Exploiting 3D bioprinting for safer packaging: Health, tech and education

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Impact in a nutshell

My research aims to improve the safety of food packaging by developing 3D-bioprinted liver models that can test how chemicals from packaging materials might affect our health.

Many everyday food products are contained in packaging that can release small amounts of chemical compounds that we might ingest. My work uses cutting-edge 3D printing technology to create realistic liver models that can better simulate how our bodies would react to these chemicals. This research could lead to safer packaging materials and help prevent harmful health effects before products reach the market.

Research details

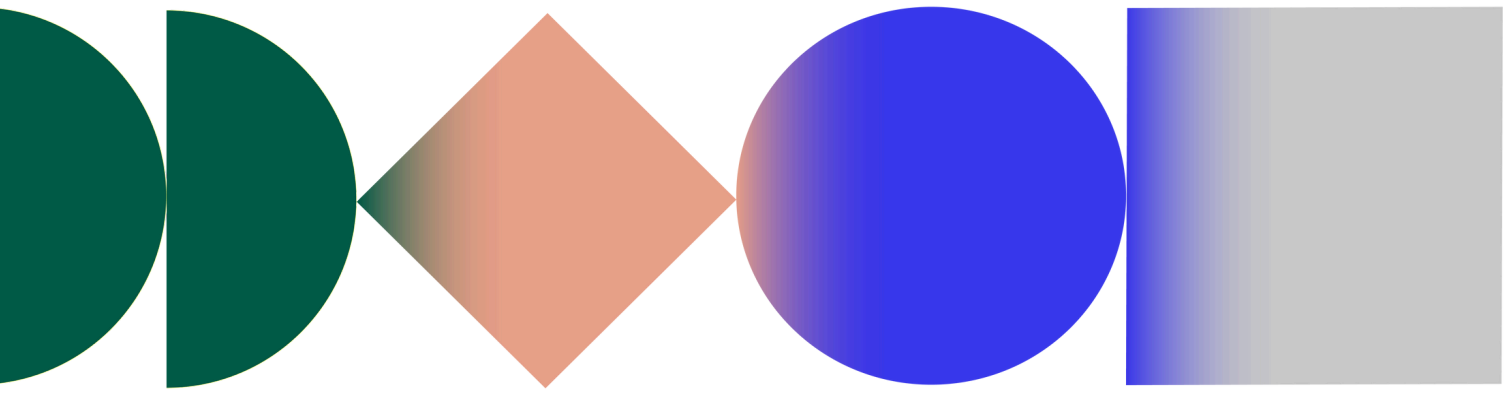
My research focuses on advancing 3D bioprinting technology to develop realistic liver models.

The initial phase involved developing and refining bioinks. These are specialized inks made from hydrogels, which have properties similar to those of human tissues. I focused on creating bioinks that closely mimic the mechanical and biochemical properties of liver tissue. This involved experimenting with different formulations, including interpenetrating polymeric networks, hydrogels of different nature topologically interlocked in a unique microarchitecture, coupled with hepatic cells.

The next phase involved using the bioinks to create 3D liver models. This required developing CAD (Computer-Aided Design) models that accurately represent the structure and function of liver tissue. These models were then printed using advanced 3D bioprinters. This phase also involved conducting preliminary tests on the printed models to assess their functionality and stability, including how well they could mimic the liver's ability to process and detoxify chemicals.

Finally, stability studies under dynamic conditions were also conducted. This step is believed to further increase the affinity of the developed models to the human tissue.

The 3D-printed liver models effectively simulated liver functions, including the processing and detoxification of chemicals, making them valuable tools for toxicity screening.



What is or will be the impact of your research?

This research not only advances the field of 3D bioprinting and toxicity testing but also has significant implications for public health and safety.

Traditional methods of testing chemical safety are often time-consuming, costly, and may not fully replicate how these substances interact with human tissues. By providing a more accurate method for testing the safety of food packaging materials, this work can help prevent harmful chemicals from reaching consumers. Environmentally, safer food packaging reduces the risk of chemical pollution, contributing to healthier ecosystems. By improving the safety of food packaging, manufacturers can avoid costly recalls and liability issues associated with harmful products.