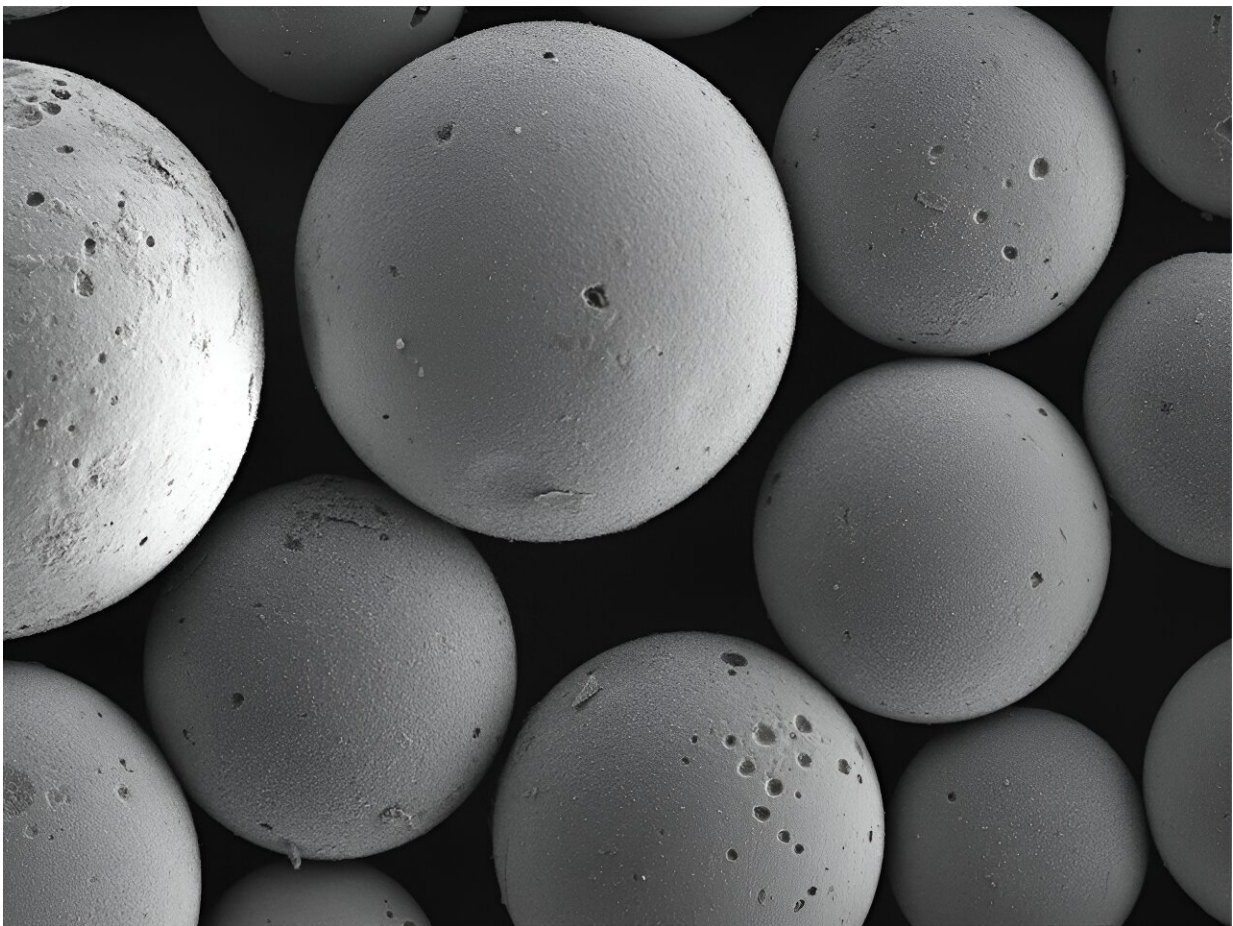


Carbon beads help restore healthy gut microbiome and reduce liver disease progression, researchers find

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CARBALIVE beads viewed with a scanning electron microscope. Credit: University of Brighton/Yaqrit

Innovative carbon beads, invented by researchers at UCL, reduce bad bacteria and inflammation in animal models, which are linked to liver cirrhosis and other serious health issues.

The study, published in *Gut*, found that the carbon [beads](#), licensed to UCL-spinout Yaqrit, were effective in restoring gut health and had a positive impact on liver, kidney and brain function in rats and mice. They were also found to be safe for human use.

The next step will be to see if the same benefits can be realized in humans, which would pave the way for them to be used to treat diseases linked to poor gut health.

Worldwide, it is estimated that there are around 100 million people living with cirrhosis of the liver and 10 million who have cirrhosis plus an additional complication.

Explaining the current clinical challenges, senior author Professor Rajiv Jalan from the UCL Institute for Liver and Digestive Health, said, "The influence of the gut microbiome on health is only just beginning to be fully appreciated. When the balance of the microbiome is upset, 'bad' bacteria can proliferate and out-compete the 'good' bacteria that keeps the gut healthy.

"One of the ways they do this is by excreting endotoxin, toxic metabolites and cytokines that transform the gut environment to make it more favorable to them and hostile to good bacteria. These substances, particularly endotoxin, can trigger gut inflammation and increase the leakiness of the gut wall, resulting in damage to other organs such as the liver, kidneys and brain.

"In cirrhosis, a condition characterized by scarring of the liver, it is known that inflammation caused by endotoxins can exacerbate [liver](#)

[damage](#). Part of the standard treatment for cirrhosis is antibiotics aimed at controlling [bad bacteria](#), but this comes with the risk of antibiotic resistance and is only used in late-stage disease."

To overcome this, scientists at UCL, in collaboration with Yaqrit, developed tiny oral carbon beads, that have a special microscopic physical structure designed to adsorb both large and small molecules in the gut.

In the study, researchers from UCL tested the effectiveness of the carbon beads, known by the product name CARBALIVE, to restore gut health and assessed the impact on liver, kidney and brain function in rats and mice.

They found that when ingested every day for several weeks, the beads were effective in preventing the progress of liver scarring and injury in animals with cirrhosis, and reduced mortality in animals with acute-on-chronic-liver-failure (ACLF).

The beads were also tested on 28 cirrhosis patients and proved to be safe with negligible side effects. If the same benefits observed in animal models occur in humans, the beads could be an important new tool to help tackle liver disease.

Michal Kowalski, a Vice President and the CARBALIVE product lead at Yaqrit, said, "These novel, engineered carbon beads, which are swallowed and pass through the body unaltered, are smaller than a grain of salt.

"They work by absorbing the endotoxins and other metabolites produced by 'bad' bacteria in the gut, creating a better environment for the good bacteria to flourish and helping to restore microbiome health. This prevents these toxins from leaching into other areas of the body and

causing damage, as they do in cirrhosis.

"The results in animal models are very positive, with reduction in gut permeability, liver injury, as well as brain and kidney dysfunction."

The results open the door for further trials to test the efficacy of the carbon beads in humans, one of which is due to start soon. If the beads are proven to be effective at halting or slowing the progression of liver damage, they could be an invaluable tool for treating liver disease and possibly other conditions associated with poor microbiome health.

Professor Jalan, a Professor of Hepatology at UCL and consultant at the Royal Free Hospital, added, "I have high hopes that the positive impact of these carbon beads in animal models will be seen in humans, which is exciting not just for the treatment of liver disease but potentially any health condition that is caused or exacerbated by a gut microbiome that doesn't work as it should. This might include conditions such as [irritable bowel syndrome](#), for example, which is on the rise in many countries.

"The study is another milestone in a journey that began at UCL and has evolved into our spin-out Yaqrit, thanks to grant funding from the European Union's Horizon 2020 research and innovation program. This has allowed us to build a factory to manufacture the beads and enabled discovery research into their potential uses. I'm optimistic that this journey will end with these beads being approved to help treat liver disease and other conditions within the next few years."

More information: Jinxia Lui et al. Clinical, experimental and pathophysiological effects of Yaq-001: a non-absorbable, gut-restricted adsorbent in models and patients with cirrhosis, *Gut* (2024). [DOI: 10.1136/gutjnl-2023-330699](https://doi.org/10.1136/gutjnl-2023-330699)

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