UT Arlington engineer developing 'Biomask' to aid soldiers recovering from facial burns

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UT Arlington engineers working with Army surgeons are developing a pliable, polymer mask embedded with electrical, mechanical and biological components that can speed healing from disfiguring facial burns and help rebuild the faces of injured soldiers.

The Biomask project is led by Eileen Moss, an electrical engineer and research scientist based at the UT Arlington Automation & Robotics Research Institute in Fort Worth. Project partners include the U.S. Army Institute of Surgical Research at the Brooke Army Medical Center in San Antonio and Northwestern University in Chicago. The work is funded through a $700,000 research grant from the U.S. Army Medical Research & Materiel Command.

“This gives our wounded warriors hope,” said Col. Robert G. Hale, commander of the U.S. Army Dental and Trauma Research Detachment in San Antonio, which is part of the Institute of Surgical Research. “That’s what it’s all about. We’re improving their quality of life.”

Northwestern University and the Institute of Surgical Research in San Antonio are currently involved in researching wound healing, while Moss and her UT Arlington team are focused on developing Biomask prototypes that will be tested by the other collaborators. They will be able to provide Moss with feedback to improve the device.

Hale expects Moss’s device to be in use at military medial centers within five years. The device also may aid in stem cell regeneration to regrow missing tissue where the Biomask is placed, he said.

Moss began her work toward the Biomask as a doctoral student at the Georgia Institute of Technology. Her dissertation focused on research into polymer-based microfluidic systems for biomedical applications. She joined UT Arlington in 2007 to continue the research.

Current burn treatment typically involves removing damaged areas followed by grafting. The outcomes may be good, but the procedures also may result in deformities, speech problems and scarring.

To aid burn victims, Army physicians have used polyethylene foam on damaged tissue that applies a vacuum to promote healing in the wounds, Hale said.

“We couldn’t use that on the face because topographically the face is very complex,” he said. “We couldn’t get a good seal.”

Plastic surgeons had shown Hale a three-dimensional, clear silicone mask that compressed the burns slightly to avoid lumpy scars. Engineers

were called on to mesh the technologies and develop a better device.

“We wanted something that blended restorative medicine and tissue engineering,” Hale said. “That’s where UT Arlington came in. Engineers are problem-solvers, and they’re solving this one right now.”

The Biomask will be embedded with arrays of sensing and treatment components. The components will allow localized monitoring and localized activation of treatment that can be applied to different parts of the wound as needed, Moss said. The sensors will provide physicians feedback about the healing process and help them direct appropriate therapy to different tissues.

“We think the Biomask will become the ultimate tool for treating burns,” Moss said. “It’s a thinking device. As the wounds heal, the Biomask will be able to adjust treatment to provide faster and better results.”

Moss said she and members of her team have traveled to San Antonio where Hale has shared the stories of soldiers with traumatic injuries that may benefit from her work.

“That really put the research into perspective,” Moss said. “It helps us keep focused on the goal, that of improving these soldiers’ lives.”

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