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## Disorders of retinal metabolism in the conceptual field of development of adaptive myopia

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**Statement of the Problem:** Choroidal all-trans retinoic acid is a possible mediator of the refractogenesis. According to literature data, trans retinoic acid has influence on proliferative activity and differentiation of scleral fibroblasts. This fact lets us to consider this substance like a potential agent of the development of myopia not only in experiment, but also in conditions of natural appearance and progression of myopia.

**Purpose:** The purpose is to study the ultrastructural features of the sclera in the simulation of axial myopia in the experiment and the reaction of scleral fibroblasts to various concentrations of all-trans retinoic acid.

**Methods:** 15 experimental 2 month old animals with weight 2.0-2.5 kilogram took a part in our study. To stimulate myopia, into the left internal carotid artery of every animal, catheter (Vasofix Certo 24G) was installed. Within 6 months, 0.5 ml of trans retinoic acid was administered daily at a concentration of 0.06 mg/ml (Sigma-Aldrich, USA). Clinical refraction was evaluated and echo biometric studies were performed. Transmission electron microscopy was used for morphological studies of scleral samples. Determination of the sensitivity of fibroblasts to retinoic acid was assessed using a microtetrazolium test (MTT test).

**Results:** The formation of axial myopia is closely related to scleral remodeling. Trans-retinoic acid is a factor that affects on proliferative activity of fibroblasts, hypertrophy and hyperplasia of cells, an increase in the volume of an extracellular matrix, thinning of collagen and elastic fibers.

**Conclusion:** A model for the formation of axial myopia in which the main initiating factor of pathogenesis is a violation of the process of physiological regeneration of photoreceptor disks is proposed. The slow absorption of retinal pigment epithelium by the cells of distal fragments of photoreceptor disks leads to the activation of oxidative processes (the concentration of vitamin A decreases and the concentration of trans retinoic acid increases). Activation of lipid peroxidation has a damaging effect on cells of the vascular endothelium, the photoreceptor layer of the retina, scleral fibroblasts. Remodeling of the sclera develops with the background of a weakened transfer of necessary metabolites through the damaged endothelium and causes the synthesis of a fragile V type of collagen with short chains.

### Recent Publications

1. Ganeshyan I P and Wildsoet C F (2010) Pharmaceutical intervention for myopia control // Expert Review of Ophthalmology 5(6):759-787.
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3. McFadden S A, Howlett M H and Mertz J R (2004) Retinoic acid signals the direction of ocular elongation in the guinea pig eye. Vision Research 44(7):643-653.
4. Seko Y, Shimokawa H and Tokoro T (1996) In vivo and in vitro association of retinoic acid with form-deprivation myopia in the chick. Experimental Eye Research 63(4):443-452.

### Biography

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