

B.Sc. Part II Paper IV A

Development & Functions of Extra-

Embryonic membranes of chick (Part I)

During the development of chick and other vertebrates, there are produced certain tissues or structures that temporarily or permanently do not enter into the formation of the embryo themselves, but are external to and devoted in one way or another to the care and maintenance of the developing embryo. Collectively these parts are termed as fetal membranes, extra-embryonic sac and or extra-embryonic membranes.

Kinds of Extra-Embryonic Membranes :-

During the chick-development following extra-embryonic membranes are developed -

- (i) Amnion or amniotic sac - It surrounds the embryo and provides a kind of private aquarium to protect it from mechanical shocks and desiccation.
- (ii) Chorion or serosa - It forms the outermost membrane surrounding the rest of the embryonic system.
- (iii) Yolk sac - filled with yolk of the egg functions as the first respiratory organ and as a digestive organ for the embryo. It also acts as haemopoietic organ like the liver and at later stages serves as a place of origin of blood cells.
- (iv) Allantois - It is precocious urinary bladder

by origin, accumulates the embryonic nitrogenous wastes and also acts as an embryonic respiratory surface. (2)

All of these extra-embryonic membranes are composite structures in the sense that they involve two germ layers. The amnion and chorion are composed of extra-embryonic ectoderm and somatic layer of mesoderm (both collectively called Somatopleur), while the yolk sac and allantois, are composed of extra-embryonic endoderm and splanchnic layer of mesoderm (both collectively called splanchnopleur).

Now onward, the somatopleur and splanchnopleur develop into four extra-embryonic membranes of chick by following methods —

1. Development of yolk sac — During neurulation,

the gut region of embryo has a dorsal roof and side but no floor. The ventrally open gut rests on the yolk mass. The splanchnopleur which remains closely applied to yolk extends peripherally and surrounds the entire yolk and forms yolk-sac. It is the first extra-embryonic membrane to form.

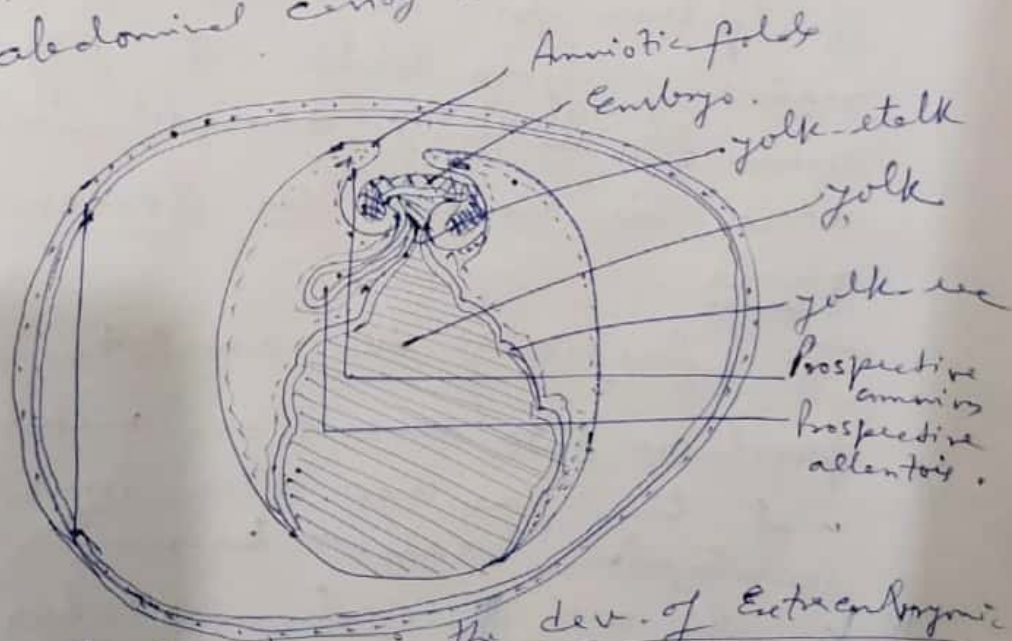
Later on, as the involuting folds move towards one another, they establish a floor to the gut except for a small region of the midgut. These folds do not

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merge, but a small aperture, the gut duct, remains open into yolk sac.

(3)

Once a completely walled gut is formed in the embryo proper, the yolk sac cavity remains in continuity with the gut cavity through the yolk duct which runs in the yolk stalk of yolk sac. Although yolk sac is connected to the digestive tract by the yolk stalk, the yolk food reserves are not transmitted to the embryo by this route. By now, a rich blood circulation develops within the mesodermal component of the yolk sac and the vitelline arteries and veins traverse the yolk sac. The construction of the yolk stalk region brings together the vitelline blood vessels, located in the splanchnic mesoderm of both sides of the embryo. The yolk, is completely absorbed during embryonic life. Shortly before hatching the yolk sac is retracted into the abdominal cavity of the embryo and the walls of the abdominal cavity close behind it.



Early stage in the dev. of Extraembryonic membrane is cleavage

2. Development of amnion and chorion: -

The origin of amnion and chorion is considered together since they are formed simultaneously from the extra-embryonic somatopleure. About 30 hours of incubation, the extra-embryonic somatopleure is elevated over the embryo by a folding process consisting essentially of a doubling of the somatopleure upon itself. The initial elevation is over the head end of the embryo, producing a double somatopleuric fold, called cephalic amniotic fold. As the cephalic amniotic fold gradually extends backward, its caudally extending side limbs called lateral amniotic folds, arch over the embryo from each side to be joined finally by a similar fold or elevation over the tail, the caudal amniotic fold. All three amniotic folds ultimately converge, so as to encase the embryo in two sheets of somatopleure from all sides except the region of yolk stalk. The region where the union of amniotic folds occur is called the seroamniotic raphe.

The fusion of the amniotic fold produces two sac-like membranes and two cavities. The inner somatopleuric sheet becomes the amnion and the outer one chorion.

The cavity between amnion & embryo is called amniotic cavity. (contd)