Medical Xpress

Engineers design glass implant that can grow new bone

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Sometimes medical advances don't come from the medical field at all. Engineers at the Missouri University of Science and Technology in Rolla have designed a super-strong glass implant with a scaffolding-like structure that is able to grow new bone.

"We have good material and engineering skills," said lead researcher Len Rahaman, "and when you put those two together, it's allowed us to use our skills to produce a bioactive glass that is strong enough to repair large structural bone defects."

Bioactive means the material reacts with body fluids and converts into living bone, so it does not need to be removed.

In previous work, the engineers proved the glass implant they developed using robocasting ? a computer-controlled technique to ensure a uniform structure - could withstand the weight and pressure experienced by long bones in the body like those in the arms and legs.

Their latest research using the skulls of rats, showed that the porous scaffolding design quickly bonded to the bone and promoted a significant amount of new bone growth within six weeks. The research was published last month in the journal *Acta Biomaterialia*.

"You can have the strongest material in the world, but it also must encourage bone growth in a reasonable amount of time," Rahaman said.

The material could someday be used to repair large bone defects that are the result of cancer, war or auto crashes.

Current treatments to structural bone repair involve either porous metal, which can heal poorly and become infected; or a bone transplant from a cadaver, which carries risk of disease. Bone also can be taken from one part of the body to other, but the amount is limited, and the result can be pain and poor healing at the donor site.

The materials for the glass implant are inexpensive and easy to obtain, Rahaman said. "If it turns out to be a viable solution, we could actually reduce health care costs."

Next, the researchers are testing the glass implant in the large leg bones of rats, which bear more weight. "Now that we know the bone will grow into the scaffold, we are testing it under more realistic conditions," Rahaman said.

The next steps would be studying the implant in larger animals and winning approval to test the design in humans.

Problems may arise, but the engineering team is ready with solutions: Adding small amounts of silver to the glass implant could prevent infection, and doping it with copper should promote the growth of blood vessels if needed to keep the bone healthy.

Rahaman said he's working with an orthopedic surgeon and a bone biologist, but the research "requires use of our engineering skills."