

MODULE 5.1

The Human Eye and Retinal Structure

Diabetic patients often have long histories of poor glycemic control,¹ which can eventually lead to the development of diabetic retinopathy (DR), characterized by vascular permeability changes. This altered vascular permeability may lead to what is known as diabetic macular edema (DME), accumulation of fluid within the retina that if left untreated leads to varying degrees of vision loss.² Diabetes acts on all retinal cell types including retinal vessels (endothelial), choroidal, Mueller (glial), and neuronal cells.³

The retina is a circular disc of 30-40 mm in diameter.^{4,6} The optic nerve (optic disc), which measures about 2.0 by 1.5 mm, is in the center of the retina.⁷ Approximately 4.5-5.0 mm to the left of the disc in the diagram lies the fovea, which is at the center of the area known as the macula. The major blood vessels of the eye radiate out from the center of the optic nerve; however, the fovea is relatively avascular under normal conditions. The peripheral retina extends from the macula to the ora serrata (the serrated junction between the ciliary body and the retina).⁸

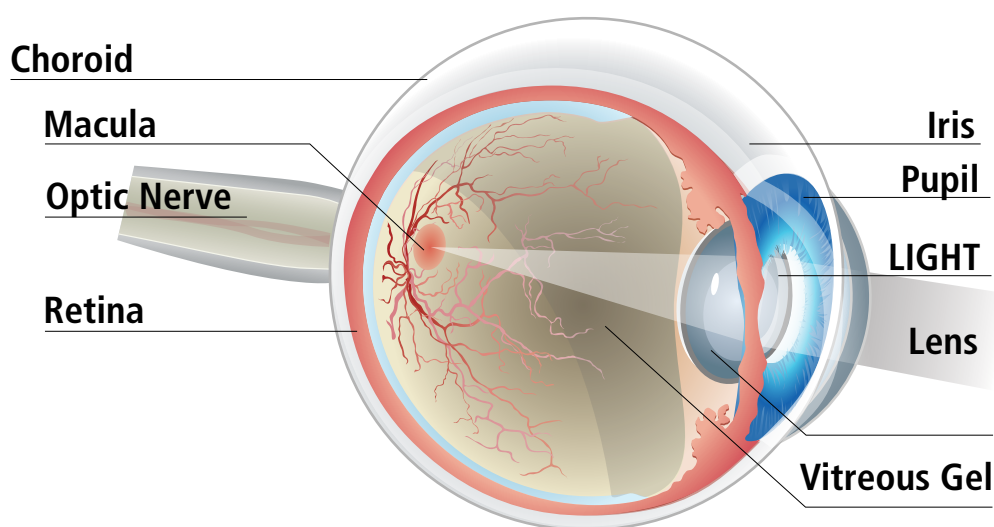
The retina comprises three layers of nerve cell bodies with two layers of synapses.⁷ The outer nuclear layer contains cell bodies of the rods and cones (Picture below). The inner

nuclear layer contains cell bodies of the bipolar, horizontal, and amacrine cells, whereas the ganglion cell layer contains cell bodies of ganglion cells and displaced amacrine cells.

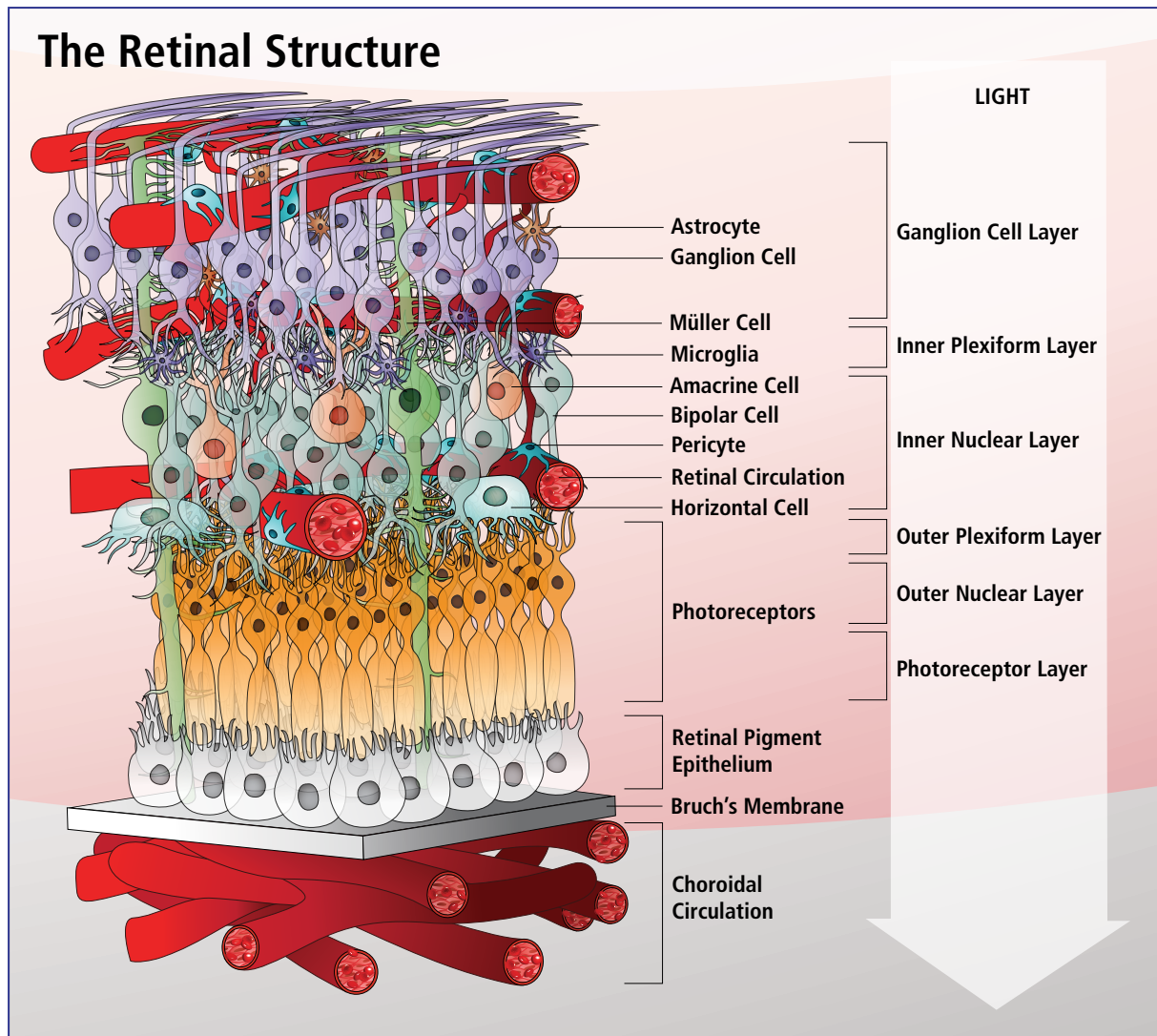
The retina is a thin layer of tissue (approximately 0.5 mm thick) that lines the back of the eye.⁷ The optic nerve contains the ganglion cell axons and incoming blood vessels that transport nutrients and oxygen to the retinal layers and neurons. The ganglion cells (output neurons of the retina) lie innermost in the retina, closest to the lens and the front of the eye. The photosensors (rods and cones) lie outermost in the retina against the pigment epithelial layer and choroid.

Light travels through the retina before striking and activating the rods and cones. Subsequently, the absorption of photons by the visual pigment of the photoreceptors is translated into a biochemical message and then transduced into an electrical message. Two simple diagrams of the retina that show only the sensory photoreceptors and the ganglion cells with a few interneurons connecting the two cell types are provided in pictures below.

The Human Eye



The major blood vessels that supply the eye with oxygen and nutrients radiate out from within the optic nerve, at the back of the eye. The fovea is relatively avascular under normal conditions. The retina is located at the back of the eye and contains the photoreceptors that translate light into a biochemical message, which is then transduced into an electrical message and processed as an image by your brain.



References

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