

DEVELOPMENT OF EYE IN CHICK

Eyes are visual organs or organs of sight. The visual system in the avian embryo is one of the last to mature. Its development has been fully studied by Hamilton (1952) & Romanoff (1966). More reviews on the subject can be found in works of Krigenith (1971), Pearson (1972) and Sillman (1973).

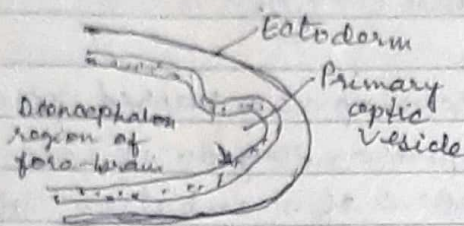
Development of Eye

The eyes begin to develop as a paired primary optic vesicles from the diencephalon region of fore-brain in embryo about 33 hours of incubation. When optic vesicles are first formed there is no constriction between them and lateral walls of forebrain and lumen of each optic vesicle communicates with lumen of fore brain.

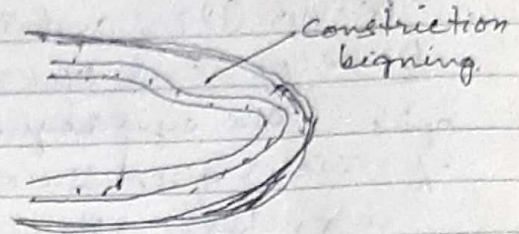
After about 33 hrs of incubation constrictions appear which mark more definitely the boundary between optic vesicle and fore brain. This constriction is much more marked in 55 hrs of incubation. Constricted area becomes elongated and narrow to form optic stalk. The distal portion of each vesicle lies closely approximated to superficial ectoderm distends to form lens.

Considerable development towards eye formation is seen after 55 hrs of incubation. An invagination starts at the distal end of optic vesicle to form double walled optic cup called secondary optic vesicle. The ventral wall of this cup is incomplete which form a gap called choroid fissure. Later on this fissure closes and its closure is closely associated with the development of Pecten. Concavity of this cup is laterally directed. The thicker inner wall of optic cup forms sensory layer of retina while the thinner outer layer is distended to form pigmented layer of retina. A narrow space present between sensory and pigmented layer disappears later on by fusion of two layers.

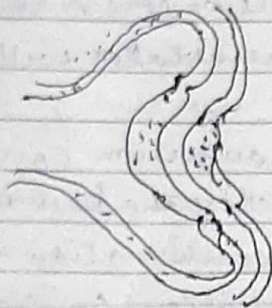
The infolding process by which optic cup is formed from optic primary vesicle is continued into region of optic stalk. As a result, ventral surface of optic stalk becomes grooved. Later on optic nerve and blood vessels come to lie in this groove.



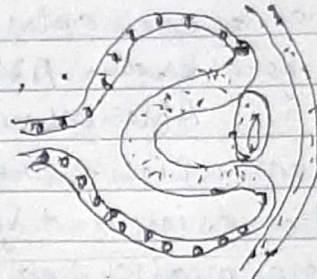
23 hrs embryo P.T. eye



38 hrs embryo P.T. eye



T.S. embryo P.T. eye (55 hrs)



T.S. embryo P.T. eye (72 hrs)

- Dev - Development of Eye of chick

Formation of various structure of eye:

(1) LENS:

It begins to develop at about 40 hrs of incubation. The superficial layer of head overlying the optic vesicle and become thickened to form lens peduncles.

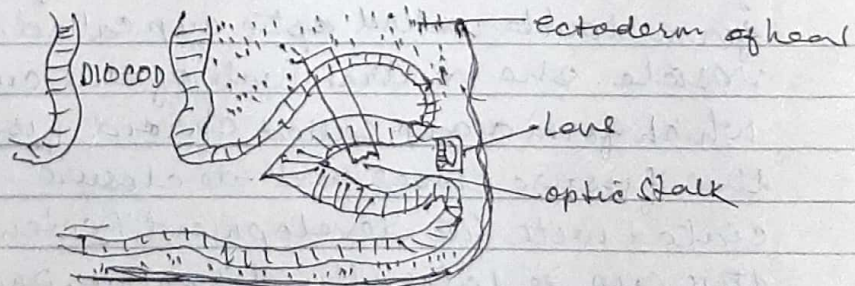
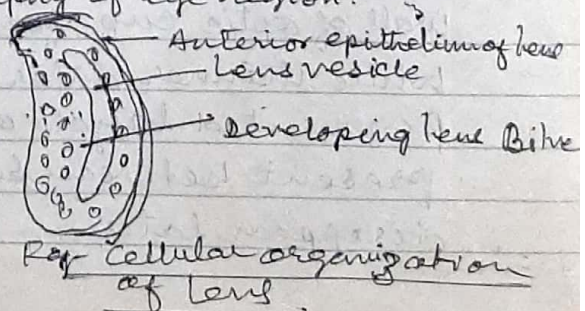
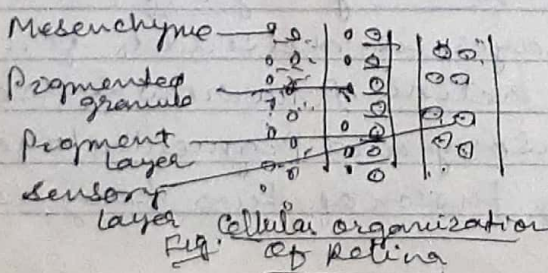


Fig - Topography of eye region.



The lens placode invaginates to form lens vesicle with subsequent separation from surface ectoderm in 62-72 hr chick. The wall of lens vesicle thickens and its cavity disappears. The cells of lens cease to divide and become elongated and fibre like, after their nuclei have disappeared (Coakley 1963). Lens capsule is apparently the product of activity of its cells.

- ③ Retina: The thickened internal layer of optic cup gives rise to sensory layer of retina. Neuroblast and nerve fibres are already present in retina by end of 3rd day.
- ④ Rods & Cones: Rods and cones cells begin to differentiate on 10th - 12th day.
- ⑤ Fovea: Retina fovea is formed by the radial migration of cells from the centre of thickened layer of optic cup.
- ⑥ Pecten: On 6th day of development pecten protrudes into various chamber as a low crest along the line of fusion of wall of choroid slit. Pigments appear in it after 4th day and fold begins to be formed on 9th - 10th day.
- ⑦ Iris: Margin of eye cup forms iris on 8-9th day in front of lens. It has hole in centre called pupil. Sphincter muscle appears on 8th^{9th} day and dilator muscles on 13th - 19th day.
- ⑧ Ciliary body: Folds of ciliary bodies are situated in centre of iris and diverge radially to lens along eye-meridians. Ciliary processes project beyond border of iris, while Zinn's fibres emerging from grooves between these processes are attached to lens capsule.

First ciliary processes appear on 6th - 9th day of development and initially consist of mesenchymal outgrowth that are directed towards lens. Ciliary body produce fluid of anterior eye chamber.

- ⑨ Ciliary muscles: Primordial ciliary muscles appear on 8th day, as a cluster of myoblasts. Its striation first become apparent in an 11-day chick embryo.

⑨ Cornea: Corneal epithelium originates from ectoderm but part of cornea underlying it originates from mesenchyme.

⑩ Vascular Coat and Sclera:

The early development of vascular coat consists of condensation of mesenchyme that is in contact of outer layer of eye cup. This can be seen in 5th day old embryos. Later on 13th-14th day, a capillary network of vascular coat increase in size and a layer of large blood vessels subsequently appear on outside.

Development of sclera begins simultaneously with that of vascular layer and protein granules can be distributed in it on 9th day of incubation.

⑪ Eye-lid and nictating membrane:

On 9th day a circular integumentary fold with an aperture in middle appears in front of eyeball. This fold subsequently become transform into upper and lower eye lids. A similar fold is formed simultaneously within circular fold on one side of beak. It is nictating membrane.

Conclusion:

Thus the development of eye is a phasic phenomenon in which different component parts appear in sequential order to establish a harmonious functional unit.

