Extra-Embryonic Membranes in Chick Embryo & formation

During the development of chick and other vertebrates, certain specialized embryonic tissues or structures are produced that temporarily or permanently do not enter into the formation of the embryo themselves. These are external and devoted in one way or another to the care and maintenance of the developing embryo.

These structures are collectively termed as Extra-Embryonic membrane or foetal membrane or extra embryonic sac.

or

The blastoderm of chick embryo is the only embryonic part. The other other parts (i.e yolk sac, amnion, allantois and chorion) are extra embryonic part-, which protect the embryo or help in nutrition, respiration and excretion.

Amnion and chorion are ectomesodermal, whereas the yolk sac and allantois develop from extra embryonic endoderm and splachnic mesoderm.

(1) Yolk sac - Most primitive structure, containing network of blood vessels and enclosing the yolk of the egg. A yolk sac is also present in those forms which have mesolecithal eggs. Despite the lack of stored yolk in mammalian eggs (except in prototherians) the yolk sac is present as it serves many important secondary functions.

Actually, the splanchnopleure does not close the gut-from the ventral side but grows over the yolk surface finally enclosing the entire yolk mass. Thus the yolk mass temporarily forms a the ventral floor of the gut. The part of the gut which remains accessible to the yolk is the midgut is diminished but it maintains its connection with the-underlying yolk by means of a yolk duct or yolk stalk.

With the constriction of the yolk stalk, vitelline arteries, veins are seen to run parallel as traverse the yolk stalk. The vascular network developed in the splanchnopleure of the yolk covers the yolk mass. Endodermal cells lining the yolk sac secrete digestive enzymes which hydrolyze the yolk.

the digested yolk is then absorbed by the blood capillaries and transported to the embryo. In older embryo, the epithelium the surface area for absorption of the digested yolk. Towards the end of incubation the remaining substance of the yolk sac is absorbed into the belly cavity of the Embryo.

(11) Formation of amnion and chorion - The amnion and chorion (serosa) are two Extra Embryonic membranes which develop together. Both the membrane develop from the Somatopleure. At about 30h of incubation, the head of the embryo bends into the yolk to some extent and the somatopleure in front of the head is known as a fold as the head fold. The margin of the head fold is somewhat crescentic and its concave side lies towards the head of the embryo. This head fold grows further into the amniotic fold. The movement of the amniotic fold caudal ward covers the head of the embryo. The tail fold of the amnion also grows towards the inner side of the embryo. The extension of these two folds covers the Embryo like a cap. The growth of the tail fold takes place about the third day of incubation. At the point where the two folds meet they become fused in a scar like thickening known as amniotic raphe. The amniotic folds, in a way involve doubling the somatopleure on itself. Only the inner layer of the somatopleure forms the amniotic cavity. The outer layer forms the Chorion. The cavity between the chorion and amnion is called the extra embryonic coelom.

(12) Formation of allantois

Unlike amnion and chorion, the allantois arises from the body of the embryo. The proximal part of the allantois remains extra-embryonic throughout development. The distal part of allantois grows out as curve upward so as to extend into the space between the amnion and chorion.

The allantois makes its appearance after 72 hours of incubation. It arises as an outpushing from the ventral wall of the hind gut. The walls of the allantois are, therefore, composed of splanchnopleure

During the fourth day of incubation, the allantois grows out into the extra Embryonic coelom. The distal portion of the allantois is sac like but the proximal part is narrow and may be called the allantoic stalk. As the fluid accumulates in the distal allantois, it gradually becomes balloon like. There is a rapid growth of allantois between 4th & 10th day of incubation. The allantois extends further and flattens in the seco-amniotic cavity and finally encompass the embryo as well as the yolk sac. In the process of expansion of the allantois, its outer wall fuses with the mesoderm layer of chorion. The mesodermal layer of chorion is the somatic layer and that of allantios is the splanchic layer. Other these two mesodermal layers fuse, this double layer acquire rich vascular network which is connected with the embryonic circulation by the allantoic arteries and veins. The allantois, thus helps, in the exchange of gases through the highly vascular chorio-allantoic membrane.

The allantois also seems to store uric acid, as this are formed during protein metabolism of the developing embryo.

Thus the allantois wards off the embryo from the undesirable effects of the metabolic wastes by absorbing and retaining them. At the time of hatching, the allantoic stalk is broken as the distal portion of the allantois shrivels up the remains adhered to the broken shell.

Functions

An extra embryonic membrane is one of the membranes which assist in the development of the embryo. Such membranes occur in a range of animals from insects to mammals. They originate from the embryo, but are not considered part of it. They typically perform roles in nutrition, gas exchange and waste removal.