



# DEVELOPMENTAL STAGES OF FROG

Permanent slides  
(Museum collection)

Compiled by : Dr. P. Jayaraj  
Illustration credits:

Pooja Kumari, B.Sc (H) Zoology

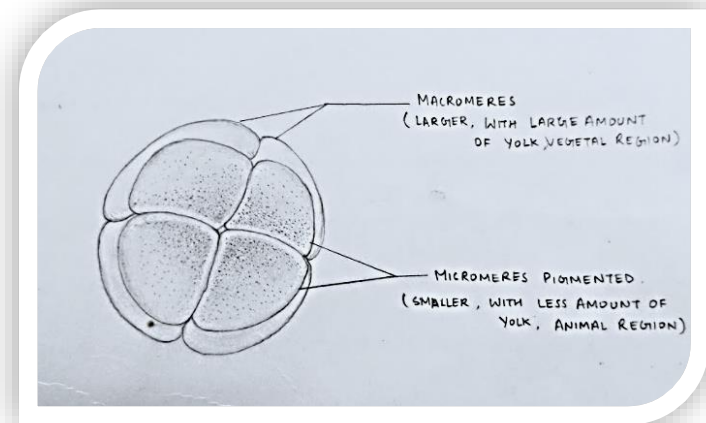
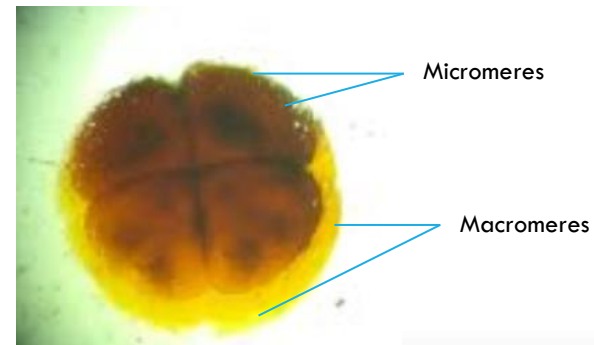
# FROG EMBRYO-THIRD CLEAVAGE (WHOLE MOUNT) 8-CELLED STAGE (ANIMAL POLAR VIEW) POLAR VIEW

The polar view shows eight cells formed in two tiers.

Upper four cells of animal pole are small called micromeres and appear pigmented.

The lower four cells in the vegetal pole are larger with large amount of yolk called as megameres or macromeres.

**Third cleavage:** This is a latitudinal division from just above the equatorial plane perpendicular to the first two divisions. As a result, eight cells are formed in two tiers.



# FROG EMBRYO : MORULA(W.M)

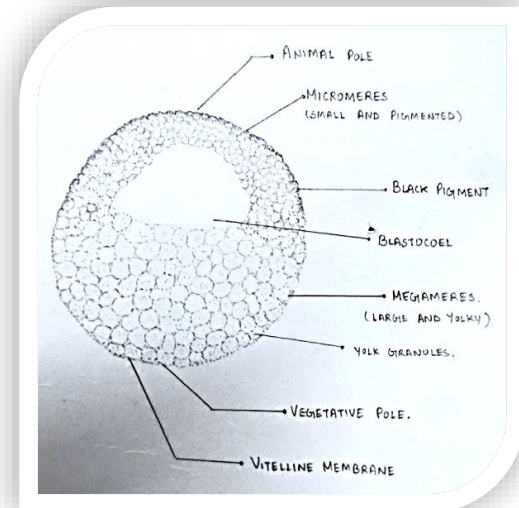
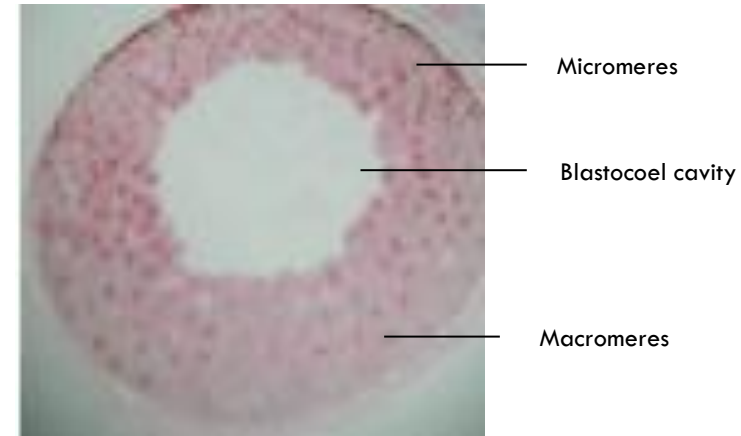
1. The cells formed by cleavage are blastomeres, the upper black blastomeres are called micromeres, and lower white ones are macromeres.
2. Further cleavages divide the micromeres more rapidly than the lower macromeres whose division is hindered by yolk. The blastomeres' mutual pressure flattens their surfaces in contact with each other but free surfaces of each blastomere remain spherical.
3. At this stage the whole embryo acquires a characteristic appearance reminiscent of a mulberry and so it is called morula.



Blastomeres

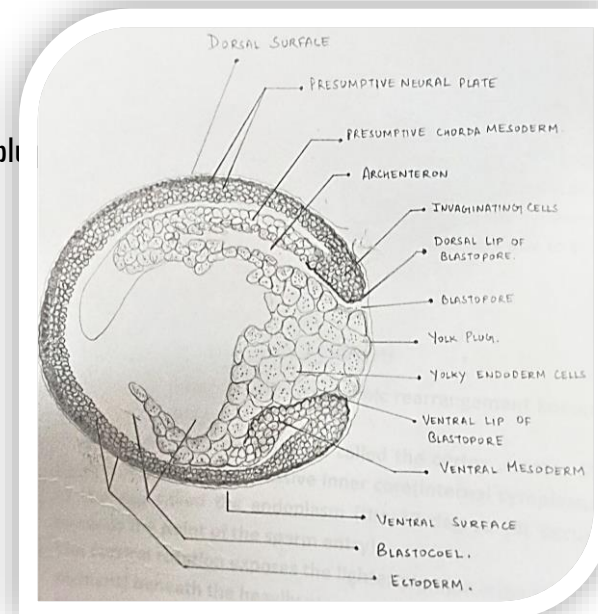
# FROG EMBRYO BLASTULA (L.S)

1. The section of blastula shows a cavity known as blastocoel
2. The Blastocoel in blastula is located above the equator, therefore it is called as eccentric in position.
3. Blastocoel is surrounded by two types of blastomeres- micromeres in the animal pole and macromeres in the vegetal pole.



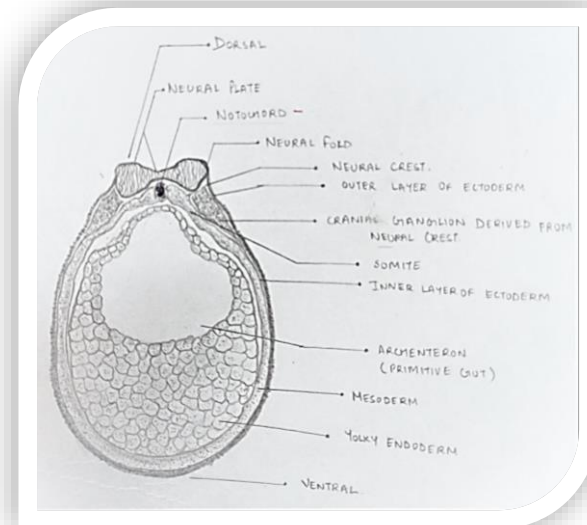
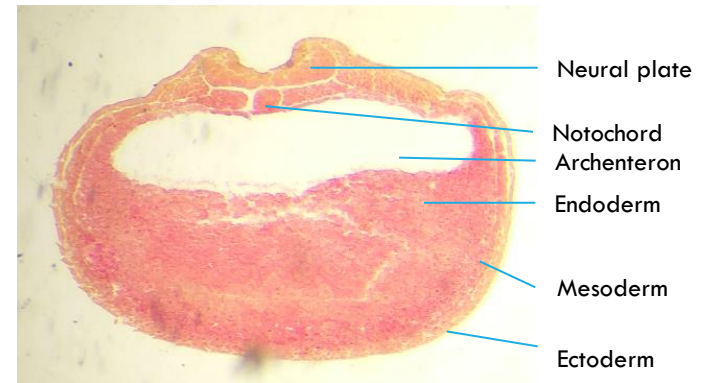
# Frog Embryo -Advanced gastrula/yolk plug stage (L.S)

1. Three primary germ layers can be found.
2. Ectoderm is made up of micromeres and surrounds the embryo
3. Endoderm is well developed and internalized
4. Mesoderm is formed from the roof of the archenteron and endoderm, from the
5. floor of the archenteron.
6. Due to enlargement of archenteron, blastocoel is gradually reduced.
7. The yolk laden macromeres are pushed towards to blastopore which forms yolk plug
8. This stage of the gastrula is called as yolk plug stage of the gastrula.



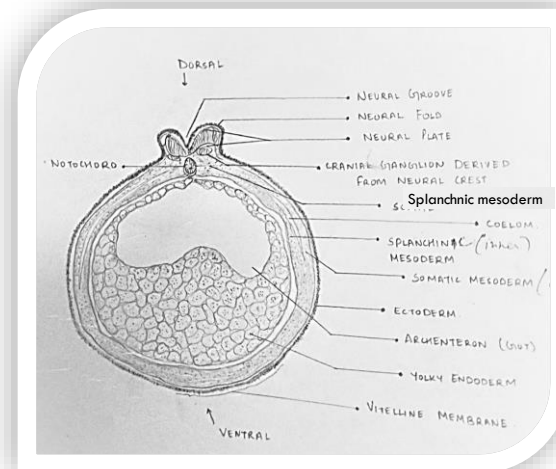
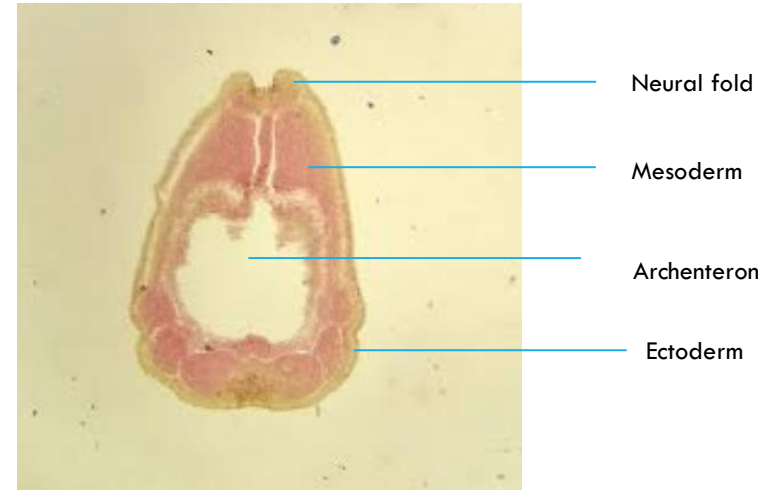
# FROG EMBRYO-EARLY NEURAL NEURAL PLATE STAGE (T.S)

1. During late gastrulation, external changes along the upper surface of the embryo begin to form the neural tube—a process called neurulation.
2. An oval-shaped area on the dorsal side of the embryo marks the presumptive neural tube. This region is the neural plate.
3. During this process the ectoderm along the mid-dorsal line becomes thick and flattens forming plate-like structure known as neural plate (medullar plate).
4. Microfilaments in neural plate cells flatten and thicken the neural plate.



# FROG EMBRYO-MID NEURULA NEURAL FOLD STAGE (T.S)

1. The edges of the neural plate roll up and over the midline of the neural plate.
2. U-shaped neural groove appears in cross section in the centre of the plate, dividing future right and left sides of the embryo



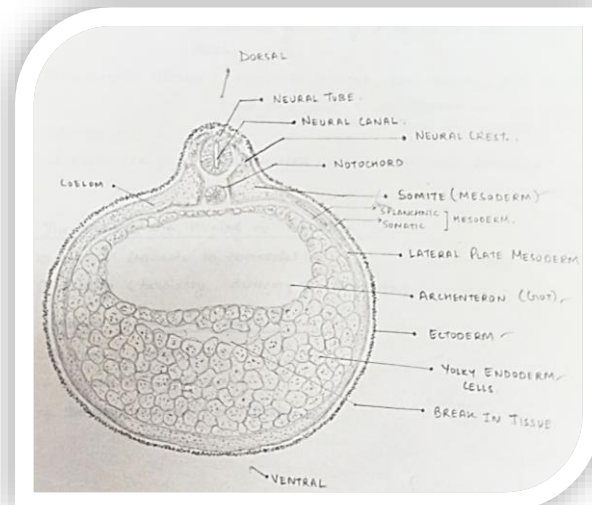
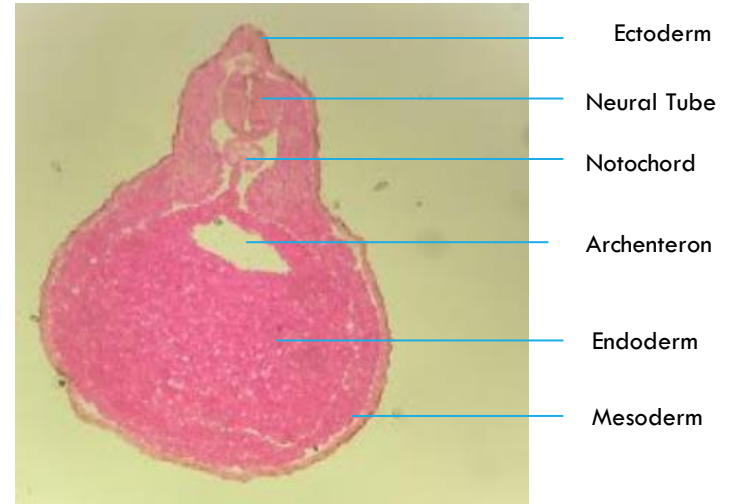
# FROG EMBRYO-ADVANCED NEURULA NEURAL TUBE STAGE(T.S)

The neural folds approach each other towards the midline of the embryo, eventually fusing to form the neural tube beneath the overlying epithelium

A distinct notochord is found in the mid line (axis) immediately below the neural tube

Paraxial mesoderm on both sides of notochord organises into blocks called somites

Downward growth of mesoderm continues

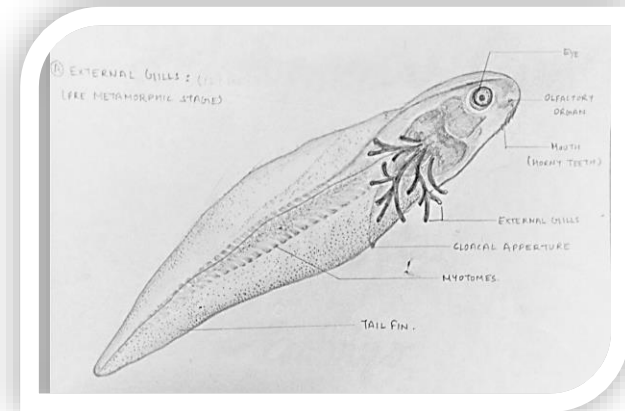
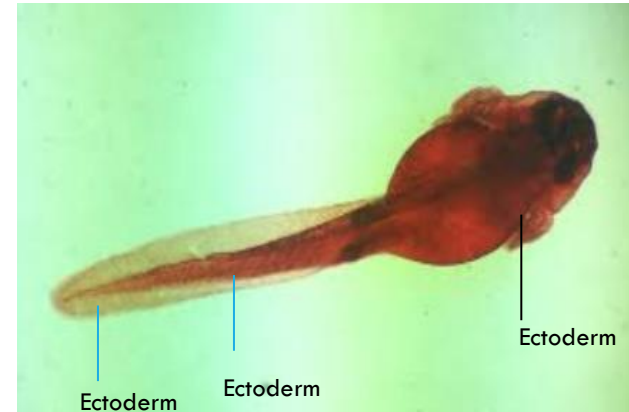




# EXTERNAL GILL-STAGE OF TADPOLE (W.M)

Tadpole at this stage is about 5.5 mm long and the following structures are visible in it:

1. Five pairs of branchial, pharyngeal or visceral pouches are formed in the gill-plate area due to out pushing of the endodermal lining of pharynx.
  2. Soon from the sides of head in the pharyngeal region three pairs of external gills are projected out, which are feathery extensions of the integument above the gill-slits. There are bathed by the surrounding water.
  3. The mouth is surrounded by fringed lips and also acquires a pair of horny jaws. The fringed lips has two rows of tiny, needle-like horny teeth. A 10.5 mm long tadpole contains 3 rows of fringed teeth.
  4. Adhesive suckers disappear.
  5. The larval gut is differentiated into pharynx, oesophagus, stomach and intestine. Liver and gall bladder also develop. The intestine is very long and coiled like a watch spring due to herbivorous mode of feeding.
  6. Myotomes extend up to the tip of tail.
  7. Melanophores appear in the skin of dorso-lateral surface of head, trunk and tail.
  8. The cornea becomes transparent and eye lens is visible.
  9. Lateral line sensory system is visible on either lateral side of the tail.
  11. A pair of pronephric kidneys becomes functional and excretes ammonia.
  12. On either side of cloacal aperture, at the junction of trunk and tail, a pair of hindlimb buds appears.
- The tadpole swims actively with the help of tail and feeds on algal and other aquatic vegetation.



# INTERNAL GILL-STAGE OF TADPOLE:

1. The opercular folds grow backward from the hyoid arch of each side covering the external gills and gill-slits and finally fuse with each other ventrally and with the belly wall. Thus, an operculum or gill-cover is formed enclosing the external gills
2. External gills later fall off and four pairs of filamentous internal gills develop on the walls of gill-slits.
3. Intestine is still coiled and long.
4. Different parts of hindlimbs such as thigh, shank, ankle, foot and five toes become well formed in the tadpole of 40 mm long.
5. A pair of forelimb buds appear behind the head but remain hidden within operculum. As development proceeds, the left forelimb emerges through the spiracle. The right forelimb appears later.
6. In a mature tadpole, a pair of lungs develop from the pharynx. Now the larva breathes by both, the internal gills and lungs.

