Glucose-powered fuel cell to drive brain implants
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MIT engineers have created a fuel cell that runs on the same sugar that powers human cells—glucose. The fuel cell is intended for use in highly efficient brain implants of the future, helping paralyzed patients move their arms and legs again.

The breakthrough technology has been designed and developed by by Rahul Sarpeshkar, an associate professor of electrical engineering and computer science at MIT.

According to the researchers, the fuel cell strips electrons from glucose molecules to create a small electric current. They fabricated the cell on a silicon chip, allowing it to be integrated with other circuits that would be needed for a brain implant. It is fabricated from silicon, using the same technology used to make semiconductor electronic chips.

The fuel cell has no biological components: It consists of a platinum catalyst that strips electrons from glucose, mimicking the activity of cellular enzymes that break down glucose to generate ATP, the cell's energy currency.

So far, the fuel cell can generate up to hundreds of microwatts—"enough to power an ultra-low-power and clinically useful neural implant."

The researchers said the glucose fuel cell could get all the sugar it needs from the cerebrospinal fluid (CSF) that bathes the brain and protects it from banging into the skull. There are very few cells in the CSF, so it's highly unlikely that an implant located there would provoke an immune response.

There is also significant glucose in the CSF, which does not generally get used by the body. Since only a small fraction of the available power is utilised by the glucose fuel cell, the impact on the brain's function would likely be small.

The technology is yet to be tested on a living animal.

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