## Cleavage of fertilized zygote :-

- Fertilization occures ~~in~~ mostly in animal hemisphere but at any place in it in amphibian embryo.
- Pt. of sperm entry is very imp. in amphibian embryo because it determines dorso-ventral axis of the tadpole and also the animal, whereas site 180° away from the sperm entry will mark the dorsal side.

~~will mark the axis.~~

- The axis b/w pt of sperm entry and the dorsal side approximates 180° but doesn't exactly corresponds to actual ventral dorsal axis of amphibian tadpoles.
- The sperm centriole organises the microtubules of the egg and causes them to rearrange parallely in the vegetal cytoplasm separating cortical cytoplasm from the yolky internal cytoplasm.
- These microtubular tracks allow the cortical cytoplasm to rotate with respect to inner cytoplasm. The arrays are first seen immediately before rotation occures and disappears when the rotation stops.
- In the zygote (one celled embryo), the cortical cytoplasm rotates 30° w.r.t. internal cytoplasm.

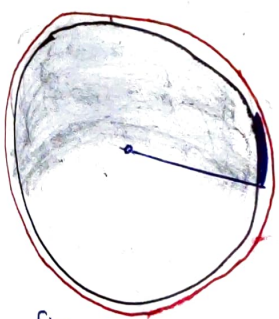


FIG: 7.1

In some eggs, this exposed a band of inner grey cytoplasm in the marginal region of single celled embryo and this displacement occures, directly opposite to sperm entry. This region is k/a gray crescent. This is the place where gastrulation begins.

- In the xenopus, the subcortical cytoplasm is not gray in colour hence it doesn't exposes a gray coloured

subcortical region but here also movement occures. Thus
- Thus formation of microtubular array and role of sperm centriole is established in gastrulation of amphibian embryo.
- It is also possible to define dorso-ventral and later on antero-posterior axis of animal.

## - Cleavage:- Iso/Homolecithal + mesolecithal.

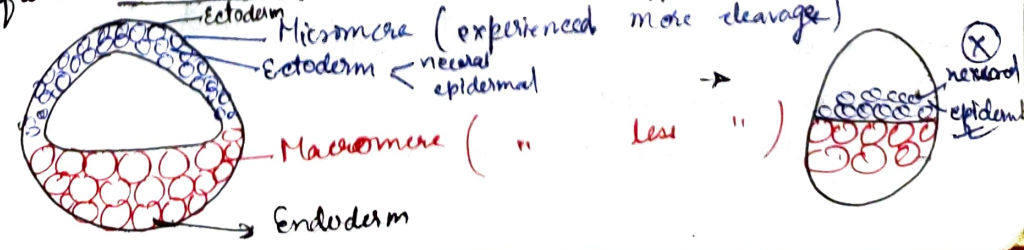
- Cleavage in frog & salamander embryos is radially symmetrical and holoblastic like echinoderms.
- Amphibian egg however contains more yolk & is concentrated in the vegetal hemisphere.
- The first cleavage division begins at the animal pole and slowly extends down into the vegetal region.
- The cleavage furrow in salamander extends to animal hemisphere at the rate of 1mm/minute & slows down gradually as it reaches the vegetal hemisphere.
- At the vegetal pole the cleavage rate is only 0.02 – 0.03 mm/minute (slows 50x).

IMP

- In many species, the first cleavage bisects the gray crescent (not in all amphibians). Thus, during the 1st cleavage one can see the appearance of the second cleavage furrow at animal hemisphere while 1st cleavage furrow is struggling to bisect the vegetal hemisphere.

- The 2nd cleavage plane is meridional and perpendicular (90° away) to the 1st cleavage plane.

- 3rd cleavage is equitorial but the cleavage furrow is flushed towards to animal hemisphere due to presence of telolecithal cytoplasm. This also supports that yolk gives inhibition to cleavage.
- 3rd cleavage give rise 2 4 small micromere and 4 large macromere in vegetal hemisphere.
- Despite their unequal sizes and differential yolk content, all the eight cells can divide synchronously upto 12 divisions
- As cleavage progresses, the animal region finally becomes packed with many small cells while the vegetal region contains relatively smaller number of large yolk-filled blastomeres. That means animal hemisphere contains more cells compared to vegetal hemisphere
- An amphibian embryo containing 16-64 cells is commonly called morula (derived from latin name morus — mulberry).
- At 128 celled stage, small cavity becomes apparent and referred to as blastula.
- The amphibian blastocoel has 2 major functions which are imp for their future development.
  1. It permit inward movement of cells during gastrulation.
  2. It prevents premature interaction among the cells below it - from the cells above it.
- When Nieuwkoop took embryonic newt cells from the roof of the blastocoel ≤ is technically k/a animal cap and placed next to the vegetal yolky cells from the floor of the blastocoel. Resultingly animal cap cells differentiated into mesodermal tissue but not as ectoderm. Thus in this way blastocoel separate contact of cells of AH from VH and allow AH cell to differentiate as neural tissue.



— There are various anterior adhesion molecule to keep clearing blastomeres together found in ——. One of the most important such adhesion molecule E·P· Cathearin. The mRNA of this protein is of maternal origin so it comes under the maternal genome. If this mRNA is destroyed by antisense oligonucleotides, the embryo will not contain any E-P. Cadhesin & results in a dramatic reduction of the blastomere and the adheasion b/w blastomere which is finally reflected in the obliteration of blastocoel.