Researchers looking to create new bone tissue generation technique

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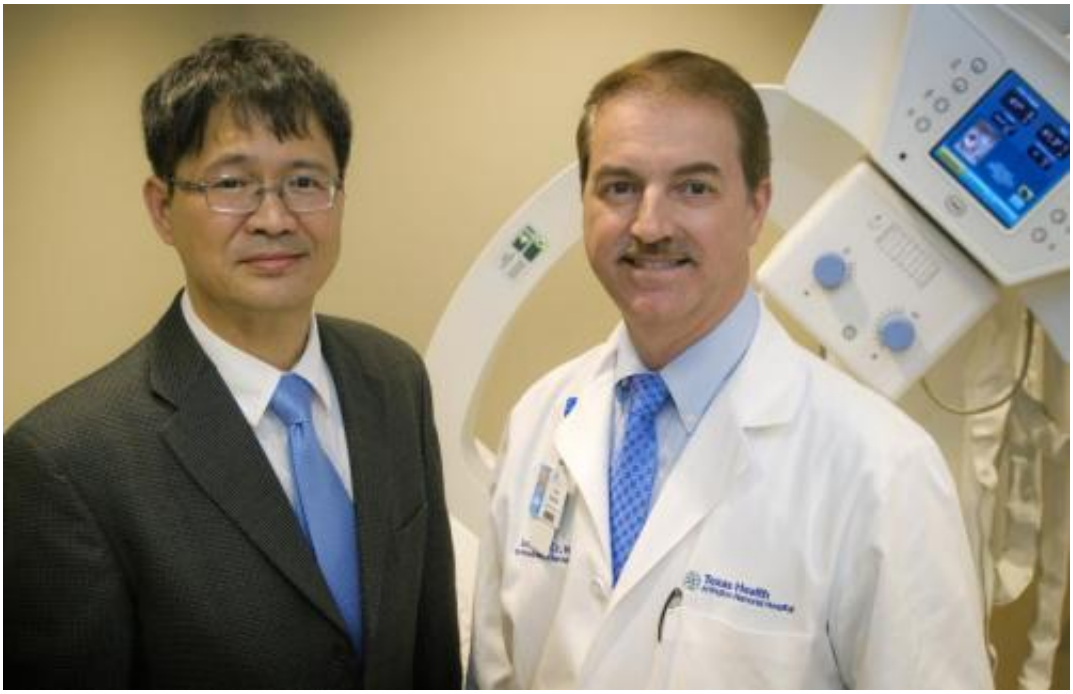

This shows Drs. Liping Tang, left, professor and chair of the UT Arlington bioengineering department, and Dr. Joseph Borrelli, chair of orthopedics for Texas Health Arlington Memorial. Credit: UT Arlington

UT Arlington and Texas Health Arlington Memorial Hospital are investigating whether bone grown from the body's own stem cells can replace traditional types of bone grafting.

The process, which has been successful in previous lab experiments, uses

biodegradable polymer scaffolding material and bone morphogenetic protein, or BMP, which was inserted into the abdomen of mice to attract stem cells that in turn produced bone. BMPs are proteins known to promote bone growth. The research is detailed in a new paper, "Tissue Engineering Bone Using Autologous Progenitor Cells in the Peritoneum," published by the online journal *PLoS One*.

Liping Tang, UT Arlington bioengineering chair and professor, and Dr. Joseph Borrelli, chair of orthopedics for Texas Health Arlington Memorial, co-authored the paper and are lead investigators of the research project. Tang said the process will allow surgeons to establish a "mini-bioreactor" in a patient's own body. Scientists determined that the abdomen of a mouse effectively mimics the traumatic and foreign body environmental response that takes place during various bone repair procedures in humans. Bone tissue can be generated in a few days through the process, he said, rather than the weeks or months existing processes take in a lab setting.

"This research will help us to formalize a specific type of scaffolding mixture that could eliminate the use of current bone grafting techniques," Borrelli said.

The procedure could help with open bone fractures, osteomyelitis, fractures that fail to heal, congenital malformations, tumors and, in a more general sense, perhaps osteoporosis.

The goal is to use the body's own healing capacity in bone repair, Borrelli said. For instance, today if a patient suffers from a bone defect or complex tibia fracture, a surgeon may perform an iliac crest bone graft, taking bone from the pelvis.

During the bone graft procedure, the surgeon uses a mechanism that scrapes or shaves bone from the pelvis. The bone shavings are then

placed directly into the defect or combined with other proteins. If successful, the research involving Borrelli and Tang will eliminate the grafting technique altogether.

Borrelli said the current grafting procedure has a 25 percent complication rate. He said the new procedure will help curtail the complication rate associated with bone grafting and reduce medical costs.

"In the future, a physician will be able to inject the scaffolding material with the ideal protein into the area where the patient's bone needs to grow or repair, and the patient's cells will never have to leave the body," Borelli said. "It will cut down on cost. It will cut down on surgery time. It will enhance patient comfort, too."

Khosrow Behbehani, dean of the UT Arlington College of Engineering, said the collaboration between the hospital and the university is the kind of collaboration that can lead to innovation in health care.

"Partners like Texas Health Arlington Memorial keep our researchers focused on goals that will help people," Behbehani said. "The work by Dr. Tang and Dr. Borrelli holds the promise of a medical advancement that can save patients time and money and improve treatment."

The research team said the process could become an outpatient procedure in the future.

Texas Health Arlington Memorial is funding $90,000 to support further research on this and other clinically relevant projects. This money will also pay for a doctoral student in Tang's lab.

"We couldn't think of a better collaborative project to be a part of," said Kirk King, Texas Health Arlington Memorial president. "By working

with talented individuals at UT Arlington, we're helping advance science with the ultimate goal of enhancing health care to improve an individual's quality of life. It's a challenging task but one we'll be honored to see come to fruition."

More information: www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0093514

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