Blood-Retinal Barrier Transport and Drug Delivery to the Retina

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Retinal diseases (e.g., age-related macular degeneration, diabetic retinopathy, glaucoma, and retinitis pigmentosa) accompany severe vision loss and pose a serious socioeconomic burden. The treatment of these retinal diseases is challenging, since the ocular barriers that effectively protect the eye from foreign materials also hinders efficient absorption of pharmaceuticals. The inner blood-retinal barrier (inner BRB) forms complex tight junctions of retinal capillary endothelial cells to prevent the free diffusion of substances between the circulating blood and the neural retina. Thus, understanding of the inner BRB transport mechanisms could provide a basis for strategies of drug delivery to the retina. Recent molecular identification and functional analyses of carrier-mediated transport systems for endogenous compounds as well as xenobiotics show that the inner BRB is equipped with a variety of membrane transport mechanisms, for both influx and efflux, to maintain homeostasis in the neural retina. Topical instillation of drugs does not result in much reaching the retina and, so, in order to achieve the maximum efficacy of retinaly-active drugs by systemic administration, it is important to understand the transport mechanisms at the inner BBB. In addition to transport processes covered in this symposium, there must be other influx and efflux transport processes at the inner BRB. Identification and characterization of all the transporters at the inner BRB will provide a basis for more successful strategies for drug delivery to the retina.