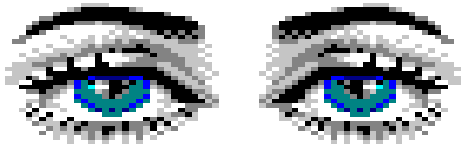

DESIGN, FABRICATION AND EVALUATION OF OCULAR DRUG DELIVERY SYSTEM

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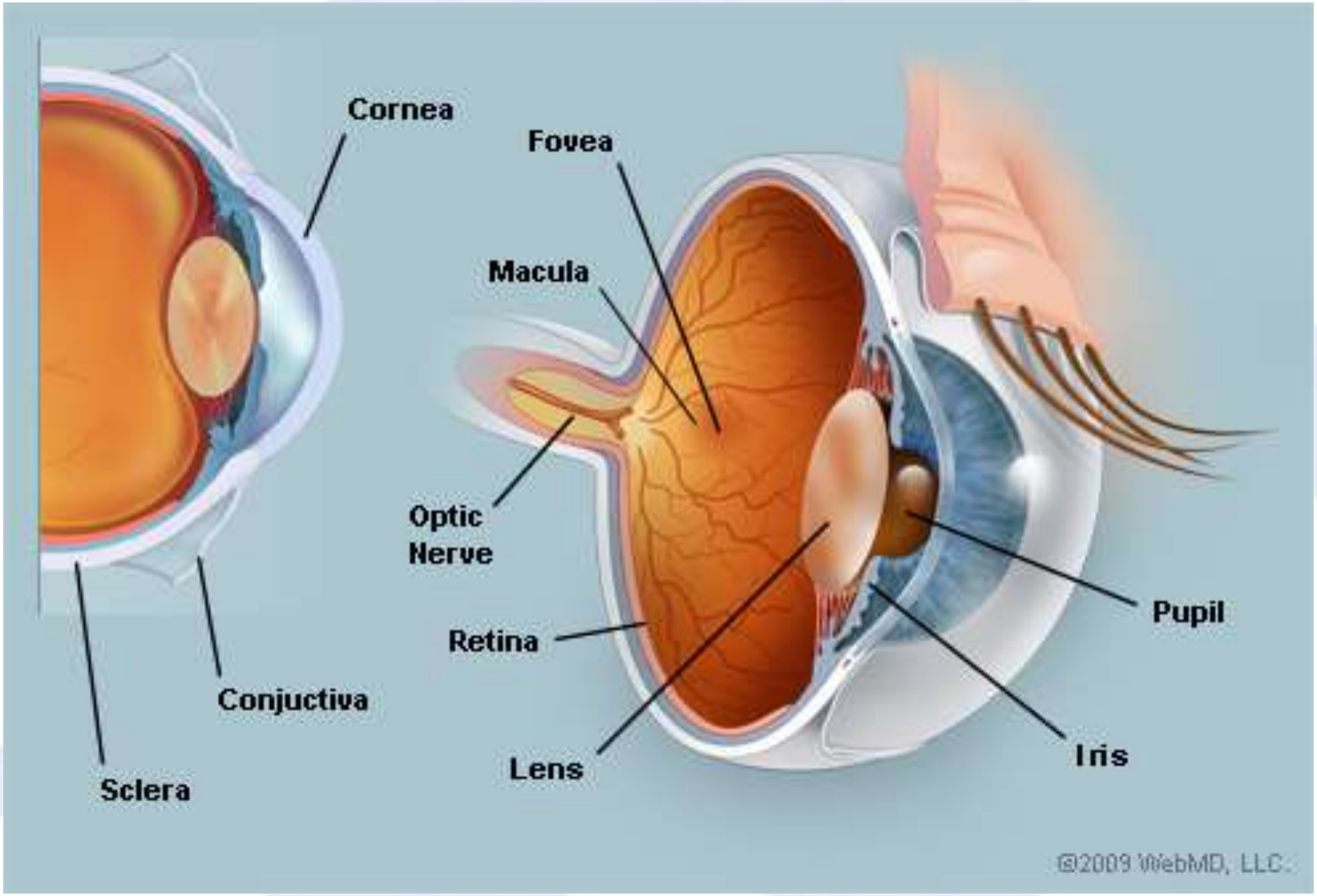
Cornea
Fovea
Macula
Optic Nerve
Retina
Pupil
Conjuctiva
Lens
Iris
Sclera
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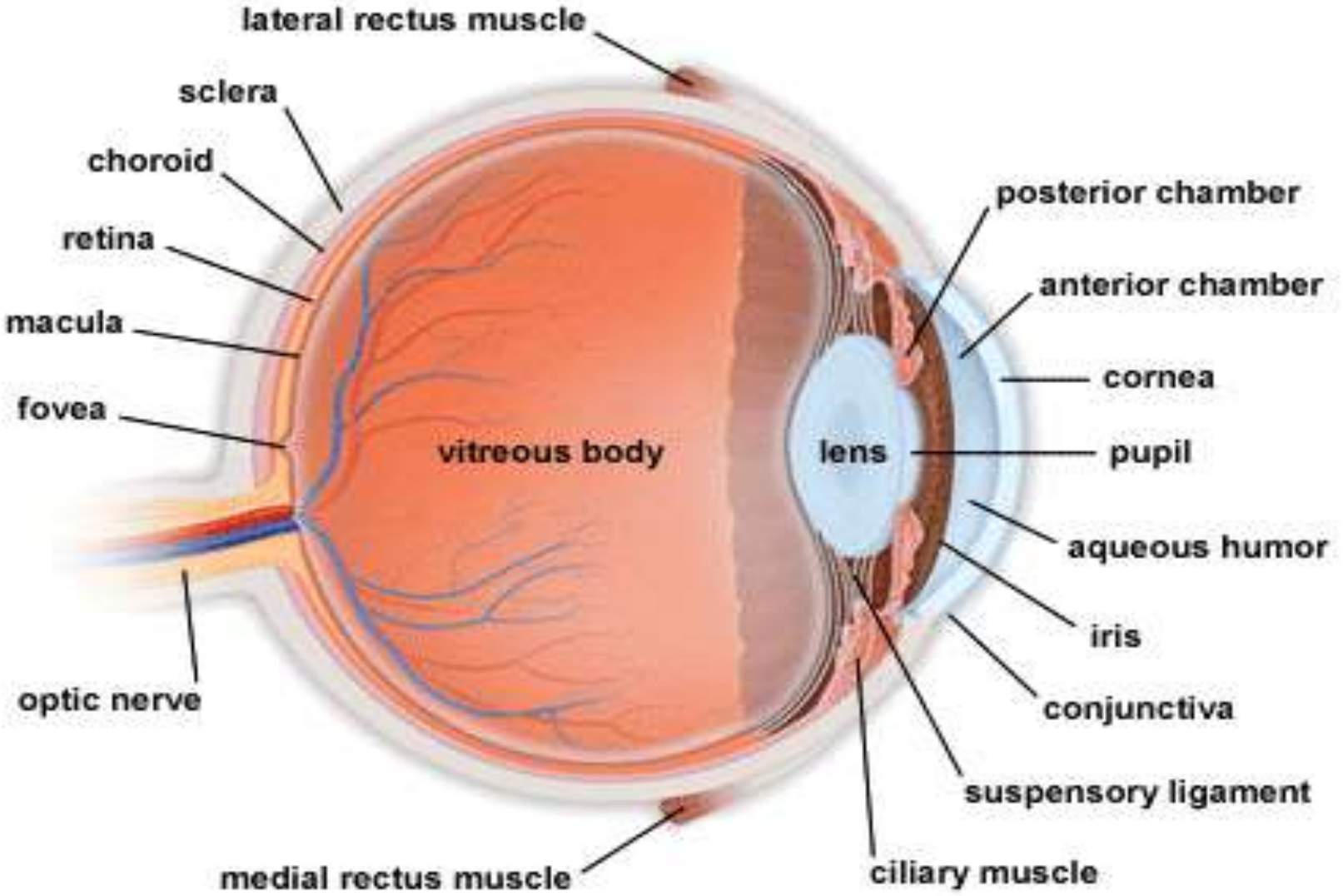
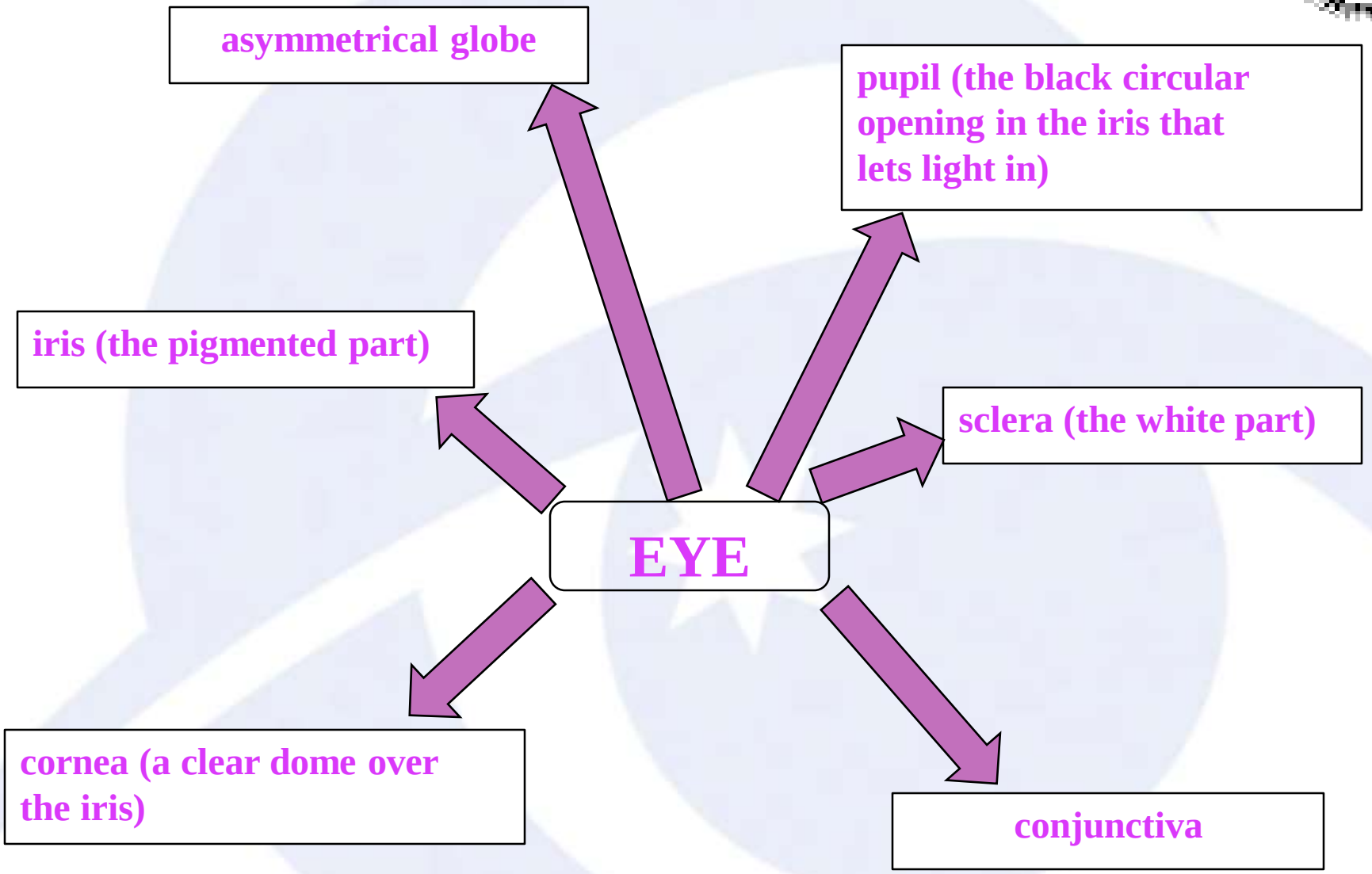
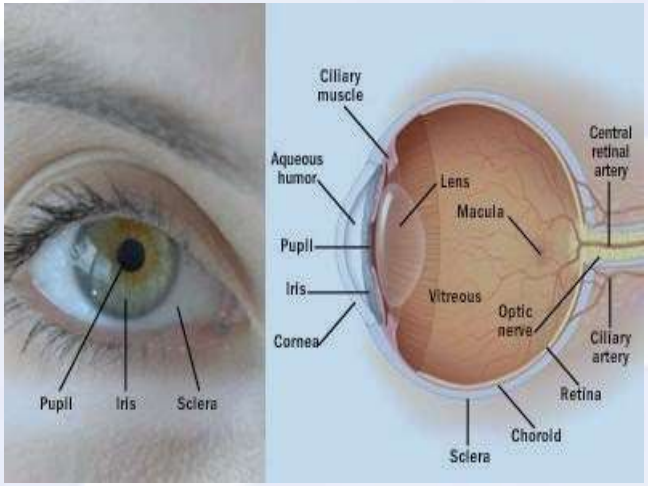
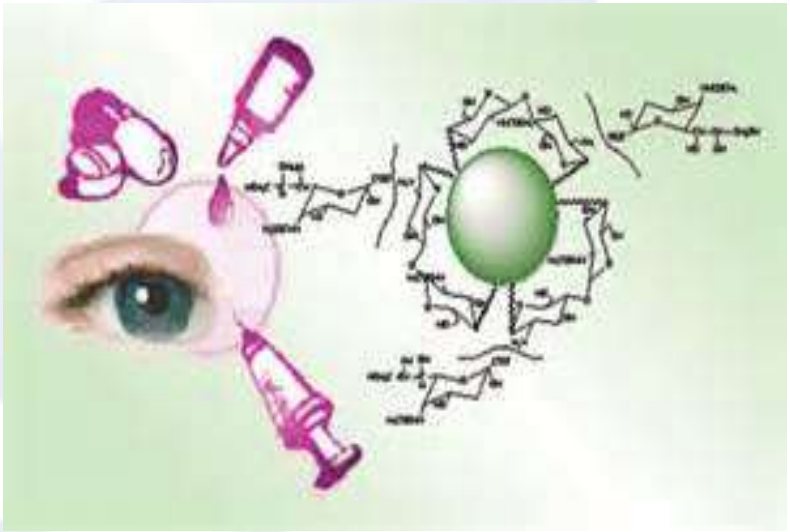
ANATOMY OF THE EYE




asymmetrical globe
pupil (the black circular opening in the iris that lets light in)
iris (the pigmented part)
sclera (the white part)
EYE
cornea (a clear dome over the iris)
conjunctiva



OCULAR DRUG DELIVERY SYSTEM



IDEAL PROPERTIES:

- ✓ Deliver drug to the right place
- ✓ Process more local activity than systemic effects

ADVANTAGES:

- ❖ Increased accurate dosing. To overcome the side effects of pulsed dosing produced by conventional systems.
- ❖ To provide sustained and controlled drug delivery.

LIMITATIONS :

- ❖ Dosage form cannot be terminated during emergency.
- ❖ Interference with vision.

FORMULATION OR DESIGNS:

1.LIQUIDS: Solutions, Suspensions, Sol to gel systems, Sprays

2.SOLIDS: Ocular inserts, Contact lenses, Corneal shield, Artificial tear inserts,

Filter paper strips

1.SEMI-SOLIDS: Ointments, Gels

2.MISCELLANEOUS: Ocular iontophoresis, Vesicular systems, Mucoadhesive

dosage forms, Particulates, Ocular penetration enhancers:

Use of Hyaluronic acid, Use of Hydroxy BetaCyclodextrin.

1. Liquids:

•Liquids are the most popular and desirable state of dosage forms for the eye. This is because the drug absorption is fastest from this state. The slow release of the drug from the suspended solids provides a sustained effect for a short duration of time.

i.Solutions and Suspensions:-

Solutions are the pharmaceutical forms **most widely used** to administer drugs that must be active on the eye surface or in the eye after passage through the cornea or the conjunctiva.

ii.Sprays

Although not commonly used, some practitioners use mydriatics or cycloplegic alone or in combination in the form of eye spray

iii.Emulsions

W/O Micro emulsions offer a promising alternative. They are thermodynamically stable and optically isotropic colloidal systems with excellent wetting and spreading properties

iv.Dispersed Systems:

Dispersed systems are based on liposomes nanoparticles or Nano capsules used for ophthalmic use. The developments of Nano products have been very challenging but not established. The reasons are

- % of drug dispersed
- Stability and shelf life

ii.SOLIDS:-

All ocular drug delivery devices are kept under solids.

Contact Lenses

Contact lenses can absorb water-soluble drugs when soaked in drug solutions. These drug-saturated contact lenses are placed in the eye for releasing the drug for a long period of time.

The hydrophilic contact lenses can be used to prolong the ocular residence time of the drugs.

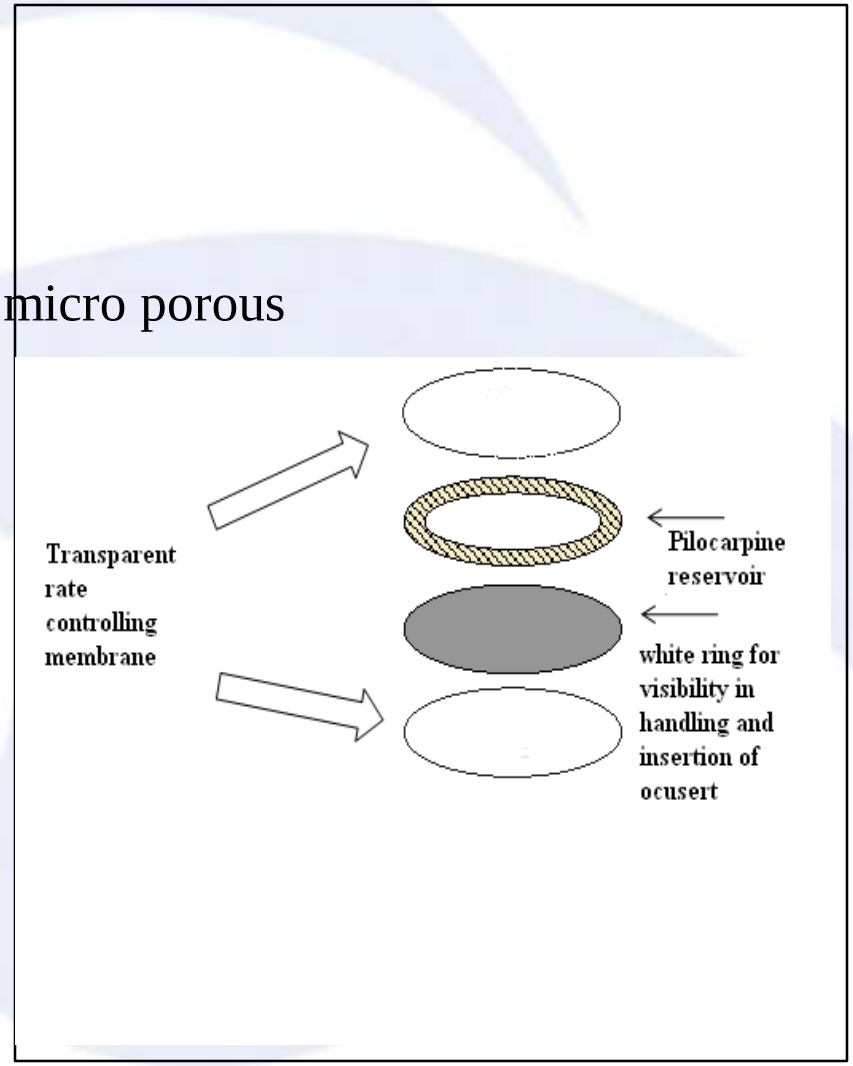
Artificial tear inserts

A rod shaped pellet of hydroxy propyl cellulose without preservative is commercially available (Lacrisert).

This device is designed as a sustained release artificial tear for the treatment of dry eye disorders.

iii.Non Erodible ocular insert:

- The earliest ocular inserts was Ocusert
- In Ocusert drug reservoir is a thin disc of pilocarpine alginate complex sandwiched between 2 transparent discs of micro porous membrane fabricated from ethylene-vinyl acetate Copolymer



Disadvantage:

Difficult of usage in self-administration

Poor tolerance in the eye

iv. Erodible ophthalmic inserts:

- These are composed of either soluble degradable matrices
- These are used to overcome drawbacks of non-erodible systems

v.NODDS (New Ophthalmic Drug Delivery Systems)

- The basic design of NODDS consists of 3 component strip

a. Water soluble , drug loaded film attached

b. Thin , water soluble membrane film , to

c. Thicker, water soluble , handle film

EVALUATION OF OCULAR DRUG DELIVERY SYSTEM

1.THICKNESS OF THE FILM :

- ✓ Measured by dial caliper at different points and the mean value is calculated.

2. DRUG CONTENT UNIFORMITY :

- ✓ The cast film cut at different places and tested for drug as per monograph.

3. UNIFORMITY OF WEIGHT :

- ✓ Here, three patches are weighed.

4. PERCENTAGE MOISTURE ABSORPTION :

- ✓ Here, ocular films are weighed and placed in a dessicator containing 100 ml of saturated solution of aluminium chloride and 79.5% humidity was maintained.

- ✓ After three days the ocular films are reweighed and the percentage moisture absorbed is calculated using the formula –

$$\% \text{ moisture absorbed} = \frac{\text{Final weight} - \text{initial weight}}{\text{Initial weight}} \times 100$$

5. PERCENTAGE MOISTURE LOSS

- ✓ Ocular films are weighed and kept in a dessicator containing anhydrous calcium chloride.

- ✓ After three days, the films are reweighed and the percentage moisture loss is calculated using formula –

$$\% \text{ moisture loss} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

6. IN VITRO EVALUATION METHODS

➢ BOTTLE METHOD

- ✓ In this, dosage forms are placed in the bottle containing dissolution medium maintained at specified temperature and pH.
- ✓ The bottle is then shaken.
- ✓ A sample of medium is taken out at appropriate intervals and analyzed for drug content.

➢DIFFUSION METHOD

- ❖ Drug solution is placed in the donor compartment and buffer medium is placed in between donor and receptor compartment.
- ❖ Drug diffused in receptor compartment is measured at various time intervals.

➢ MODIFIED ROTATING BASKET METHOD

- ❖ Dosage form is placed in a basket assembly connected to a stirrer.
- ❖ The assembly is lowered into a jacketed beaker containing buffer medium and temperature 37 °C.
- ❖ Samples are taken at appropriate time intervals and analyzed for drug content.

➢MODIFIED ROTATING PADDLE APPRATUS

- ❖ Here, dosage form is placed in a diffusion cell which is placed in the flask of rotating paddle apparatus.
- ❖ The buffer medium is placed in the flask and paddle is rotated at 50 rpm.
- ❖ The entire unit is maintained at 37 °C.
- ❖ Aliquots of sample are removed at appropriate time intervals and analyzed for drug content.

7.IN VIVO DRUG RELEASE RATE STUDY

- Here, the dosage form is applied to one eye of animals and the other eye serves as control.
- Then the dosage form is removed carefully at regular time interval and are analyzed for drug content.
- The drug remaining is subtracted from the initial drug content, which will give the amount of drug absorbed in the eye of animal at particular time.
- After one week of washed period, the experiment was repeated for two times as before.

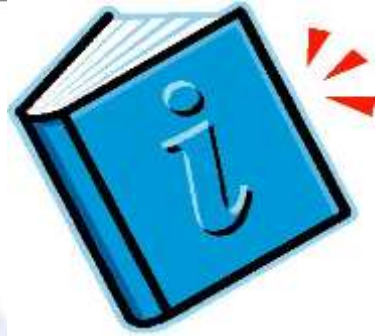
8.ACCELERATED STBILITY STUDIES

- These are carried out to predict the breakdown that may occur over prolonged periods of storage at normal shelf condition.
- Here, the dosage form is kept at elevated temperature or humidity or intensity of light, or oxygen.
- Then after regular intervals of time sample is taken and analyzed for drug content.
- From these results, graphical data treatment is plotted and shelf life and expiry date are determined.

CONCLUSION

- All approaches improve ocular drug bioavailability by increasing ocular drug residence time, diminish side effects due to the systemic absorption, diminishing the necessary therapeutic amount of drug for therapeutic response in anterior chamber.
- They increasing patient compliance by reducing frequency of dosing.
- They reduce the dose and thereby reduce adverse effects of the drug.

REFERENCES



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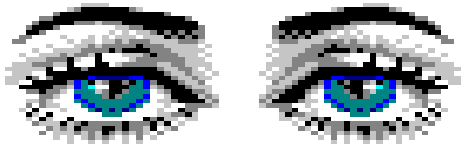

THANK YOU