

Notes from the Body Shop: Mesenchymal Stem Cells and Joint Repair

By Joseph T. Yull

Medicine in the 21st century has produced stunning results that have greatly enhanced our ability to repair the human body. Like any new technology, from iPhones to electric cars, the first people with access to new medical technology are those with both the means to get their hands on it and a need for it - and world class professional athletes fit the bill. They're both extremely dependent on their bodies for success and typically well compensated, with access to the top tier of medical care.

When human joints break down, whether due to age, disease, or rigorous use, as in the case of a baseball pitcher's throwing arm, the body's ability to repair itself can be both limited and slow-moving. One of the most talked about treatments of the last few years has been stem cell injections for joints; household names like Tiger Woods, Peyton Manning, the late Kobe Bryant, and luchador Rey Mysterio have all used these treatments to aid in recovery, especially as they aged and wanted to keep performing at a high level.

What these treatments have in common is that they utilize injections of mesenchymal stem cells (aka MSCs). Stem cells themselves are cells that come from earlier in the chain of development of the human body, and are capable of developing into tissue that forms the mature, functional parts of a person. MSCs are a type of stem cell that can develop into osteoblasts, the cells that create our bones, chondrocytes (cartilage), and myocytes (muscle), among others.

Scientific studies have shown that MSCs can lessen the symptoms of arthritis when administered to patients. In some cases, a liquid containing stem cells is injected directly into the patient's joint, and in others MSCs are injected into the bloodstream. The stem cells in question can last up to a year in the human body, and can function to reduce inflammation and help the body regenerate.

What's fascinating is that while scientists initially thought that MSCs would be able to help patients with arthritic or injured joints by growing into new tissue to repair a joint, they actually don't function in this manner. The body naturally gets rid of the MSCs in a certain amount of time, and the cells don't become part of the permanent tissue where they are injected.

Why is this fascinating? Because MSC injections are still effective. It turns out that instead of directly replacing missing or damaged tissue, MSCs instead signal to the cells that are already there and instruct them to do things that result in less pain and inflammation.

Intercellular signaling—a complex process about which the scientific community has much, much more to learn—is how cells in the body of a human, or other organism, talk to each other. This is usually accomplished through chemical means, in that cells emit chemicals that are then picked up by other cells, which receive the signal and act accordingly. MSCs, in this context, can be thought of as crisis consultants; when an organization is having trouble, they step in and give expert advice on how to solve the problem. In this analogy the joint would represent an organization and the crisis would be an injury. The analogy then breaks down in the sense that crisis consultants go find a different firm to consult for after a given job finishes instead of just hanging around the office until they disappear, but hopefully you've got the idea.

While it would in theory be possible to just use the signaling molecules to tell your joint to repair itself, injecting cells has the benefit of giving a sustained, renewable source of these signaling molecules. Additionally, MSCs can be pulled from adipose tissue (body fat), so they're easily accessible. This means that MSCs necessary for treatment can be created with minimal invasiveness - a boon for people hoping to keep their body and joints healthy as they get older.

What does the future of stem cell treatments look like? Healthier and longer-lasting joints definitely seem to be part of it. While these treatments are becoming more common, they are not part of the average person's medical care. Hopefully MSC treatments will become safe, reliable, and effective, and not solely accessible to those professional athletes we discussed earlier.