

# High-tech medical research for severely wounded warriors

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North Carolina researchers are trying to make sure the U.S. military isn't fighting the war of the future while treating its wounded with medicine from the past.

Their work eventually could speed the growth of new skin over traumatic burns, replace lost arms and hands, restore disfigured faces and undo some of the other lasting damage of combat.

"It's all about quality of life," said Dr. Anthony Atala, director of Wake Forest School of Medicine's Institute for Regenerative Medicine, which announced Tuesday that it will lead a five-year, \$75 million federally funded effort to improve treatment options for severely wounded servicemen and women.

Researchers in the field of regenerative medicine work to engineer tissues and organs and develop healing cell therapies, either to replace or to help the body regrow what has been lost. The technologies and techniques developed to help wounded warriors could benefit civilian patients as well.

Better protective gear, improved medical treatment in the field and quick evacuation to hospitals have made it possible to save the lives of soldiers who would have died in past wars. But those who survive often have severe and disabling injuries, most of them caused by improvised explosive devices.

Atala and his researchers will work with colleagues at more than 30 institutions around the country to develop clinical therapies focused on:

- Restoring function to severely traumatized limbs.
- Regenerating tissue to reconstruct after facial and skull injuries.
- Regenerating skin after burn injuries.
- Preventing the rejection of transplants such as of the face and hands.
- Reconstructing genital and urinary organs and the lower abdomen.

The projects will fall under the umbrella of the Armed Forces Institute of Regenerative Medicine II; the first five-year grant, for \$42 million, ended last year. It, too, was led by Wake Forest researchers, who have been doing [regenerative medicine](#) studies for 25 years.

Wake Forest announced the launch of the second phase of the work at its BioTech Place, which opened last year in downtown Winston-Salem. The event drew state and local political leaders, including state Senate leader Phil Berger and Maj. Gen. Joseph Carvalho Jr., commanding general of U.S. Army Medical Research and Materiel Command and Fort Detrick in Frederick, Md.

While the military is working on the problems, it needs the help of academic and industry researchers as well, which is why it, the Department of Veterans Affairs and the National Institutes of Health invited proposals from researchers around the nation.

"The military doesn't have the resources to do it all," Carvalho said, so it told researchers the kind of help its warriors needed and asked them to work on solutions.

Besides traumatic brain injury, which has received most of the attention as the "signature injury" of the wars in Afghanistan and Iraq, burns and lost limbs are among the most common injuries, Atala said.

Both can have a severe impact on soldiers' lives, often making it impossible for them to continue to serve in the military and difficult for them to adjust to civilian life.

Both are medical challenges, as well. Burn injuries often are treated with repeated skin grafts, and can result in restricted movement and heavy scarring.

Lost limbs can be replaced with prosthetics, but their comfort and usefulness varies.

Regenerative research is looking for ways to improve healing of burn injuries, such as spray-on skin cells that could be applied within days of the [injury](#). Scientists also have had success with limb transplants using techniques to reduce the likelihood of rejection, so patients' immune systems don't have to be indefinitely suppressed.

Wake Forest researcher George Christ describes himself as "a muscle guy," whose research has focused on how organs and tissues work and how they change over time. As people age, they have less tissue available to make injuries heal, Christ said. Soldiers who have lost full or partial limbs have essentially the same problem: a tissue shortage.

"If you run out of viable tissue, what's the answer?" he asked. "You make more tissue, right?"

One of his projects, he said, could result in a way to create new tissue to replace what is lost in a blast.

Christ said he is driven in the work that he does by the recollection of some wounded soldiers who came to speak to a group of the consortium's scientists. One by one, he said, they stood and described their injuries and how they had been hurt. One, he said, told the scientists that he hoped they would do their research without concern for who gets the credit for it, or who gets the biggest grants.

"We gave everything we had," Christ said the soldier told them. "We have no regrets. We just ask that you guys check your egos at the door and do the same for us."

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