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A Model for the Precorneal Tear Film with Osmolarity and Corneal Supply R.J. BRAUN, University of Delaware, P.E. KING-SMITH, The Ohio State University — In the human tear film, a thin liquid layer is spread with a blink; it subsequently levels due to surface tension and evaporates more slowly than pure water due to the floating lipid layer. While eventually the tear film almost always ruptures, recent evidence suggests that in some cases supply of fluid from the cornea or conjunctiva may prolong the life of the tear film and prevent the osmolarity (combined concentration of certain salts and sugars) from reaching very large values that can cause irritation and damage. We incorporate osmolarity into a lubrication model for the tear film and study the dynamics of the tear film with osmotic supply from the corneal surface by numerically solving equations for the film thickness and osmolarity. It is treated as a classical osmotic semi-permeable barrier with parameters appropriate to the cornea. The tear film thinning may be slowed by these effects, and in some cases rupture prevented. The value of the osmolarity in regions thinned by evaporation is reduced by osmosis from the underlying surface.

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