Research at MIT has produced a fuel cell that could power small neural implants with the same source of energy as the brain itself: glucose. Engineers created a fuel cell that breaks down the ubiquitous sugar molecule much the same way as the body does, and it could enable a new generation of self-sustaining medical devices.

Glucose is one of the main fuels used by the body and especially the brain, so the idea of using it to power implants isn't new; in fact, it goes back as far as the 1970s. But poor energy production or questions of safety have prevented such devices from being put into use. The new system does not rely on enzymes or microorganisms, as earlier ones did, but on a stable solid-state catalyst that produces modest power and (due to its platinum construction) is unlikely to cause an immune response within the body.

The project, led by MIT associate professor Rahul Sarapeshkar, was created with brain implants in mind, with the fuel cell tapping the
glucose-rich cerebrospinal fluid that surrounds the brain and fills its cavities. And it's designed to allow electronics to be connected easily, as the fuel cell is itself embedded on a silicon chip that could easily be modified for different applications.

The power it generates isn't much: up to 180 microwatts per square centimeter at maximum, but only a modest 3.4 microwatts can be counted on for a steady current. That's not nearly enough to power something like a laptop, but the team says that for a tiny implant that only needs to activate a few key cells, it should be sufficient. Sarapeshkar has written an entire book on ultra-low-power bioelectronics, so it's more than an educated guess.

Benjamin Rapoport, who also worked on the project, warns that such devices are still a ways off: "It will be a few more years into the future before you see people with spinal-cord injuries receive such implantable systems in the context of standard medical care." But as a proof of concept, it's a major step forward.

The paper describing the new system was recently published by PLoS One and can be read here.

Devin Coldewey is a contributing writer for msnbc.com. His personal website is coldewey.cc.
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