Clearance of bioactive lipids from cellular membranes

Technology #cu13326

The accumulation of bioactive lipids in cell membranes is associated with a variety of diseases for which there are limited treatment options, including age-related macular dystrophy (AMD), diabetic retinopathy, atherosclerosis, and cancer. Cyclodextrins are a family of oligosaccharide molecules that have recently been approved for therapeutic use by the U.S. Food and Drug Administration. Due to their hydrophobic cavity size, cyclodextrins are capable of forming complexes with many hydrophobic molecules. However, the therapeutic applications of cyclodextrin for lipid removal have yet to be fully explored. This technology describes methods for which cyclodextrin can be used as a therapeutic agent to remove bioactive lipids from cell membranes. Cyclodextrin-mediated therapy has the potential to treat the underlying cause of lipotoxic conditions such as AMD at an earlier stage compared to current medications.

Cyclodextrins provide safe extraction of bioactive lipids that accumulate during AMD

In 2010, the FDA approved a clinical trial to use cyclodextrins for treatment of Niemann Pick Type C disease, based on the ability of cyclodextrins to remove cholesterol from cell membranes located in the brain. However, there are several other lipid-related diseases that may benefit from this approach. For instance, AMD is accompanied by lipid-rich drusen deposits, which may be linked to the degradation of corneal cell membranes. The only currently approved AMD medications, anti-VEGF molecules, treat downstream stages of the disease and are extremely expensive. Cyclodextrins, which for years have been used as a solubility agent in various pharmaceuticals, are inexpensive to produce and act on lipid depositions that are upstream from anti-VEGF targets. As such, cyclodextrin compounds may serve as a safe and inexpensive treatment for AMD while providing intervention at the early stages of the disease.

Previous studies have indicated the ability of cyclodextrins to reduce the cytotoxic activity of lipids present in cultured human retinal cells. Cyclodextrins were also shown to reduce angiogenesis and lipid-induced corneal burn injury in rabbit models.

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Applications:

- Extraction of harmful lipids from cell membranes
- Treatment of AMD and other lipid-related disease
- Prevention of neovascularization in treatment of corneal alkali burns
- Detection of hydrophobic disease markers

Advantages:

- Inexpensive formulation
- Active compound is currently used in many pharmaceutical formulations
- Recent FDA approval of cyclodextrin-based treatment
- Treats earlier stage of AMD compared to anti-VEGF compounds

Patent Information:


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