CDMRP
DEPARTMENT OF DEFENSE
CONGRESSIONALLY DIRECTED MEDICAL RESEARCH PROGRAMS

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PEER REVIEWED ORTHOPAEDIC RESEARCH PROGRAM

VISION

Provide all Service Members with orthopaedic injuries the opportunity for optimal recovery and restoration of function.

MISSION

Address the most significant gaps in care for the leading burden of injury and for facilitating return-to-duty by funding innovative, high-impact, clinically relevant research to advance optimal treatment and rehabilitation from musculoskeletal injuries sustained during combat and service-related activities.

PRIORITIES OF THE PRORP

Find solutions that **IMPROVE OUTCOMES**

HIGH-RISK/HIGH-GAIN PROJECTS

Develop the field for **COLLABORATIVE ORTHOPAEDIC TRAUMA RESEARCH**

Fund clinical trials to **MOVE INTERVENTIONS INTO THE CLINIC**

Fund translational research to **MOVE THE FIELD FORWARD**

Provide the clinical evidence to **IMPACT CLINICAL CARE**

PROGRAM HISTORY AND MILITARY RELEVANCE

The most common reason for medical discharge from the Armed Services is the inability to return to full duty due to musculoskeletal injury or pre-existing musculoskeletal condition.

>35 million adults with a musculoskeletal injury reported lost work days in a single year, totaling nearly 364 million days[1]

Musculoskeletal injuries affect >50% of Soldiers and are responsible for 10 million limited-duty days annually[2]

More than 70% of active-duty injuries are due to cumulative micro-traumatic musculoskeletal "overuse" injuries[2]

In FY09, the U.S. Congress provided support for research of exceptional scientific merit focused on optimizing recovery and restoration of function for military personnel and all persons with a traumatic orthopaedic injury through the establishment of the Peer Reviewed Orthopaedic Research Program. Since FY09, a total of $518.5 million has been appropriated to the program for military-relevant orthopaedic research.

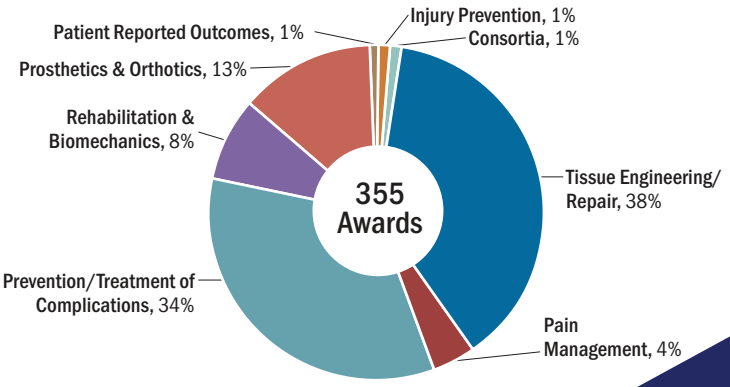
FY23 FOCUS AREAS

The PRORP uses Focus Areas to target research funding to the highest program priority needs.

- Prostheses and Orthoses
- Retention Strategies
- Composite Tissue Regeneration
- Limb Stabilization and Protection
- Volumetric Muscle Loss
- Osseointegration
- Translation of Early Findings

PROGRAM PORTFOLIO

FY09-FY22 PRORP Research Alignment Buckets[3]



[1] https://bmus.latticegroup.com/fourth-edition/id2/ lost-work-days.

[2] https://phc.amedd.army.mil/ Periodical%20Library/2018%20Health%20of%20the%20 Force%20report%20-%20 web.pdf.

[3] Data indicates percentage of portfolio by total number of awards and is categorized by the primary goal of the study.

PRORP COMMITMENT TO ORTHOPAEDIC RESEARCH

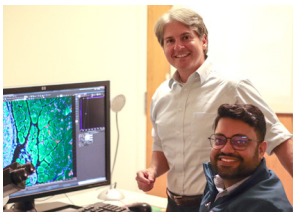
The PRORP strives to address treatment and knowledge gaps in the care of Service Members and Veterans with significant orthopaedic injury. Service Members and Veterans, alongside scientists and clinicians, serve on the PRORP Peer and Programmatic Review Panels determining the Program's research investments.

SAMPLE FUNDED RESEARCH PROJECTS

Cognitive Function and ACL Rehabilitation

Dustin R. Grooms, Ph.D., AT, CSCS,
Ohio University

Surgical reconstruction and physical therapy of the anterior cruciate ligament often have high rates of reinjury and long recovery times. Current rehabilitation methods tend to focus on mechanical milestones relating to knee motion and load, but data on the impact of the central nervous system on recovery are limited. Dustin Grooms, Ph.D. was awarded an FY17 PRORP Applied Research Award to quantify brain activity and the effects of cognitive interference in high-risk and ACL injury-repaired individuals with the goal of developing new rehabilitation strategies. Grooms and his team's findings from evaluating high-risk individuals suggest that elevated brain activity in specific regions is associated with a higher risk of injury. For cognitive interference, the investigators evaluated Reserve Officers' Training Corps members at a simulated shooting range and found that adding visual cognitive challenges delayed shot initiation and completion times. From these studies, Grooms and his team have developed tests for athletic return to activity that incorporates cognitive-motor interference and have found that adding a visual-cognitive challenge has improved outcomes. The benefits of environmental and cognitive load demonstrate the importance of cognitive function in physical rehabilitation, which could be used to aid both civilian and military populations going forward.



Pre-Innervated Muscle Complexes: A New Avenue for Treatment of Volumetric Muscle Loss

D. Kacy Cullen, Ph.D., and Suradip Das, Ph.D.,
Corporal Michael J. Crescenz Veterans Affairs Medical Center and the University of Pennsylvania

Volumetric muscle loss from orthopaedic trauma or surgical interventions results in substantial functional deficits in joint range of motion and skeletal muscle strength, which may cause lifelong dysfunction and disability. Current clinical procedures such as muscle grafts and tissue-engineered muscle products often fail due to limited nerve intervention at the muscle site. The current gold standard of treatment for VML is free functional muscle transfer, but its success is limited due to donor-site morbidity, extensive operation time, and the necessity for the muscles to remain without nerve attachments for a prolonged period of time. With funding from an FY18 PRORP Applied Research Award, Kacy Cullen, Ph.D. and his team are using a novel mechanical bioreactor to facilitate nerve growth and develop tissue-engineered muscle that can be used to promote functional muscle regeneration following VML. Specifically, their approach uses a bioreactor with either muscle or myocyte cells that are grown in combination with nerve cells to help induce muscle stimulation to promote movement. The team implanted the cellular scaffold into a small animal model to evaluate their effect. After three weeks of implantation, the addition of nerve cells promoted muscle volume recovery, increased host cellular infiltration, and increased revascularization compared to the group lacking nerve cells. The team's findings suggest the potential that nerve cells significantly increase the functional regeneration of muscle at the site of injury for VML patients. Upon future testing, the ability to regenerate lost or damaged tissue could dramatically improve clinical outcomes and long-term recovery of Service Members, Veterans, and civilians impacted by traumatic injury.

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