

The sites of the blood-retinal barrier are the retinal pigment epithelium which separates the retina from the choroid and which is analogous to the choroid plexus of the brain, and the retinal blood vessels, which are lined by a continuous layer of endothelial cells that are connected by tight junctions (*zonulae occludentes*) that restrict intercellular diffusion. The retinal blood vessels are analogous to blood vessels of the brain, which also contain a continuous endothelial layer. This monograph, "The Blood-Retinal Barriers" examines new basic and clinical observations on the eye and compares them with similar observations on the blood-brain barrier. It is a well-organized book with some very extensive reviews, and should be a reference source for clinicians and basic scientists interested in the eye.

The first two chapters by P. Carvalho and J.J.P. de Lima, respectively, present mathematics and observations on energy dependent transport, and on water and ionic fluxes across epithelia and cell membranes. K. Dorovini-Zis then reviews recent research on the structure and function of the blood-brain barrier, and on its modification in response to hypertension or hypertonic treatment. She suggests a possible role for astrocytes and their assemblies in transfer processes. I (S.I. Rapoport) summarize physiological studies with osmotic opening of the blood-brain barrier, and relate cerebrovascular permeability of nonelectrolytes to their lipid solubility.

J. Cunha-Vaz summarizes the kinetic relations among the ocular compartments, and regulation by the ocular barriers of aqueous and vitreous humor compositions. He showed that fluorescein is normally transported out of the vitreous across the retina, but that the gradient is reversed when transport is inhibited. Potentially neurotoxic substances are excluded from the retina by the blood-retinal barriers. A. Lajtha summarizes observations on  $\text{Na}^+$ -dependent amino acid uptake by brain tissue slices, in relation to cerebrovascular transport, and discusses the effects of altered nutrition and hormones. He emphasizes brain heterogeneity.

L. Bito reviews transport systems of the blood-retinal barrier and concentration distributions of substances among plasma and aqueous and vitreous humors. Retinal transport is examined for prostaglandins,  $\text{K}^+$ ,  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$ . D.M. Maurice presents a unique summary of drug exchange between the blood and the vitreous. With a simple equation, he examines the half-life of substances injected into the vitreous and distinguishes loss into the posterior chamber and aqueous humor as compared to loss through the retina itself. A. Bill discusses water exchange in the eye, and concludes that continuous water flow from vitreous to choroid across the retina tends to prevent retinal detachment. This flow is maintained by hydrostatic and osmotic pressure gradients across the retina. He also discusses aqueous drainage *via* the uvea and Schlemm's canal.

J. Cunha-Vaz shows how the method of the vitreous fluorophotometry has been used to examine leakage of sodium fluorescein from retinal blood vessels or from the pigment epithelium, in the diabetic eye and following photocoagulation or retinal vascular damage. G. Coscas summarizes additional clinical observations with fluorescein angiography, although his presentation is somewhat weakened by the absence of references. M.O.M. Tso presents electronmicroscopic studies on the pathological blood-retinal barrier. Injury activates proliferation of slowly-cycling cells of the vascular endothelium and retinal pigment epithelium, and increases retinal capillary permeability by opening endothelial tight junctions or by stimulating pinocytosis,

The concept of a decompensated endothelial cell which does not lose its semi-permeability properties is introduced, but may be an artifact.

P. Henkind discusses clinical observations which allow him to propose an original model for extracellular-vasogenic retinal edema. His table of retinal vascular diseases summarizes pathogenesis, fluorescein findings and morphological findings. A. Laties indicates that the blood-retinal barrier is less vulnerable to acute hypertension than is the blood-brain barrier. He does not find capillary leakage of fluorescein in streptozotocin-induced diabetic retinopathy in rats, although this retinopathy stimulates proliferation of basal infoldings of the retinal pigment epithelium. D.B. Archer summarizes the morphological changes which occur following experimental branch vein occlusion. The pathological course involves distension of blood vessels, venous stasis and increased permeability. D. Finkelstein refers to rather unsuccessful attempts to find an angiogenic factor that stimulates neovascularization in the retina.

F. Goldberg presents an outstanding review of the pathophysiology of various retinal diseases and the associated alterations in the blood-retinal barrier to fluorescein. A.F. Deutman also reviews pathological changes in the blood-retinal barriers in relation to retinal function.

In summary, this book includes an outstanding series of papers, which summarize recent findings on the blood-retinal barrier in relation to normal and pathological ocular function. By relating these observations to the blood-brain barrier, our understanding of both fields is augmented.

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