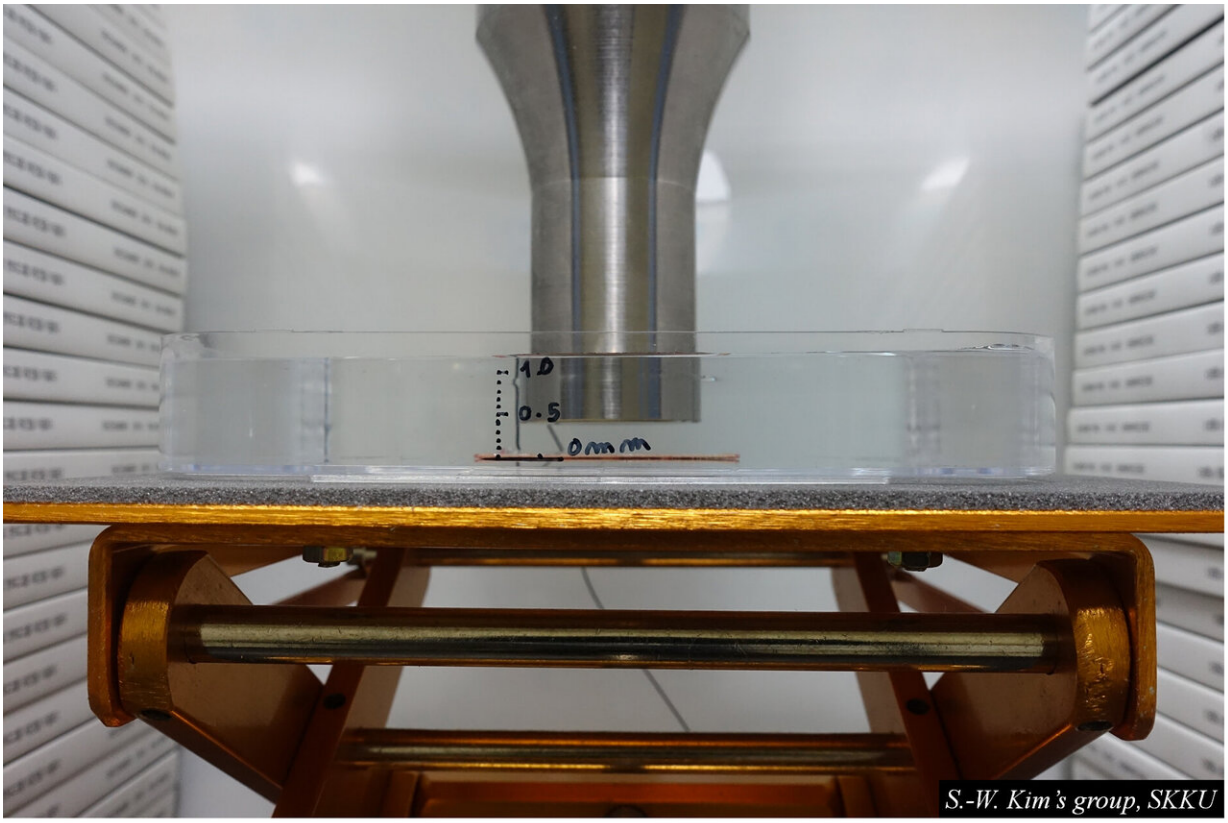
# An implantable device that produces energy using ultrasound

August 2 2019, by Bob Yirka




Ultrasound transmitted to VI-TEG device in water. Credit: Sang-Woo Kim

A team of researchers affiliated with several institutions in the Republic of Korea has developed a type of implantable device that produces energy using an external ultrasound source. In their paper published in

the journal *Science*, the group describes their device, how it was built and how well it worked when tested on animal tissue.

The development of the pacemaker has undoubtedly saved many lives, but it also has risks for patients that have them implanted into their chests. The devices have to be replaced periodically, putting patients at risk of infection—there is also some degree of pain and irritation involved. For that reason, scientists have searched for ways to generate power inside the body, making batteries unnecessary. In this new effort, the researchers have designed a generator that produces power when exposed to an ultrasound source.

The generator designed by the researchers is a type of triboelectric generator. Such generators harvest energy from the triboelectric effect—where contact electrification occurs when two dissimilar objects touch and are then pulled apart—static electricity is an example of the triboelectric effect. The generator used by the team had two squares of material inside of it that were forced together when exposed to ultrasound. When the ultrasound signal was removed, the materials separated and a small amount of electricity was produced and captured in the generator. By repeating the process over and over in rapid succession, a constant stream of electricity was generated. The team also added other components to their device to allow for interfacing with other devices—and they had to make sure it could withstand being implanted into a living creature.

The researchers tested their generator by implanting it into some pig tissue at various depths and then firing ultrasound at it through the skin. They report that at depths of five millimeters, the generator produced electricity with a current up to 156 microamps and up to 2.4 volts. At depths of a centimeter, the generator was able to produce 98 microamps and 1.9 volts. The researchers note that if such a generator could be used to run pacemakers and other implantable devices, patients could be

spared the necessity of having to undergo surgery to have them replaced periodically.

**More information:** Ronan Hinchet et al. Transcutaneous ultrasound energy harvesting using capacitive triboelectric technology, *Science* (2019). DOI: 10.1126/science.aan3997

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