Re-thinking the Treatment of our Wounded Warriors: Regenerative Medicine Brings Science and Wound Care Together with Amazing Results

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Some practices of military medicine were largely unchanged over the past decade, until 2008 when the Armed Forces Institute of Regenerative Medicine was established to research the amazing feats of regeneration that the human body is capable of and how those feats could be translated into medical breakthroughs that have the potential to change medicine as we know it.

"The goal of the AFIRM is to accelerate regenerative medicine therapies and technologies to help heal the wounded warriors where the current available technologies are not adequate," explains Terry Irgens, project director of the AFIRM.

They accomplish this through a multi-institutional, interdisciplinary network of scientists and researchers who are dedicated to finding new methods of treatment that will improve upon or replace traditional practices. The AFIRM envisions a day when injured Soldiers are healed from the wounds sustained in combat within several weeks as opposed to several months or years. Their hope is for an injured soldier to return to fully functional after a treatment that, in the past would have left them with painful, limiting, and disfiguring scars. Furthermore, the AFIRM imagines that all of this can be accomplished by the Soldiers' own body; through cells, tissue, and fat that create virtually "self-made" medicine. The AFIRM believes this concept is not only achievable but also that it will be available very soon. How is it possible that the human body has the potential to regrow and recreate itself to heal and recover from combat injuries? It happens with just a small amount of assistance from science.

The AFIRM is managed and funded through the U.S. Army Medical Research and Materiel Command; with additional funding from the U.S. Navy, Office of Naval Research; the U.S. Air Force, Office of the Surgeon General; the National Institutes of Health; the Veterans Administration; and local public and private matching funding.

The AFIRM has five major research programs: Limb Repair and Salvage, Craniofacial Reconstruction, Burn Repair, Scarless Wound Repair, and Compartment Syndrome Repair. These five research programs work under two main objectives: to save lives and close wounds; and to improve the injured Soldiers life. The AFIRM is made up of two civilian research consortia working with the U.S. Army Institute of Surgical Research in Fort Sam Houston, Texas. One consortium is led by Wake Forest University Baptist Medical Center and the McGowan Institute for Regenerative Medicine in Pittsburgh and one is led by Rutgers, the State University of New Jersey and the Cleveland Clinic. The third component of the consortiums is the U.S. Army Institute of Surgical Research. USAISR provides additional support to accelerate regenerative medicine projects through the regulatory process to provide FDA approved therapies and provides the infrastructure for clinical trials of products that are being evaluated for FDA licensure. Each consortia and the USAISR work on products on within all five of AFIRM's focus areas. They work together to share experiences and to increase the focus on technologies that have the greatest chances for developing into a FDA approved product.

Col. Robert Hale, the USAISR representative to the AFIRM, often refers to regenerative medicine as a "game-changer." Before the establishment of AFIRM, Hale conducted a study to help identify and define

the types of facial injuries that are commonly sustained during battles and the various challenges associated with those injuries. This study helped to clarify the multitude of differences that exist between military and civilian injuries it also helped to indentify the focus of Hale's work; soft-tissue. Soft-tissue refers to the tissues that connect, support, and surround the structures and organs of the body. It includes tendons, ligaments, fascia, skin, fibrous tissues, fat, connective tissue, muscles, nerves, and blood vessels. Contained within the soft-tissue is a combination of collagens, elastins, and water and these materials are capable of regenerating with very little assistance. This was an exciting development, as traditional medicine relies primarily on bridge technology (using skin and cells from another person's body).

However, regenerative medicine treats a patient using his/her own cells or similar skin substitutes; this is a superior form of treatment because it expedites the treatment process, creates less risk of secondary infections or adverse reactions, and can be used "off-the-shelf" to treat a patient without the need to search a donor or subject the patient to painful grafting procedures.

Hale surmises that with this technology we will eventually be able to regenerate a patient's skin for a full facial transplant that is both smooth in appearance and allows for better form and function. This is groundbreaking technology that has the potential to completely reinvent the way that medicine is conducted.

One area that has seen major developments is the treatment of burns. Though frequently seen in both civilians and Soldiers, burns are common in theater due to the increased use of IEDs in combat. Traditional treatment of burns included the use of antibiotics and tissue excision for deeper burns; the excised tissue would then be replaced with tissue substitutes. While this method has been used successfully for years, there are challenges with the current method. Aside from being an extremely painful and lengthy process there is also a higher rate of infection and scarring. However, new technologies being developed by the AFIRM and USAISR provide the ability to close burn wounds using a patient's own skin with relatively less pain in two to three months as opposed to the six months to one year timeframe with traditional methods. One such product is the ReCell device. ReCell provides a simple, safe technique for the harvesting of epidermal cells for skin repair. First a split-thickness skin biopsy is conducted, followed by separation of the dermis from the epidermis to harvest the cells of the epidermal-dermal junction. The separated cells are combined in a suspension fluid that consists of a mixed population of live skin cells. The liquid suspension is then sprayed onto the prepared wound. The cells migrate over the wound, reconstructing the skin with site-matched characteristics such as skin color and texture. The ReCell device is currently undergoing clinical trials. If successful, it will be FDA approved and available for use within the next two to three years.

When you speak to any of the more than 50 Doctors supporting the AFIRM and USAISR, one thing is immediately clear. They are excited about treating both military and civilian patients with new and improved methods that are not only feasible but also within months or years of being readily accessible. Other new and exciting clinical trials include the development of a regenerative powder that enables the regrowth of muscles, using an extra-cellular matrix to signal the re-growth of adult stem cells. This product could potentially be used to regenerate limbs or missing portions of limbs. Or the use of autologous fat transfer which uses fatty tissue from other parts of the body and transplants it into the wound. This technique could possibly improve the quality and appearance of scar tissue.

“When the skin is badly injured or burned, it becomes so scarred on top of muscles it can cause patients to develop a large divot or contour deformity,” explains Hale, “we’ve been using the latest tissue engineering techniques to use fat collected around the belly button and transfer it under the damaged or deformed skin.”

According to Hale, “The goal of regenerative medicine is to reconstruct muscular, skeletal, skin injuries with fewer surgeries, less invasive procedures, and better results,” adding that “if we can unleash the possibilities of regenerative medicine and perform surgeries in this way we can all agree that would be an elevation of care.”

In the past, there have been many evolutionary changes to medicine, but Hale is quick to clarify that regenerative medicine offers “revolutionary changes” that put us on the verge of a huge shift in the way that doctors treat their patients.

If you are interested in learning more about the AFIRM visit http://www.afirm.mil/ or the USAISR visit http://www.usaisr.amedd.army.mil/. Information about current Clinical Trials is also available on the AFIRM website listed above.