Research may be in use in a few years

3D printer used to make bone-like material

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By Eric Sorensen, WSU science writer

PULLMAN, Wash. - It looks like bone. It feels like bone. For the most part, it acts like bone.

And it came off an inkjet printer.

Washington State University researchers have used a 3D printer to create a bone-like material and structure that can be used in orthopedic procedures, dental work and to deliver medicine for treating osteoporosis. Paired with actual bone, it acts as a scaffold for new bone to grow on and ultimately dissolves with no apparent ill effects.

The authors report on successful in vitro tests in the journal Dental Materials and say they're already seeing promising results with in vivo tests on rats and rabbits. It's possible that doctors will be able to custom order replacement bone tissue in a few years, said **Susmita Bose**, co-author and professor in WSU's School of Mechanical and Materials Engineering.

"If a doctor has a CT scan of a defect, we can convert it to a CAD file and make the scaffold according to the defect," Bose said.

The material grows out of a four-year interdisciplinary effort involving chemistry, materials science, biology and manufacturing. A main finding of the paper is that the addition of silicon and zinc more than doubled the strength of the main material, calcium phosphate.

The researchers – who include mechanical and materials engineering **Professor Amit Bandyopadhyay**, doctoral student **Gary Fielding** and research assistant **Solaiman Tarafder** - also spent a year optimizing a commercially available ProMetal 3D printer designed to make metal objects.

The printer works by having an inkjet spray a plastic binder over a bed of powder in layers of 20 microns, about half the width of a human hair. Following a computer's directions, it creates a channeled cylinder the size of a pencil eraser.

After just a week in a medium with immature human bone cells, the scaffold was supporting a network of new bone cells.

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