Background: Systemic polyunsaturated fatty acids (PUFAs) were shown to improve the symptoms of dry eye syndrome due to their anti-inflammatory effects. This study evaluated the in-vitro anti-inflammatory effects of PUFAs on human corneal epithelial (HCE) cells.

Research Hypothesis: The primary objectives and the stage of the research were to study whether there are anti-inflammatory effects of ALA on HCE cells.

Aims: To study the anti-inflammatory effects of ALA on HCE cells in-vitro.

Methods: HCE cells were incubated for 2 hours with different concentrations of PUFAs: Alpha-linolenic acid (ALA), Gamma-linolenic acid (GLA) and Linoleic acid (LA). Oleic acid (OA) and Dexamethasone (DM) served as negative and positive controls, respectively. Cells were stimulated with either polyinosinic:polycytidylic acid (poly I:C) or lipopolysaccharide (LPS) complex. The protein contents and mRNA expression levels of cytokines were evaluated with multiplex fluorescent bead immunoassay and real time-PCR, respectively.

Results: The protein and mRNA levels of IL-6, IL-8, IL-1β and TNF-α were significantly increased after stimulation with LPS or poly I:C. Following treatment with ALA, a significant decrease was demonstrated in the protein content of TNF-α to 23.81% (P<0.001), IL-6 to 46.71% (P<0.001), IL-1β to 20.86% (P<0.05) and IL-8 to 52.21% (P<0.001). Similar results were demonstrated at the mRNA level. The anti-inflammatory effects of ALA were similar to those of DM for all of the pro-inflammatory cytokines. The ALA inhibition of the pro-inflammatory cytokines was associated with a significant reduction of I-κBα.

Discussion: our study demonstrates several significant direct effects of ALA in reducing inflammation of the ocular surface in vitro. These findings may have clinical relevance to the treatment of dry eye disease, as inflammation plays a central role in its pathogenesis. Topical n-3 PUFA treatment for ocular surface inflammation associated with dry eye syndrome, or with contact lens intolerance, may enable a widely available, inexpensive and efficient therapy, with less undesired side effects, compared with systemic PUFA administration. Thus, topical ALA may be more beneficial in reducing inflammation associated with dry eye disease, compared with oral PUFA administration.

Conclusions: The anti-inflammatory effects of ALA are comparable to those of corticosteroids, and are mediated through NF-κB signal transduction.

Key words: polyunsaturated fatty acids, anti-inflammatory, human corneal epithelial