RAMA UNIVERSITY

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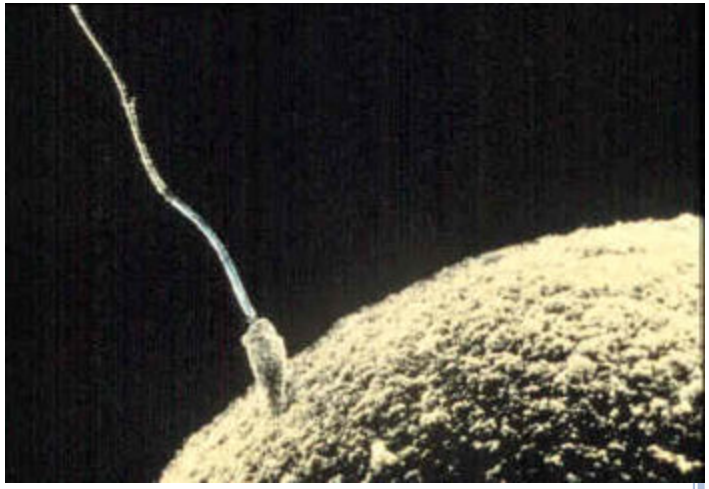
FACULTY OF NURSING



UNIT 2.FERTILIZATION

BY….

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ASSO .PROFESSOR/H.O.D OBS/GYN

DEPT OF OBG

RAMA COLLEGE OF NURSING

FERTILIZATION:

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

FERTILIZATION:

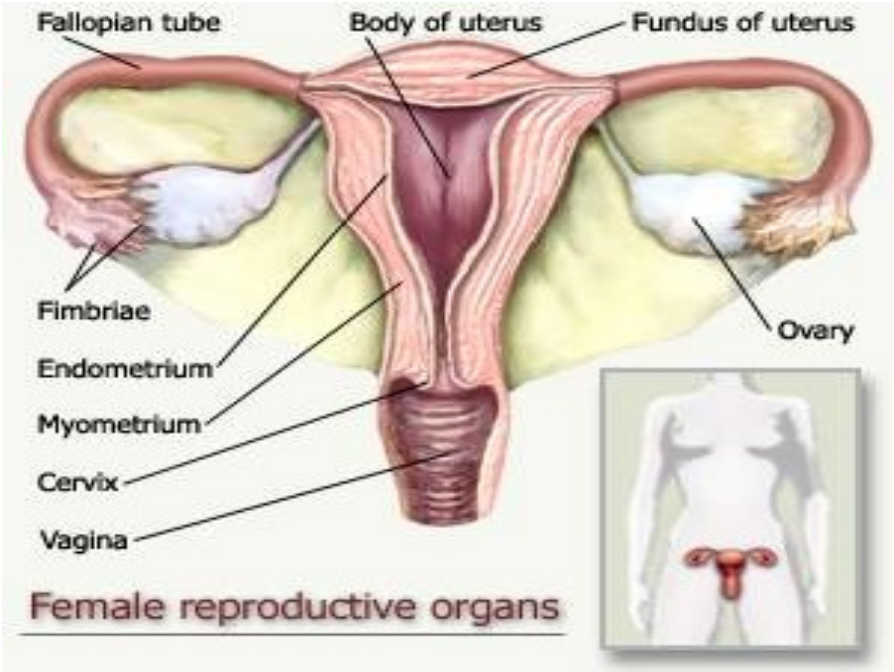
- External
- Occurs outside of the body of the female
- Increased number of eggs produced to insure the survival of the species
- Ex) fish and amphibians

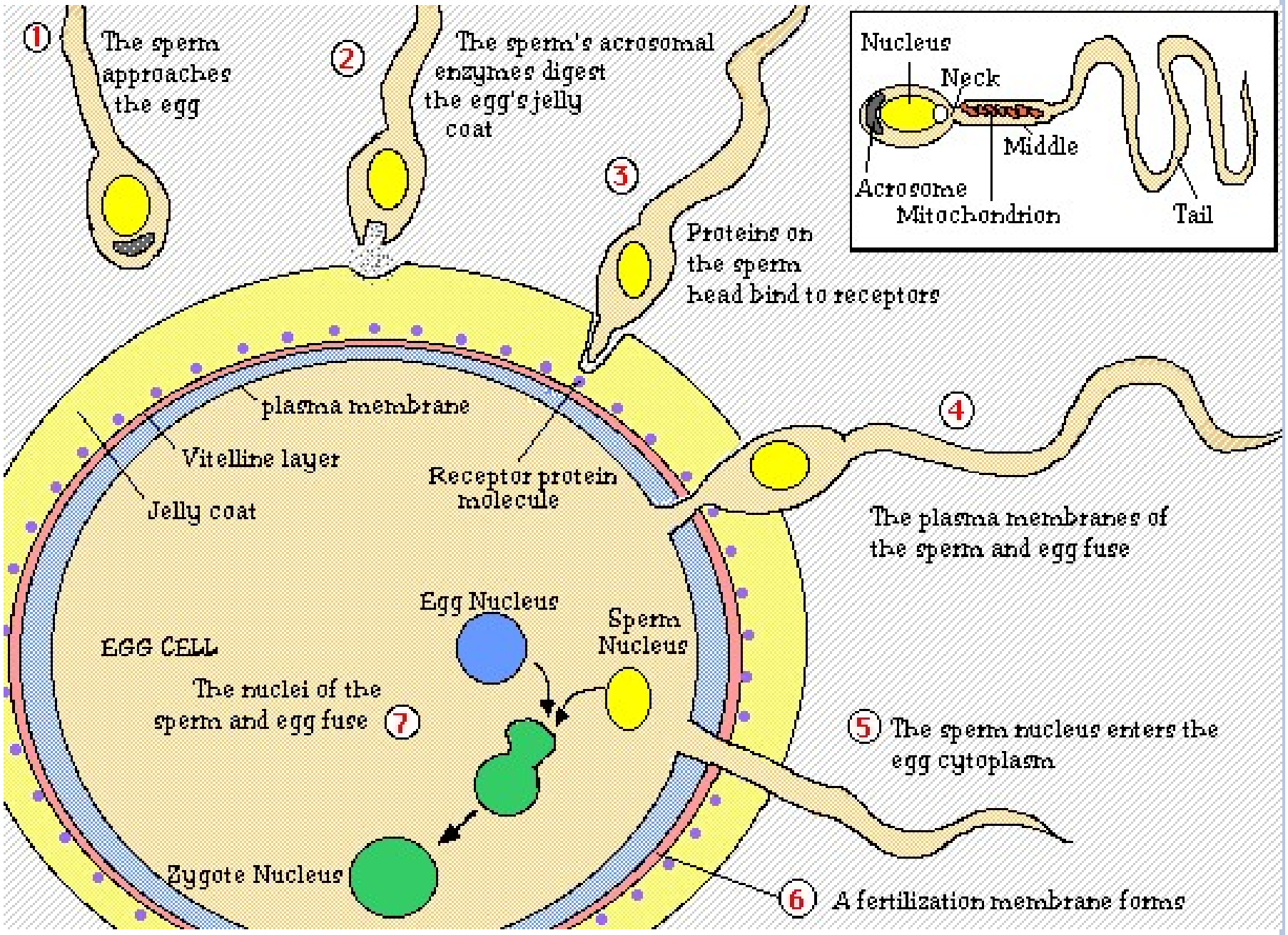
FERTILIZATION:

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

FERTILIZATION:

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




1
The sperm approaches the egg
2
The sperm's acrosomal enzymes digest the egg's jelly coat
3
Proteins on the sperm head bind to receptors
Nucleus
Neck
Middle
Acrosome
Mitochondrion
Tail
plasma membrane
Vitelline layer
Jelly coat
Receptor protein molecule
4
The plasma membranes of the sperm and egg fuse
Egg Nucleus
Sperm Nucleus
EGG CELL
The nuclei of the sperm and egg fuse
7
5
The sperm nucleus enters the egg cytoplasm
Zygote Nucleus
6
A fertilization membrane forms

Implantation

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

Within three or four days after fertilization, the embryo has traveled down to the uterus and implants itself in the endometrium. During the next nine months, the embryo develops into the growing fetus.

IMPLANTATION - EMBEDDING OF BLASTOCYST INTO UTERINE LINING BEGINS AT DAY 7

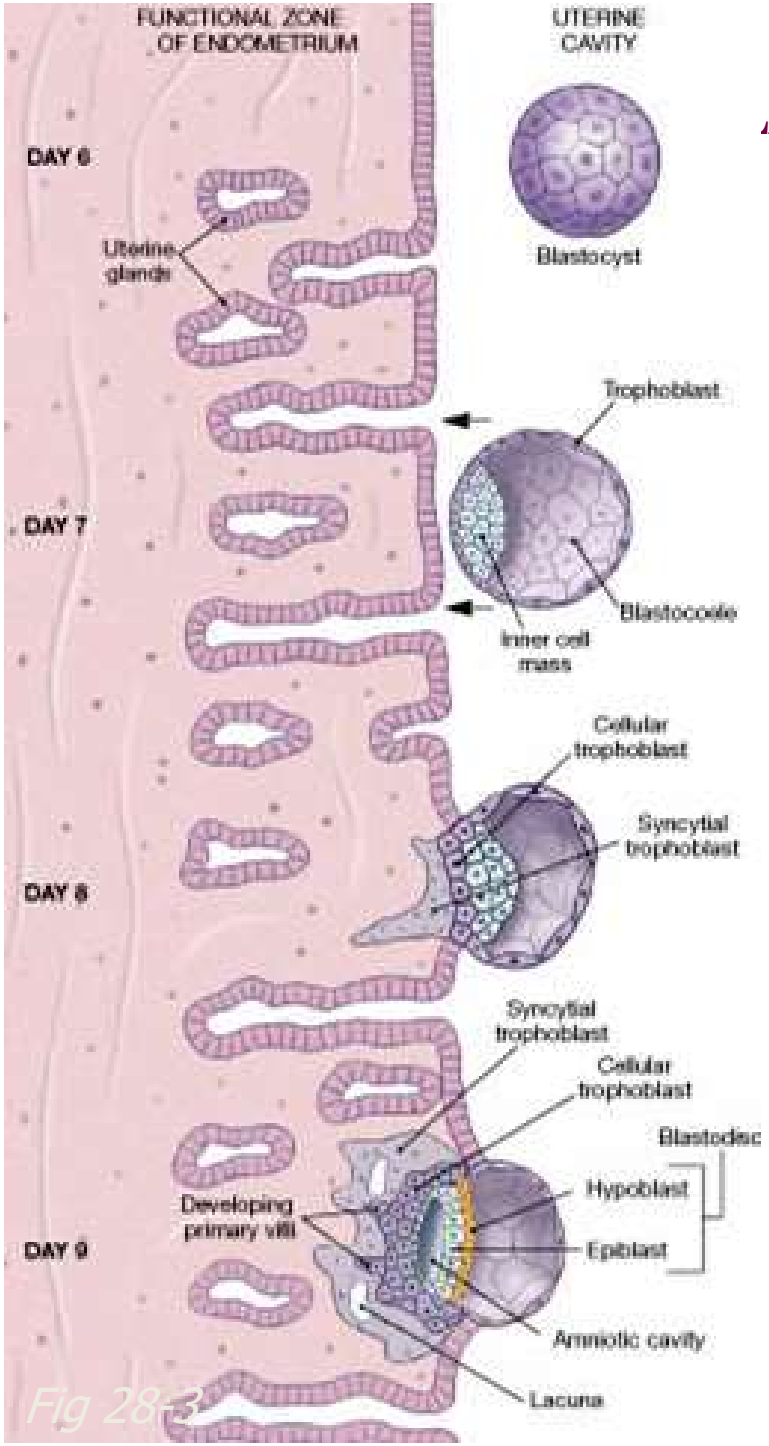
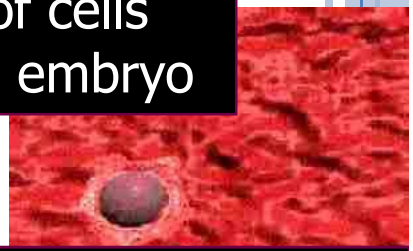


Fig 28-3

Blastocyst - with blastocoele cavity
Trophoblast - outer layer of cells
Inner cell mass - will form embryo



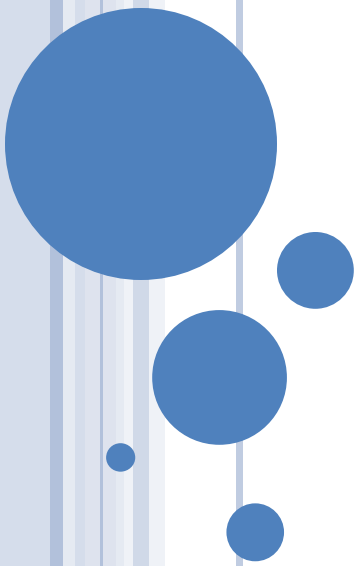
Trophoblast forms syncytial trophoblast- erodes into endometrium
Cellular trophoblast - carries nutrients to inner cell mass

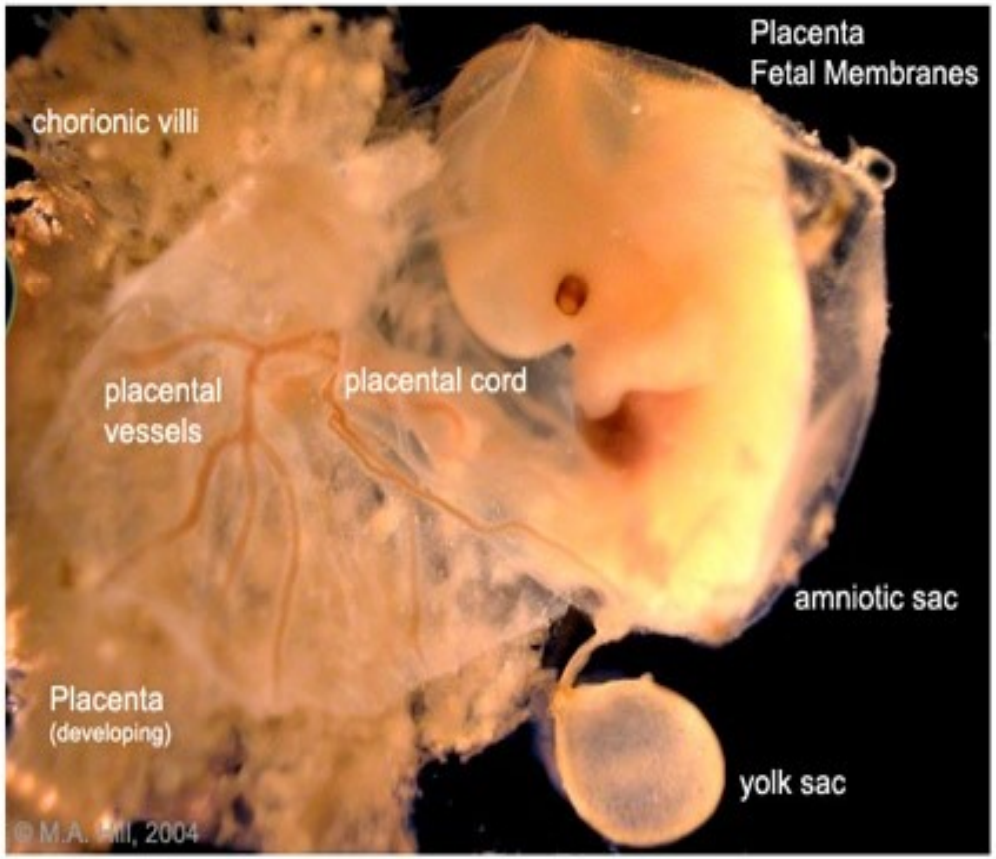
Lacunae and primary villi formed by trophoblast
All of these form placental tissues

NIDATION

- Apposition
- Adhesion
- Penetration
- invasion

UNIT 2.EMBRYONIC DEVELOPMENT



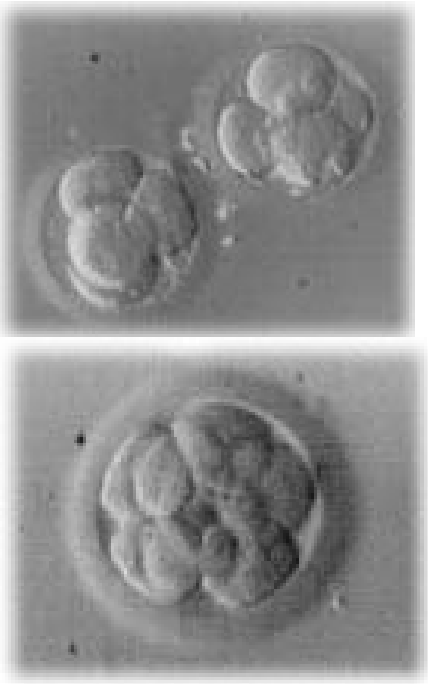

Placenta
Fetal Membranes
chorionic villi
placental vessels
placental cord
amniotic sac
Placenta
(developing)
yolk sac
© M.A. Hill, 2004

EMBRYO:

- a multicellular organism in the early stages of development

2 four cell stage embryos

Eight cell stage embryo



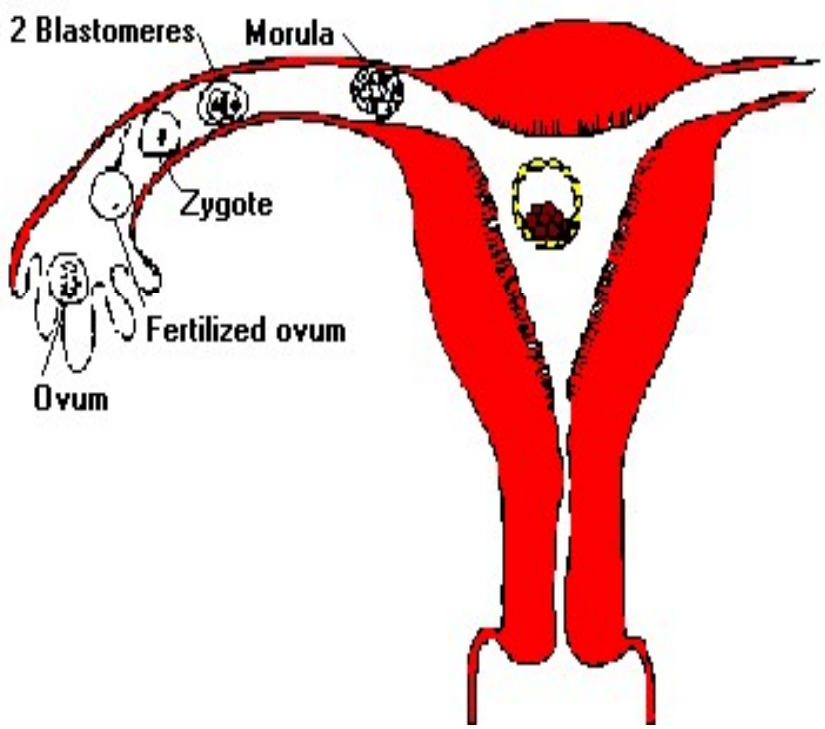
EMBRYO:

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



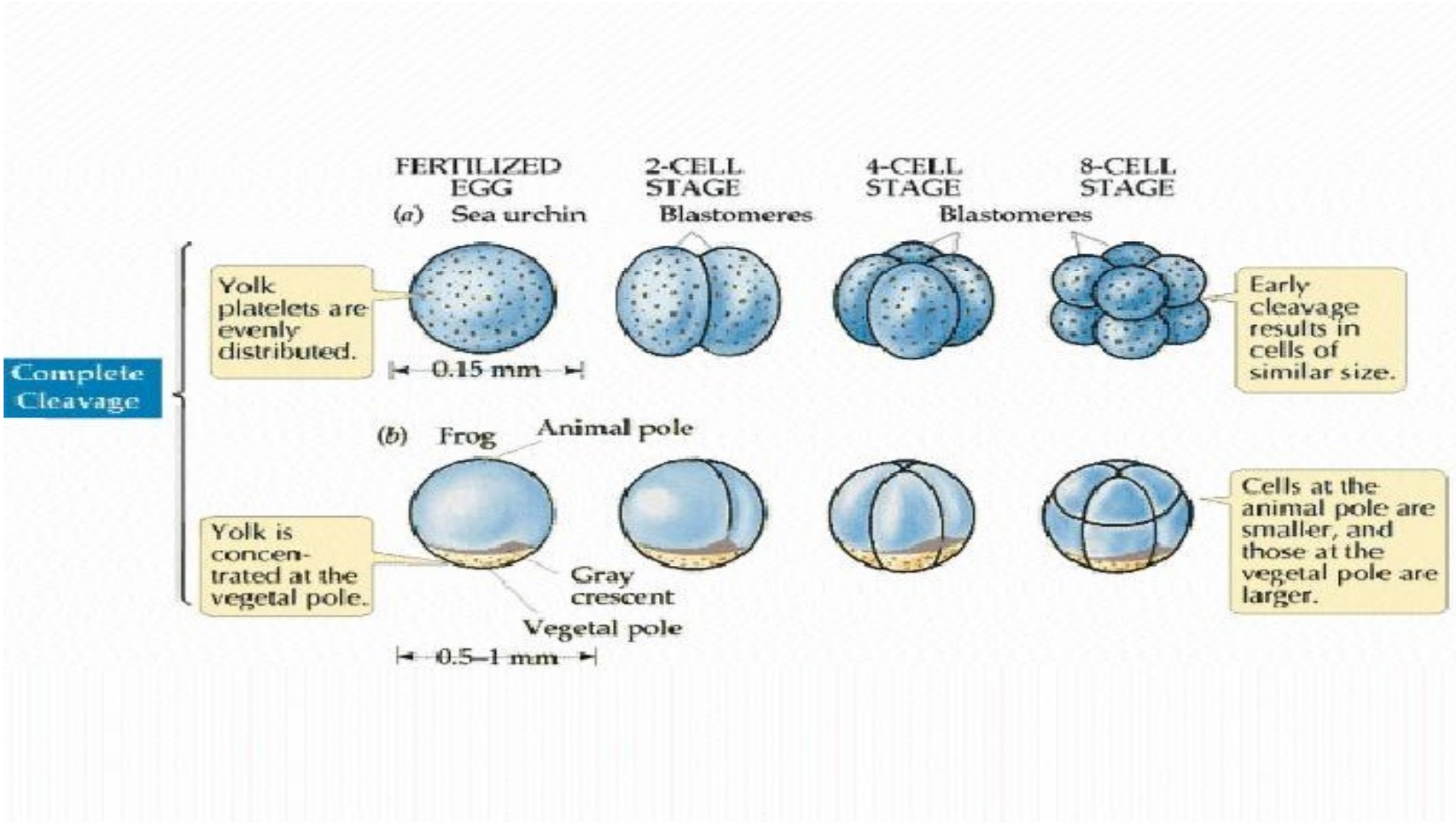
CLEAVAGE

the first series of cell divisions by mitosis after fertilization

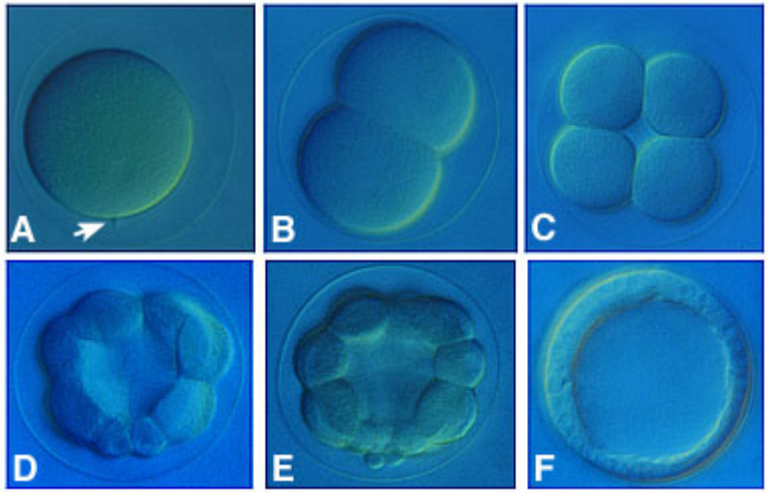
Cell division is rapid, new cells do not take time for the growth phase G_1

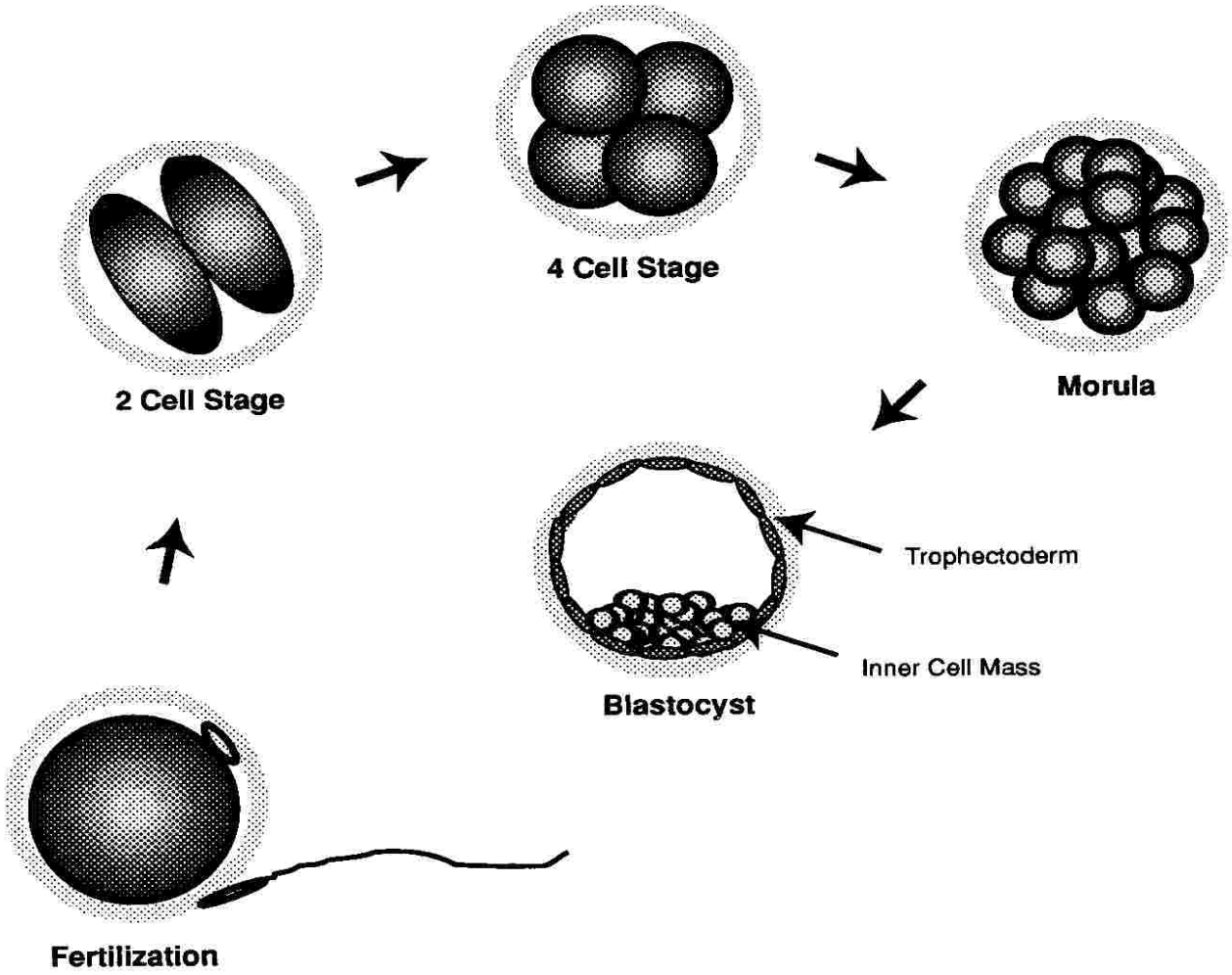
cell growth does not occur so cells decrease in size with each cleavage division

CLEAVAGE DIVISIONS



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




2 Cell Stage
4 Cell Stage
Morula
Trophectoderm
Inner Cell Mass
Blastocyst
Fertilization

THE FIRST TRIMESTER

WEEKS 1-12; FETUS SIZE ~ 3 IN.; WEIGHT ~ 14 G

Cleavage

Implantation

Placentation

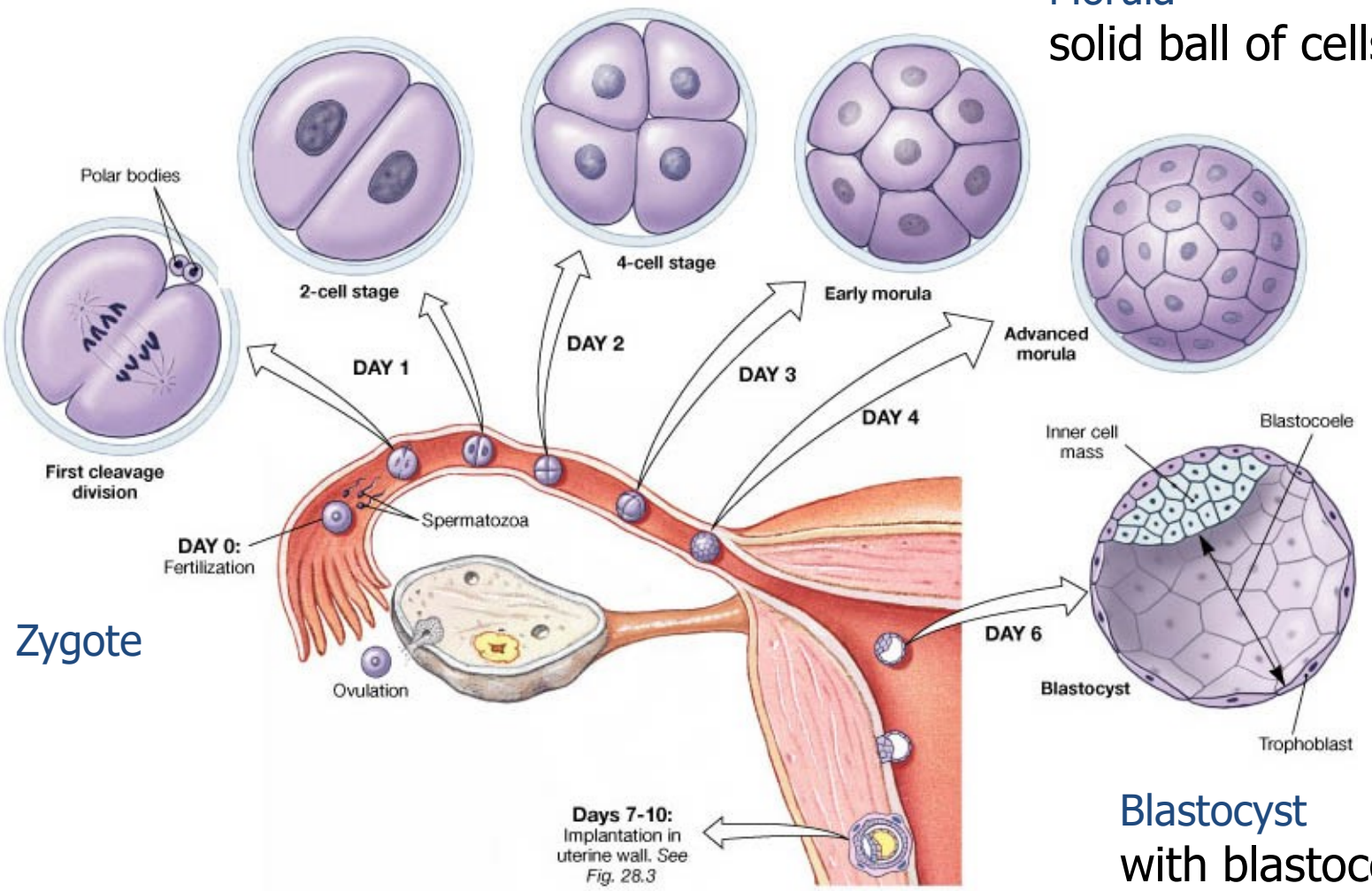
Embryogenesis

Basic organ plan and tissues laid out –
most susceptible to damage or disorganization at this time

CLEAVAGE

Early division of zygote into multiple cells without increase in size, partitions contents

Morula
solid ball of cells

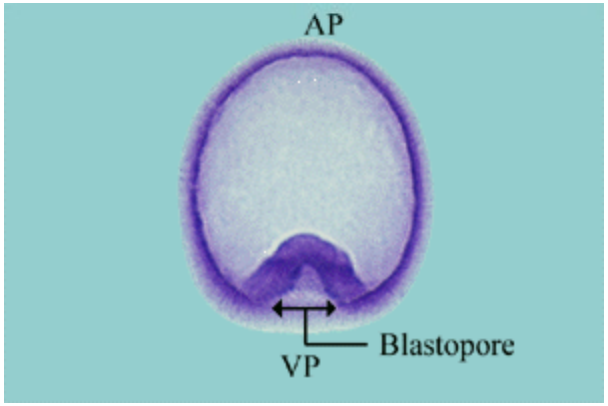


Zygote

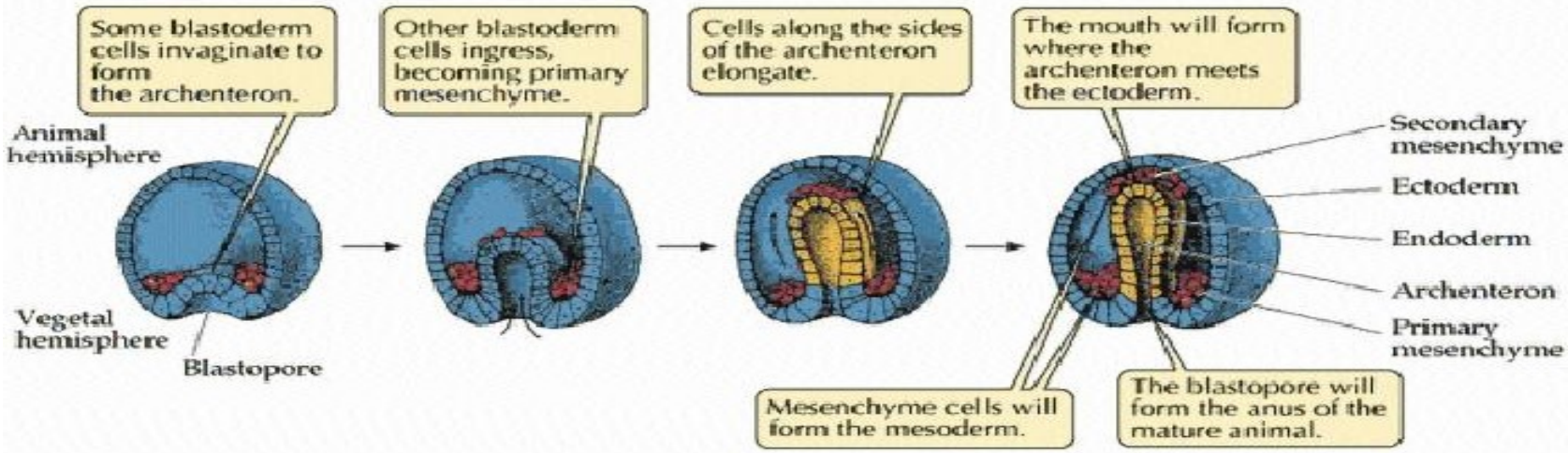
Blastocyst
with blastocoele cavity

Differentation

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



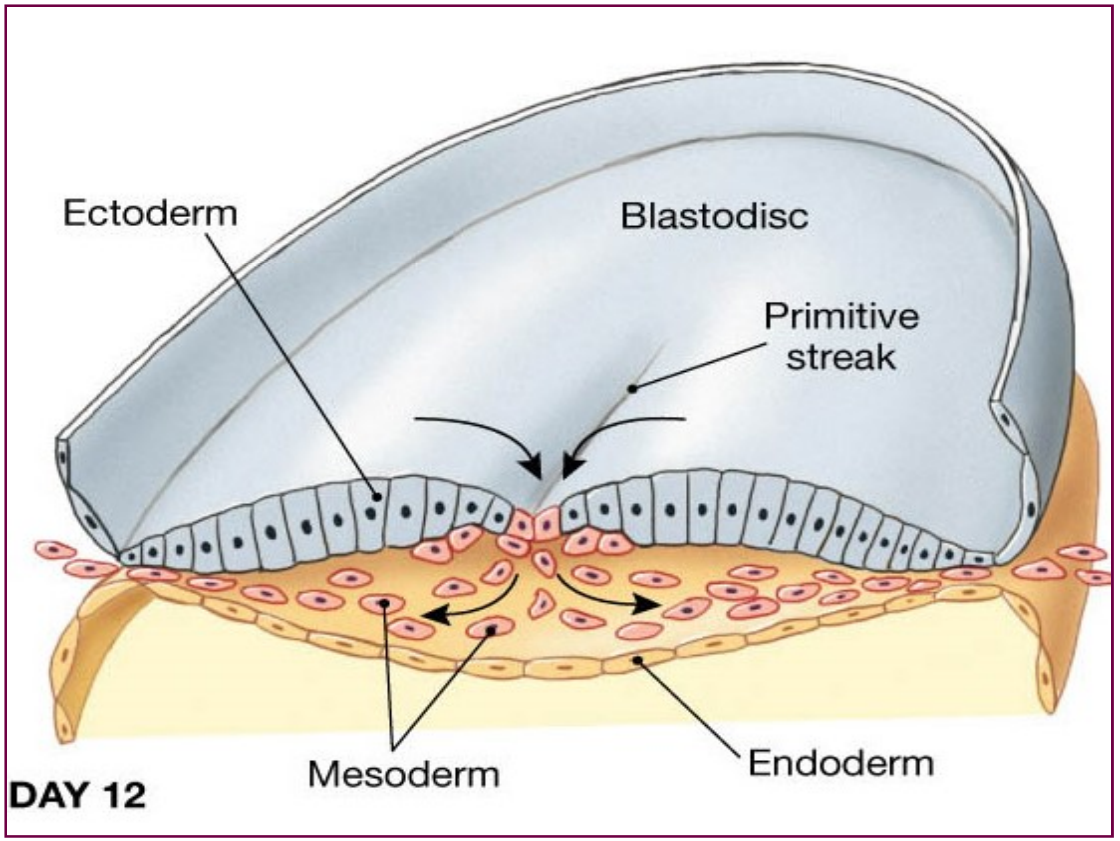
DIFFERENTATION



Differentiation

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

Gastrulation: 3 Germ Layers Formed



Germ Layers

- **EctodermOuter 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

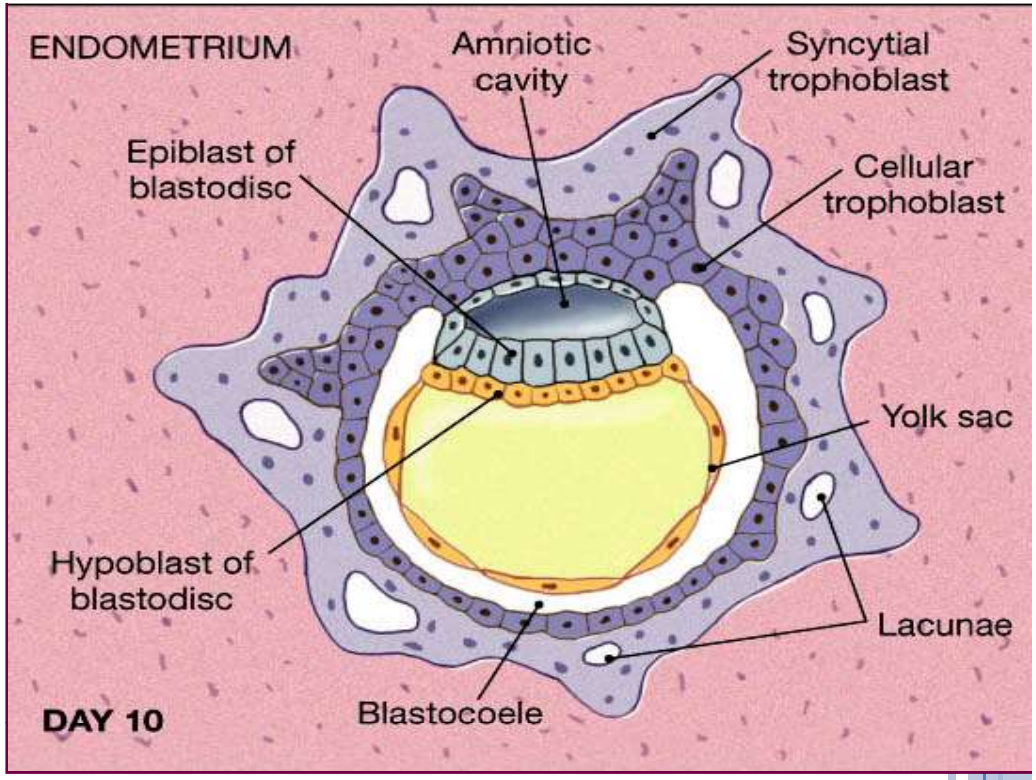
DAY 10

Embryo completely embedded in endometrium

Amnion and yolksac visible

Blastodisc formation (2 cell layers)

- Epiblast
- Hypoblast



PLACENTA

- organ that forms from the embryo and the uterus

Placenta

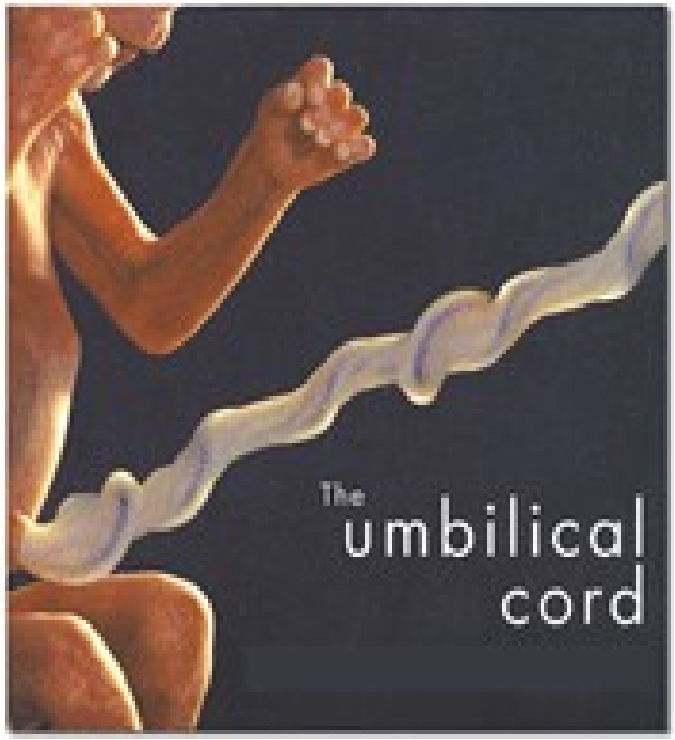
- contains blood vessels from the mother and the developing baby

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

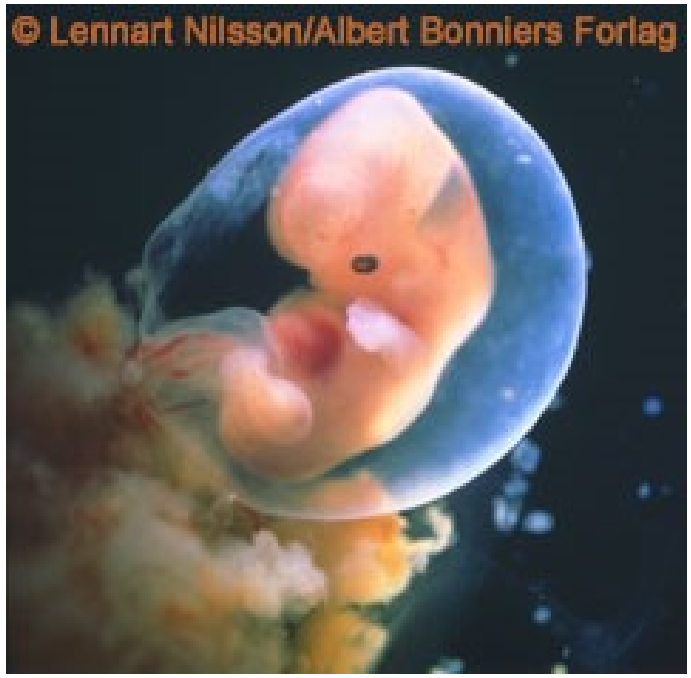
- two arteries and a vein
  Connects the fetus to the placenta



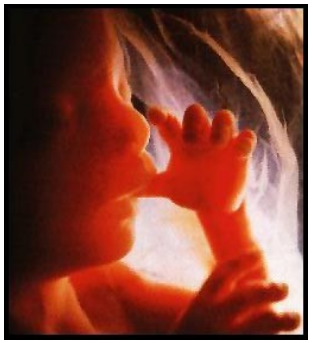
Amniotic Sac

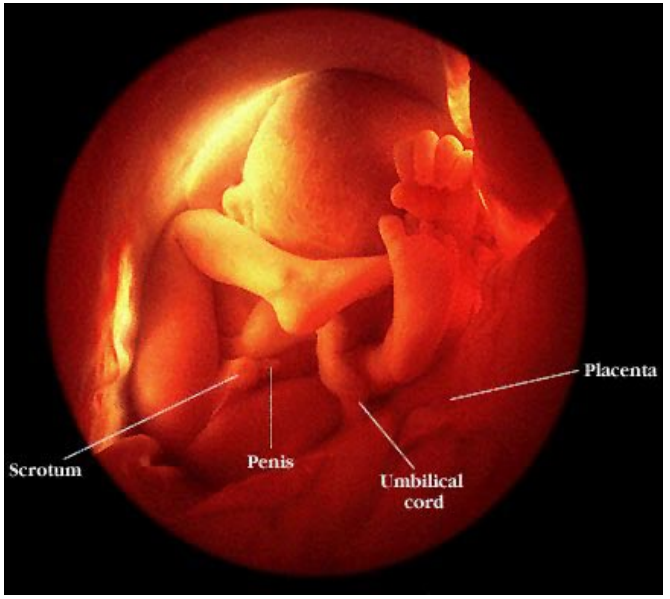
- Contains fluid (amniotic fluid) that protects fetus by giving it a stable environment and absorbing shock

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



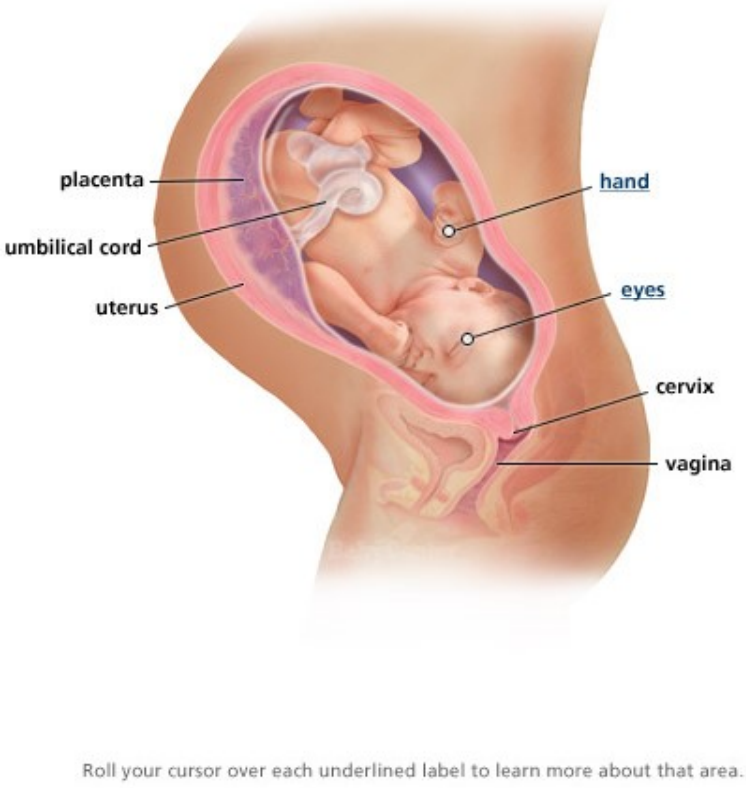
Later Stages of Fetal Development





HUMAN GESTATION

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

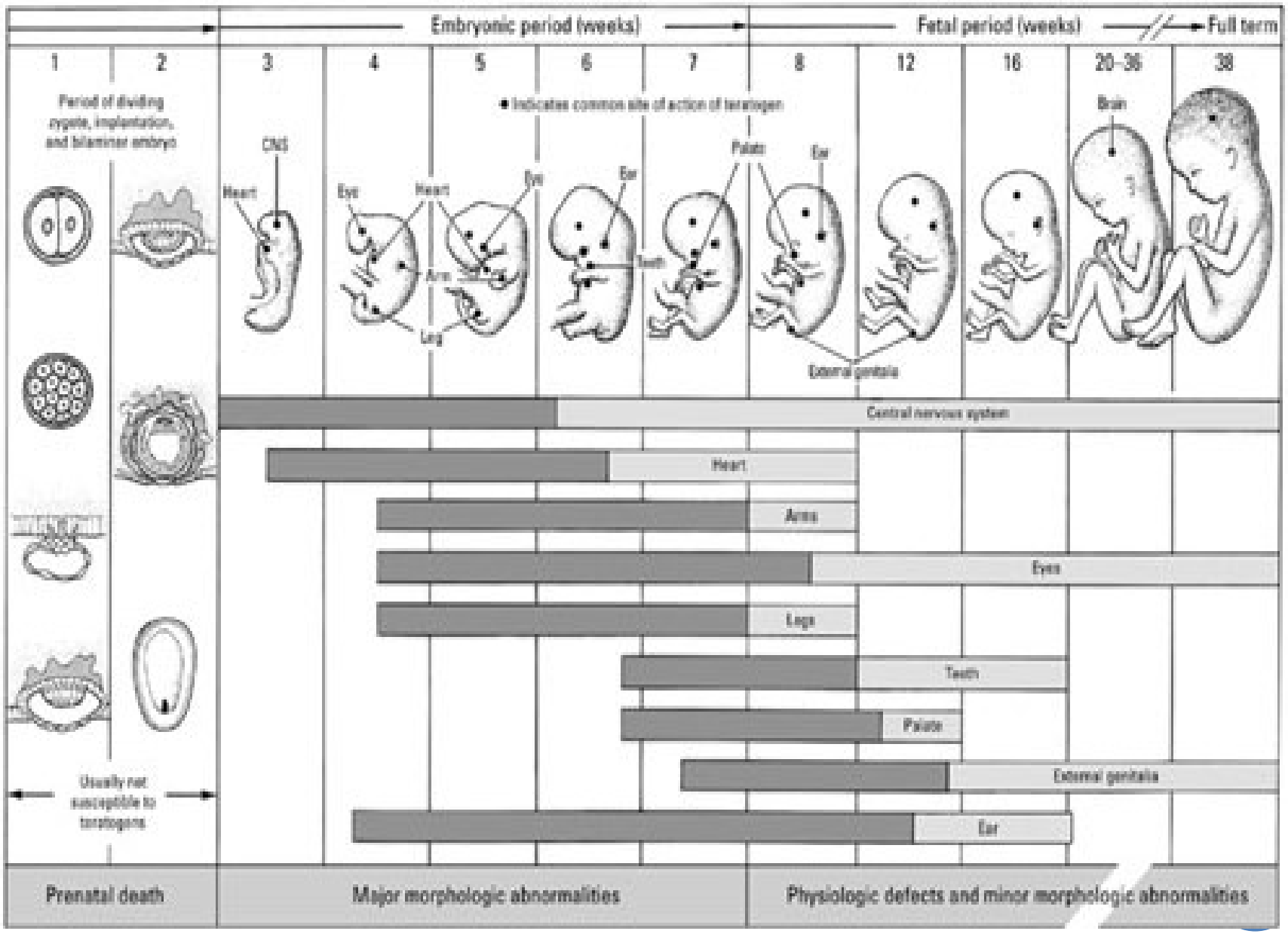


TERATOGENS

- 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


Embryonic period (weeks)
Fetal period (weeks)
Full term
1
2
3
4
5
6
7
8
12
16
20–36
38
Period of dividing zygote, implantation, and bilaminar embryo
Indicates common site of action of teratogen
CNS
Heart
Eye
Heart
Eye
Ear
Palate
Ear
Brain
Arm
Leg
Tooth
External genitalia
Central nervous system
Heart
Arms
Eyes
Legs
Teeth
Palate
External genitalia
Ear
Usually not susceptible to teratogens
Prenatal death
Major morphologic abnormalities
Physiologic defects and minor morphologic abnormalities

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)

THANK YOU……