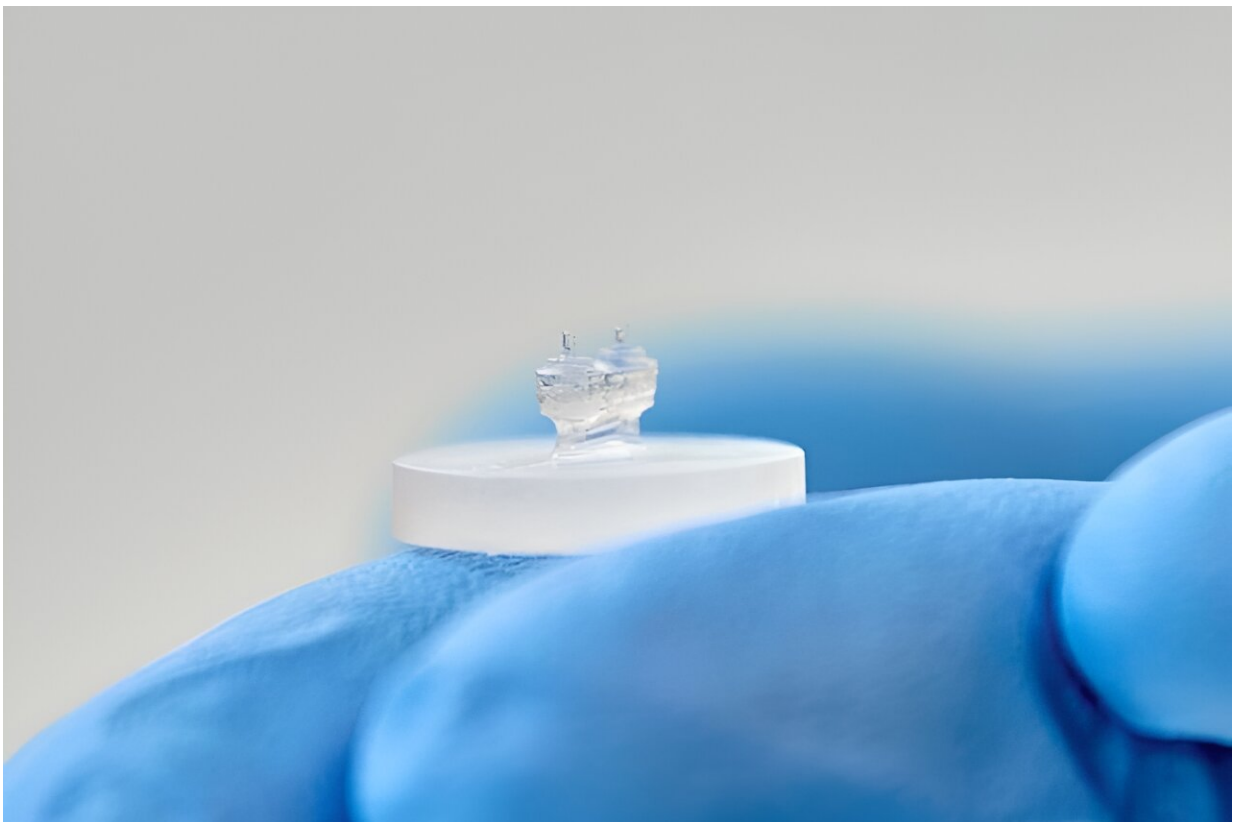


Bioinks with improved electromechanical properties for 3D printing of cardiac BioRings

February 14 2024, by Catherine Goulet-Cloutier



The ring-shaped heart tissues are printed with a bioink containing a patient's stem cells. Credit: Véronique Lavoie, Chu Sainte-Justine

Scientists at the Centre de recherche Azrieli du CHU Sainte-Justine,

affiliated with Université de Montreal, have developed a device that accurately simulates the electrical activity, mechanics and physiology of a human heart.

Dubbed a "heart on a [chip](#)," it's been 3D-bioprinted using a bioink and promises to aid in better understanding the specific nature of individual cases of heart disease, as well as develop new treatments and accurately assess their efficacy in an automated, high-throughput manner.

Developed by a team led by UdeM pharmacology professor Houman Savoji and doctoral student Ali Mousavi, the [device](#) and its bioink are described in [a study](#) published in the journal *Applied Materials Today*.

Since the heart is a vital organ, its activity can't be directly analyzed "live" at the [cellular level](#). Hence the usefulness of the "heart on a chip," a sort of ring-shaped tissue made up of the patient's own cells, mimicking as closely as possible the complexity of the human heart.

These devices are usually produced individually in laboratories in a non-standardized way.

"Our research has made it possible to combine 3D bioprinting technology to produce standard hearts-on-a-chip much more quickly and precisely," said Savoji. "What's more, our results show that printed devices perform better than those produced manually."

The ring-shaped heart tissues are printed with a bioink containing a patient's stem cells.

"We've formulated a [bioink](#) that best reproduces the properties of the heart, such as elasticity and [electrical conductivity](#), and has suitable properties required for 3D bioprinting," said Mousavi, the study's first author, who's doing his Ph.D. at the Institute of Biomedical Engineering.

The device opens up new prospects for the identification of new drugs, he added.

"The next step will be to compare healthy and diseased heart cells to develop solid cardiac pathology models. That will also let us safely and accurately test the effect of new therapeutic molecules on cells."

The ultimate goal is to be able to use the cells of cardiac patients to model their [heart disease](#) and validate the efficacy of treatments available for their condition—a big step toward personalized medicine.

More information: Ali Mousavi et al, Development of photocrosslinkable bioinks with improved electromechanical properties for 3D bioprinting of cardiac BioRings, *Applied Materials Today* (2023). [DOI: 10.1016/j.apmt.2023.102035](https://doi.org/10.1016/j.apmt.2023.102035)

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