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Professor taking knee replacements from bionic to biological

By Mara Rose Williams / McClatchy Newspapers

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KANSAS CITY, Mo. — It pained James Cook to watch his grandfather hobble on arthritic, achy knees.

The elderly man had undergone several surgeries, including one of the first knee replacements in the late 1960s. Ultimately his joints reduced him to crutches and, in his last years, to a wheelchair. Cook said he vowed at age 8 to become a doctor or a scientist and fix it so that “no one would ever have to suffer through what my grandpa did.”

He is getting close. The professor of veterinary medicine at the [University of Missouri](#) said he thought he and team members were on the brink of changing the way the human knee was replaced. The goal, Cook said, “is to put metal and plastic joints out of business.”

He wants to take the joint replacement process from bionics to biological. The concept? Biological cartilage, specifically grown from [stem cells](#) outside the body and then shaped for insertion into the knee.

Cook, 45, has performed the procedure successfully in dogs. The research, the result of 11 years of work, recently was written up in the medical journal *The Lancet*.

“If we continue to prove the safety and efficacy of this biologic joint replacement strategy, then we can get FDA approval for use of this technology for joint replacements in people,” he said.

Cook is collaborating with a tissue regeneration research team led by professor Jeremy Mao at [Columbia University](#), as well as a lab at [Clemson University](#).

“The work reported in *The Lancet* represents the first time that an entire articular surface of a synovial joint was regenerated,” Mao said. “This was accomplished by the homing of the body’s endogenous stem cells — another first.”

The American Academy of Orthopedic Surgeons considers knee replacements one of the most important advances of the last century. In the United States, 581,000 procedures a year are performed.

Most are done using metal or plastic replacements. Cook said he thought biological replacements would last longer, be more flexible and give the patient a better quality of life. The process involves taking a patient’s own cells to create new cartilage and then mold it to a knee.

“The whole field of biological joint replacement is beginning to grow, and many doctors haven’t even heard about it,” said Kevin Stone, who has been doing a limited form of biological joint repair at his [San Francisco](#) clinic for a decade.

To Cook, however, “these are really treatments that patch the potholes in the joint rather than resurface the whole joint with normal cartilage and bone like ours.”

“These other treatments also are not patient-specific,” he added. “There are limitations for each of these treatments, which are what we are trying to address with ours.”

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