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Characteristic properties of the inflammatory process in eye surface tissues in Rex rabbits with modelled dry eye disease

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Introduction: The possibility of modelling dry eye disease in rabbits, using botulinum toxin A (BT-A), and the assessment of characteristic properties of the inflammatory process in eye surface tissues in animals are of great interest.

Aim: The aim was to study local immunity properties in rabbits with modelled dry eye disease.

Material & Methods: 10 rabbits (20 eyes) were given transconjunctival 5ED BT-A injections into the main, garter and suborbital lacrimal glands, using a 29G needle, under anesthesia. Tear fluid osmolarity was determined, using Tear Lab Osmolarity System (Tear Lab Corp., USA), and the quantity of cytokines IL-1β, IL-2, IL-4, IL-6, IL-8, IL-10, IL-17A, IL-1Ra, TNF-α, INF-α, INF-γ was estimated, using ELISA, before the investigation and on the 21st day.

Results: Reliable lacrimal production decrease and development of pronounced xerotic changes in the eye surface epithelium were recorded in animals on the 21st day after BT-A injections. Reliable 1.6 times or greater increase of all pro-inflammatory cytokines in the tear fluid ($p<0.05$-0.001) was recorded on the 21st day of the experiment. However, IL-10 production became 1.9 times ($p<0.001$) smaller in comparison with the initial data. The change of the level of pro-inflammatory cytokines was followed by a reliable increase of precorneal tear film osmolarity ($p<0.05$) naturally stimulating inflammatory process in eye surface tissues.

Conclusion: There is a possibility of using the worked out model to investigate xerotic process pathogenesis and means of its correction.

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Efficiency of 0.01% dexamethasone solution in polyvinylpyrrolidone aqueous solution in treating dry eye disease of different etiology

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Age related macular degeneration (AMD) is a degenerative eye disorder that can lead to serious implications such as central blindness. Sub-RPE deposits are known to be the hallmark of the disease, however the cause of their formation remains an enigma. Recent studies have identified hydroxyapatite (HAP) spherules in these deposits and a proposed mechanism has suggested that these spherules could initiate the growth of sub-RPE deposits. This project investigated the size and distribution of these HAP spherules at the retina/choroid interface in the human eye. HAP spherules were identified using scanning electron microscopy (SEM) to generate high-resolution images and they were analysed with ImageJ. Three specimens of human eye tissue were sampled in three different sections: the far periphery, mid-periphery and macula. Energy dispersive X-ray elemental analysis (EDX) was also used to confirm the calcium and phosphorus content of the spherules. HAP spherules were identified within and outside of sub-RPE deposits at the retina/choroid interface. 4680 spherules were analysed and upon measuring these spherules, it was found that their diameter ranged from 0.1 μm to 9 μm. Spherules were found in greater abundance in the mid-periphery compared to the macula and far-periphery. In addition, spherules were found to be smaller in the far-periphery. EDX confirmed that the spherules contain calcium and phosphorus. HAP spherules were present throughout the retina/choroid interface. The results strongly support the notion that HAP spherule size and distribution varies across the central-peripheral axis of the human eye.

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