Clinical Translation of Mesenchymal Stem Cell Therapy for Corneal and Ocular Surface Injuries

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PUBLIC ABSTRACT

This proposal defines a firm roadmap to study, research, and develop a novel treatment for Service Members suffering from non-penetrating injuries to the eye surface. The specific injuries range from the common corneal abrasion, i.e., a scratch, to the more severe thermal and chemical burns. The latter can result from explosions, fires, or from exposure to chemical agents, e.g., mustard gas. We plan to develop a new treatment that will (1) accelerate healing and promote a faster return to a Service Member's normal level of functioning, and (2) prevent the development of such secondary problems as scarring and loss of vision that often follow the initial burn injuries.

The development target, an eye drop treatment, consists primarily of a stem cell "broth." The principal agent producing this broth is a type of stem cell, known as a mesenchymal stem cell, found in many tissues in the body. Currently, a number of ongoing research studies are exploring and showing their healing effects. For instance, these stem cells are being injected directly into the heart of heart attack patients to see if it will help repair the heart muscle. Likewise, these stem cells have been shown to promote healing of the surface of the eye after injuries.

In a slight departure from other stem cell studies, instead of using the actual cells on the eye, we propose using a "broth" that contains the factors that are produced by these cells. In fact, we have already found that by growing stem cells in a solution in the laboratory, the solution itself (the broth without the actual cells) has great healing effects for eye injuries in mice. Therefore, we are planning to study and develop the stem cell broth as a treatment for eye injuries in patients. We are specifically planning to test several different conditions to optimize the stem cell broth and determine the best conditions for collecting the broth.

We are projecting 3 years to finish our study and development. At the end of this period, we will have an eye drop, ready to be used clinically to promote healing in Service Members with combat related corneal injuries.