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Institute for Collaborative Biotechnologies Undertakes Regenerative Medicine Challenges

Four researchers from the UC Santa Barbara-led Institute for Collaborative Biotechnologies (ICB) are undertaking important studies in a new, national $85 million program in the nascent field of regenerative medicine to develop new treatments for wounded soldiers. UCSB's Matthew Tirrell, Erkki Ruoslahti, and Hyongsok (Tom) Soh, and Caltech's David Tirrell are members of one of two multi-institution consortia which constitute the newly-established Armed Forces Institute for Regenerative Medicine (AFIRM).

Matt Tirrell, dean of UCSB's College of Engineering and professor of chemical engineering and of materials, is developing artificial extracellular matrices (ECMs), on which tissues can regenerate, using transformable, self-assembled micelles of peptides conjugated to lipids. The principal emphasis of his AFIRM work is on functional regeneration of nerve tissue; the methodology may also apply to regenerating large osseous (bone) defects and re-growing functional tendons and other connective tissue.

Erkki Ruoslahti, distinguished professor in the Burnham Institute for Medical Research at UCSB, is working on targeting technology for drug delivery—the selective delivery of systemically injected compounds to wounds and other tissue injuries. He is initially proposing to apply this technology to wound-targeted delivery of decorin, a natural inhibitor of scarring and fibrosis. This has the potential to promote wound healing and prevent scarring.

Tom Soh, associate professor of mechanical engineering and co-director of UCSB's Center for Stem Cell Biology and Engineering, is developing a high performance, disposable cell-sorting device based on micromagnetics and microfluidics. The system is designed for the purification of rare cells for cell-transplant therapy, and will be capable of sorting cells with purity, rare cell recovery yield, and throughput not currently available. The disposable, contamination-free cell sorters will represent new capabilities for the field-based separation and purification of cellular products to be used in cell-based therapies.

David Tirrell, professor of chemistry and chemical engineering and chair of the division at Caltech, is developing artificial extracellular matrix (ECM) proteins for use in regenerative therapies for limb and digit reconstruction, facial reconstruction, healing without scarring, and burn repair. His initial focus is on burn repair, which could subsequently lead to the development of additional therapies that would benefit from rapid regeneration of the skin.

The UCSB-led ICB is a member of the 17-institution consortium managed by Wake Forest University and the University of Pittsburgh; the other consortium, similarly structured, is led by Rutgers University and the Cleveland Clinic. Each received $42.6 million from a combination of sources that include the U.S. Army Medical Research and Materiel Command (USAMRMC), in conjunction with the Office of Naval Research, the National Institutes of Health, the Air Force Office of the Surgeon General and the Department of Veteran Affairs. The U.S. Army Institute of Surgical Research in San Antonio, Texas, will provide guidance on military medical needs to these academic consortia and will conduct trials of the new therapies being developed.

While focused initially on developing restorative therapies for battlefield trauma, the therapies developed will have far-reaching benefits in the treatment of traumatic injuries and degenerative diseases throughout the civilian world.