

Hip chip uses nanotechnology to monitor healing

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It is as small as the tip of a pen, but a microsensor created by University of Alberta engineers may soon make a huge difference in the lives of people recovering from hip replacement surgery.

The U of A research team has invented a wireless microsensor to monitor the bone healing process after surgery. Using nanotechnology, the researchers built a tiny device that measures the degree to which bone attaches itself to a surgical implant - a process called osseointegration - and lets doctors know when the joint needs to be replaced.

"The ability to monitor and quantify this healing process is critical to orthopedic surgeons in determining a patient's rehabilitation progress," said Dr. Walied Moussa, a professor in the Department of Mechanical Engineering, who has a lab in the National Research Council's National Institute for Nanotechnology, based at the U of A. "Until now, there has been no quantitative method for assessing osseointegration."

"This microsensor not only reduces post-operation recovery time, it will also help reduce the wait time for patients needing artificial joint implants," he said.

The sensor will be permanently implanted with the joint and is powered kinetically - it uses the natural movement of the patient's body as its power source. It stays dormant until a doctor asks it to start transmitting data.

Careful monitoring of how patients are healing will help them recover as quickly as possible and resume normal activities with less chance of stressing the fracture during recovery and rehabilitation. It also allows the surgeon to more accurately decide when it is safe to send patients home from the hospital with their new implants.

The device will also cut down the need for X-rays to monitor bone functionality, reducing costs and exposure to radiation. And the sensor can detect and identify bone loss before it's even visible on a radiograph.

This research can also be applied to artificial knees, hip replacement and other joint therapy.

Earlier this year, TEC Edmonton, a joint initiative of the U of A and Edmonton Economic Development Corp., filed a provisional U.S. patent application for the work.

Moussa collaborated on this project with Dr. Edmond Lou, a research associate in the Rehabilitation and Technology Department of Glenrose Hospital in Edmonton and an adjunct professor in the Department of Electrical and Computer Engineering, and Dr. John Cinats, section head of orthopedics for Capital Health and associate clinical professor at the University of Alberta Hospital.

Source: University of Alberta

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