Micro-ear lets scientists eavesdrop on the micro-world

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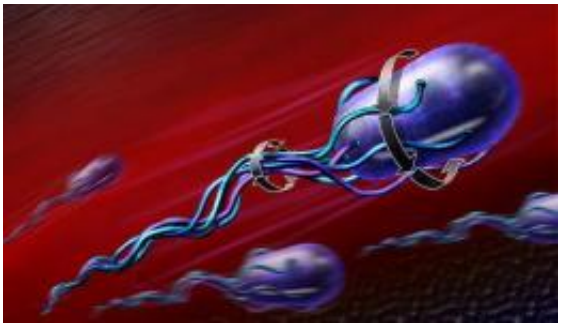

The micro-ear could enable scientists to listen to bacterial flagellum in a non-invasive way. Credit: Nicolle Rager Fuller, National Science Foundation.

(PhysOrg.com) -- Acting as a microscope for sound, a new device called a micro-ear could make objects on the micro-scale audible. The device could enable scientists to listen to the sounds that cells and bacteria make as they move about, as well as listen to micro-scale events such as how drugs interact with microorganisms.

The micro-ear is being developed by scientists from the University of Glasgow, the University of Oxford, and the National Institute of Medical Research at Mill Hill in the UK. It's based on the same laser technique that is used to create optical tweezers, which measure tiny forces on small scales.

"We are now using the sensitivity afforded by the optical tweezer as a

very sensitive microphone," said Jon Cooper from the University of Glasgow, who is heading the micro-ear project.

While optical tweezers work by suspending tiny electrically-charged beads in a single beam of laser light, the micro-ear concept consists of several of these light beams arranged in a ring in order to surround and eavesdrop on a tiny object. Sound emitted from the object causes the beads suspended in the light to vibrate, and these vibrations can be measured by a high-speed camera.

The scientists have already used the micro-ear to listen to Brownian motion - the random movement of particles in a fluid. They also plan to use the device to listen to bacterial flagella, the tail-like motors that propel bacteria through their environments. Currently, in order to study the movement of flagella, scientists have to genetically engineer bacteria to enable beads to be stuck to their flagella, and observe the beads with a camera. The micro-ear will hopefully make it possible to observe natural bacteria in a non-invasive way.

The micro-ear could also have applications in the medical field. For example, researchers hope to listen to the movement of the human trypanosome parasite, which causes sleeping sickness. By understanding how the parasite moves through human blood, scientists might be able to develop new medicines that stop the bacteria's flagellum.

"It's truly exploratory in that we expect and hope we will hear something interesting, but we really don't know," said physicist Richard Berry of the University of Oxford.

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