Supports Layered Cell Regrowth, Tissue Repair, Fluid Perfusion and Wound Healing to Replace Injured Bone, Muscle and Skin Tissues

This tissue regeneration platform facilitates the layered regrowth of cells to heal traumatic wounds and other injuries by growing bone, muscle, and skin tissues right where they are needed. Regenerative medicine, in which engineered neo-tissues are used to replace damaged or defective tissue in patients, has the potential to revolutionize the treatment of complex wounds. However, traditional systems utilize top-down tissue regeneration, which has a variety of limitations, including, most prominently, the inability to provide enough nutrients to the cells developing within engineered tissue. Since available treatments cannot engineer entire vascular networks, the engineered tissue is dependent upon nutrient delivery by diffusion to keep cells viable until they are able to form a vascular network.

Researchers at the University of Florida have developed an in-situ, bottom-up tissue regeneration platform technology that functions to support cell viability and the self-assembly of neo-tissues, such as bone, muscle and skin, over time and directly at the site of injury. The combination of extracellular matrix, micro-irrigation, a provided nutrient solution, and a negative pressure system support the viability of cells in larger tissue-engineered constructs until they vascularize and establish their own nutrient uptake.

Application

Wound treatment that combines tissue-engineering and micro-irrigation for in-situ tissue regrowth

Advantages

- Assembles tissue from modular units into more complex structures, integrating them with the surrounding tissue and providing them with adequate nutrients during the vascularization process
- Uses negative pressure to deliver nutrients to cells/neo-tissue, supporting tissue constructs larger than previously possible, and accomplishing such directly in the wound bed/injury site
- Reduces time for vascularization, decreasing overall recovery time
**Technology**

This bottom-up tissue regeneration system functions by packing a wound bed with an array of modular scaffolds seeded with cells, called modular tissue forming units, or MTFUs. These MTFUs are largely adjustable according to the needs of the wound or tissue defect. The modular nature of the scaffold leaves void space in the packed wound bed between the MTFUs. Tubing, placed below most of the MTFUs, supplies perfusion fluid to the base of the wound bed. A negative-pressure wound dressing then draws this fluid up towards the surface through the void space, providing nutrients that support the cells until they can assemble into neo-vascular networks and neo-tissues that subsequently integrate into the surrounding wound tissues.

**Inventors**

Adam Katz, M.D., is a professor of surgery in the plastic and reconstructive surgery division in the College of Medicine at the University of Florida. He earned his M.D. at the University of Michigan and he completed a residency in plastic surgery, a research fellowship, and his general surgery residency training at University of Pittsburgh Medical Center. Prior to joining UF, Dr. Katz was an associate professor at the University of Virginia, where he directed the department of plastic surgery’s Laboratory of Applied Developmental Plasticity. He is a fellow of the American College of Surgeons and a member of the American Association of Plastic Surgeons, and the American Society of Plastic Surgery. His research focuses on adipose-derived cells and matrix components and their therapeutic application and translation within the broader context of tissue engineering and regenerative medicine.

**Contact:**

Zahara M. Jaffer • 352-392-8929 • zjaffer@ufl.edu
UF #14275 • Patent Pending

www.otl.ufl.edu