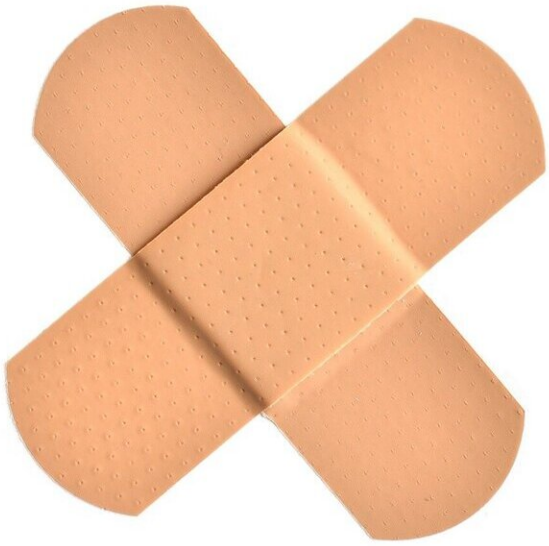
New microrobot with in situ, in vivo bioprinting offers promise for gastric wounds

August 12 2020



Credit: Pixabay/CC0 Public Domain

Researchers in China have taken the first step towards a new way of treating gastric wounds by using a microrobot combined with the new concept of "in situ in vivo bioprinting" to carry out tissue repair inside

the body.

Their study, published today in the IOP Publishing journal *Biofabrication*, establishes proof-of-concept for this new method in the field of bioprinting.

Co- author Professor Tao Xu, from Tsinghua University, Beijing, said: "Gastric wall injury is a common problem in the digestive tract, and about 12 percent of the world's population suffer from it to varying degrees. Bioprinting—delivering new cells directly to the wound site to repair the tissue—offers a potentially very useful way to treat the problem.

"The difficulty is that current bioprinting technology focuses on external sites. Bioprinters are normally quite large, and cannot be applied to inner tissue repair without invasive surgery to give enough room for the printing operation. To overcome this, we developed a microrobot that enters the body via an endoscope to carry out tissue repair inside the body."

The bioprinting platform Professor Xu and the co-author, Professor Xu's Ph.D. student Wenxiang Zhao developed is a Delta robot composed of a fixed base, moving platform and three identical kinematic chains. To be as minimally-invasive as possible, it can fold itself down when entering the patients' body, then unfold before beginning the bioprinting operation.

Mr. Zhao, also from Tsinghua University, said: "We tested the system in two ways. First, with a biological model of a human stomach and an endoscope, to mimic the insertion and printing operation elements of the process. Second, we carried out a bioprinting test in a cell culture dish to test how effective the device was at bioprinting viable cells and repairing wounds.

"Both tests showed promising results. A 10-day cell culture showed that printed cells remained at a high viability and a steady proliferation, which indicated good biological function of the cells in printed tissue scaffolds."

Professor Xu added: "Although only a first step, this study has verified the feasibility of this concept for treatment for gastric wall injuries. More work is needed to bring it to full realisation, including reducing the size of the bioprinting platform and developing bioinks. Our future studies will concentrate on these areas."

More information: Wenxiang Zhao et al, Preliminary engineering for in situ in vivo bioprinting: a novel micro bioprinting platform for in situ in vivo bioprinting at a gastric wound site, *Biofabrication* (2020). DOI: 10.1088/1758-5090/aba4ff

Provided by Institute of Physics