

Magnesium surgical implants can be designed to biodegrade, promote bone growth

August 20 2014, by Cindy Spence

(Phys.org) —Ask anyone who has a surgical pin in their body, and they likely will tell you they wish it would just go away.

In the future, it just might, with help from research by Michele Manuel, an associate professor of materials science and engineering at the University of Florida.

Manuel has developed a surgical pin made from [magnesium](#) and is working to control the rate at which the pin degrades in the body. In laboratory tests, the pin offers several advantages over the plastic and stainless steel or titanium pins currently used.

"We don't always want to put in a metal implant and leave it there forever," Manuel said. "The idea with this pin is that it would dissolve over time, and after it's finished, your body is basically in the same state it was before you had an injury.

"Everybody knows someone who has an implant in their body that they wish wasn't there," Manuel said. "Surgical pins don't have to become permanent fixtures in the body."

The pin not only biodegrades but also aids healing. Magnesium builds bone, so it can function both as a pin and as a nutrient.

"You have to have magnesium to live, and many people take [magnesium supplements](#)," Manuel said. "So this is a good orthopedic application. It's

not only an implant that serves a medical need in terms of fixing bones, it's also serving a nutritional need as well, so that's why you see a lot of activity in the surrounding tissue."

The use of magnesium isn't new, Manuel said. In the early 1800s, physicians experimented with magnesium implants but ran into problems because magnesium produces [hydrogen](#) as it breaks down, which creates hydrogen gas bubbles under the skin that are clearly visible. Doctors of the era tried to remove the hydrogen gas with syringes but eventually gave up until new, improved metals were developed.

The trick to using magnesium, Manuel said, is controlling the rate at which it breaks down to give the body time to absorb the hydrogen.

"Your body can handle the hydrogen, just not in large doses, so pockets form," Manuel said. "So if we can slow down how fast the magnesium degrades so it releases hydrogen more slowly, the body would take up the hydrogen the way it would take up any other gas and release it."

In lab tests, Manuel has compared the magnesium pin with clinical implant materials. Surgical pins are shaped like screws, so in addition to controlling the rate at which the magnesium breaks down, Manuel is trying to determine how much torque can be applied before the screw is stripped.

In [lab tests](#), the magnesium pin has been inserted into the tibia of rats. X-rays show the rate at which the magnesium pins dissolve, and at six weeks the new bone is indistinguishable from the bone before the break.

Another use of the magnesium could be as a coating for an implant to promote bone growth.

As Manuel's research continues, entrepreneurs at UF's Innovation Hub

are keeping watch, with an eye toward bringing the technology to market.

"People who have sensitivity to metal or inflammation from a foreign material in the [body](#) could benefit from this," Manuel said. "There are a lot of different applications that could be possible."

Provided by University of Florida

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