

Stem cells may prevent post-injury arthritis

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Duke researchers may have found a promising stem cell therapy for preventing osteoarthritis after a joint injury.

Injuring a joint greatly raises the odds of getting a form of [osteoarthritis](#) called post-traumatic [arthritis](#), or PTA. There are no therapies yet that modify or slow the progression of arthritis after injury.

Researchers at Duke University Health System have found a very promising [therapeutic approach](#) to PTA using a type of stem cell, called mesenchymal stem cells (MSCs), in mice with [fractures](#) that typically would lead to them developing arthritis. Their findings could lead to a therapy that would be used after joint injury and before signs of significant osteoarthritis.

The scientists thought the stem cells would work to prevent PTA by altering the balance of inflammation and regeneration in [knee joints](#), because these stem cells have beneficial properties in other regions of the body.

"The stem cells were able to prevent post-traumatic arthritis," said Farshid Guilak, Ph.D., director of orthopaedic research at Duke and senior author of the study.

The study was published on August 10 in [Cell Transplantation](#).

The researchers also thought that a type of mice bred for their super-healing properties would probably fare better than typical mice, but they

were wrong.

"We decided to investigate two therapies for the study, said lead author Brian Diekman, Ph.D., a [postdoctoral researcher](#) in the Guilak lab. "We thought that stem cells from so-called superhealer mice would be superior at providing protection, and instead, we found that they were no better than stem cells from typical mice. We thought that maybe it would take stem cells from superhealers to gain an effect as strong as preventing arthritis after a fracture, but we were surprised – and excited – to learn that regular stem cells work just as well."

Certain people appear to fall into the superhealer category, too. They bounce back quickly and heal well naturally after a fracture, while other people eventually form cases of arthritis at the fractured joint, said Guilak, who is a professor of orthopaedic surgery and biomedical engineering.

"The ability of the superhealer mice to have superior healing after a fracture may go beyond the properties of their stem cells and be some beneficial factor, like a growth factor, that we don't know about yet," Guilak said.

The delivery of 10,000 typical or superhealer stem cells to the joint prevented the mice from developing PTA, unlike a control group that received only saline.

Diekman said the team looked at markers of inflammation and saw that the stem cells affected the inflammatory environment of the joint after fracture.

"The stem cells changed the levels of certain immune factors, called cytokines, and altered the bone healing response," said Diekman, who is also with the Duke Department of Biomedical Engineering.

Guilak said that very few studies have purified stem cells to the degree they were purified for this study. They used mesenchymal stem cells, which are bone marrow cells not destined to become part of blood.

Diekman said that one of the challenges in the field is isolating and developing a system for sorting the specific cells they wanted, the [mesenchymal stem cells](#), which form a very rare cell type in the bone marrow.

"We found that by placing the [stem cells](#) into low-oxygen conditions, they would grow more rapidly in culture so that we could deliver enough of them to make a difference therapeutically," Diekman said.

Provided by Duke University Medical Center

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