Lipid Neuroprotectants and Traumatic Glaucomatous Neurodegeneration

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PUBLIC ABSTRACT

Glaucoma refers to a group of irreversible blinding diseases that steal sight slowly in increments without pain or obvious symptoms. Specific lipids are naturally present in the clear fluid of the anterior chamber of the eye in healthy individuals but not in individuals suffering from glaucoma. Thus, we have termed them endogenous lipids, which belong to a class of lipids known as sphingolipids. The proposed research is to develop several such sphingolipids as potential glaucoma therapeutics.

Trauma to the eyes often results in glaucoma in military Servicemen. The progressive loss of vision in glaucoma is often associated with elevated intraocular pressure (IOP). Lowering IOP remains the only proven strategy to halt glaucoma progression. An endogenous lipid of another class, termed prostaglandin, is currently the only known lipid that lowers IOP. However, about 25% of glaucoma patients, a large number of whom are military Servicemen or Veterans, are recalcitrant to available glaucoma medications including prostaglandins; thus, new therapeutic molecules are needed to treat this group. The proposed research will further assess the efficacy of the new sphingolipids to lower IOP using mouse and monkeys that can develop glaucoma naturally or by design. Proposed research will also determine the mechanisms by which these molecules lower IOP in glaucomatous mouse and monkeys. About 2.5 million Americans suffer from glaucoma, of which >600,000 do not adequately respond to conventional glaucoma medications, and this number is increasing. For all glaucoma patients, having more efficient drugs that can be used alone or in combination with current conventional drugs will be beneficial. A large number of active duty military Servicemen and Veterans with trauma-induced glaucoma are mostly non-responsive to conventional glaucoma medication. The proposed research aims to provide a new mechanism-based therapy for such recalcitrant patients immediately upon their establishment of their efficacy in mouse and non-human primates. This will provide long-term benefits to military Servicemen and Veterans by stemming the vision loss from glaucoma.