Vision Research Program

Vision

Be the model of transformational vision research for our armed forces and the nation

Mission

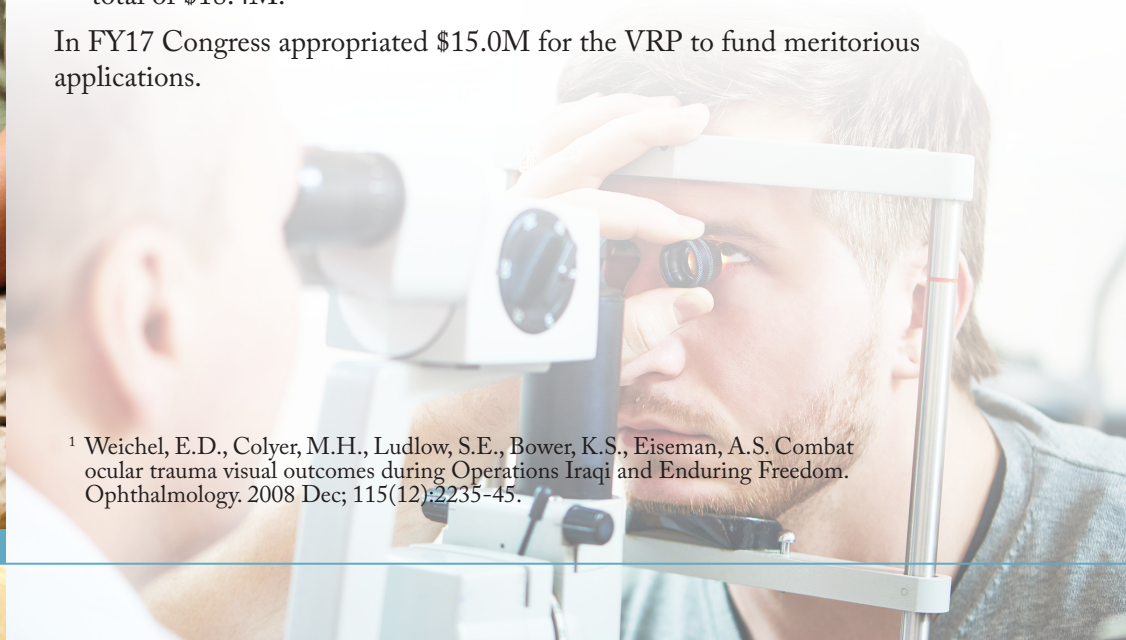
Improve the care of military personnel affected by eye injuries and diseases by identifying clinical needs and addressing them through directed medical research efforts

Program History

From 2002-2007, 13% of military personnel evacuated from Iraq and Afghanistan suffered a combat-related ocular injury.[1] Combat injuries such as blast injury and traumatic brain injury (TBI) may affect visual nerve pathways even though there are no outward cuts or contusions to the eye. The causes, effects and treatment of eye injury and diseases that, despite their different pathogenesis, all have a common end result: degeneration of the critical components of the eye and impairment or loss of vision. The Vision Research Program (VRP) was created and funded by Congress in FY09 with the goal of fostering innovative research that has the potential to make significant impact on improving the health and well-being of military Service members, Veterans, their caregivers, family members, and the American public living with visual dysfunction. Since inception, the VRP has awarded 79 grants totaling $68.3M to researchers addressing penetrating eye injuries, corneal healing, retinal/corneal protection, visual dysfunction associated with TBI, the eye blast phenomenon, and vision rehabilitation.

- FY09-FY10: 12 projects were funded for a total of $11M.
- FY11-FY12: 21 projects were funded for a total of $13.9M.
- FY13-FY14: 34 projects were funded for a total of $25M.
- FY15-FY16: 12 applications were recommended for funding for a total of $18.4M.

In FY17 Congress appropriated $15.0M for the VRP to fund meritorious applications.



[1] Weichel, E.D., Colyer, M.H., Ludlow, S.E., Bower, K.S., Eiseman, A.S. Combat ocular trauma visual outcomes during Operations Iraqi and Enduring Freedom. Ophthalmology. 2008 Dec; 115(12):2235-45.

Featured Vision Research Program Projects

Temporal Progression of Visual Injury from Blast Exposure

Dr. Brittany Coats, Ph.D., University of Utah

Closed-globe eye injuries often go undiagnosed initially as there is no visible trauma to the eye. However, visual dysfunction can develop months or even years after blast exposure. With an FY11 VRP award, Dr. Brittany Coats has investigated the progression of eye injury from blast exposure and worked to identify early predictors of visual dysfunction, two uncharacterized phenomena. Using rat models, Dr. Coats found that there was a significant initial drop in visual acuity that was unable to resolve over the 8-week monitoring period. The drop in visual acuity was attributed to retinal and corneal damage. Dr. Coats aims to corroborate the animal findings in a cohort of Veterans that were not diagnosed with visual dysfunction at the time of blast exposure.

OCT Technology Development to Assess Ocular Integrity and Characterize Intraocular Scatterers

Dr. Joseph A. Izatt, Ph.D., Duke University

Optical Coherence Tomography (OCT) is a diagnostic imaging modality used worldwide in eye clinics to image the anterior and posterior portions of the eye; however, current systems are large, thus limiting their use to clinic settings. Dr. Izatt obtained an FY15 VRP award to improve upon a first-generation hand-held OCT ocular imaging system platform that could be used by medics in theater to triage Service members. With the award, a second-generation system that has 3D scanning abilities and is capable of scanning four times faster than the first-generation system will be produced. In addition to increased scan range and speed, the new system will also incorporate new technology to differentiate intraocular cellular response to injury.

Active Confocal Imaging System for Visual Prostheses

Dr. Eliezer Peli, O.D., Schepens Eye Research Institute

There have been significant advancements made in the field of vision prosthetics; however, current technologies are highly limited, as they are low-resolution and offer a low dynamic range and limited visual field. With an FY14 VRP award, Dr. Peli aims to use a new confocal technology to enable blind Service members using any visual prosthetic or sensory substitution device to efficiently scan, focus, and "see" objects of interest in different depth planes while simultaneously eliminating background clutter. Two prosthetic devices, the BrainPort V100 and the BrainPort V200 Vision Pro have been acquired by the research team and successfully tested in various tasks: recognition of simple stimuli such as line orientations, shapes, and letters for comparing the performance with and without background de-cluttering. Image mode testing for high-contrast and edge enhancement (3-grey scale level) is ongoing.

Maturation and Implantation of Engineered Retinal Tissue Grafts

Dr. Lawrence Rizzolo, Ph.D., Yale University

In both combat-related retinal injury and age-related macular degeneration (AMD), a retinal degeneration condition affecting many Veterans, retinal damage manifests in the retinal pigment epithelium (RPE) and photoreceptors. Advances in stem cell biology have led to Phase I/II clinical trials that use RPE grafts to restore vision; however, these grafts are only effective in patients with mild AMD or injury. With an FY13 VRP award, Dr. Rizzolo has engineered a scaffold that enhances the ability of stem cells to form a multilayered retinal tissue. Preliminary studies demonstrated that the scaffold promotes differentiation of stem cells into matured multilayered retinal cells; which was enhanced by co-culture with human RPE. Pilot studies of transplantation in mice showed that the scaffolds were well tolerated and able to integrate in the host retina. Dr. Rizzolo plans to test the novel retinal scaffolds in a severe, acute retinal-injury pig model.