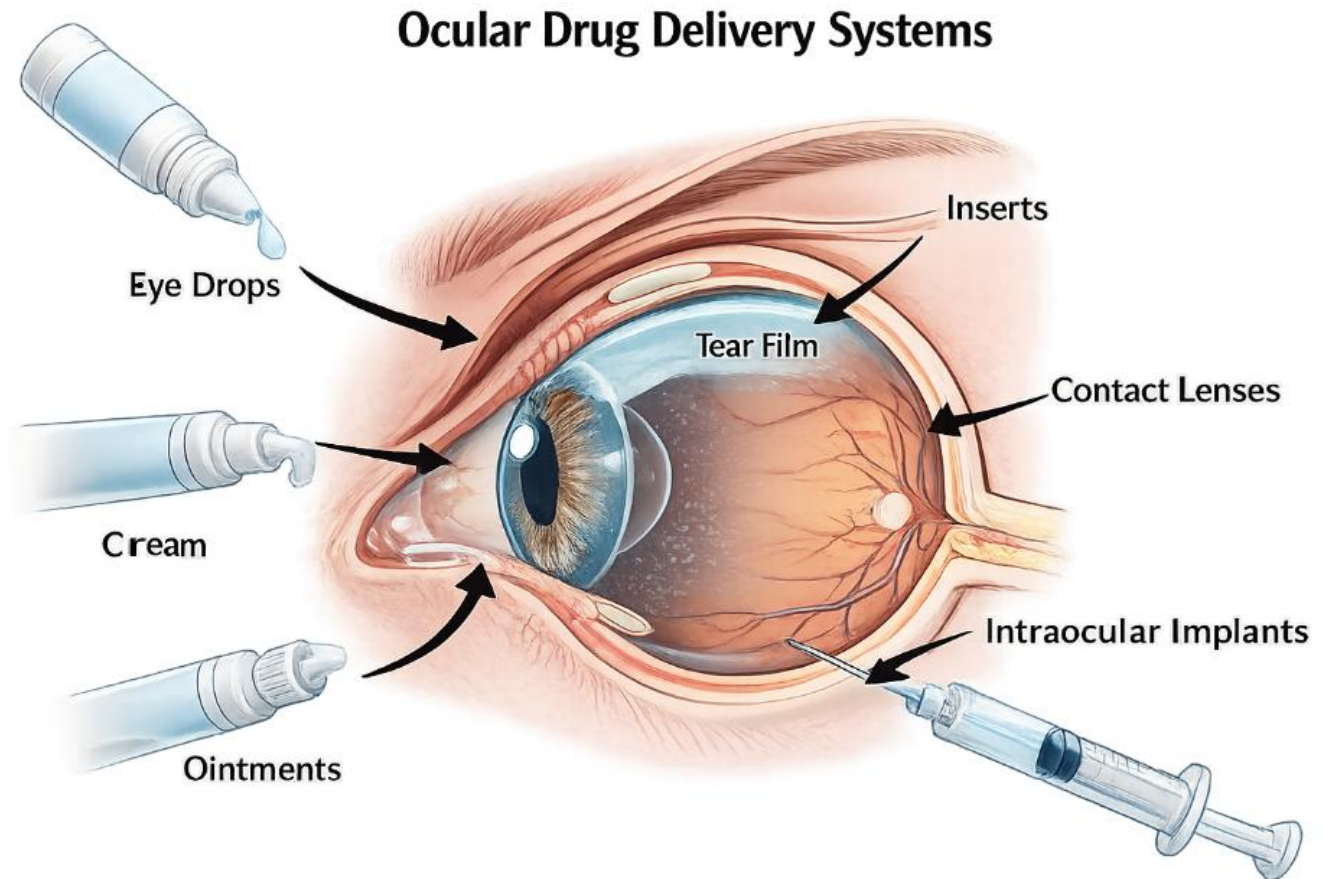


Ocular Drug Delivery Systems

Introduction of Ocular Drug Delivery Systems

- Ocular drug delivery systems are pharmaceutical formulations designed to deliver drugs to the eye for the treatment of various ocular diseases.



- The eye is a highly specialized and sensitive organ, and delivering drugs effectively to the eye is challenging due to several anatomical and physiological barriers.
- The eye is a highly protected organ with several anatomical and physiological barriers that limit drug absorption.
- Because of these barriers, only a small fraction of administered drug reaches the target tissues of the eye.

Objectives of Ocular Drug Delivery Systems

- Increase drug bioavailability
- Improve therapeutic efficacy
- Prolong drug residence time in the eye

Common Ocular Diseases Treated

- Conjunctivitis
- Glaucoma
- Dry eye syndrome

- Keratitis
- Uveitis

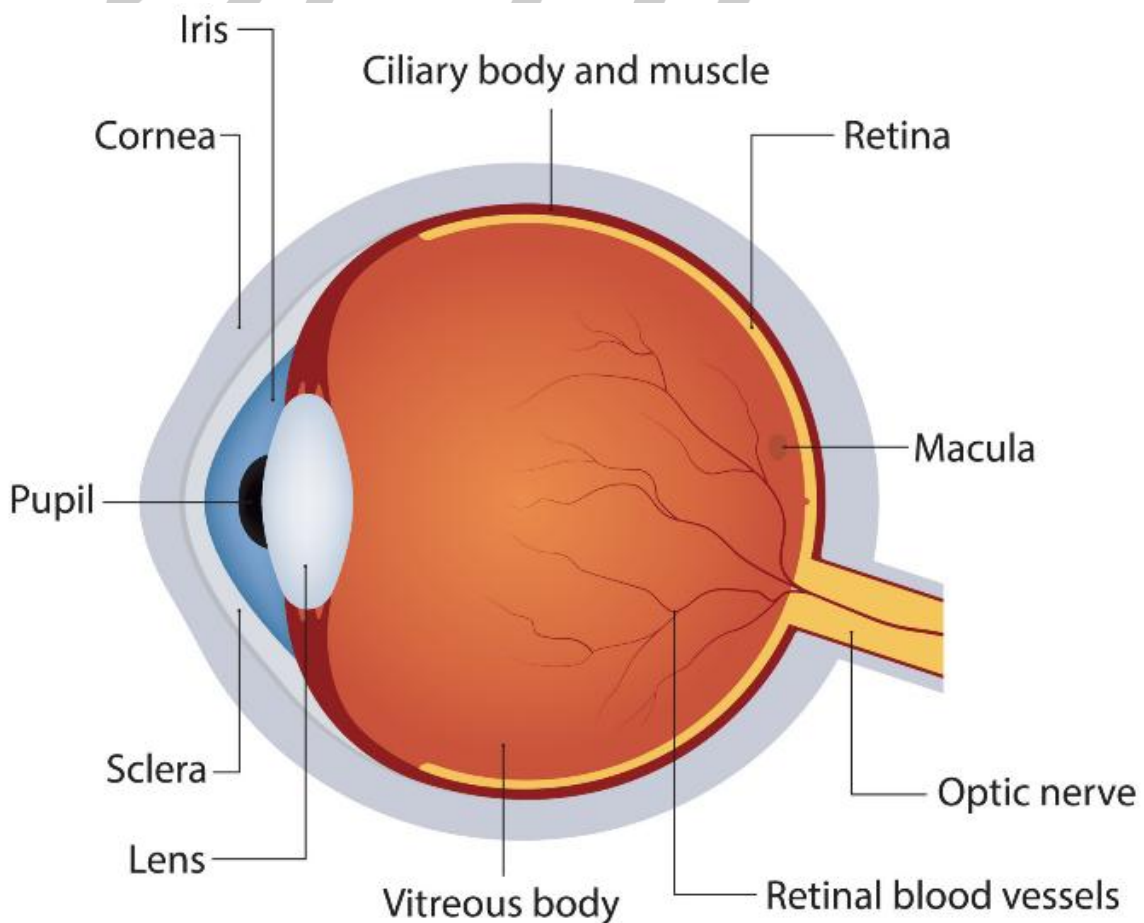
Common Ocular Dosage Forms

- Eye drops
- Eye ointments
- Eye gels
- Ocular inserts
- Ocular implants

Bioavailability Issue

- Despite the availability of many dosage forms, the bioavailability of drugs administered to the eye is usually very low.
- Often **less than 5% of the administered drug** reaches the target tissues due to various barriers that limit drug absorption.

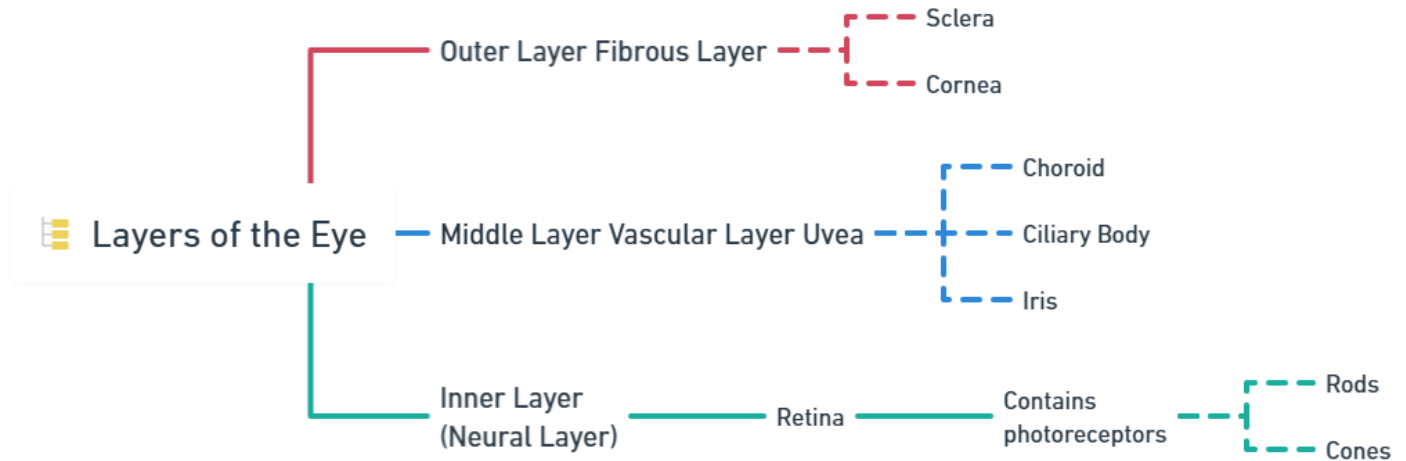
Structure of the Eye (Brief Overview)



- The **eye** is a sensory organ responsible for **vision**.
- It converts light into electrical signals, which are interpreted by the brain to produce images.

- The eye is composed of several specialized structures that work together to enable vision.
- The **structure of the eye** is broadly divided into:
 - Three main layers
 - Two segments

Layers of the Eye



1. Outer Layer (Fibrous Layer)

- This is the outer protective layer of the eye.
- It consists of:

A. Sclera

- White, tough connective tissue
- Maintains the shape of the eye
- Protects internal structures

B. Cornea

- Transparent front portion of the eye
- Allows light to enter the eye
- Helps in focusing light

2. Middle Layer (Vascular Layer / Uvea)

- This layer contains blood vessels that supply nutrients to the eye.
- It consists of:

A. Choroid

- Pigmented layer containing blood vessels
- Supplies oxygen and nutrients to the retina

B. Ciliary Body

- Produces aqueous humor

- Controls the shape of the lens for focusing

C. Iris

- Colored part of the eye
- Controls the size of the pupil
- Regulates the amount of light entering the eye

3. Inner Layer (Neural Layer)

- This layer is **responsible for vision**.

Retina

- Contains photoreceptor cells:
 - **Rods**
 - **Cones**
- Converts light into electrical signals
- Signals are transmitted to the brain through the optic nerve

Segments of the Eye

1. Anterior Segment

- The **front portion of the eye** includes:
 - Cornea
 - Aqueous humor
 - Iris
 - Ciliary body
 - Lens
- The **aqueous humor**:
 - Maintains **intraocular pressure**
 - Nourishes the **cornea and lens**

2. Posterior Segment

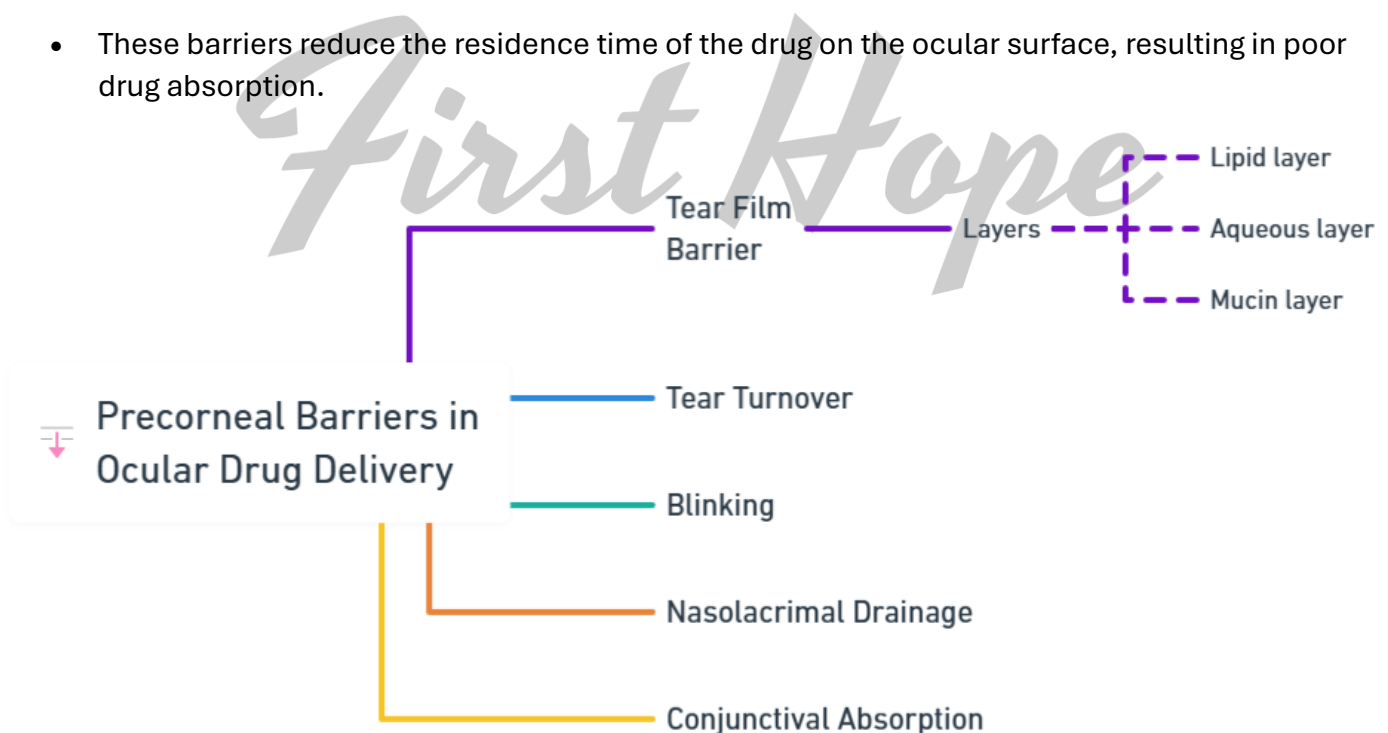
- The **back portion of the eye** includes:
 - Vitreous humor
 - Retina
 - Choroid
 - Optic nerve

Barriers of Drug Permeation in Ocular Drug Delivery

- The eye has multiple protective mechanisms and anatomical barriers that restrict drug penetration.
- These barriers protect the eye from harmful substances but also reduce drug absorption and bioavailability.
- **The barriers can be classified into:**
 - Precorneal barriers
 - Corneal barriers
 - Non-corneal barriers
 - Blood–ocular barriers

Precorneal Barriers

- Precorneal barriers are the first obstacles encountered by drugs applied to the eye surface after topical administration.
- These barriers reduce the residence time of the drug on the ocular surface, resulting in poor drug absorption.



A. Tear Film / Tear Fluid Barrier

- **The tear film covers the surface of the eye and consists of three layers:**
 - Lipid layer
 - Aqueous layer
 - Mucin layer

Functions of Tear Film

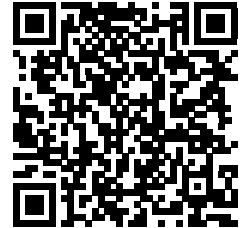


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