Could 3-D Printing Transform Liver Transplantation?

Scientists say they have developed a new 3-D printing technique that can produce viable organ tissues.

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A new 3-D printing technique could one day create working models of organs like lungs and livers for people in need of transplants, potentially revolutionizing the way we source and distribute donated organs for sick patients, a new story in Scientific American reports.

Every day, an average of 18 people die waiting for an organ transplant in the United States. Meanwhile, viable donated organs are hard to come by in hospitals across the country—making for a continuous shortage of new hearts, livers, kidneys and more. Scientists have spent the last two decades trying to figure out how to create new organs out of nothing, but so far, nothing has panned out.

However, in a promising new study published in Science, research teams from the University of Washington in Seattle and Rice University in Texas say they produced functional tissue models using a 3-D printing technique known as projection stereolithography. After growing a polymer "scaffolding," they attempted to implant live cells into the molds, with the aim of making an artificial organ able to function like a human lung or liver. According to the scientists, their latest implanted cells survived, and the organ tissue performed some of the functions of the real thing.

So why is this such a big deal? Although researchers have 3-D–printed tissues before, they have been unable to keep cells alive long enough to test their functionality. But the fake lung tissue the research team created kept red blood cells alive while exchanging oxygen in a recreated air sac. The team's liver tissue model, which was infused with specialized liver cells known as hepatocytes, survived in living mice.

Study authors, caution, though, that bioprinted organs are a long way off and much remains to be resolved before real-life transplants begin. For one, they still need to figure out which protein works best for their scaffolding and whether growth factors should be added to help speed the process. Then there is the question of how best to build the organs and how much printed material could realistically replace human tissue.

"Those are questions that this new leap in tech enables us to ask for the first time, said paper

coauthor Kelly Stevens, PhD, an assistant professor in the University of Washington's bioengineering and pathology departments. "Now we can start methodically varying these factors to see which are more important—and asking how this affects the functions of cells."

To foster expansion on their research, the researchers made their technology open-source, meaning others can use it to develop and test their own 3-D–printed organ applications.

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