

# Gut Microbiome Aids Liver Repair in Mice

Disturbed gut bacteria may contribute to slower tissue regeneration after liver surgery or other injury.

May 8, 2023 By [Sukanya Charuchandra](#)

---

Liver regeneration following surgery is influenced by gut microbes in mice, according to a study published in the [Journal of Hepatology](#). If confirmed in humans, these findings could help guide physicians treating people after liver surgery or with other liver types of liver injury.

The liver [has a unique capacity to regenerate](#) and repair itself after injury, which can be caused by viral hepatitis, [fatty liver disease](#), toxins, surgery or other causes. In order to grow and multiply, liver cells require short-chain fatty acids, which are products of gut microbe metabolism.

“Liver cells need these fatty acids to grow and divide,” lead study author Klaus-Peter Janssen, PhD, of the Technical University of Munich, said in a [press release](#). “We have now succeeded in showing for the first time that gut bacteria influence the lipid metabolism in liver cells, and therefore their ability to regenerate.”

Janssen and his team explored the effect of gut microbes on lipid metabolism and liver repair in mice that had a small section of their liver surgically removed. In some mice, they used antibiotics to disrupt the gut microbiome. They also analyzed laboratory mouse strains born without gut microbes.

“Antibiotics do not kill all gut bacteria,” said coauthor Anna Sichler, a PhD student. “However, the medication changes the composition of the microbiome: The remaining bacteria species produce far fewer short-chain fatty acids.”

Mice with a poor gut microbiome experienced liver regeneration at a slower pace, while those with no gut microbes had no liver regeneration. Mice with slower liver repair had a higher mortality rate. Eventually, the gut microbiome flourished again in the first group of mice once the antibiotics wore off.

When the researchers provided the second group of mice with a specific “starter set” of microbes to establish a gut microbiome for the first time, the mice were able to produce lipids, grow new liver cells, regenerate their liver and survive after surgery.

Next, the team used mini livers, or organoids made of mouse liver cells, to observe how short-chain fatty acids contribute to liver cell formation. They found that low levels of these fatty acids, which are needed to form cell membranes, led to poor liver cell growth. What's more, the enzyme needed to catalyze this process in mice, known as SCD1, is also present in human liver cells and functions during regeneration of human liver tissue.

While these findings are preclinical, they might have a greater impact in the future. For instance, doctors could take into account the make-up of the gut microbiome when helping people recover after surgery or other liver injury. It might also be possible to promote liver recovery with diet changes.

"It is important to bear in mind that the role of gut bacteria in our bodies is highly complex. We have a long way to go before we fully understand it," Janssen said. "However, our results could be used for new research into which microbiome compositions offer better conditions for liver regeneration. Physicians could then examine patients' gut bacteria to determine whether conditions are favorable for surgery or whether it is better to wait for the microbiome to recover. And conversely, physicians might also be able to examine the microbiome through stool samples to determine how well the liver is regenerating after an operation."

Click here to read the study in the [Journal of Hepatology](#).