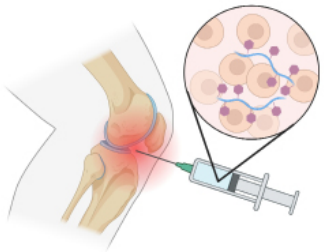
Stem cells boosted with glucose to combat osteoarthritis

Scientists at UNIGE have discovered how to increase the lifespan of stem cells injected into cartilage to facilitate the regeneration of tissue damaged by osteoarthritis.

Osteoarthritis, a degenerative disease of the cartilage that affects the majority of the elderly population, seriously compromises patients' quality of life. Researchers at the University of Geneva (UNIGE) have explored the possibility of new treatments for this as yet little-studied pathology by injecting stem cells, which until now have had little success because of their premature death. The scientists discovered that by combining the injection of stem cells with a gradual release of glucose, their survival was prolonged, making it possible to stimulate cartilage regeneration. These preliminary but already promising results are published in the *International Journal of Pharmaceutics* and open up new prospects for regenerative therapies.

Osteoarthritis, which can appear as early as the age of 40, becomes more widespread with age, affecting 65% of the population over the age of 65 and 80% of the population over the age of 80. This degenerative cartilage disease leads to friction that causes inflammation, pain, swelling and stiffness, frequently leading to real handicaps. It mainly affects the joints of the knees, hips, spine and hands. Despite the size of the population affected, relatively little research has been devoted to this multifactorial disease.

Until now, those affected are offered anti-inflammatory treatments to reduce pain, or lubricants such as hyaluronic acid - naturally present in the body but whose production diminishes with age - to limit friction. In the most problematic cases, prostheses may need to be fitted.



Stem cell therapy for cartilage regeneration.

High resolution pictures

Treating rather than relieving

The groups led by Eric Allémann, full professor of pharmaceutical technology at UNIGE Faculty of Science, and Olivier Jordan, senior lecturer, have been working for more than fifteen years on developing new treatment modalities. They are collaborating on several lines of research, including the injection of stem cells into joints that will naturally release biomolecules, such as growth factors, capable of interacting with cartilage cells to reduce inflammation and stimulate the growth of new cells.

«The problem is that these stem cells, which come from another part of the patient's body (usually fat or the spinal column), are not in an optimal environment for their growth and die very quickly, without having had time to release sufficient molecules with beneficial effects on the degenerating cells,» explains Paula Gonzalez-Fernandez, a doctoral student in Eric Allémann's laboratory and first author of the study. «This is particularly true for injections of stem cells into joints, since these tissues are not vascularised and are therefore not supplied with nutrients and oxygen», continues the researcher.

Feeding stem cells to ensure their survival

To overcome this problem, the scientists tried to provide these stem cells with a source of energy in order to increase their lifespan. «Glucose was a good candidate, but it is eliminated too quickly by the body's fluids. The trick of our work was to attach the glucose molecules to hyaluronic acid, so that the glucose is not eliminated immediately, but is released in small, regular doses», explains Olivier Jordan.

The authors therefore tested the lifespan of stem cells with or without modified glucose, under laboratory conditions. They found that stem cells injected into cartilage tissue cell cultures survived for more than three days in the presence of glucose associated with hyaluronic acid (compared with less than 24 hours in the absence of this glucose). These three days are sufficient to release the growth factors and activating molecules that are responsible for cartilage regeneration.

«These results are encouraging and promising, but are still only at the stage of cell studies in the laboratory. Our next step is to confirm these results in an animal model,» says Eric Allémann. This approach, which involves adding a nutrient (glucose in this case) to hyaluronic acid, opens up new prospects for stem cell therapies in poorly vascularised and nutrient-poor environments, such as osteoarthritic joints, but also for other regenerative therapies.

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