

Fertilization



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Fertilization:

the fusion of the sperm cell nucleus with the egg cell nucleus to produce a **zygote** (fertilized egg)

Fertilization:

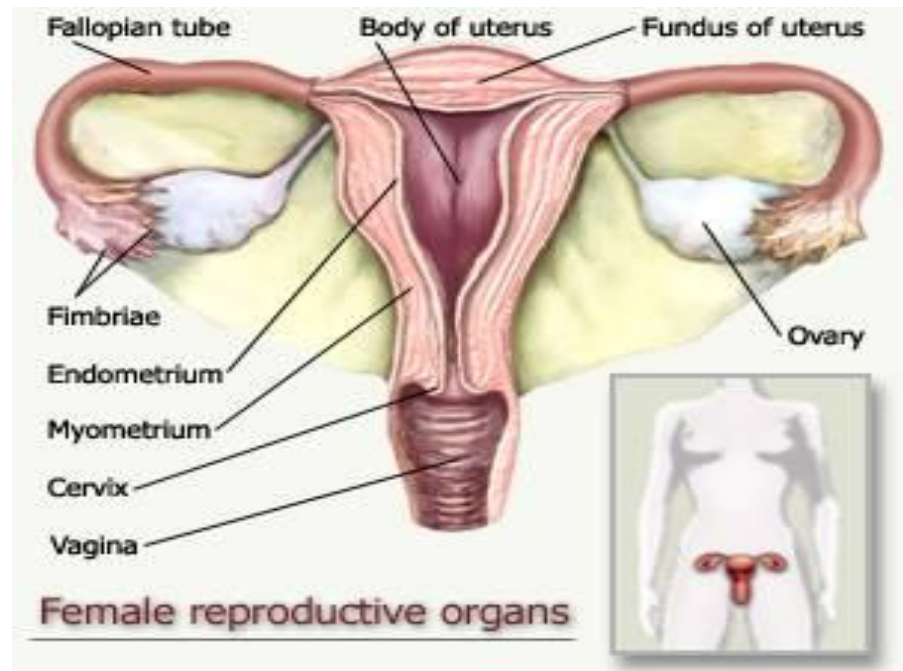
- External
- Occurs outside of the body of the female
- Increased number of eggs produced to insure the survival of the species
- Ex) fish and amphibians برمائيات

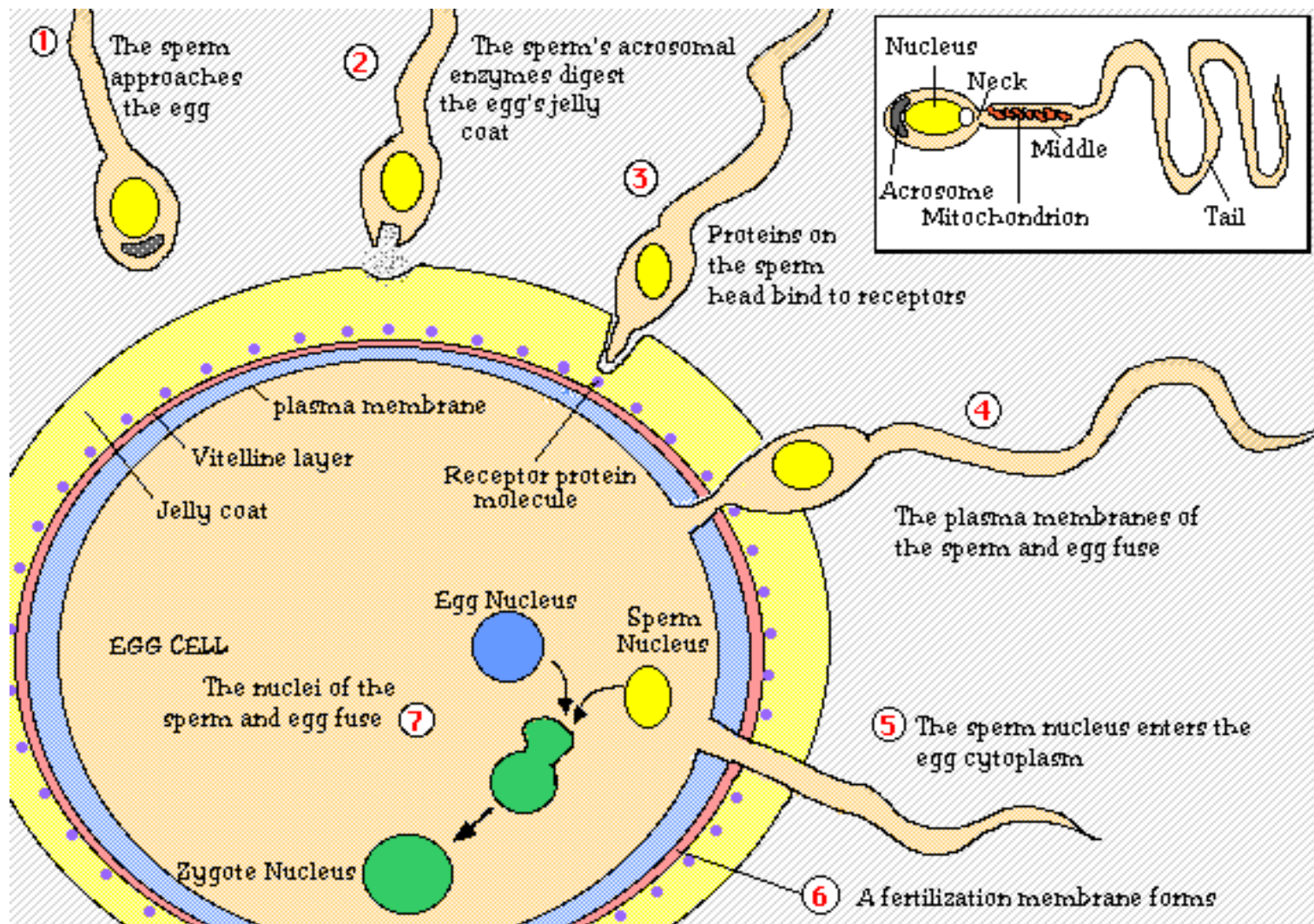
Fertilization:

- Internal
- Occurs inside the body of the female
- Fewer number of eggs are produced
- Increased parental care insures species survival
- Ex) mammals, reptiles , زواحف , birds

Fertilization:

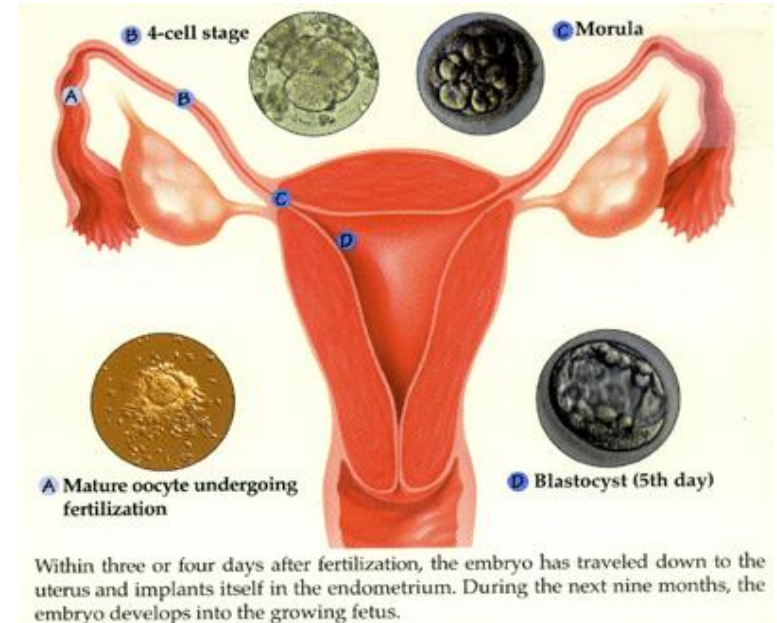
- fertilization in mammals occurs in the oviduct قناة البيض
- The ova is viable for approximately 24 hours after ovulation



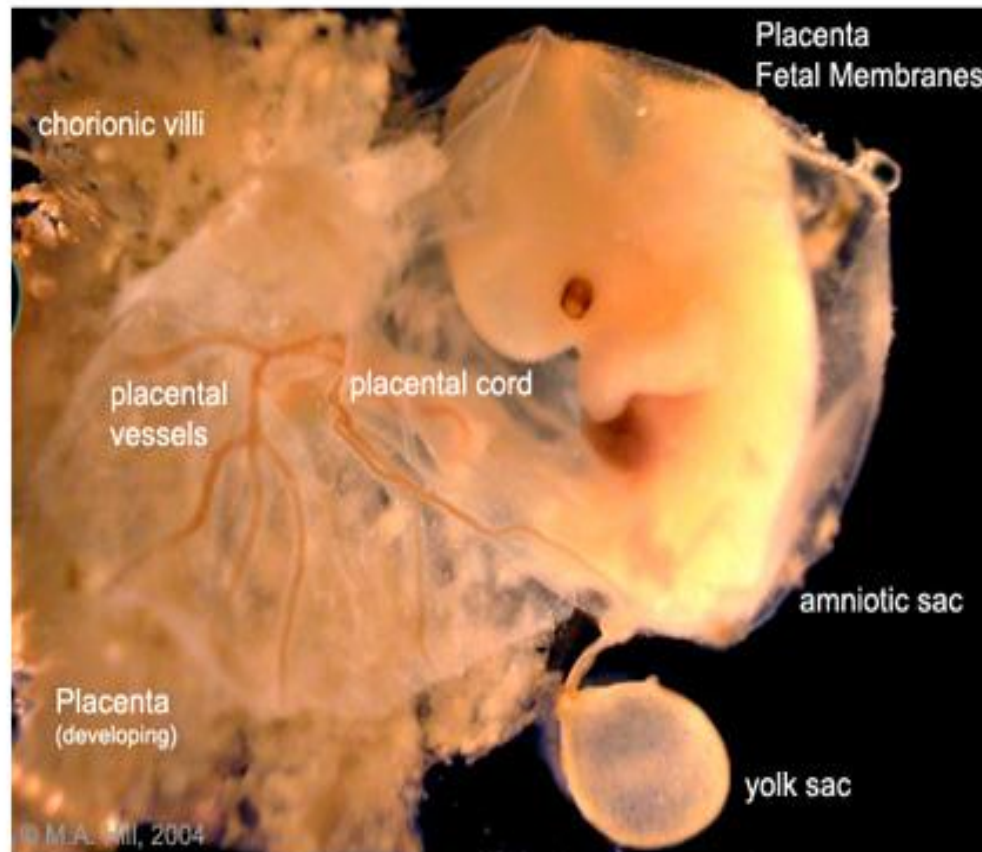


Implantation

- After approximately a week, the developing embryo is implanted into the uterus
- **Embryo:** conception to 8 weeks



Embryonic Development



Embryo:

- a multicellular organism in the early stages of development

2 four cell stage embryos



Eight cell stage embryo



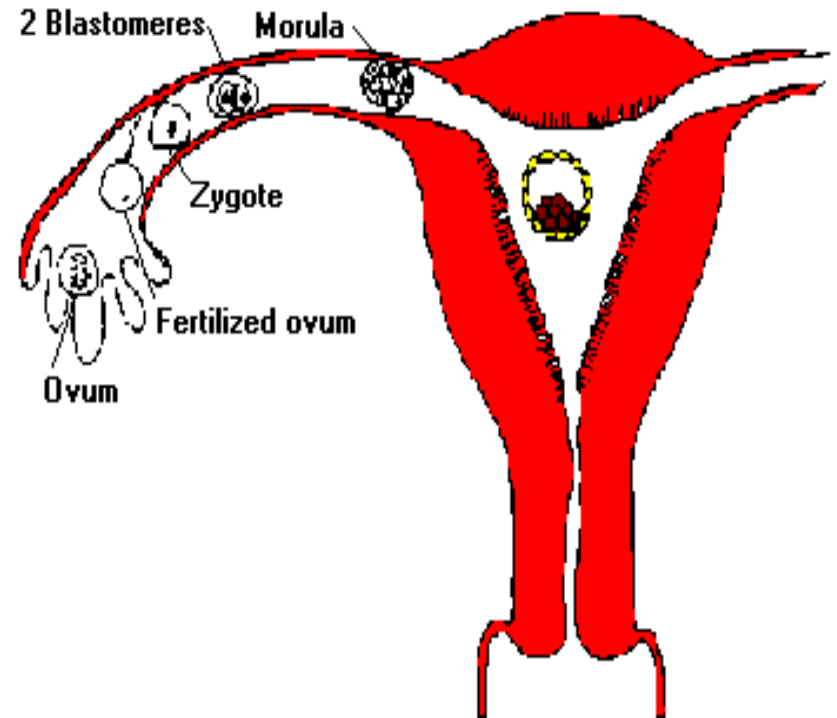
Embryo:

The beginning developmental processes are always the same in all animals:

- 1) cleavage
- 2) growth
- 3) differentiation

Embryo:

- after fertilization the diploid ZYGOTE undergoes cleavage divisions in the oviduct



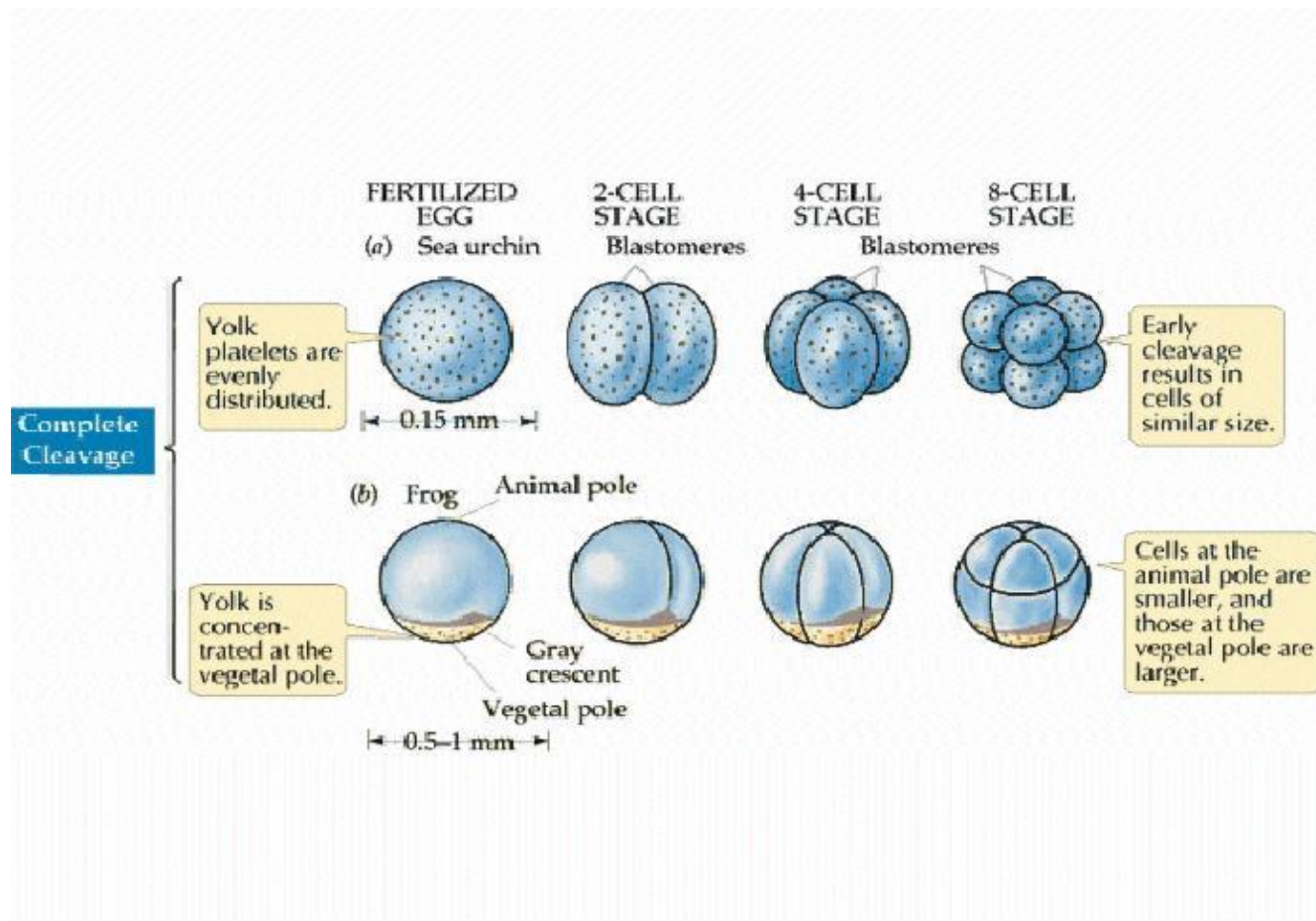
Cleavage

the first series of cell divisions by mitosis after fertilization

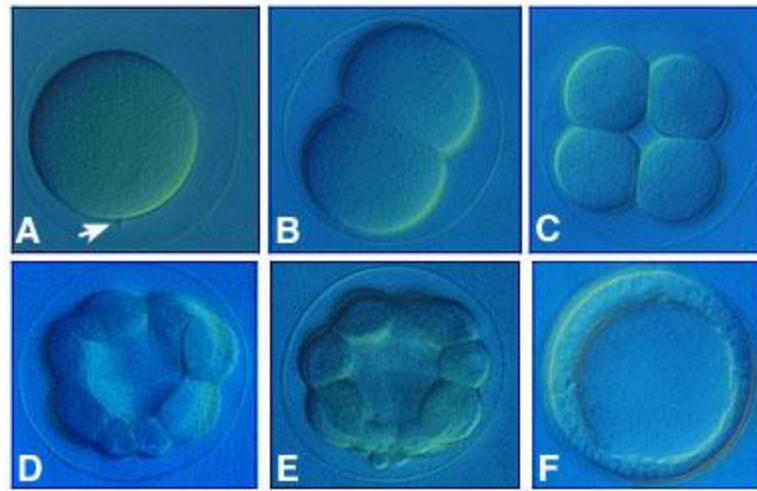
Cell division is rapid, new cells do not take time for the growth phase G_1

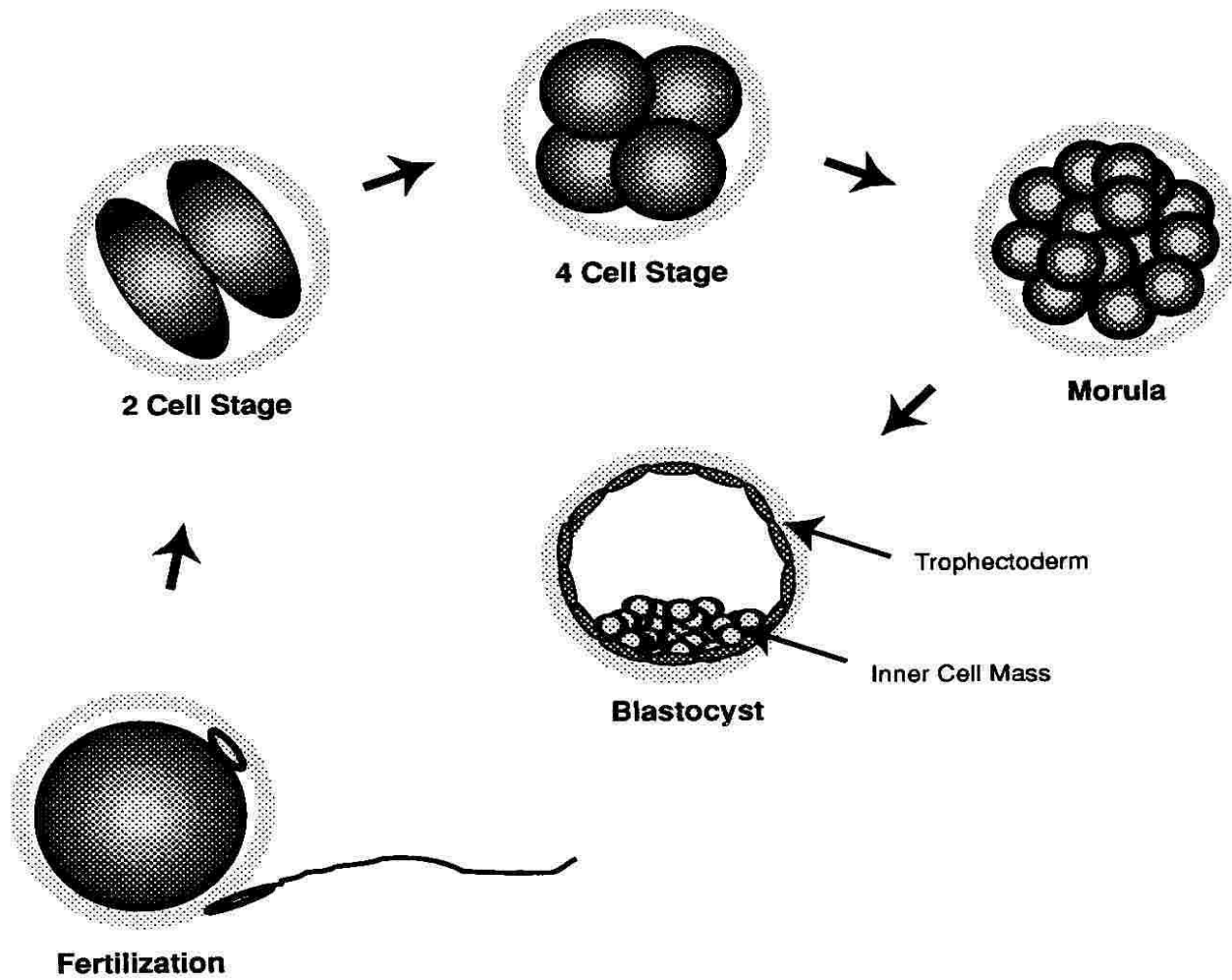
cell growth does not occur so cells decrease in size with each cleavage division

Cleavage divisions



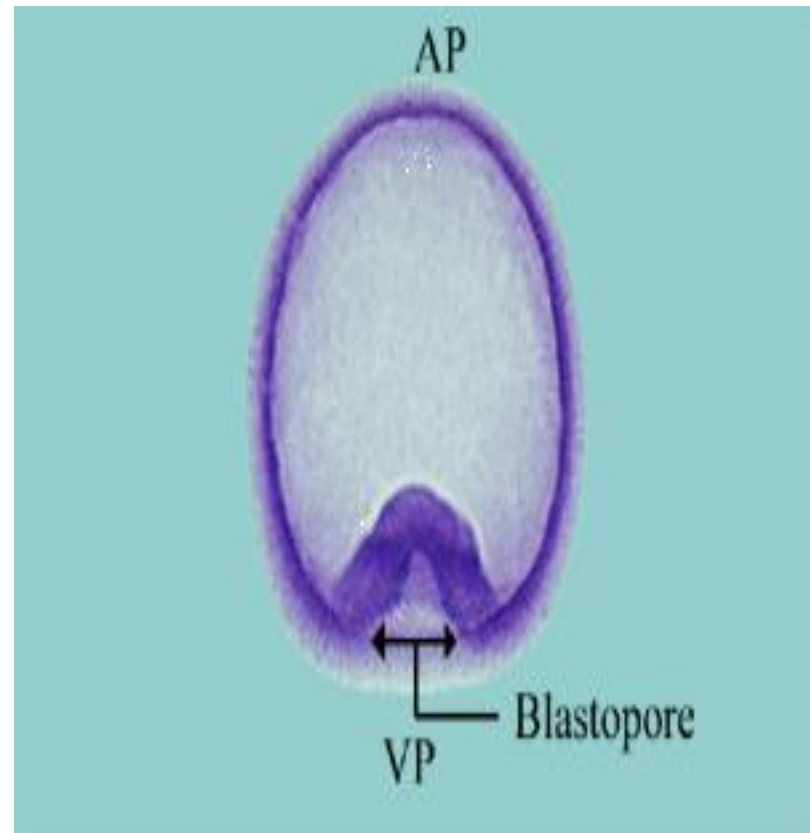
- Morula forms (solid ball of cells)
- Blastula forms (hollow ball of cells)
- Cells begin to grow before dividing



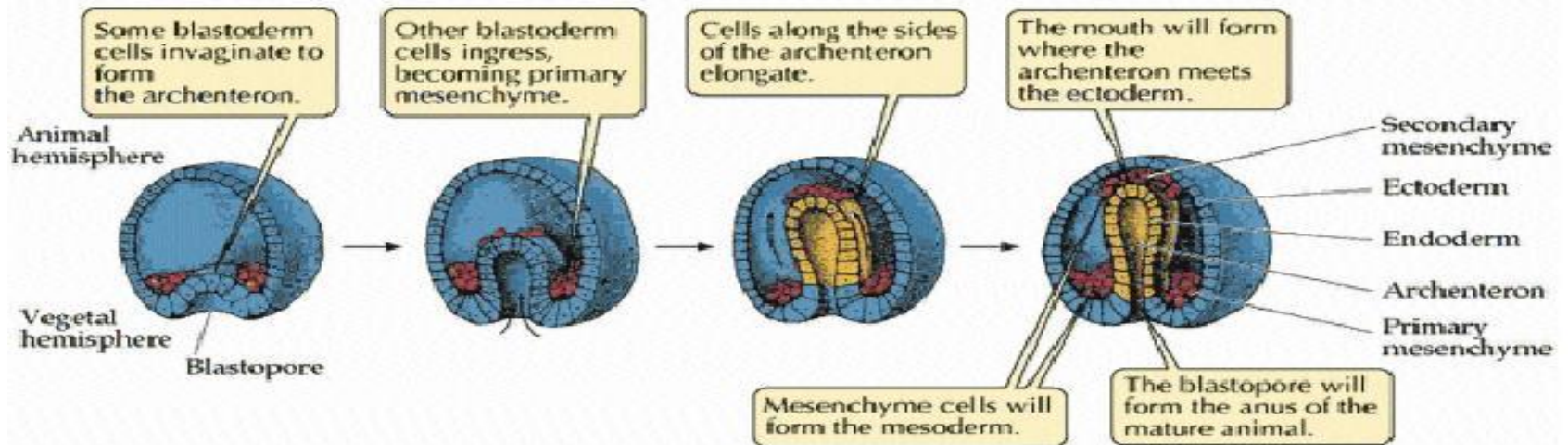


Differentiation

- **Gastrulation:** one side of the blastula invaginates (indents) forming a gastrula
- Three cell layers form



Differentiation



Differentiation

- The changing of unspecialized embryonic cells into the specialized cells, tissues and organs of a multicellular animal

Germ Layers

- **Ectoderm Outer layer**
- Nervous system including brain, spinal cord and nerves
- Lining of the mouth, nostrils, and anus
- Epidermis of skin, sweat glands, hair, nails

Germ Layers

- **Mesoderm Middle Layer**

- Bones and muscles
- Blood and blood vessels
- Reproductive and excretory systems
- Inner layer (dermis) of skin

Germ Layers

- **Endoderm Inner Layer**
- Lining of digestive tract
- Lining of trachea, bronchi, and lungs
- Liver, pancreas
- Thyroid, parathyroid, thymus, urinary bladder

Placenta

- organ that forms from the embryo and the uterus



Placenta

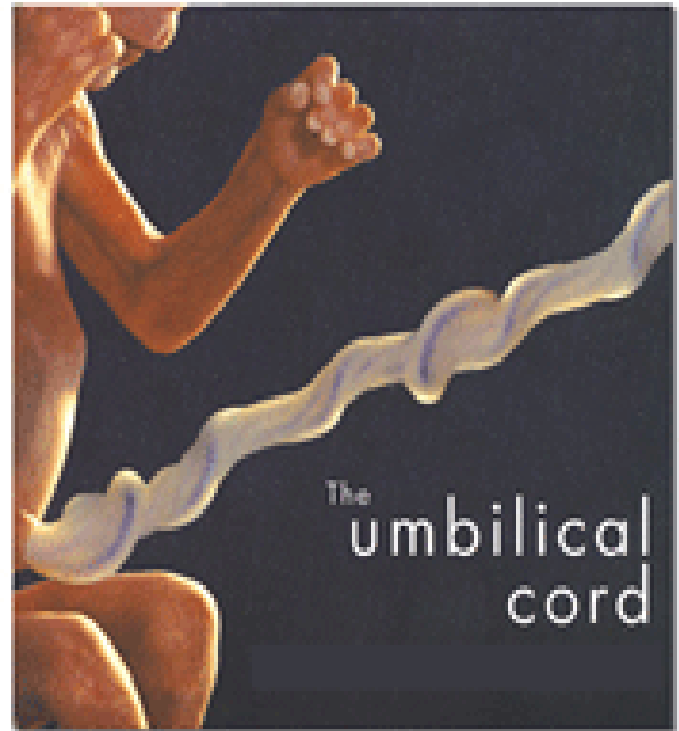
- contains blood vessels from the mother and the developing baby

Placenta

- Oxygen & nutrients diffuse from the mother's blood vessels into the baby's blood vessels
- Wastes diffuse from the baby's blood vessels into the mother's blood vessels

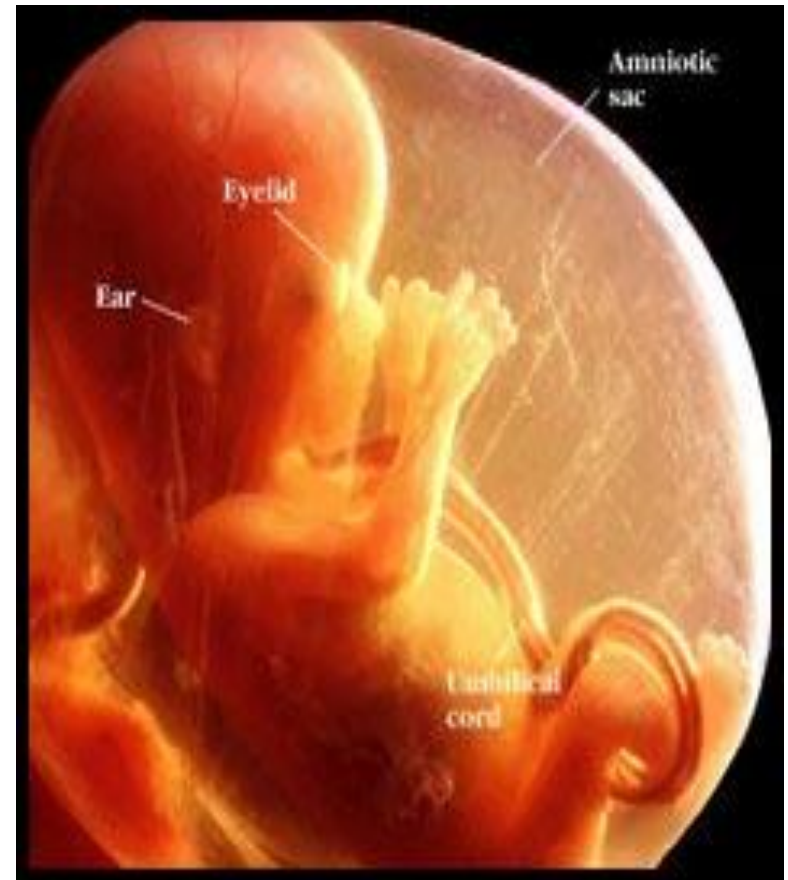
Umbilical Cord

- two arteries and a vein Connects the fetus to the placenta

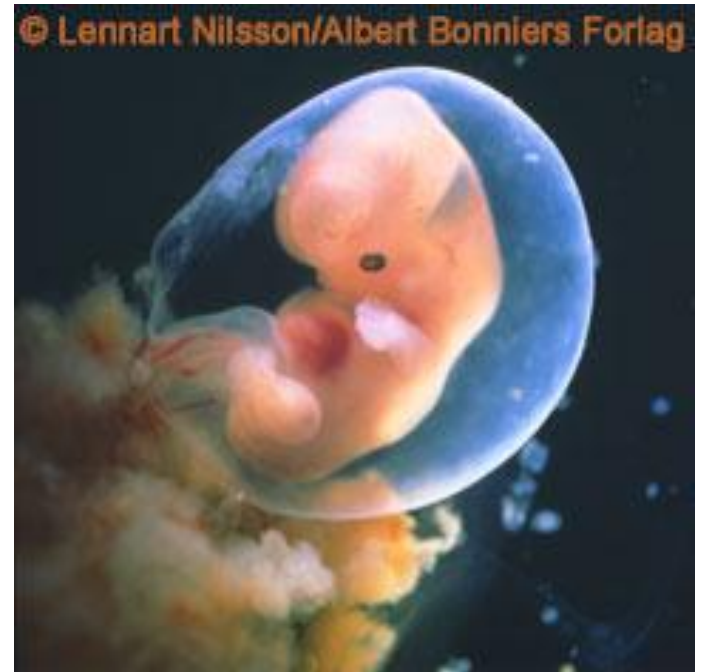


Amniotic Sac

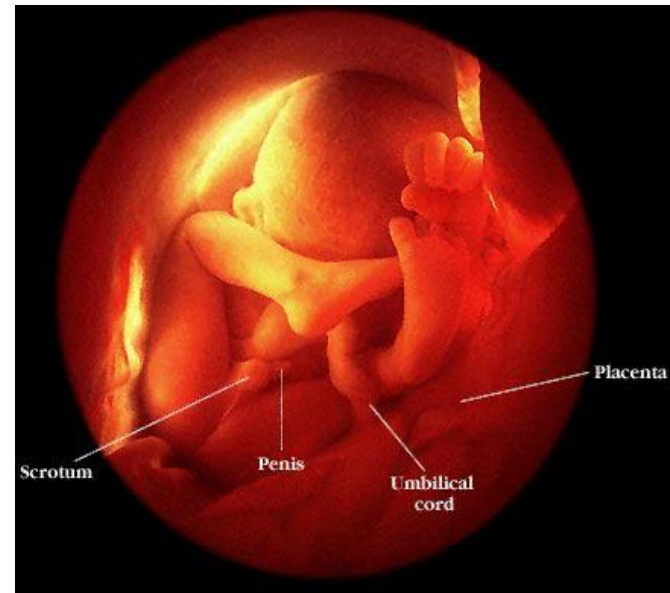
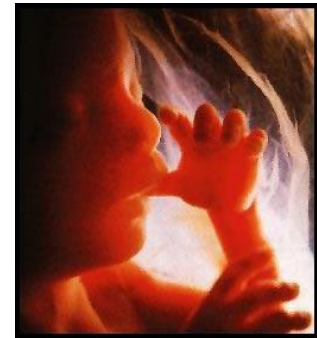
- Contains fluid (amniotic fluid) that protects fetus by giving it a stable environment and absorbing shock



- By the end of the 8th week of pregnancy the embryo is called a fetus and all of the major structures are present

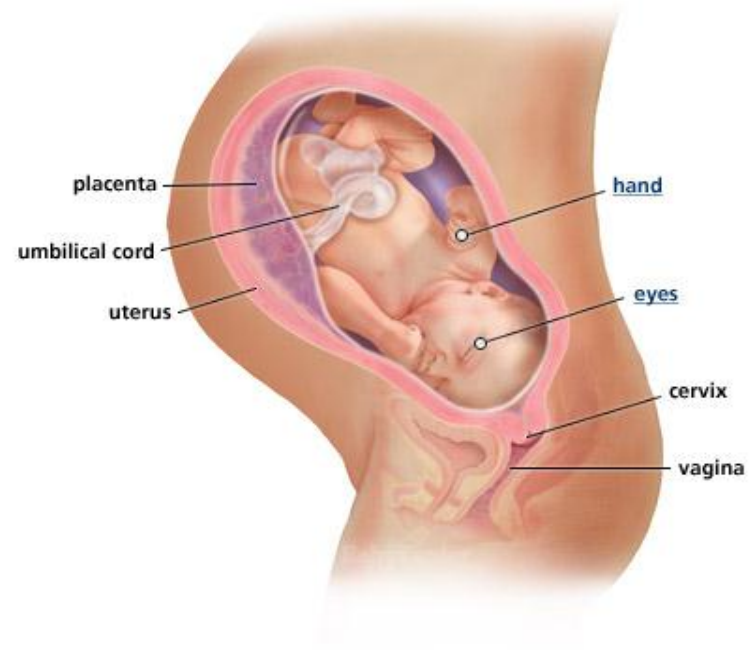


Later Stages of Fetal Development



Human gestation

- the period between fertilization and birth
- approximately 38-40 weeks



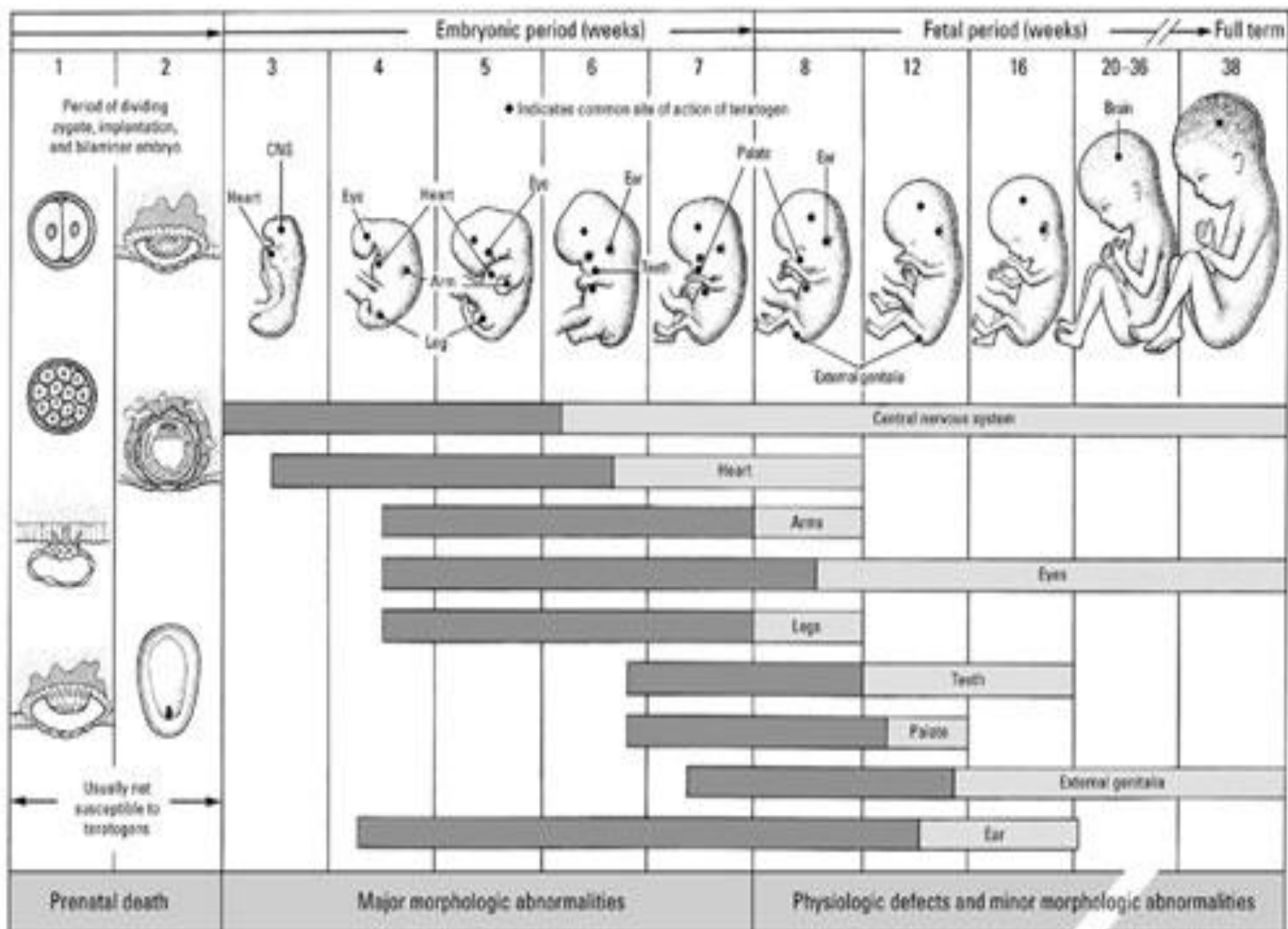
Roll your cursor over each underlined label to learn more about that area.

Teratogens

- Substances that may harm the developing fetus and result in the formation of birth defects

Teratogens include:

- Alcohol, certain drugs/medications, infections, and certain chemicals



Fetal Alcohol Syndrome

Can result in mental retardation / learning disability

Facial Features

- Epicanthal folds
- Small, widely spaced eyes
- Flat midface
- Short, upturned nose
- Smooth, wide philtrum
- Thin upper lip
- Underdeveloped jaw



Cleft Lip / Palate

- maternal alcohol consumption and maternal smoking during the early stages of pregnancy have been shown to increase the risk of developing orofacial clefts
- http://www.hopeforkids.com/body_cleft_lip%5B1%5D.html#

How do twins form???



Monozygotic Twins (Identical Twins)

- One egg is fertilized by one sperm
- Embryo splits into two during the early stages of development
- Have identical genes and must be of the same sex
- (Incidence: about 3 in every 1000 births)

Dizygotic Twins (Fraternal Twins)

- Two eggs are ovulated and each is fertilized by a sperm cell
- No more genetically similar than any other sibling in the family (can be same/different sexes)
- Maternal age, use of assisted reproductive technologies are factors
- Incidence (6.7/1000 births in Japan to 40/1000 births in Nigeria)