

**DEVELOPMENT**

# DEVELOPMENT

- Prenatal –Before birth
- Postnatal development- After birth
- PRENATAL DEVELOPMENT –
  1. **Embryonic development** – Up to 8 weeks after fertilization.  
Devided into 23 arbitrary stages called as **Carnegie Stages**  
  
Pre implantation development  
Post implantation development
  2. **Foetal development** 8 weeks onwards after fertilization

# Cleavage

## ( post fertilization)

- process of subdivision of ovum into smaller cells called cleavage.
- process of repeated mitotic divisions of zygote occur **with in zonapellucida**,
- these cells are known **as blastomeres**,
- first cleavage division occur **around 24 hrs** after fertilization,
- during 8 cell stage compaction of cells occur within the cells flatten & increase their intercellular contact ,

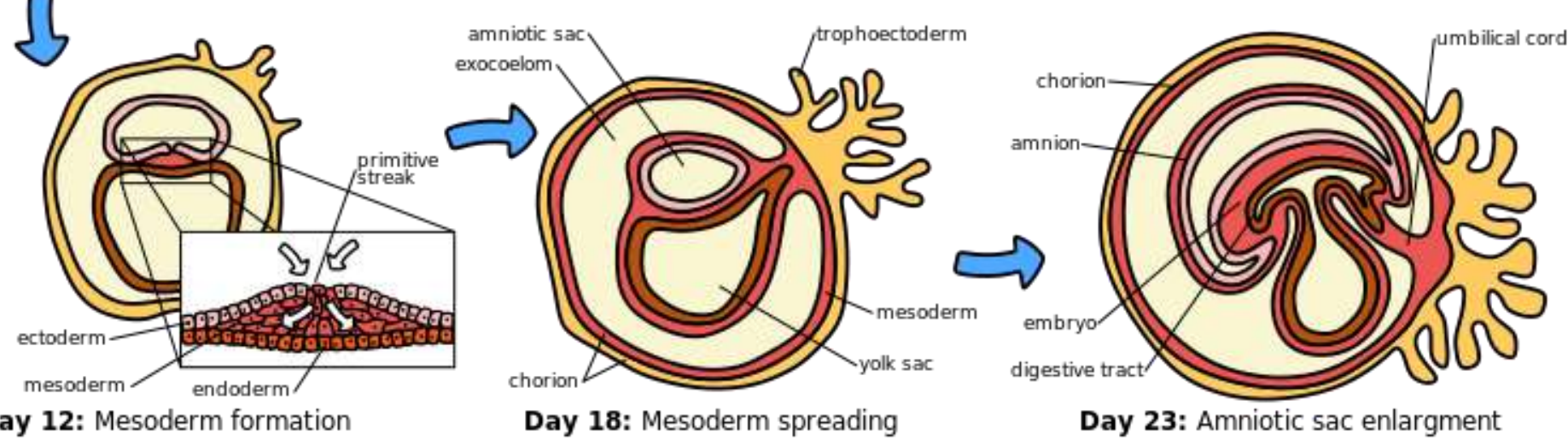
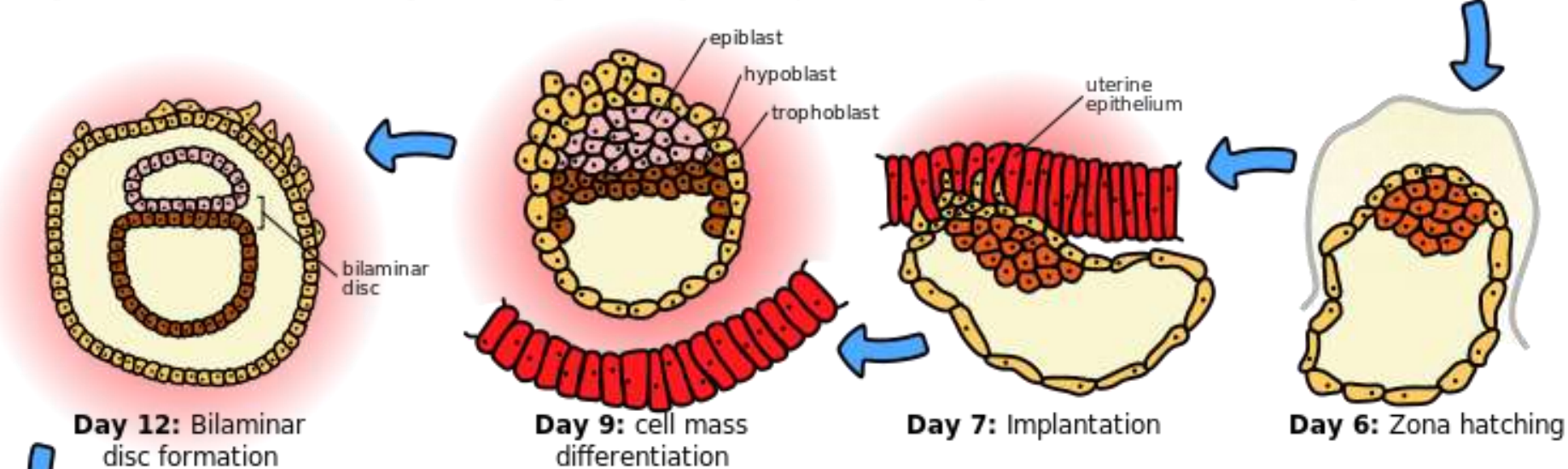
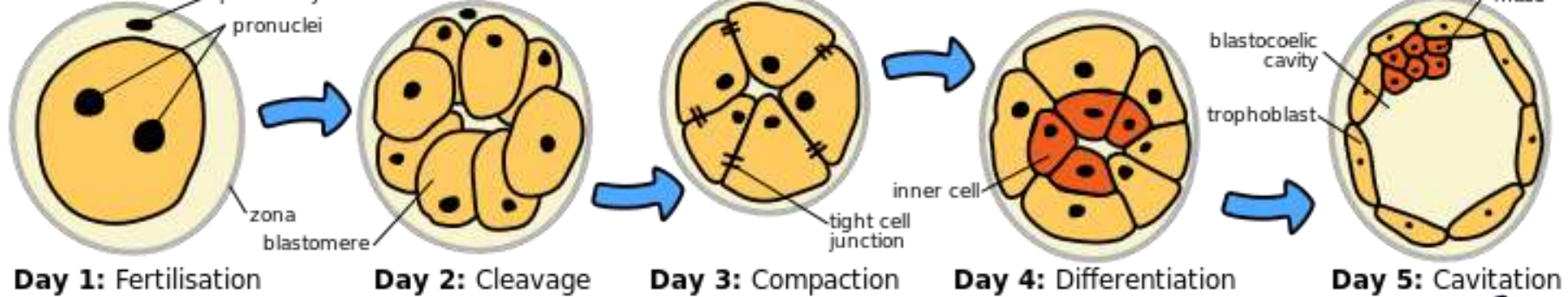
- Cleavage proceed to 16 celled stage --- MORULA,
- All cells of approximately same size,
- At 16 cells stage cells polarity is determined to form outer trophoectoderm & inner cell mass,
- inner cell mass give rise to embryo in future, while outer cell mass is destined to form the fetal membranes including placenta

- the inner cell mass also called embryoblast ,
- cells of trophoblast help to provide nutrition to embryo,

# blastocyst

- some fluid now passes into morula from uterine cavity , & partially separate the cells of inner cell mass from trophoblast.
- as quantity of fluid increases the morula acquires shape of a cyst,the cells of trophoblast flattens out & inner cell mass gets attach to one side only,
- the morula now is called **blastocyst** ,cavity is called **blastocoele**.

- site where blastocyst is attach to inner cell mass is **calld embryonic** or animal pole , while opposite site **is aembryonic pole**.





# Zona pellucida( function)

- trophoblast has property of being able to stick to uterine ( or other) epithelium & its cells have capacity to eat up other cells( property of invading)
- thus as embryo is travelling down the uterine tube & uppermost part of uterine cavity , it is prevented from sticking to epithelium by a **zona pellucida**.
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- During this time , it receives nutrition , from substances stored within the ovum( e.g yolk) & partly by diffusion from uterine secretions,
- when blastocyst is formed ,it is necessary for zonapellucida to disappear, to acquire additional source of nutrition , & then it sticks to uterine endometrium and implants there.

# Function of zona pellucida

- to prevent implantation of blastocyst at an abnormal site .
- zona pellucida allows a sperm of the same species to fertilize the oocyte, sperms of other species cannot pass through zona pellucida,
- zona pellucida is responsible for zona reaction that prevents any additional spermatozoa from entering the fertilized ovum.

- it holds blastomeres of early embryo together.
- It act as a barrier that seperates maternal tissues from the embryo, as after its disapperence various immunosuppressive cytokines & proteins are produced by implanting embryo.( this blocks recognisation of embryo as a tissue foreign to the mother)

# Test tube babies

- in vitro fertilization , used in couples who are not able to achieve fertilization in normal way.
- gonadotropins are administered to stimulate growth of follicles in ovary,
- just before ovulation , ovum is removed & placed in suitable medium, spermatozoa is added to medium,
- fertilization & early development of embryo takes place in this medium.

- this procedure is carefully monitored & when embryo is 8 celled stage it is put in uterus ,
- Successful implantation takes place in 20% cases.
- this technique is followed when—
- no. of spermatozoa is inadequate ( spermatozoa count is <20 million /ml) n— 2-5 ml may have 100 million spermatozoa.

- if inadequate motility of spermatozoa,
- obstruction of uterine tube
- absence of ovulation

# Sex determination

- all ovas  $-23+ x$  chromosomes
- spermatozoa has ---half of them has  $-22+ x$  , other half is  $22+ y$  , called as x-bearing or y-bearing spermatozoa.
- Ovum can be fertilized by either of them,
- if sperm is x bearing then zygote is --- $44+ x+x =$ girl offspring
- if sperm is y then zygote is --- $44+ x+ y =$  boy .
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