



Eye Fluids

Reference Books:

- **Text Book of Medical physiology** (Guyton and Hall)
Eleventh edition


Fluid System of the Eye (Intraocular Fluid)

- The eye is filled with intraocular fluid, which maintains sufficient pressure in the eyeball to keep it distended.
- Intraocular fluid can be divided into two portions: aqueous humor, which lies in front of the lens, and vitreous humor, which is between the posterior surface of the lens and the retina

- The aqueous humor is a freely flowing fluid, whereas the vitreous humor, sometimes called the vitreous body, is a gelatinous mass held together by a fine fibrillar network composed primarily of greatly elongated proteoglycan molecules. Both water and dissolved substances can diffuse slowly in the vitreous humor, but there is little flow of fluid. Aqueous humor is continually being formed and reabsorbed. The balance between formation and reabsorption of aqueous humor regulates the total volume and pressure of the intraocular fluid.

Formation of Aqueous Humor by the Ciliary Body

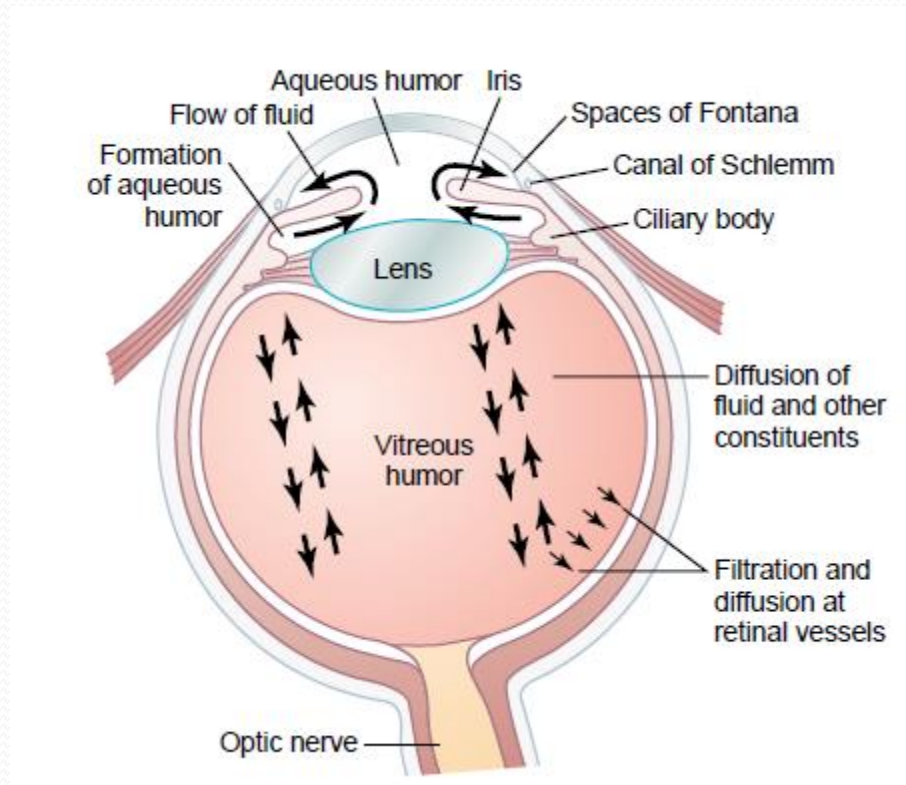
- Aqueous humor is formed in the eye at an average rate of 2 to 3 microliters each minute.
- The surfaces of ciliary processes are covered by highly secretory epithelial cells, and immediately beneath them is a highly vascular area.
- Aqueous humor is formed almost entirely as an active secretion by the epithelium of the ciliary processes. Secretion begins with active transport of sodium ions into the spaces between the epithelial cells.



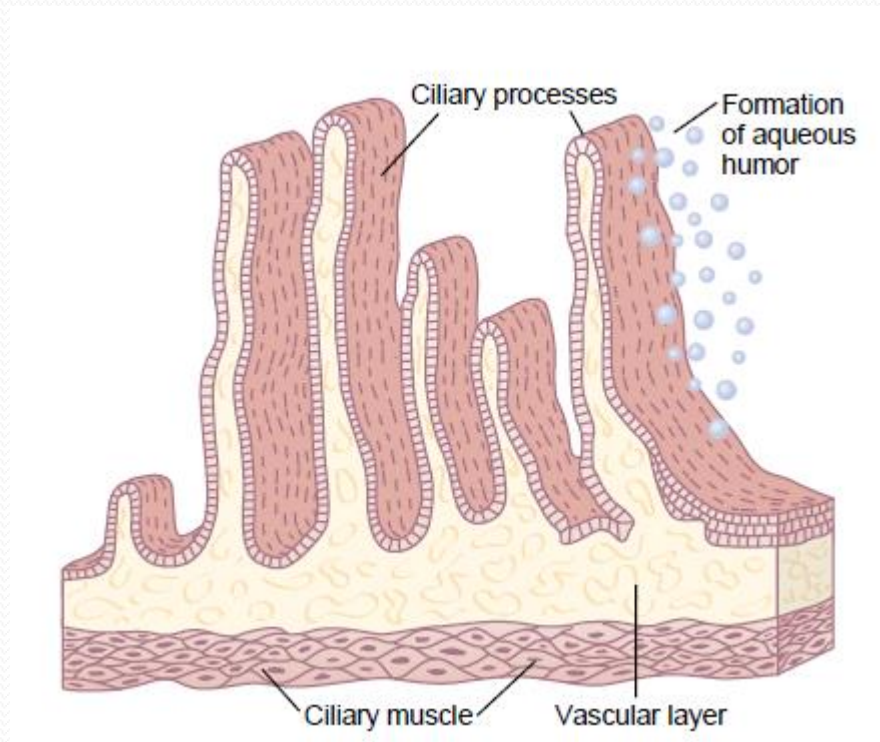
The sodium ions pull chloride and bicarbonate ions along with them to maintain electrical neutrality.

- Then all these ions together cause osmosis of water from the blood capillaries lying below into the same epithelial intercellular spaces, and the resulting solution washes from the spaces of the ciliary processes into the anterior chamber of the eye.
- Nutrients are transported across the epithelium by active transport or facilitated diffusion; they include amino acids, ascorbic acid, and glucose.

Formation and flow of fluid in the eye.

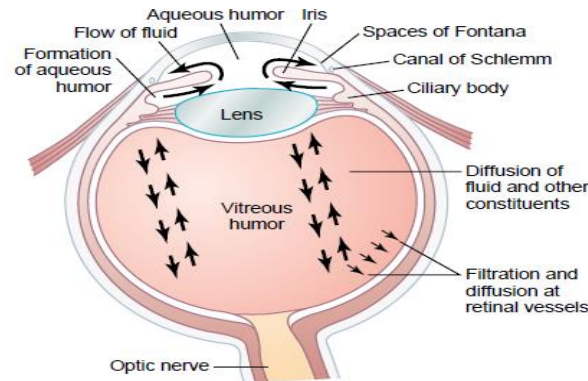


Anatomy of the ciliary processes. Aqueous humor is formed on surfaces.



Outflow of Aqueous Humor from the Eye

- After aqueous humor is formed by the ciliary processes, it first flows through the pupil into the anterior chamber of the eye. From here, the fluid flows anterior to the lens and into the angle between the cornea and the iris, then through a meshwork of trabeculae, finally entering the canal of Schlemm, which empties into extraocular veins.



Functions

- Maintains the intraocular pressure.
- Provides nutrition (e.g. amino acids and glucose).
- Carries away waste products .
- Serve to transport ascorbic acid in the anterior segment to act as an anti-oxidant agent.
- Presence of immunoglobulins indicate a role in immune response to defend against pathogens

“Glaucoma,” a Principal Cause of Blindness

- Glaucoma is one of the most common causes of blindness. It is a disease of the eye in which the intraocular pressure becomes pathologically high, sometimes rising acutely to 60 to 70 mm Hg. Pressures above 25 to 30 mm Hg can cause loss of vision when maintained for long periods. Extremely high pressures can cause blindness within days or even hours.

Vitreous fluid

- The vitreous is the transparent, colorless, gelatinous mass that fills the space between the lens of the eye and the retina lining the back of the eye.
- It is produced by certain retinal cells.
- It contains few phagocytes which remove unwanted cellular debris, as well as the hyalocytes of Balazs, which produce the hyaluronic acid).
- No blood vessels, and 99% of its volume is water with salts, sugars, and a network of collagen with the mucopolysaccharide hyaluronic acid accounting for the rest