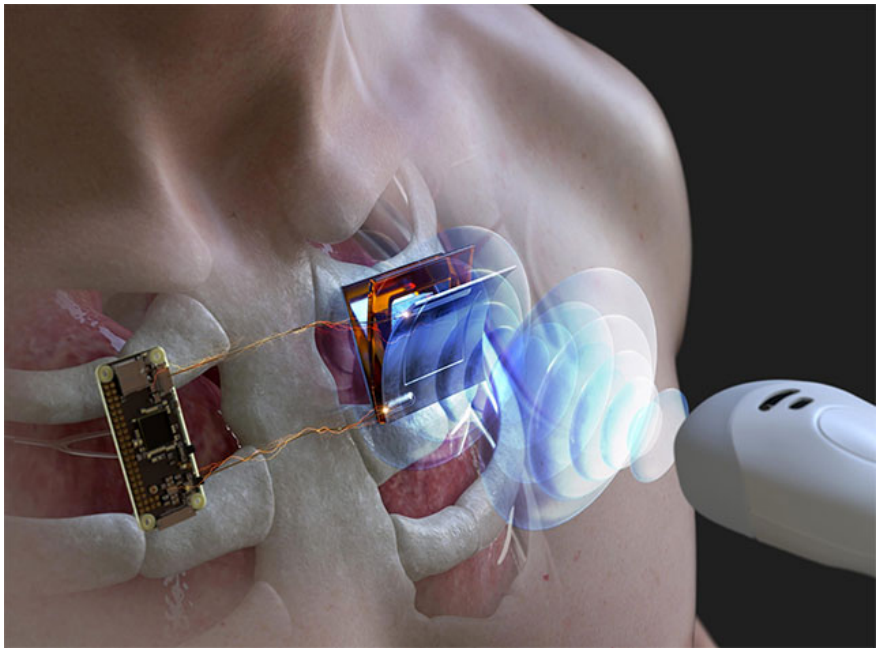
New technology can charge electronic devices underwater and even through the skin

Technology is developing rapidly, more and more electronic devices are compact and modern enough to be used inside the body and underwater.

Technology is advancing rapidly, with more and more electronic devices becoming so small and advanced that they can be used inside the body and underwater. Finding a safe and stable way to power these devices is a major challenge. Common wireless charging methods – such as electromagnetic induction or radio waves (RF) – often do not work well in these types of environments. They only transmit small amounts of power, over short distances, and can cause interference with nearby electronic devices.

To address these issues, researchers from the Korea Institute of Science and Technology (KIST) and Korea University are turning to ultrasound technology. Unlike RF waves, ultrasound waves are less absorbed by human tissue and cause less interference, making them more suitable for charging medical implants and wearable devices.

The team, led by Dr. Sunghoon Hur and Professor Hyun-Cheol Song, built a flexible ultrasound receiver using advanced piezoelectric materials. The receiver remains functional even when bent and can adhere to curved surfaces such as skin. Initial testing showed that it can deliver 20 milliwatts of wireless charging power through 3cm of water and 7 milliwatts through 3cm of skin – enough to power small devices such as underwater sensors or implants in the human body.



The team also showed that the receiver could be used to charge batteries, opening the door to implantable devices with longer lifespans that do not require frequent surgical battery replacements. ' *Through this study, we have demonstrated that ultrasonic wireless power transfer technology can be applied in a practical way. We plan to conduct further research on miniaturization and commercialization to accelerate the practical application of the technology* ,' said Dr Hur.

In parallel, scientists are also working on ultrasound-powered triboelectric nanogenerators (US-TENGs). These devices can deliver energy through the skin without surgery, but they are limited by low power output and stiffness. To improve this, a new version called US-TENGDF-B (Dielectric-Ferroelectric Enhanced Ultrasonic Triboelectric Nanogenerator) has been developed. It uses a special design to generate more energy with softer ultrasound waves and from a greater distance.

The upgraded device outputs about 26 volts and delivers 6.7 milliwatts of power when charging a battery from a distance of 35mm. It remains stable even when bent — useful for curved body parts or implanted devices like artificial hearts. The researchers say US-TENGDF-B is effective for short-term wireless charging deep inside the body, especially in flexible systems.

These new technologies show real potential for safely powering low-power electronics, both underwater and inside the human body. They could help future devices such as pacemakers, neurostimulators, underwater sensors and drones operate longer and more reliably – without needing to be recharged or replaced as often.