Collaborative research aims at joint repair

Experimental procedure can grow new cartilage.

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University of Missouri-Columbia researchers are collaborating with scientists at Columbia University in New York to grow cartilage from cells and use the tissue to resurface knee joints damaged by arthritis or injury.

Researchers say the work is in its early experimental stage using dogs but shows promise. They say it might be 15 years before the joint-repair methods can reach the human medical marketplace just as millions of aging baby boomers are finding it painful to walk.

James Cook, the professor leading the research at MU, says the potential value of the project is that it could create a knee joint that could get better with time. Knee replacements now are made of metal and plastic and can wear out after 15 or 20 years.

"This could have a lot of implications for human knee replacements in the future," said Cook, a professor of veterinary medicine and surgery.

While other universities and laboratories are working on cartilage regeneration, the major difference in the work between MU and Columbia University is that the joint tissue is being prepared to handle stress and weight.

Although development so far has been encouraging, Cook said there are potential obstacles. He said the research has taken place on a dog's healthy knee. It could be a more challenging situation to replace cartilage in a damaged or arthritic knee.

Cook is working with Clark Hung of Columbia University, using a $250,000, two-year grant from the National Institutes of Health. Hung is an associate professor of biomedical engineering. Much of his work is to restore joint function using tissue regeneration and biomechanics.

Hung said the grant was a high-risk and exploratory grant that provides financing for cutting-edge research that has the potential for a major payout.

"My general sense is, whether we hit the home run or not with this kind of grant, we will learn a lot," Hung said.

In the research at MU, a computer-generated image is created of a dog's knee, and cells are taken from donated cartilage. These are sent to scientists at the university in New York, where the computer image is used to create a special mold in which the cells will grow. Later, the new tissue is put into a device that manipulates it in such a way to make the cartilage stronger.

"The idea here is, by providing an environment that mimics what exists inside the joint, we think it will help promote the development of a stronger tissue," Hung said.

Cook has successfully used the procedure on two dogs that have not rejected the new cartilage.

"We can do this whole procedure and get it back in a living dog and have it function," Cook said. "The point that we can use donated cells and that those won't cause an immune reaction is a big step."

Human knees damaged by arthritis or injury lose the cartilage that provides cushions between bones, leaving them to rub against each other. The American Academy of Orthopaedic Surgeons reported that 400,000 patients in the United States had knee replacements in 2003. A new study for the organization predicted a need for 3.48 million knee replacements in 2030.

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