

# Egg Envelops

All membranes (covering) which are present outside to plasma membrane of oocyte or ovum is known as egg membranes now instead on membrane envelop term is used. Envelope containing oocyte or ovum is called as egg

Egg envelope on the basis of origin are of three types.

**(1) Primary egg envelops** - These are secreted by egg.e.g. Vitelline membrane- (Zona pellucida & Zona Reticulate)

**(2) Secondary egg envelops** - These are secreted by ovary. e.g.- Chorion on insects.

**(3) Tertiary egg envelops** - These are secreted by oviduct. e.g.- Jelly coat of frog, Albumin, shell membrane and shell of Hen.

## **Primary egg membrane:**

Laid down between the follicle cells and egg membrane (space occupied by interdigitating microvilli).

Formed of mucopolysaccharides, fibrous proteins

In different animals egg primary membranes have different structures and are known by different names as follows,

1. Vitelline membrane.

It is a constant thin membrane which remains closely apposed with the plasma membrane before fertilization.

ii. Occurrence- in insects, mollusks, amphibians and bird.

2. Zona radiate.

It owes stratification from the degraded microvilli of the growing oocyte. In fishes, it is perforated by minute pores

**(micropyle)** formed by withdrawal of microvilli in the mature egg.

ii. Occurrence- in shark, some bony fishes, amphibians and reptiles.

3. Zona pellucida.

Formed of secretions both from the ovum and the follicle cells.

ii. Occurrence- in eggs of mammals.

4. Jelly envelope.

Formed of jelly and is much thicker.

ii. Occurrence- in echinoderm and many marine invertebrates.

## **Secondary membrane:**

Secreted outside the primary egg membrane by a layer of follicle cell that surrounds the oocyte.

a) chitinous shell---In some case like insects, ascidians and cyclostomes secondary membrane is present as a chitinous shell.

b)Single layered membrane--- In mammals corona radiata around the ovum and exterior to the zona pellucida.

### **Tertiary membrane:**

This membrane formed due to secretion of the cells of the oviduct, as in many cases when egg travels down towards the cloaca.

Examplesi.

*Albumen or Horny capsules-*

Albumen in birds and shell membrane and calcareous shell of reptilian and avian eggs. *It is to be noted that reptilian eggs contain little albuminous covering except in snake.*

ii.*Leathery shell-*

In prototheria leathery shell is present.

Remark: Absent in sponges and coelenterates.

### **SIGNIFICANCE OF EGG MEMBRANE**

- 1.Prevents further sperm entry after fertilization.
- 2.Helps the egg to assume bilateral symmetry from a state of radial symmetry.
- 3.Secondary membrane provides protection and ensures processing of nutritive materials from the surroundings.
- 4.Tertiary membrane ensures adequate water supply and provisions for organic food.

## **Hen's egg**

### **Examples of Eggs**

#### **(1) Egg of Insect**

These are megalecithal polylecithal & centrolecithal eggs.

The cytoplasm of insect egg is limited to periphery only whole central place is filled by yolk.

Two types of egg envelopes are present on egg of insects.

Inner - Vitelline membrane - Primary egg membrane.

Outer - Chorion - Secondary egg membrane. Chorion is thick, hard and ornamented.

This ornamentation is taxonomically important in insects.

Egg membrane is absent on a definite place, this place is known as micropyle.

Micropyle is a place to enter for sperms in egg.

#### **(2) Egg of Frog**

These are Mesolecithal and telolecithal egg.

Two types of egg membranes are present on frog egg.

(i) Inner - Vitelline membrane - Primary egg membrane. It is secreted by egg cell.

(ii) Outer - Jelly coat - Tertiary egg membrane (Secreted by oviduct).

All eggs are laid at a time. These eggs are attached together by jelly coat. This group is called as spawn. Spawn formation in frog occurs after false copulation (amplexus).

### **Importance of Jelly coat**

Air bubbles are present in jelly coat. These provide buoyancy.

Jelly coat protects egg from outer mechanical injury.

The jelly is tasteless hence it prevents the eggs from being eaten by water snails, aquatic insects, fishes and birds.

It prevents infection of bacteria and fungal spores.

The jelly reflects sun-rays, due to melanin it is also protected from UV rays.

The jelly is able to keep the eggs warm.

Like other eggs frog egg also have two poles:

(i) Animal pole - Cytoplasm and nucleus are found in this pole.

(ii) Vegetal pole - It mainly have yolk white yolk is filled in this pole. It is heavy so it is found in lower side.

In animal pole in cytoplasm melanin pigments are also present. Melanin protects the egg from harmful radiation and helps in camouflage.

Sperm enters into egg through animal pole. The entry site of sperm in egg forms anterior part of embryo. Along with entrance of sperm determines the future polarity. The entrance path of sperm determines the plane of cleavage in egg. First cleavage of egg starts from right angle of the entrance path of sperm. From opposite direction of entry of the sperm, melanin granules move towards the sperm. So a clear region is formed between animal pole and vegetal pole. This clear region is known as "Grey crescent". It produces dorsal lip of blastopore in future.

### **(3) Egg of Chick**

These are megalecithal or polylecithal, discoidal and cleidoic: Yolk is present in large amount and cytoplasm is found in the form of a disc. This disc is known as Germinal disc. Beneath the germinal disc yolk is present. On the basis of colour and content yolk is of 2 types. Yellow yolk-It have more phospholipids White yolk – It is rich in protein. Phospholipids are in fewer amounts. Both types of yolks are arranged in alternative and concentric layers. Innermost and outermost layer is of white yolk. A stalk like structure of white yolk is present just beneath the germinal disc. This is known as latebra and upper part of latebra is known as Isthmus of pander. Primary envelop vitelline membrane is found around the egg.

Remaining all envelopes of chick egg are secreted by oviduct after fertilization. These are tertiary envelopes. Egg of chick is filled with liquid albumin which is called as "White of egg". It is produced by Isthmus part of oviduct. Dense albumin on the sides of egg upto shell membrane is coiled chord like structures. These are called as Chalaza. It keeps the ovum upward.

Two shell membranes are present just beneath the shell. These are made up of keratin. A air pocket or air space is found between shell membranes in broad (wider) part of egg. The outermost part of egg is a shell made up by calcium carbonate [ $\text{CaCO}_3$ ]. This shell is porous for exchange of gases.

The oviduct of birds is differentiated into three parts

- i) Anterior part -- Magnum part—Fertilization of egg occurs in this part. After fertilization this part secretes liquid albumin around the egg.
- (ii) Middle part — Isthmus — Keratin shell membranes are secreted around the egg by this part.
- (iii) Posterior part — Nidamental part — This part secretes a shell of  $\text{CaCO}_3$  around the egg.

#### **(4) Egg of Eutherian Mammals**

Eggs are alecithal, non-clidoic and microscopic (0.1mm) in metatheria and eutheria.

In prototheria egg are same as hen egg.

Two membranes or egg envelopes are present on egg-

- (i) Inner envelop : Zona pellucida — Primary egg membrane produced by egg itself. In few mammals zona pellucida is linear and called as zona radiata.
- (ii) Outer envelop : Corona radiata — formed by follicular cells of ovary. Follicular cells are attached with surface of egg through Hyaluronic acid. Hyaluronidase enzyme is present in Mammalian sperm, which dissolves hyaluronic acid and the corona radiata cells are separated from egg surface. This helps in sperm entry.

Egg cytoplasm have very less or negligible amount of yolk.

On the basis of ovulation mammals are of two types.

- (i) Induced or Reflex Ovulators — Animals in which ovulation is induced by copulation. eg. All mammals have fixed breeding period. The chances of fertilization increases to 100% in it e.g. Rabbit.
- (ii) Spontaneous Ovulators: Ovulation is not depended upon the copulation. Egg passes out in oviduct from ovary after fix period. The chances of fertilization are very low in these animals