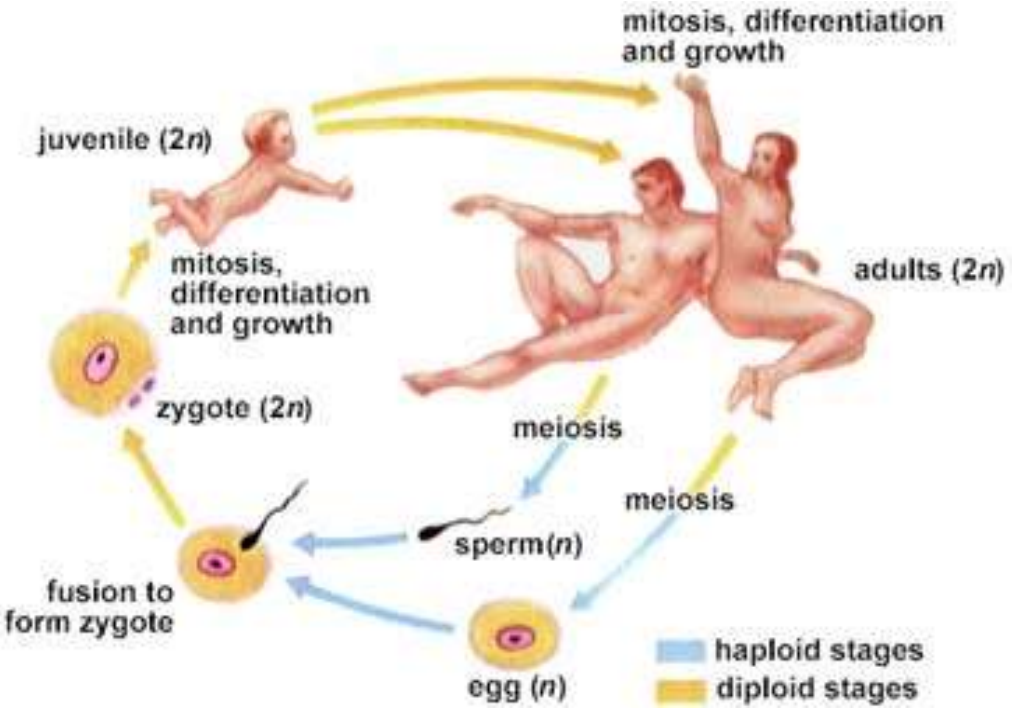
Reproduction

Review

- <u>Asexual Reproduction</u>
  - One parent
  - No reproductive organs
  - No genetic variation
  - Mitosis and Cytokinesis
  - Binary Fission, Budding, Spores, Regeneration, Vegetative Propagation

Review

- Sexual Reproduction
  - Two parents
  - Sex cells
  - Meiosis
  - Genetic variation
    - Survival of species



Sexual Reproduction in Animals

- Have Male and Female
- Have sex organs (Gonads)
  - Ovaries-Ova or eggs (Haploid)
  - Testes-Sperm (Haploid)

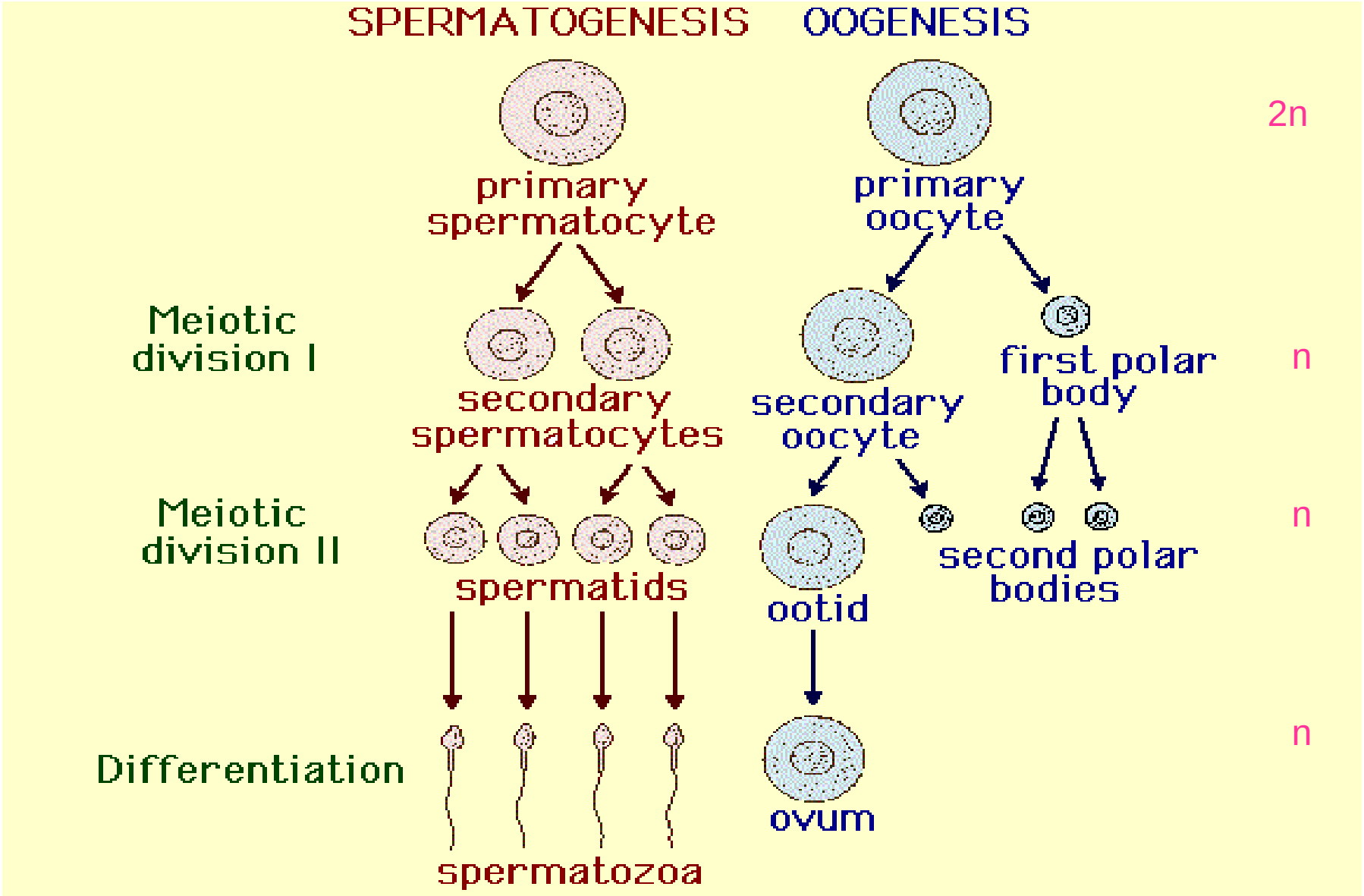
Sexual Reproduction in Animals

- Hermaphrodites
  - Ovaries and testes in same animal
  - In slow or sessile organisms (worm ,hydra snail)
  - Self fertilization rare

How are gametes made?

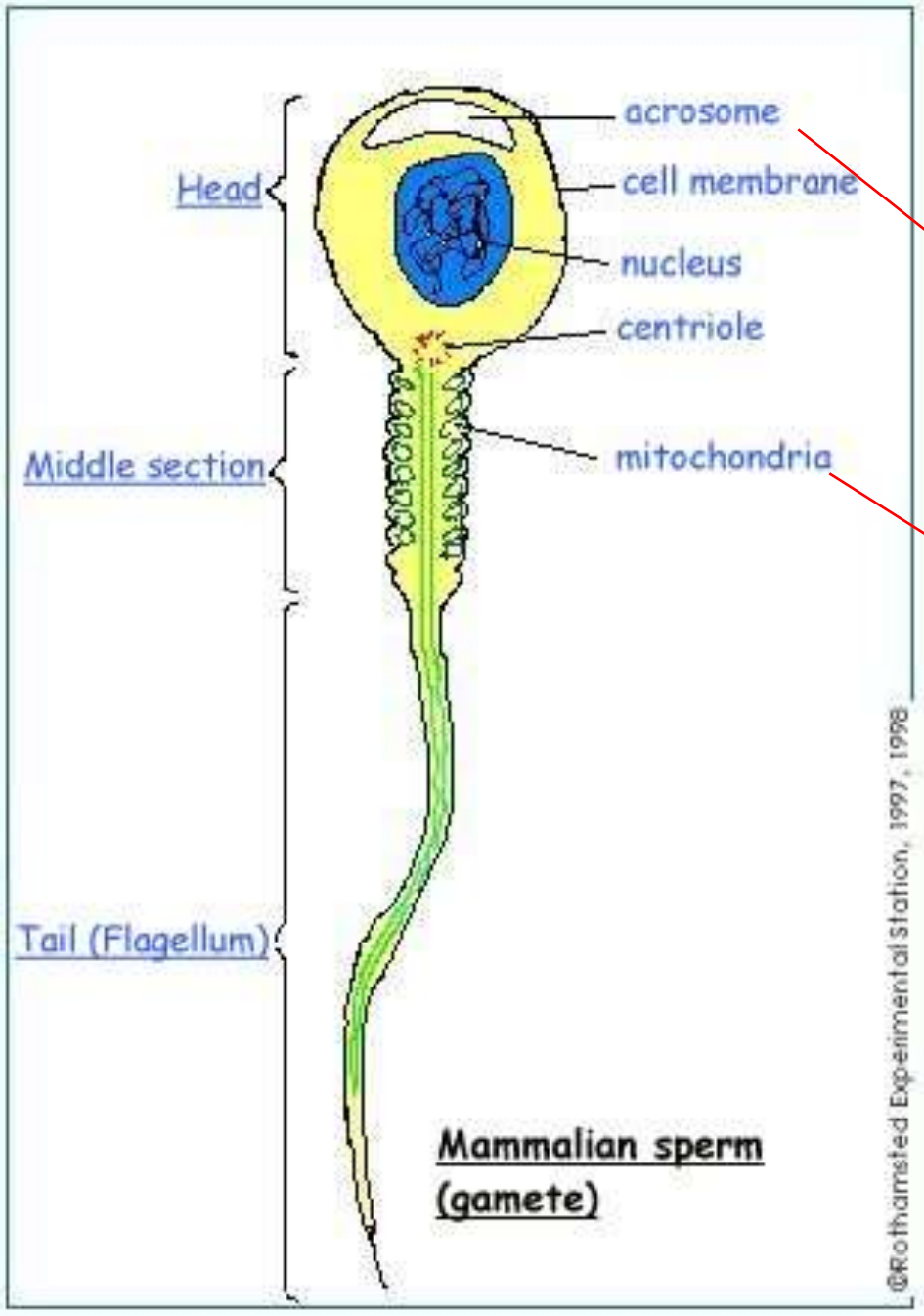
- Gametogenesis
  - Oogenesis
  - Spermatogenesis

Spermatogenesis & Oogenesis



Sperm vs. Egg

Sperm	Egg
Small	Larger
Many	Few
Mobile (1-4mm/min)	Nonmobile
Complex shape	Round
	May have Yolk



Sperm

Digestive Enzymes

Energy to swim

Fertilization

- Sperm swim to egg
- Sperm releases enzymes to make hole in egg
- Sperm injects nucleus into egg
- Fertilization membrane form around egg
- No future fertilization
- Joining of sperm nucleus and egg nucleus
- Form diploid zygote

Where can fertilization happen?

1. Outside female (External Fertilization)
2. Inside Female (Internal Fertilization)

External Fertilization

- Female releases eggs in water
- Male releases sperm in water
- Problems?
- Sperm find eggs
- Many gametes made!
- Spawning behavior or Amplexus

Internal Fertilization

- Safer
- Terrestrial animals and some aquatic
- Need moist female repro. tract
- Fewer eggs needed
- Short life span of gametes (24hrs)
- Need specialized organs
- Timed release of gametes (Hormonal)

Adult with no fertilization?

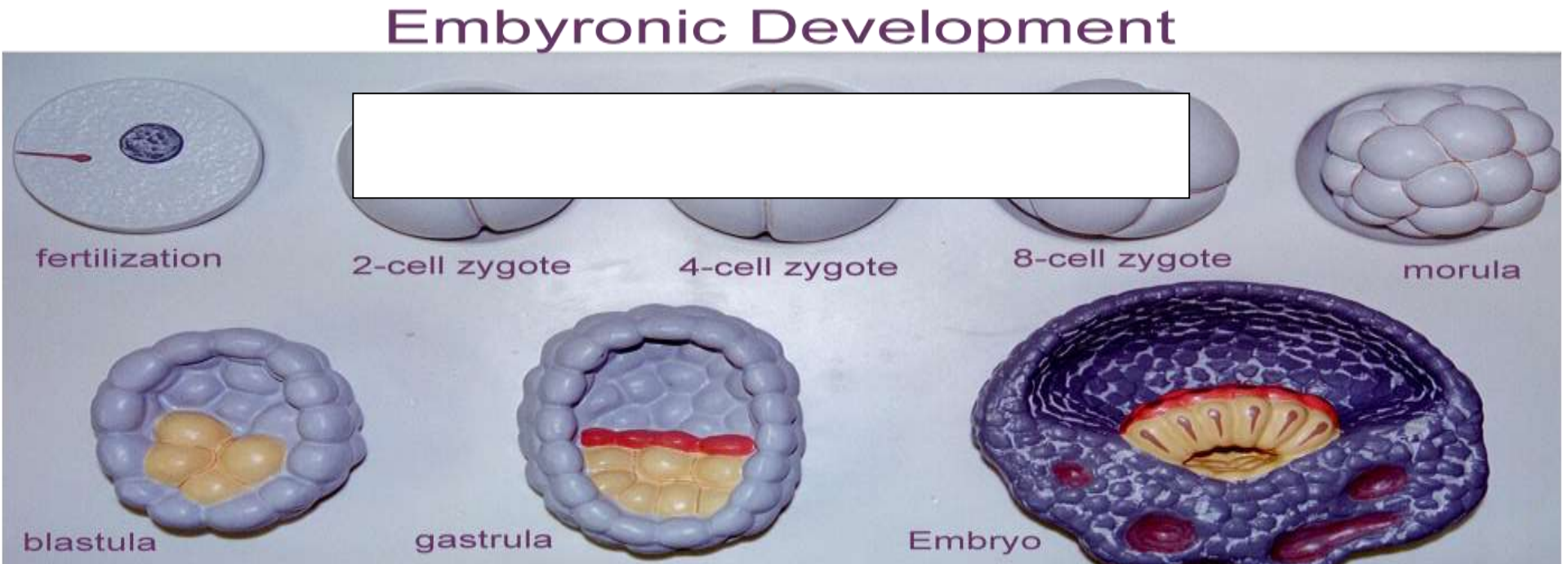
- Parthenogenesis
  - Egg develops without sperm
  - Insects
  - Unfertilized eggs of queen bee=male drone
  - Fertilized eggs of queen bee=female workers or queens

What happens after fertilization?

- Development
- Embryology=Study of embryo development

Stages of Development

- Mitotic cell divisions
- 2 cells, 4, 8,…..morula=solid ball of cells
- No growth in cell size (cells get smaller)



Development

3. Differentiation
   - Embryonic cells become specialized
   - Embryonic Induction=“organizers” influence cells to take on a certain role in life
   - Where cell is located will determine what it will become

External vs. Internal Development

- External:
  - Water
    - Embryo feeds on yolk
    - Wastes and Oxygen exchange via diffusion
    - Little to no care, dangerous
    - Ex. Many fish

External vs. Internal Development

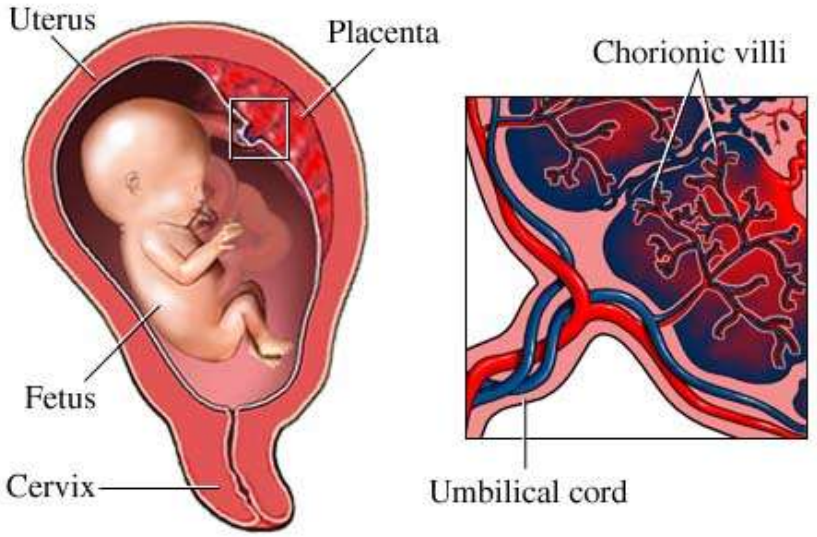
- External:
  - Land
    - Embryo feeds on yolk in a SHELLED egg
    - Pores in shell for gas exchange
    - Ex. Reptiles (Leathery Shell)-leave eggs
    - Ex. Birds (Hard Shell)-protect eggs

External vs. Internal Development

- Internal
  - Some organisms: nutrients mostly from yolk and babies born self-sufficient
  - Others: development in womb (Uterus)
  - High protection
  - Little yolk, nutrients from mom
  - Born undeveloped
  - Mammals continue to feed via mammary glands

Placental vs. Nonplacental Mammals

- Placental
  - Have placenta=site of nutrient and waste exchange between mom and baby
  - Baby side and mom side with space between
  - No blood-blood contact



Placental vs. Nonplacental Mammals

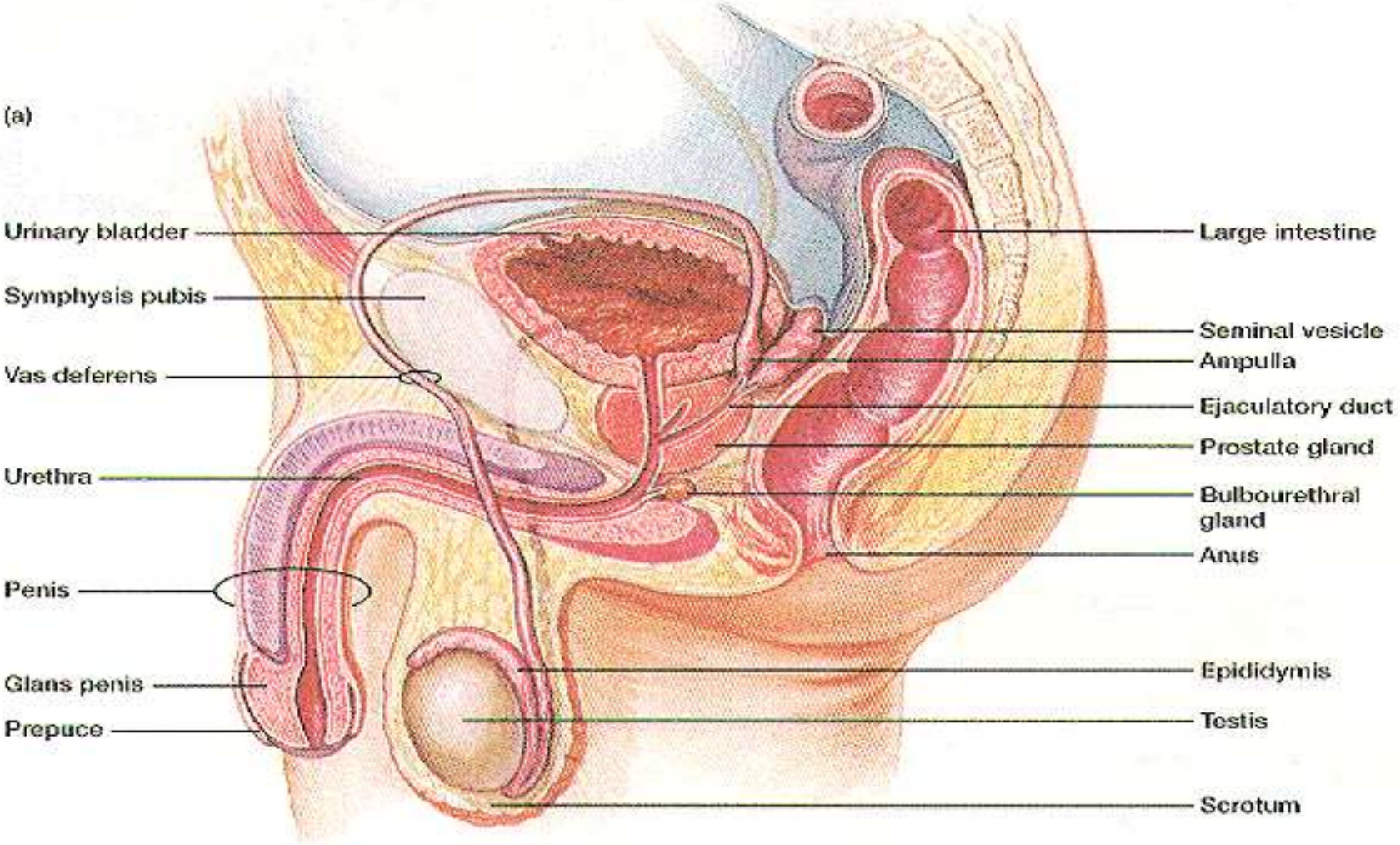
- Nonplacental:
  - **Egg-laying mammals (External Development)

  Monotremes
    - Ex. Spiny anteater and duckbill platypus
    - Eggs with yolk develop outside
    - Babies feed on mammary gland milk

Placental vs. Nonplacental Mammals

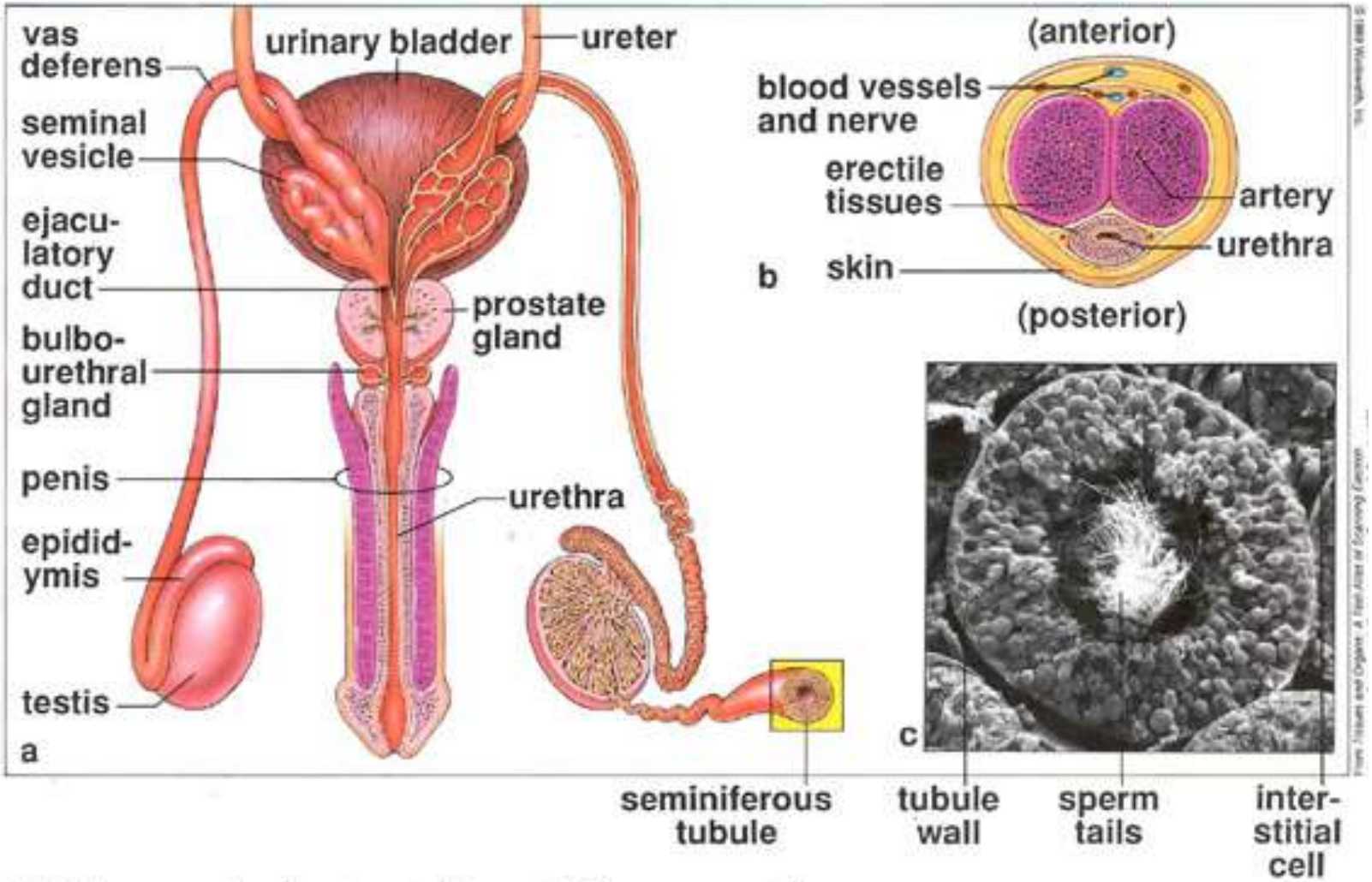
- Nonplacental
  - Pouched mammals (Marsupials)
  - Some internal development
  - Poorly developed babies born and remain in a pouch feeding on milk
  - Ex. Opossum, Kangaroo

Human Male Reproductive System



Male Reproductive System, Sagittal
Figure·22.1a

Human Male Reproductive System



(a) Male reproductive tract, (b) penis in cross-section, and (c) seminiferous tubule in cross-section.

Parts

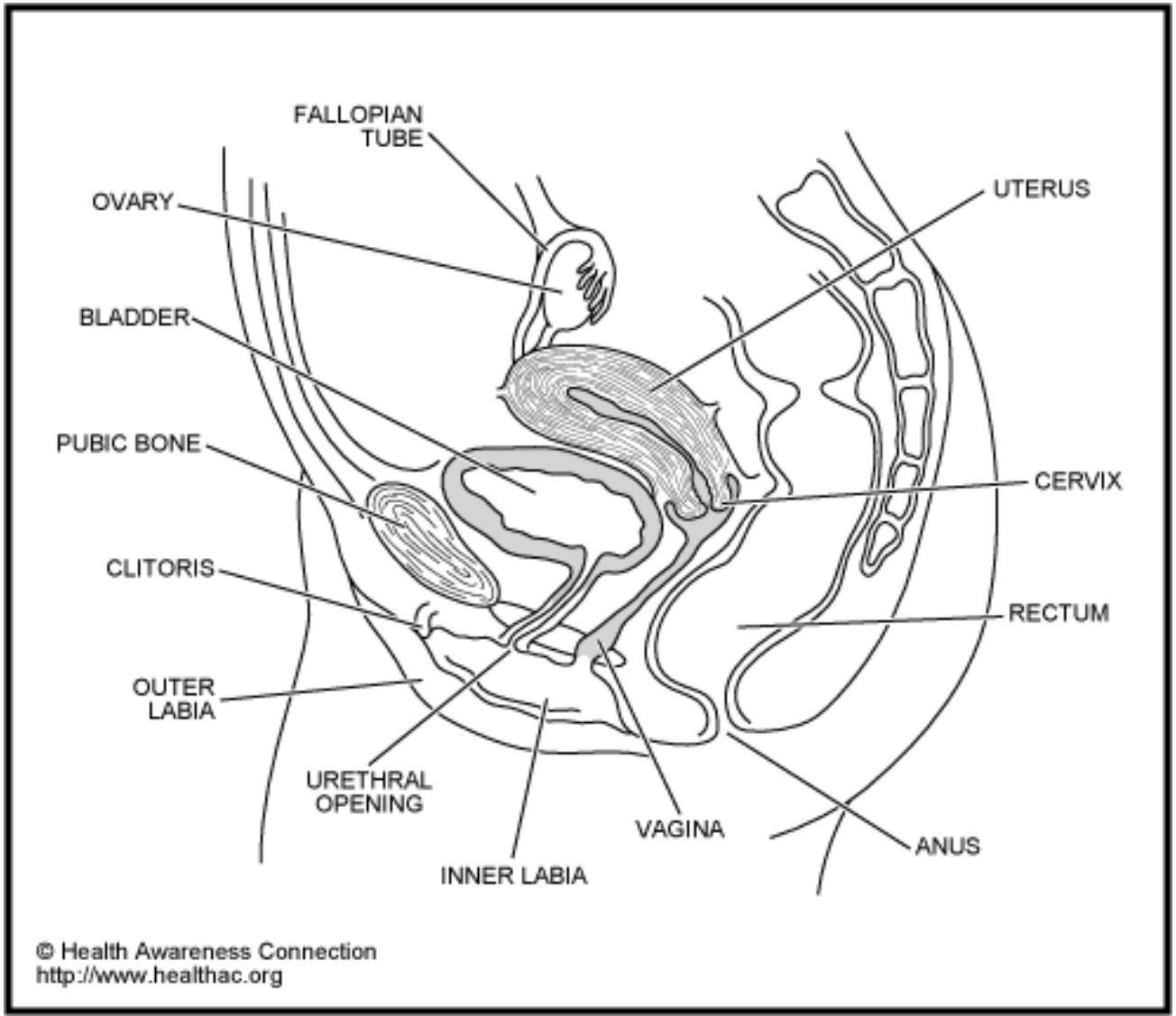
- Testes:
  - Semineferous tubules
  - Sperm production
  - Testosterone production
  - In scrotum sac
- Epididymis
  - Sperm storage and maturation site

Parts

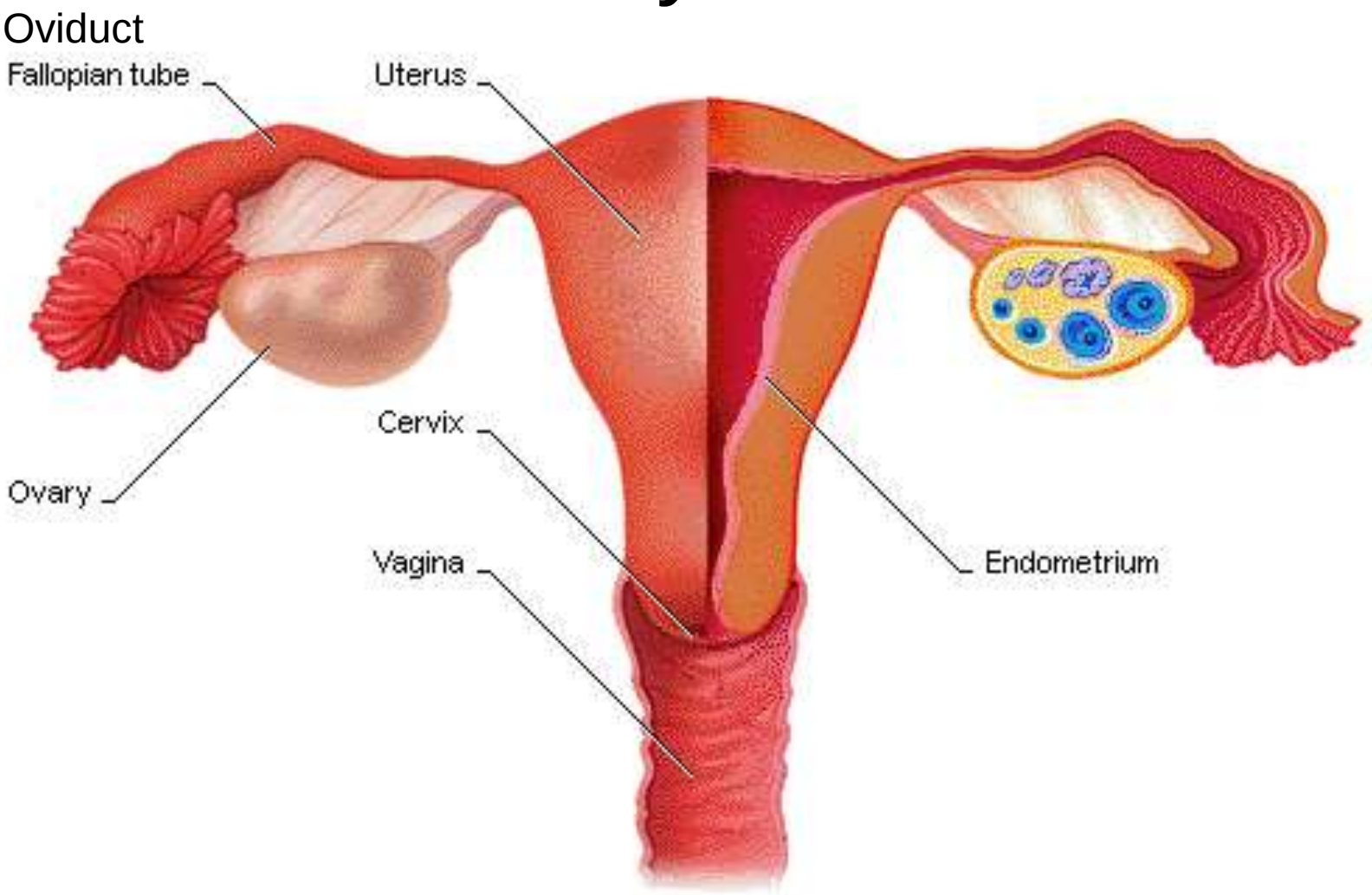
- Vas deferens
  - Sperm ducts
- Urethra
  - Exit route for sperm through penis
- Glands:
  - Seminal vesicles=thick, nutrient-rich fluid
  - Cowper's Gland (Bulbourethral glands)= preejaulation lubricant
  - Prostate Gland=milky, alkaline fluid

  (Semen is sperm and fluids)

Human Female Reproductive System

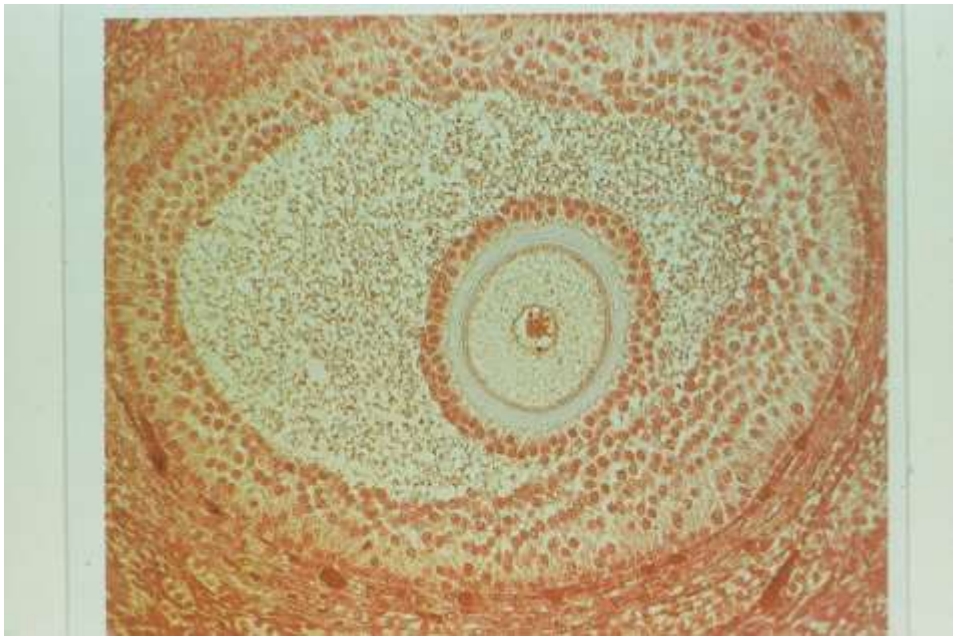


Human Female Reproductive System



Parts

- Ovaries
  - matures eggs located in follicle sacs
  - Make estrogen
  - Usually one egg matures/month
  - Mature egg ovulated
  - Egg enters oviducts

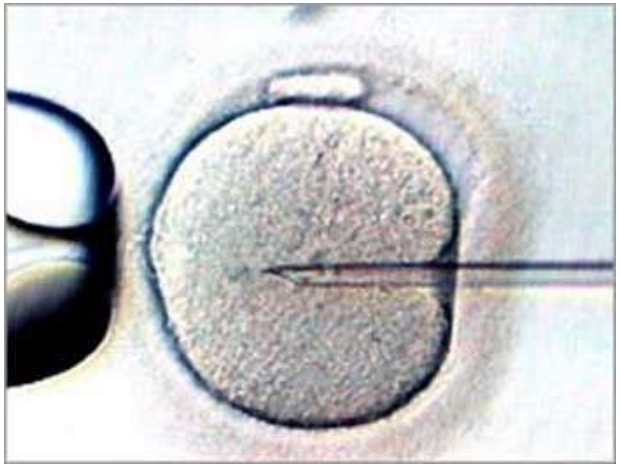


Parts

- Oviduct
  - Site of fertilization
- Uterus
  - Site of embryo development
- Cervix
  - Doorway into Uterus
- Vagina
  - Birth canal and sperm receiving area

Human Sexuality

- Fertilization
  - Hundreds of millions of sperm ejaculated into vagina
  - Fertilization in oviduct
    - (In vitro vs. in vivo fertilization)

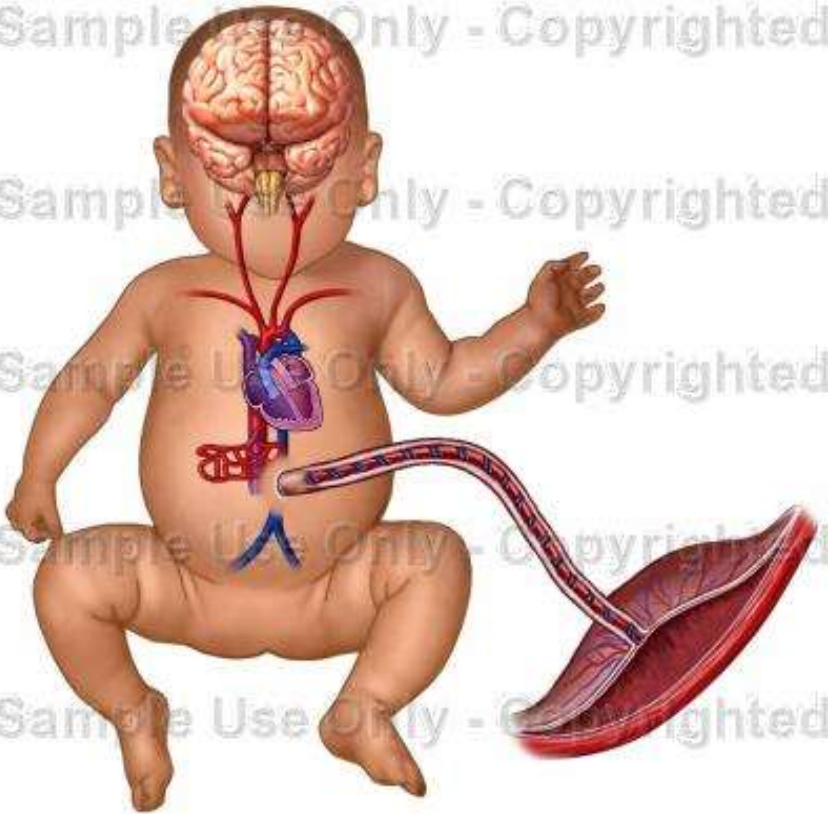


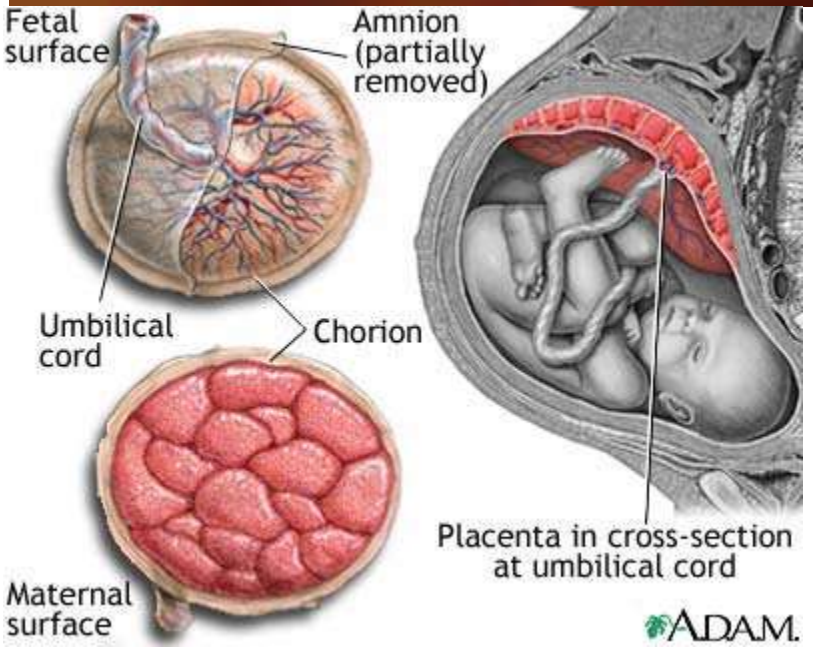
Fraternal vs. Identical Twins

"Identical" Twins may have some genetic differences.

Can have difference in quantities of a gene (Am. J. Human Genetics)

- Cleavage as zygote moves towards the uterus
- Implantation and Gastrulation
  - Ectopic pregnancy





Birth

- Gestation Time= Time in womb
  - 9 months for humans
  - 20 days for mouse
  - 21 months for elephant
- Labor
  - uterine contractions
  - Cervix enlargement
  - Amnion breaks
  - Baby’s head out first
- Afterbirth
  - Placenta comes out

Terms

- Embryo= zygote from fertilization till 8 weeks
- Fetus= 8 weeks-birth

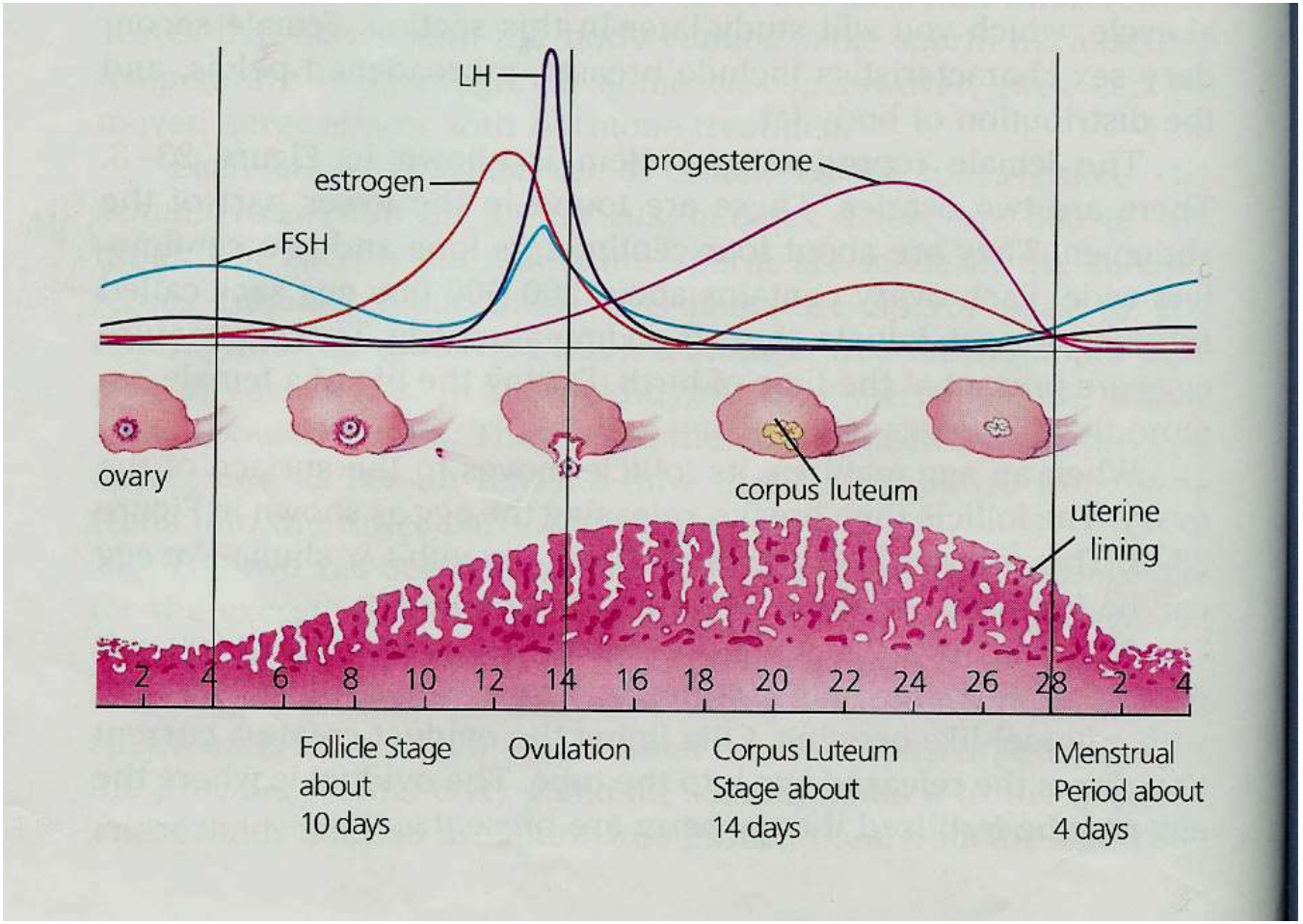
Menstrual Cycle

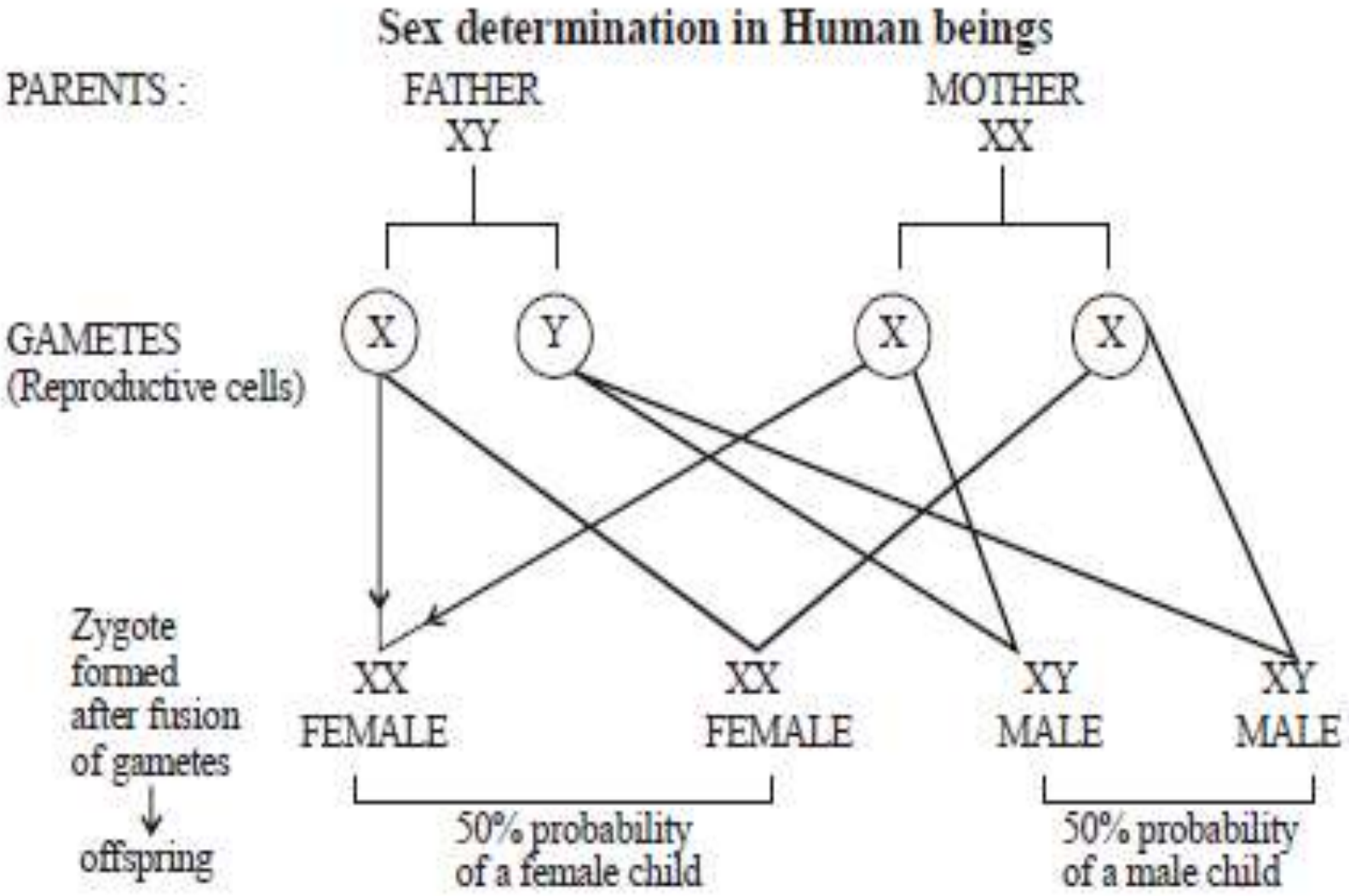
Starts at Puberty

(10-14 years old)

Stops at Menopause

(45-50 years old)




Sex determination in Human beings
PARENTS :
FATHER
XY
MOTHER
XX
GAMETES
(Reproductive cells)
X
Y
X
X
Zygote
formed
after fusion
of gametes
offspring
XX
FEMALE
XX
FEMALE
XY
MALE
XY
MALE
50% probability
of a female child
50% probability
of a male child