

Sandia labs scientist develops armor for cells

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Give a cell a chance, and it will build itself some biological body armor.

That's what Jeff Brinker discovered when he tried putting cells in a liquid full of microscopic living versions of Legos: The cells took the blocks and built themselves fortified homes.

Brinker is a materials science professor at the University of New Mexico and a scientist at Sandia National Laboratories. The goal of his experiment was to make a durable cell that could survive conditions other cells can't - such as in a space vacuum or scanning an electron microscope.

It's important because durable cells can be used to study how diseases work, how life will withstand the dangers of space and could potentially be formed into biological circuit boards that generate their own power, Brinker said.

His work was published this week in the journal Science.

"The original idea that started this was to make a sensor," Brinker said. "We wanted to make a cell-based sensor that could withstand very harsh conditions."

In the sensor, a single cell would change color when exposed to certain things, like environmental contaminants.

Such a sensor could be put on the back of an insect and sent into an area where people are unable to go - like the scene of a nuclear accident or a suspected biological weapons facility - to determine how dangerous it is, Brinker said.

Brinker and his graduate students have been studying ways to protect cells for about the past five years. Work on this and other experiments was funded by the Air Force, Sandia and UNM through about \$500,000 in grants during that time.

The problem, before the discovery, was that typical methods of protecting cells didn't keep them alive for very long. Cells were put in nonliving casings that lasted a few days before drying out, which is not long enough

SMART BOX

The experiment:

Scientist Jeff Brinker put yeast and other cells in a soup of microscopic Legos.

What happened:

The cells built themselves living armor, covered by a nonliving shield

Why it's important:

The cells can live for weeks and withstand harsh conditions - which will enable biological studies that weren't possible in the past.

What's next:

The process works with yeast, bacteria and reptile cells. Next up is to try it with mammal, and perhaps human cells.

to have them at the ready for use as sensors, Brinker said.

But when Brinker tried putting the cells in a solution of lipids - a living type of Lego block - and silica - a nonliving block - the cells took control of those materials and built themselves strong biological shells that can keep them moist and healthy for weeks.

"It doesn't dry out, doesn't crack," he said. "If you don't have the lipids there the cells just die."

The shell of living material - which is then surrounded by the rest of the nonliving silica - is so strong that it might be able to survive in a space vacuum. Some of the cells were sent up to the International Space Station on the recent Discovery mission to test that idea.

"If they withstand space conditions, you could send them to a place like Mars to see how organisms from Earth handle conditions on another planet," Brinker said.

It might be wise to check Mars with the cell-based sensors before sending human astronauts, in case the planet holds some unknown toxins that kill Earth-based life, he added.

The cells can also be organized and printed out on a piece of paper to make arrays of self-powered biological circuit boards.

One benefit of the cells is their size, far too small for the eye to see and nearly weightless, said Helen Baca, a graduate student working with Brinker. That makes it easy to put a lot of them together and send them into space, she said.

"It's not something you can see, but it has a wide range of potential," she said. "You can put them in packages that are cheap and light-weight."

Arrays of cells could be used to study how diseases work and how they initially attack cell surfaces, Brinker said.

Biological study of cells has been difficult because they die easily, especially under a scanning electron microscope. The protected cells don't die when hit by electrons, so it's possible to study more thoroughly what happens as a toxin or disease moves through a cell, he said.

"When diseases start, they start on the surface of a cell," Brinker said.

"Listening in on this can tell us more about how disease works - and how types of drug therapy will work to fight those diseases."