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Thursday, August 28, 2008

A Helping Hand for Surgery

A tiny gripper that responds to chemical triggers could be a new tool for surgery.

By Prachi Patel-Predd

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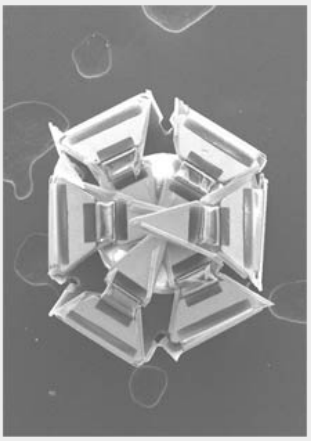

Get a grip: The fingers of this metal-and-polymer gripping gadget curl around a tiny bead when the device senses a certain triggering chemical. The gripper could someday help doctors perform minimally invasive surgeries.
Credit: Timothy Leong/JHU

MULTIMEDIA

See the micro-gripper in action.

A tiny handlike gripper that can grasp tissue or cell samples could make it easier for doctors to perform minimally invasive surgery, such as biopsies. The tiny device curls its "fingers" around an object when triggered chemically, and it can be moved around remotely with a magnet.

Minimally invasive, or "keyhole," surgery currently involves making several centimeter-size incisions and inserting surgical tools through hollow tubes placed in these incisions. Wires connect the tools to external controls that a surgeon uses to operate inside the body. This is less damaging than conventional surgery, but it limits a surgeon's ability to maneuver the instruments.

The new technology is a step toward surgical tools that move more freely inside the human body. "We want to make mobile surgical tools," says David Gracias, a biomolecular- and chemical-engineering professor at Johns Hopkins University, who led the development of the new gripper. "The ultimate goal is to have a machine that you can swallow, or [to] inject small structures that move and can do things [on their own]."

A gripper based on the current design could respond autonomously to chemical cues in the body. For example, it might react to the biochemicals released by infected tissue by closing around the tissue, so that pieces can be removed for analysis.

Gracias and his colleagues presented the microgripper at the American Chemical Society meeting earlier this month. To demonstrate the device, they used it to grasp and maneuver tiny beads and clumps of cells in a petri dish. They have also used the device in the laboratory to perform an in vitro biopsy on a cow's bladder. "This is the first micromachine that has been shown convincingly to do very useful things," Gracias says. "And it does not require electric power for operation."

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