



3D Human Liver Reconstruction Reveals Changes in Cirrhosis

A new 3D reconstruction of human liver tissue shows the organ's complex internal architecture at a cellular level.

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At a Glance

- A new 3D reconstruction of human liver tissue shows the organ's complex internal architecture at a cellular level.
- The reconstruction illustrates how changes in the liver's internal structure may be linked to liver disease.

The human liver helps people stay healthy in many ways. It helps filter blood and waste, process and store nutrients, produce blood-clotting proteins, resist infections, and fulfills many other important roles in maintaining the body's functions.

Healthy liver tissue is made up of many basic components, called lobules, that each contain a central vein, blood vessels, bile ducts, and cells. The arrangement of these components within each lobule is critical for the liver to function properly. Advanced liver disease can cause extensive scarring of the liver, called cirrhosis. Cirrhosis affects the liver's internal structure and prevents the liver from functioning properly.

Researchers don't fully understand how the liver changes internally during cirrhosis. Current models for studying the liver's structure are mostly flat, 2D cultures. These don't show the organ's complex internal 3D structure or how it changes during liver diseases.

An NIH-funded research team led by Dr. Kelly Stevens of the University of Washington developed a new 3D reconstruction of the human liver that shows its structure down to a cellular level. Created using a method called the LiverMap pipeline, the reconstruction can help researchers learn how the liver changes internally in liver disease and identify new treatments. The results were published in [Science Advances](#) on February 18, 2026.

The researchers obtained samples of healthy liver tissue from six patients who had tumors

removed from their livers. Cirrhotic liver tissue was obtained from three patients who received liver transplants. The researchers treated sections of tissue with fluorescent antibodies to identify different cell types. They also applied a chemical treatment to turn the tissue sections transparent.

The sections were then imaged under a microscope. Computer software created 3D reconstructions based on the images. The 3D reconstructions showed how the lobules are structured and the arrangement of veins and arteries at a cellular level.

The approach revealed architectural changes that occur during cirrhosis. Cells and blood vessels were rearranged across several lobules. Cirrhotic tissue had fewer cells making a key liver enzyme. It also had fewer central veins than healthy liver tissue. The network of ducts that transport bile, a substance that aids digestion, became more fragmented as well.

The LiverMap pipeline represents a significant advance over prior imaging studies. But it doesn't capture the full depth of a human liver lobule. Future research will be needed to create a complete lobule reconstruction. Additional research also could show how structural changes in the liver evolve as cirrhosis progresses.

The researchers hope that 3D organ maps will eventually allow them to use 3D printers to build living tissues for transplantation. "We don't yet have the 'blueprints' of human organs to feed into bioprinters," Stevens explains. "If the maps aren't right, the organs produced will not be functional."

This [research summary](#) was published by the National Institutes of Health on March 10, 2026.