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Physiological characteristics diffusion of fluid in the lens and vitreous chamber of rabbits

The purpose of this study was to identify the mechanisms of water-exchange processes in the lens and the vitreous chamber of a rabbit. Fluid transport processes in the lens were studied *in vitro* by the change in mass when immersed in the washing environments of the lenses, with the addition of an inhibitor of the active transport system Na+,K+-ATPase and without it. The direction of movement of aqueous humor was studied *in vivo* by the displacement of the fluorescein using biomicroscopy and "stopped diffusion". The removal of aqueous humor from the vitreous chamber was investigated by changing the concentration of the fluorescein in blood plasma taken from the vascular eye veins and the lateral ear veins, with increased or decreased pressure in the vascular system. It is established that water-exchange processes represent the physiological mechanism of "breathing" in the lens at the moments of accommodation "near-in the distance".

At a sight "in the distance" pressure in the flattened lens is minimal, therefore "fresh" aqueous humor enters the lens through its anterior capsule. The active ion transport system Na+,K+-ATPase, which is localized in the epithelium of the anterior capsule, promotes the osmotic transport of "fresh" aqueous humor and its further unidirectional diffusion from the anterior capsule to the posterior. Intensive receipt of aqueous humor maximally increases the inside the lens pressure to 6 mm Hg and translates the lens into a accommodation phase "near". The lens is maximally rounded and the greatest inside the lens pressure, which promotes the diffusion of "spent" aqueous humor through the posterior capsule. The movement of aqueous humor in the vitreous chamber takes place in the direction of the retina along the gradient of the oncotic pressure. Excretion of aqueous humor from the eye's posterior part occurs through the eye's vortical veins into the total bloodstream.

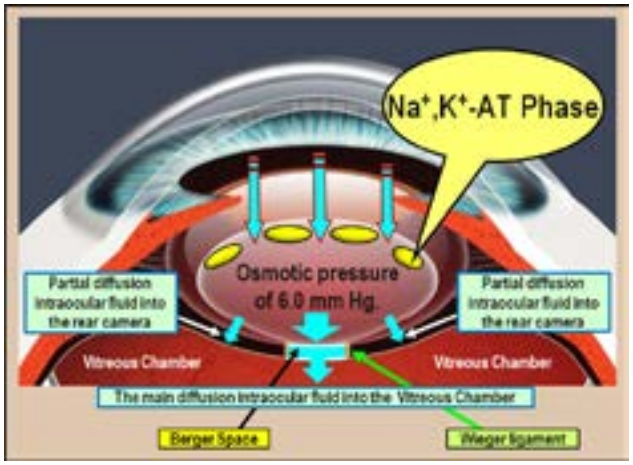

Figure1: Scheme of unidirectional movement of aqueous humor in the lens *in vivo*.

The narrow blue arrows indicate the direction of movement of aqueous humor with its partial diffusion into the back chamber. The main volume of spent explosives is removed from the lens by diffusion through the central part of its posterior capsule, first into Berger's space bounded Weiger bunch, and then into a vitreous chamber with a vitreous body.

Recent Publications

1. Koshitc I.N., Svetlova O.V., Gorban' A.I. Functioning of the executive mechanisms of accommodation and the development of the Helmholtz accommodation theory. Normal physiology of the eye.- St.- Petersburg: Publishing House North-Western State Medical University after I.I. Mechnikov, 2016, 288 pp. [in Russian].
2. Stepanova L.V., Sychev G.M., Svetlova O.V. Features of water exchange processes in rabbit lenses.- Eye, 2014.- 6 (100): 29-33.[in Russian].
3. Stepanova L.V., Sychev G.M., Svetlova O.V. Physiological characteristics of the water exchange processes inside the lens of animals with extreme phases of accommodation.- Ophthalmic journal, 2017.- 4 (477): (in print). [in Russian, in English].

Biography

Liudmila Stepanova has completed her PhD for studying the biophysical mechanisms of water exchange in the eye. Currently, he works at the Siberian Federal University in the direction of health-saving technologies based on bioluminescent analysis of biological fluids. She conducts joint research with the staff of the Department of Ophthalmology of Medical Universities to study the problems of cataract development and children's myopia in violation of water-exchange processes in the eye.

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