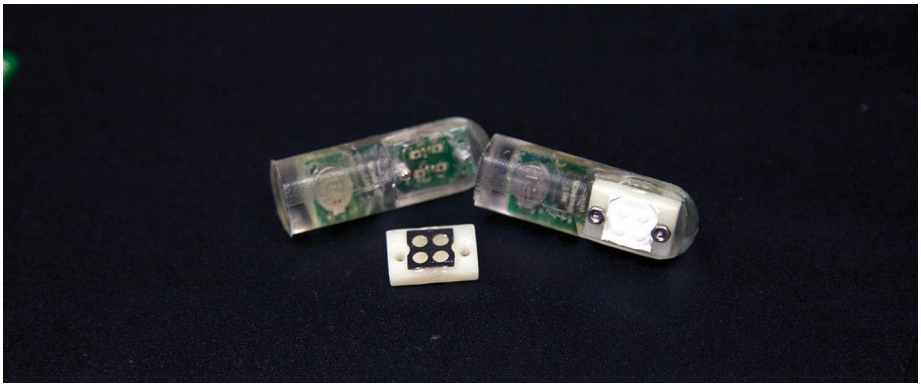
INGESTIBLE ELECTRONICS

Better sensing with bacteria

Science **360**, 915–918 (2018)



Credit: Melanie Gonick/MIT

Ingestible sensors — small electronic devices that can be swallowed and then provide readings from inside the body — could be a useful tool in the assessment and treatment of medical conditions. Devices have already been developed that can, for example, measure pH levels or different gases in the gut. However, the biochemical sensing capabilities of the devices are still relatively limited. Anantha Chandrakasan, Timothy Lu and colleagues now show that by combining low-power microelectronics with biosensing bacteria, ingestible sensors can be created that can detect gastrointestinal biomolecules.

The researchers — who are based at Massachusetts Institute of Technology, MassGeneral Hospital for Children in Boston, Harvard Medical School, and Brigham and Women's Hospital in Boston — used genetically engineered bacteria that can detect heme, a component of red blood cells. The bacteria are enclosed within wells that are part of a larger sensor capsule. One side of the wells is connected to readout electronics, while the other has a semipermeable membrane that allows small biomolecules to diffuse through. In the presence of the targeted biomarker, the bacteria generate light, which can be detected by a photodetector embedded within the electronics. This signal is processed by a detection circuit and can then be wirelessly transmitted to an external device such as a smartphone.

Lu and colleagues illustrate the capabilities of their ingestible sensor by using it to detect gastrointestinal bleeding in pigs. They also show that the device could be adapted to detect a biomarker of gut inflammation.

Owain Vaughan

Published online: 13 July 2018
https://doi.org/10.1038/s41928-018-0111-3