Objectives
To investigate the pathogenesis of ocular surface damage and dry eye disease (DED) using the EpiCorneal in vitro human 3D tissue model.

Methods
Oxidative stress was generated by exposing the EpiCorneal tissues to non-toxic doses of UVB, hydrogen peroxide, or by placing tissues under desiccating stress conditions (DSC) for up to 72h in the presence and absence of topical lubricating eye drops. At the end of each treatment, the culture medium was collected and analyzed for release of 8-Isoprostane and cytokines. Also, tissues were fixed and stained with H&E or harvested for gene analysis or tissue viability (MTT assay).

Results
Dramatic reduction in tissue thickness was observed for EpiCorneal tissues incubated at DSC (40°C, 60%RH, 5%CO₂). Topical application of lubricant eye drops improved tissue morphology and barrier function. Oxidative stress (exposure to UVB or H₂O₂) and incubation under DSC induced the release of 8-Isoprostane and IL-8 and upregulated the expression of genes for the pro-inflammatory cytokines, IL1α and IL1β.

Conclusion
The EpiCorneal tissue structurally and functionally reproduces corneal oxidative stress and DED markers and will provide a comprehensive means to study DED and develop ophthalmic pharmaceuticals.