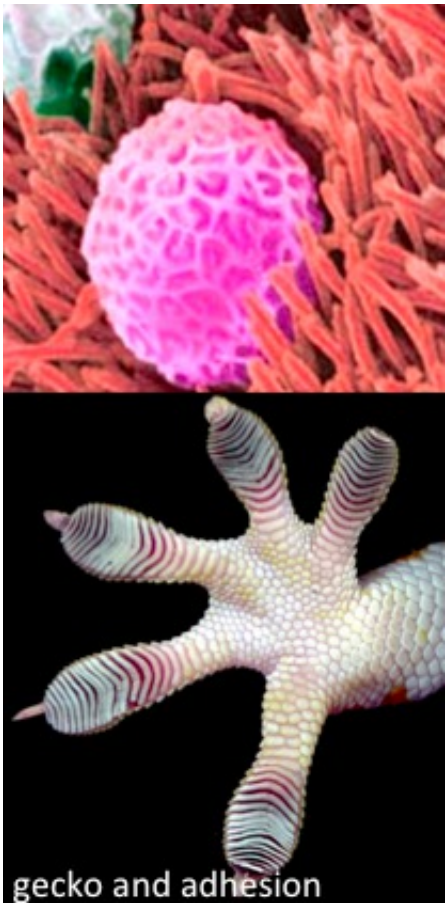
Protein-engineered gels mimic body's own functions

August 11 2015



The U.S. Army Research Laboratory's Army Research Office (ARO) recently awarded a New York University Polytechnic School of Engineering researcher a grant to advance protein-engineered,

environmentally responsive hydrogels that could replicate biochemical processes currently found only in nature. These protein hydrogels could become fundamental building blocks of important new biomimetic materials.

Associate Professor Jin Kim Montclare of the Department of Chemical and Biomolecular Engineering received $368,000 over three years to fabricate patterned protein hydrogels for applications in sensing, drug delivery, and wound healing. As an example, these biomimetic materials could mimic the adhesion properties of the human body well enough to heal wounds. Montclare also envisions biomimetic materials that will be able to sense and control the flow of fluids, or even control the delivery of drugs within the bloodstream.

After testing the protein hydrogels, which are made from the Escherichia coli bacterium, they will be patterned onto various solid substrates to mimic biological functions. An example of this would be the patterning on a gecko's finger that allows it to adhere to surfaces. A similarly designed protein hydrogel could yield a similar stickiness. Using different patterning, protein hydrogels can adopt various other capabilities seen in nature.

Montclare's research differs from previous scientists' work in that it uses biologically engineered proteins instead of synthetic polymers or materials. The advantage, she explains, is that the new materials can be controlled by external stimuli such as temperature or salt.

With soldier protection and performance a priority, the U.S. Department of Defense has invested heavily in synthetic biology—the ability to make things using biology. Since 2005, Montclare and her research group have been at the forefront of protein engineering and molecular design.