American Forces Press Service

Wounded Warriors
By Donna Miles
American Forces Press Service

WASHINGTON, Feb. 25, 2010 – Movie-goers have seen the concept play out time and time again on the big screen. Sinister Borg drones reconstitute missing digits and limbs before their eyes in the "Star Wars" series. Alien Jack Jeebs in "Men in Black" regrows his head after it's damaged or blown off.

The military is working to bring some of that science-fiction capability to wounded warriors so they can harness their own body's power to regenerate itself and repair disabling and disfiguring battlefield injuries.

The Armed Forces Institute of Regenerative Medicine is leading the charge with an ambitious program that aims to help soldiers with burn and blast injuries regrow muscle, skin, tendons, nerves and even bone, said Army Col. (Dr.) Robert Vandre, the project director, based at this western Maryland Army post

"Ultimately, we will be able to grow limbs," Vandre said. "But in the next decade, we should be able to reduce the number of limbs that have to be amputated, just because we will have new ways to fix things that can't be fixed now."

A dentist with a background in combat casualty care research, Vandre said he's been impressed by the way the military has saved warfighters' lives, even those who in past wars would have died from their combat wounds.

"They are alive, but a lot of them still have deformities, or things that are wrong," he said. "What we want to do is to put wounded warriors back together, and restore them to how they were before their injury."

Think of a salamander that's able to regenerate a lost tail, and apply that same amphibian technology to humans, Army Surgeon General Lt. Gen. (Dr.) Eric Schoomaker said last spring as he unveiled the five-year, $250 million initiative.

The effort has attracted some of the best minds in regenerative medicine, working together through consortiums at Wake Forest and Rutgers universities, and in cooperation with the Army Institute of Surgical Research. Funding comes from the Defense Department, the National Institutes of Health and a broad range of public and private organizations.

But unlike other regenerative medicine programs, which focus primarily on basic research or commercial enterprises, the AFIRM effort is dedicated to "translational research" – which Vandre defines as putting research into practice.

"We are aimed completely toward the clinic," he said. "Our goal is to take research being done, get a clinical trial and get it into military patients."

Over the course of the program, AFIRM plans to develop clinical therapies to repair burns; reconstruct the head, skull and face; reconstruct, regenerate or transplant limbs; eliminate scarring as wounds heal; and reduce inflammation around wounds that can damage nerves and kill muscle cells.

The work already is paying off, Vandre said, with three clinical trials under way, and five more to start within the next year.

And it's already showing promise.

Former Marine Josh Maloney, 24, who lost his right hand in a training accident at Marine Corps Base Quantico, Va., was among the first troops to benefit from the effort. When he received a hand transplant last March at the University of Pittsburgh Medical Center, his doctors introduced a new protocol that combines cell therapy and a bone marrow transplant.

The goal, Vandre explained, was to get Maloney's body to accept the new hand while reducing the risk associated with toxic anti-rejection drugs. Just 10 days after his transplant, he had some movement in his fingers.

In another trial, researchers used regenerative medicine to get a soldier whose entire thigh muscle had been blown away a roadside bomb to generate new tissue. They applied "extracellular matrix" material – a mix of growth factors, protein and connective tissue taken from a pig's bladder – to the wound. This, Vandre explained, signaled the body to start the tissue regrowth process.

So far, AFIRM researchers have used the procedure on two patients, and they plan to conduct 15 more surgeries as part of their trial.

In other trials, researchers are constructing "scaffolding" in the exact shape of a nose or other missing or damaged body part, then applying cells on it to grow new tissue. After the new growth is completed, the biodegradable scaffolding material dissolves.

The AFIRM initiative to begin next month shows particular promise for burn patients, whose treatment often requires multiple painful, invasive skin grafts. Researchers will begin "cell spraying," taking a postage stamp-size piece of a burn victim's healthy skin, exposing it to an enzyme that separates the cells from each other, then immediately spraying them onto the damaged skin.

“There’s much less pain and cost, and the results look way better,” Vandre said of results seen in a previous clinical trial conducted in Australia. “The results are pretty incredible.”

Meanwhile, researchers also are looking into ways to reduce the scarring associated with burns. Not only is it unsightly, but it also limits movement and flexibility after patients have healed.

One trial soon to be introduced will involve injecting fat cells under the burn scars – a procedure Vandre said dermatologists and plastic surgeons do all the time, with good results.

Vandre gets downright giddy talking about the developments already being seen, and the potential they hold for wounded warriors. It’s the ultimate reward for an effort he took on with crusade-like enthusiasm, pitching the concept for an armed forces regenerative medicine program, identifying the government and private-sector funding sources and helping attract what he calls “the Einsteins” in the regenerative medicine field.

“I’m just thrilled that I have been able to have the chance to do something like this, that can mean so much to so many people, and that it’s gotten this level of support,” he said. Chuckling, he added, “I just think I have the greatest job in the whole world.”