Docket #: S18-414

Engineered growth factor variants as receptor antagonists

Stanford Reference: Dockets S18-414 *and* S19-371:

Stanford researchers have invented a new treatment for corneal epithelial defects and corneal neovascularization through combining a novel fibroblast growth factor (FGF) and a variant of hepatocyte growth factor (HGF) which significantly accelerated wound healing in the cornea. Injuries and diseases of the cornea blind millions of people every year by causing permanent scarring and neovascularization. These engineered growth factor variants act as receptor antagonists to neovascularization and fibrotic cumulation. This therapy has been successfully tested with animal models by evaluating daily corneal wound repair after an induced alkali burn. Compared to current ocular therapeutics, the engineered growth factors showed superior efficacy and stability properties (compared to wild-type proteins) to treat corneal diseases with epithelial defects, infections, burns, scarring, and neovascularization (such as, but not limited to contact lens over wear, limbal cell stem deficiency, Steven-Johnson Syndrome, and herpetic disease). Corneal diseases are the 2nd leading cause of blindness (cataracts are #1). Hence, with more predictable and efficacious therapies like this one, treatment of these types of corneal diseases will help to prevent functional blindness on a global scale.

Stage of Development:

- Animal studies showed that corneal wound healing was significantly accelerated after topical administration of the engineered proteins
- *In vitro* and *in vivo* data was generated

Applications

- **Treatment and/or prevention of corneal burns:** represents 11.5-22.1% of all ocular traumas

- **Treatment and/or prevention of corneal neovascularization:** affects approximately 1.4 million patients per year (Massachusetts Eye and Ear/Harvard Medical School study)
- **Examples of visual impairment due to corneal epithelial defects or neovascularization:** Contact lens over wear, limbal cell stem deficiency, Stevens-Johnson Syndrome, infections, and herpetic disease

Advantages

- **Superior efficacy** in inhibiting vascularization and scarring of the cornea compared to current standard therapies
- **Only one amino acid mutation** so an immune response is reduced
- **Ability to treat a vast range of ocular conditions** susceptible to aberrant vascularization (driven by growth factor ligand/receptor signaling)

Patents

- Published Application: WO2020076987
- Published Application: 20220249611

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