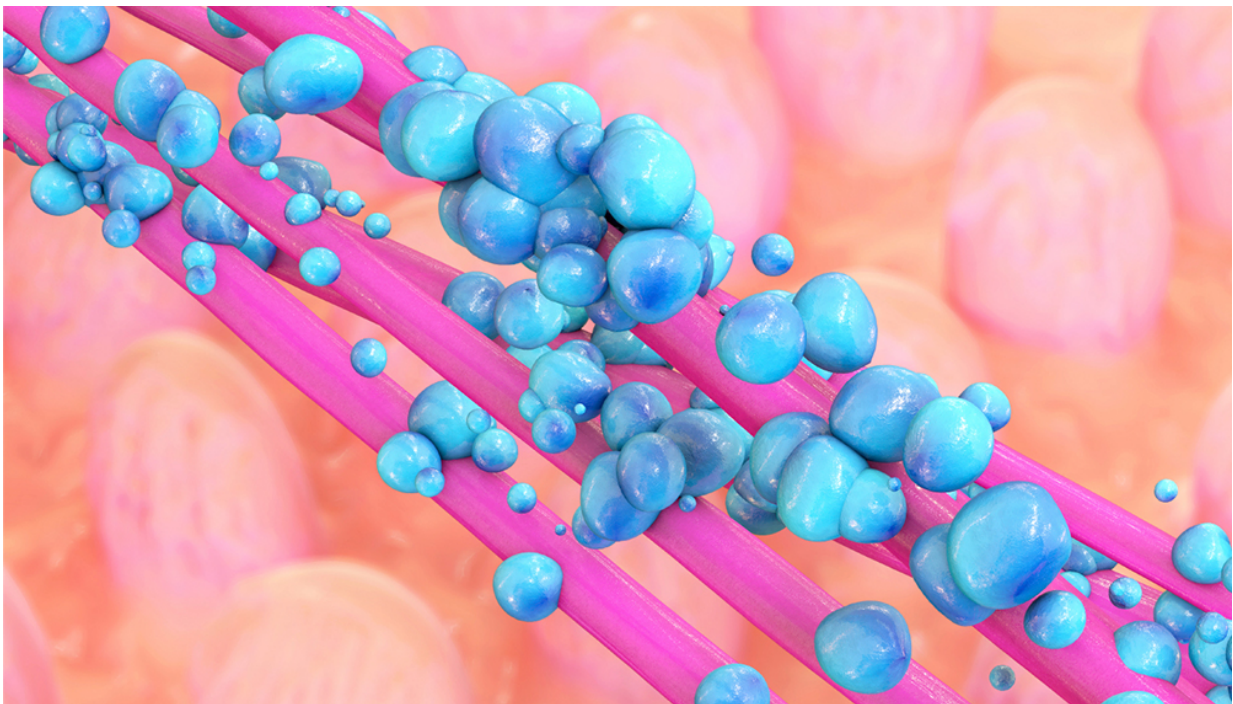


Minimally invasive colitis screening using infrared technology could offer fast, simple test

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Credit: Georgia State University

A minimally invasive screening for ulcerative colitis, a debilitating gastrointestinal tract disorder, using emerging infrared technology could be a rapid and cost-effective method for detecting disease that eliminates the need for biopsies and intrusive testing of the human body,

according to researchers at Georgia State University.

The technique involves testing serum, the clear liquid that can be separated from clotted blood, for the increased presence of mannose, a sugar that is a marker for [colitis](#), using Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy. This technology is sensitive to vibrations in the chemical bonds of the serum sample's molecules and requires minimal sample preparation, making it a rapid diagnostic alternative.

The findings are published in the *Journal of Biophotonics*.

"We found that ATR-FTIR spectroscopy is an effective tool for detecting colitis in the serum of mice," said Unil Perera, a Regents' Professor of Physics and researcher in the Center for Nano-Optics at Georgia State. "This rapid, simple, cost-effective and minimally invasive technique could be further developed into a personalized diagnostic tool that would assess disease status based on an individual's molecular composition and allow for personalized diagnosis and drug management. Perhaps this technology could be integrated into a portable device, such as the glucometer used by patients with diabetes."

Inflammatory bowel diseases, which include ulcerative colitis and Crohn's disease, involve chronic inflammation of all or part of the digestive tract and can lead to life-threatening complications such as colorectal cancer. Assessing this inflammation remains a challenge, and clinical diagnosis is now achieved by colonoscopy, which uses an endoscope or flexible tube with a light and camera attached to examine the [digestive tract](#). This technique is not ideal for an annual checkup or monitoring disease activity regularly because it's expensive, invasive and requires sedation.

As a result, "there is a need for a simple, inexpensive and low-risk

diagnostic tool for inflammatory bowel diseases," said Didier Merlin, professor in the Institute of Biomedical Sciences at Georgia State and a researcher at the Atlanta Veterans Affairs Medical Center. "Infrared spectroscopy has greatly enhanced clinical medicine in the last two decades and shows promise as a solution."

In the study, mice in two categories were tested for colitis using ATR-FTIR spectroscopy. The first group was mice with targeted deletion of the interleukin 10 (IL10) gene, known as interleukin 10 knockout (IL10^{-/-}) mice, which develop colitis through T helper immune cells. Disease in IL10^{-/-} mice closely resembles the physiological, histological and biochemical features of chronic colitis in humans. In the second group of mice, colitis was induced by administering Dextran Sodium Sulphate. Colitis in these mice is similar to [ulcerative colitis](#) in humans. In both groups, feces and blood samples were collected and tested. Mice in control groups were also tested.

The researchers found ATR-FTIR spectroscopy is an effective tool for detecting colitis in [mice](#) serum, showing a significant increase in the levels of mannose, an indicator of colitis. The Georgia State University Research Foundation has filed a provisional patent for the screening technique.

More information: Jitto Titus et al. Minimally invasive screening for colitis using attenuated total internal reflectance fourier transform infrared spectroscopy, *Journal of Biophotonics* (2016). [DOI: 10.1002/jbio.201600041](#)

Provided by Georgia State University

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