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Are you drinking microplastic? A new device can tell you

Story by Andrei Ionescu • 4d • 3 min read

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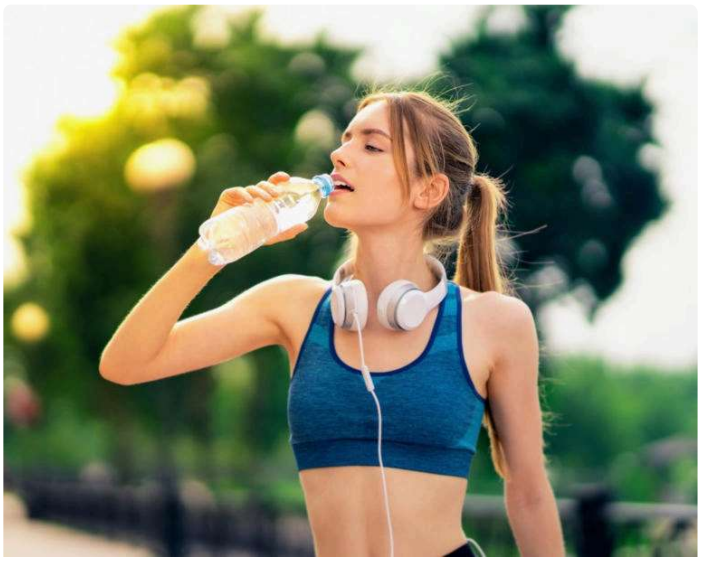

Are you drinking microplastic? A new device can tell you

Microplastics have infiltrated our food, water, and even the air we breathe, and they are increasingly being found in our bodies, from testicular tissue to brain matter.

In response to this growing concern, researchers at the University of British Columbia have developed an affordable, portable device that can accurately measure the microplastic particles released from everyday items like disposable cups and water bottles.

Microplastic detection devices

"The accumulation of micro/nanoplastics (MNPs) in ecosystems poses tremendous environmental risks for terrestrial and aquatic organisms. Designing rapid, field-deployable, and sensitive devices for assessing the potential risks of MNPs pollution is critical," noted the study authors.

'However, current techniques for MNPs detection have limited effectiveness. Here, we design a wireless portable device that allows

from 50 nanometers to 10 microns – far too small to be seen with the naked eye. The results are provided within minutes.

Nanoplastics and human health concerns

"The breakdown of larger plastic pieces into microplastics and nanoplastics presents significant threats to food systems, ecosystems, and human health," said Tianxi Yang, an assistant professor in the Faculty of Land and Food Systems, who developed the tool. "This new technique allows quick, cheap detection of these plastics, which could help protect our health and ecosystems."

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Nano- and microplastics are the result of degrading plastic materials like lunchboxes, cups, and utensils. Due to their tiny size and large surface area, nanoplastics are particularly concerning for human health because they can more easily absorb toxins and penetrate biological barriers within the human body.

Fast microplastic detection device

Detecting these tiny plastic particles traditionally requires specialized skills and expensive equipment. Yang's team aimed to make detection faster, more accessible, and more reliable.

They created a compact, biodegradable, 3D-printed device that includes a wireless digital microscope, a green LED light, and an excitation filter. To measure the plastic particles, they customized MATLAB software with machine-learning algorithms and combined it with image capture software.

The result is a portable tool that works with a smartphone or other mobile devices to detect the presence of plastic particles in a sample. The tool requires only a tiny liquid sample - less than a drop of water - and makes the plastic particles fluoresce under the green LED light in the microscope, allowing them to be visualized and measured.

The results are easy to interpret, whether by a technician in a food processing lab or by someone curious about the microplastic content in their coffee cup.

Focus of the research

For their study, the scientists tested disposable polystyrene cups by filling them with 50 mL of distilled, boiling water and allowing it to cool for 30 minutes.

The results showed that these cups released hundreds of millions of nano-sized plastic particles, each roughly one-hundredth the width of a human hair or smaller.

"Once the microscope in the box captures the fluorescent image, the app matches the image's pixel area with the number of plastics," explained co-author Haoming (Peter) Yang, a master's student in the Faculty of Land and Food Systems. "The readout shows if plastics are present and how much. Each test costs only 1.5 cents."

The device is currently calibrated to measure polystyrene, but the machine-learning algorithm can be adjusted to detect other types of plastics, such as polyethylene or polypropylene.

Broader implications of the study

The researchers' next goal is to commercialize the device and expand its use to analyze microplastics in various real-world applications.

The long-term effects of ingesting plastic from food, beverages, and airborne particles are still being studied, but early findings indicate cause for concern.

"To reduce plastic ingestion, it is important to consider avoiding petroleum-based plastic products by opting for alternatives like glass or stainless steel for food containers," said Yang.

"The development of biodegradable packaging materials is also important for replacing traditional plastics and moving towards a more sustainable world."

The development and findings of this tool are detailed in the journal *ACS Sensors*.

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