Bug power makes salt water sweet

It's not often that bacteria make water more drinkable, but a new microbial desalination cell does precisely that. The proof-of-principle system removed 90 per cent of the salt from a seawater-like solution.

"We just wanted to show that it was possible," says Bruce Logan, an electrical engineer at Pennsylvania State University in University Park who helped make the prototype. "We hope that there will be more research going into this and it could lead to a commercial technology," he adds.

Microbial desalination could offer big advantages over the methods currently used to purify seawater, which require enormous pressure to operate, and gobble up huge amounts of energy.

Salt licked

Logan and colleagues at Tsinghua University in Beijing, China, adapted one of these techniques, electrodialysis, in which electricity draws ions from salt water through semipermeable membranes into two chambers – negatively charged chlorine ions in one and positively charged sodium ions into another – leaving the water salt-free.

Logan's team replaced an external source of electricity with a microbial fuel cell, which transforms bacteria into batteries. When the bacteria metabolise nutrients – acetate in this case – they generate protons and electrons. The researchers then used these positive and negative charges to drive desalination by electrodialysis.

The device removed between 88 and 94 per cent of the salt from various salt-water solutions, including one that approximated sea water. This water might still leave you thirsty, but Logan thinks that efficiency can be improved. Furthermore, even with its performance so far, microbial desalination could produce drinking water from brackish waters that contain much less salt than seawater.

"You could also consider this to be a pre-treatment technology for seawater," he says. Using microbial fuel cells to draw most of the salt out of seawater first could make conventional desalination techniques, such as reverse osmosis, more economical.

Cheaper charge

That's not to say that microbial desalination is cheap, at least not now: Logan's team fed the bacteria expensive laboratory-grade acetate.

But the team is working on microbial fuel cells that subsist on waste water. "Instead of spending money to treat waste water, why not get some electricity from it and help to desalinate some water?" he asks.

Lars Angenent, a microbial fuel cell researcher at Cornell University in Ithaca, New York, says that advances in electrode and membrane materials will be key to commercialising microbial desalination and other microbial fuel cell technologies.

"It is possible, but is it economical?" Angenent asks. "I'm sceptical, but after a couple of beers I'm much more positive."


If you would like to reuse any content from New Scientist, either in print or online, please contact the syndication department first for permission. New Scientist does not own rights to photos, but there are a variety of licensing options available for use of articles and graphics we own the copyright to.