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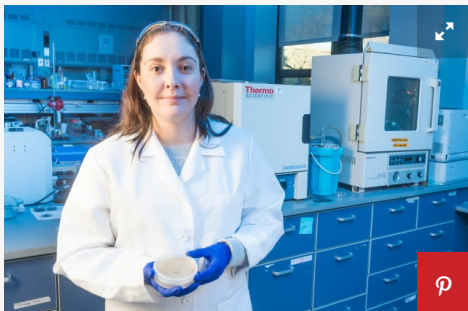
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Could Soldiers Wear an Anthrax-Proof "Second Skin"?

Army researchers are working on it.

By Eric Tegler Feb 15, 2016

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Paola D'Angelo, a research bioengineer at the U.S. Army Natick Soldier Research, Development and Engineering Center, is working on second-skin, chemical-biological protection.

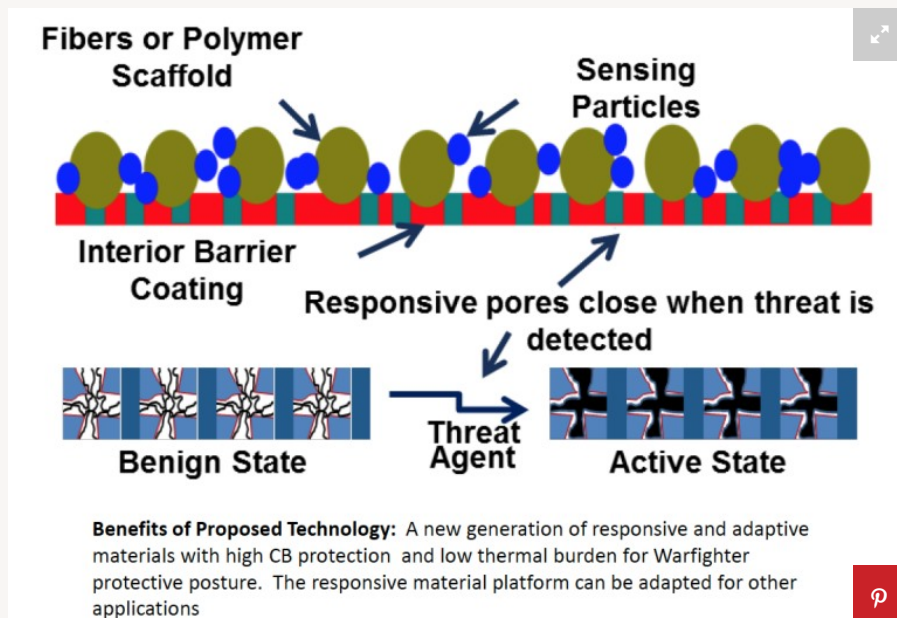
US Army

If you're an American soldier or adviser in Iraq, where ISIS is known to have captured chemical warfare agents, then you have little choice but to don your Joint Service Lightweight Integrated Suit Technology (JSLIST) gear that protects you from chemical, biological, radioactive and other weapons. JSLIST, which includes a hood, suspenders, high-waist pants, and waist length jacket, is designed to be worn over a soldiers' uniform. It's effective. But it's bulky.

What if instead of putting all those pieces on over a uniform, soldiers could put on a protective layer of lightweight undergarments (essentially anti-anthrax underwear), throw on the uniform, and be protected and ready to go? The Army and researchers from MIT, the University of California, Santa Barbara, and

the Air Force Civil Engineering Center are working on such a "second skin" concept.

The second skin is a protective fabric engineered with a textile substrate. The design uses responsive polymer gels, including organohydrogels and functional chemical species such as catalysts, according to Ramanathan Nagarajan, senior research scientist for Soldier Nanomaterials at the Army's Natick Soldier Research, Development and Engineering Center in Massachusetts (NSRDEC). Thanks to all those fancy materials, the fabric will be able to sense chemical and biological agents, which will trigger a swelling response within the gels.



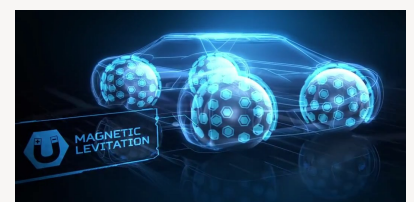
US Army

"The response will close the pores of the textile," Nagarajan says, "keeping the chemical or

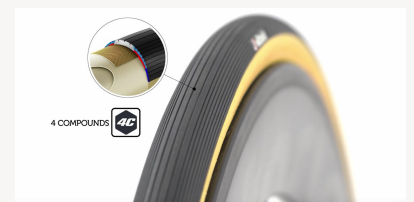
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biological agent from entering. During this protection state, the threats will also be inactivated, allowing the second skin to return to its normal state. *HiQPdf Evaluation 03/09/2016*

An instantly responsive protective fabric has obvious operational benefits. "Right now we're envisioning it as a base layer for one of our uniforms," says Paola D'Angelo, a research bioengineer at NSRDEC. D'Angelo adds that the technology can be tailored to any part of a uniform and possibly integrated within it. In its current experimental stage, the second skin is seen as integrated undergarments which offer no impairment to soldier mobility or comfort.

"The second skin is a very, very thin fabric," Dr. D'Angelo explains. "Right now we're using a non-woven fabric so it's very breathable."

The second skin would add practically no weight, crucially important in an era when soldiers are burdened with heavy uniforms and gear. It would work alongside current protective masks and possibly integrate into head coverings. It would also protect against repeated exposure to chemical-biological agents.

Once the second skin detects an agent and its pores close and neutralize that agent, they re-open up again, ready to protect again. D'Angelo says the polymer gels would have to be periodically "recharged" with bromine to maintain protection against biological agents, but for chem or bio threats, the gels would be effective for "many months" in between refreshes. Importantly, the second skin is safe for unprotected human contact after detecting and neutralizing agents.

The research team will test two small fabric swatches to prove the concept then work to insure its various chemical/textile components integrate properly. Tantalizingly, D'Angelo says, the technology could potentially be used to protect food packaging and other applications.

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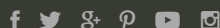
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