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Data on novel IL-1 inhibitor protein for topical treatment of dry eye disease published

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Eleven Biotherapeutics, a biopharmaceutical company creating novel and differentiated protein-based biotherapeutics, has published preclinical data in *Proceedings of the National Academy of Sciences* showing beneficial effects of EBI-005, the first rationally-designed topically administered IL-1 protein for the treatment of ocular diseases. In the paper entitled "Design of a superior cytokine antagonist for topical ophthalmic use," the scientists, including drug developers from Eleven Biotherapeutics and collaborators from Howard Hughes Medical Institute and Stanford University School of Medicine, describe how EBI-005 was designed to specifically bind more tightly to its target than IL-1Ra providing a dramatic increase in potency in vivo. EBI-005 was also shown to have substantially greater stability, potentially providing the convenience of room temperature storage.

"To date, blocking of IL-1 has only taken the conventional form of proteins as injectable therapies." said Thomas M. Barnes, Vice President of Discovery at Eleven Biotherapeutics and lead author of the *PNAS* publication. "These published data reflect the basis of our innovative approach to rationally design proteins with ideal therapeutic properties, including the specificity to target and block IL-1 providing localized treatment of ocular diseases through topical administration."

"EBI-005 is unique in that it is rationally designed to be a topically-administered protein with IL-1α and IL-1β blocking capabilities and other ideal pharmacologic and pharmaceutical properties," said Abbie Celniker, PhD, Chief Executive Officer of Eleven Biotherapeutics. "We

are currently evaluating the potential of EBI-005 in a multi-center Phase 1b clinical study in patients with dry eye disease and plan to report top line data in the second half of 2013."

Key findings include:

- EBI-005 binds to its target, IL-1R1, 85-fold more tightly than IL-Ra, translating into a 100-fold increase in potency in vivo.
- EBI-005 is more thermally stable than IL-1Ra, indicating potential for a room temperature-stable product.
- EBI-005 has been rationally designed by chimerizing two IL-1 receptor ligands, IL-1β and IL-1Ra, to create an optimized receptor antagonist, for topical ocular administration.
- As a rationally-designed antagonist, EBI-005 represents a novel approach to therapeutic design that can potentially be exploited for other proteins in the IL-1 and FGF families.

Provided by Eleven Biotherapeutics