

Self-injecting pill allows for oral administration of monoclonal antibodies and other injected drugs

August 30 2021



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Many people suffering from diseases like Crohn's disease, rheumatoid arthritis, and diabetes inject themselves or have to receive drug infusions

to help treat their disease. These injections require training, equipment and often take a toll on one's life. But what if you could take monoclonal antibodies, insulin and other injectables as a pill? A study by investigators at Brigham and Women's Hospital, Massachusetts Institute of Technology and Novo Nordisk unveils a new type of self-injecting capsule, called the liquid-injecting self-orienting millimeter-scale applicator (L-SOMA) that administers typically injected liquid medications orally. In large animal preclinical models, investigators used this technology to deliver four commonly injected medications, including a monoclonal antibody. Findings are published in *Nature Biotechnology*.

"We recognize today that pills are the preferred route of drug administration, not only for patients, but also for health care providers. If we can make it easier for patients to receive their medication, we can help maximize drug adherence or compliance," said C. Giovanni Traverso, MB, BChir, Ph.D., of the Division of Gastroenterology, Hepatology and Endoscopy at the Brigham and the Department of Mechanical Engineering at MIT. "Our group focuses on developing systems that make it easier for patients to receive their medications."

The researchers designed the L-SOMA so that it can be loaded with up to 4 mg doses of a desired medication. The pill contains a retractable needle that injects the treatment directly into tissue within the stomach. After the L-SOMA delivers the drug, the needle retracts back into the capsule. Traverso and colleagues based the L-SOMA on their initial invention, the SOMA, which injects solid medications but does not work with liquid drugs. This innovation expands upon the developed technology by enabling the device to work with [liquid medications](#) that need to be absorbed more quickly or are challenging to formulate as solids.

To evaluate the pill's efficacy, researchers tested the L-SOMA devices in

pigs, dosing each one with one of four treatments, including insulin, epinephrine, adalimumab (a monoclonal antibody used to treat [rheumatoid arthritis](#), Crohn's disease and other autoimmune diseases) and a semaglutide-like GLP-1 analog (an anti-diabetic [medication](#)). They then collected [blood samples](#) from each of the animals and found that the L-SOMA pill delivered medications at comparable levels to those given with an injection. They also found that repeated treatments with the L-SOMA dosed with insulin induced the same results, suggesting it may be effective to give multiple, subsequent doses using L-SOMA.

Going forward, researchers aim to test this technology in humans. They anticipate that in the future, patients may be able to orally take a diverse array of medications that were once only available via needle.

Additionally, because of the L-SOMA's injectable nature, scientists believe that it has the potential to administer vaccines, including the COVID-19 vaccine as well as potentially others. Traverso and his collaborators continue to explore what's possible with this device.

"Through the application of fundamental engineering, the type of drugs we can deliver orally is being transformed. It changes how we think about managing different conditions," Traverso said. "This [technological advancement](#) could apply to chronic conditions that require regular dosing or to systems that are more episodic. Mass administration of an otherwise injectable [drug](#) also becomes much easier if it can be given orally."

More information: Oral delivery of systemic monoclonal antibodies, peptides and small molecules using gastric auto-injectors, *Nature Biotechnology* (2021). [DOI: 10.1038/s41587-021-01024-0](https://doi.org/10.1038/s41587-021-01024-0) , www.nature.com/articles/s41587-021-01024-0

Provided by Brigham and Women's Hospital

Citation: Self-injecting pill allows for oral administration of monoclonal antibodies and other injected drugs (2021, August 30) retrieved 23 April 2024 from

<https://phys.org/news/2021-08-self-injecting-pill-oral-administration-monoclonal.html>

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