SI Session 3.1 10/15/19 Lecture: 10/11 and 10/14

List out prenatal development beginning with an oocyte and ending with a hatched blastocyst:

oocyte → *fertilization* → ootid → zygote → 2-celled stage → 4 celled stage → 8 celled stage →

Morula → early blastocyst → hatching blastocyst → hatched blastocyst

- Solid ball of cells
- hollow ball of cells w/ a fluid filled cavity

Inner cell mass = embryo develops here, differentiates into endo-, meso-, and ectoderm

Trophoblast = fetal portion of placenta

The zona pellucida stays with the embryo until it reaches the uterus. The blastocyst hatches from here.

Match the following terms to the correct definition:

B Totipotent C Pluripotent A Multipotent

A. Have the ability to form a limited range of cells and tissues appropriate to their location (muscle cells for smooth and striated muscle, blood cells for RBC, WBC, and platelets, etc.)

B. Have the ability to form all cell types of the conceptus = stem cells

C. Have the ability to form several types of all three germ layers (ectoderm, mesoderm, endoderm) but not the whole organism

What is a gastrula? What is gastrulation? Where does gastrulation occur?

- Gastrula = embryo with 3 primary germ layers (endo-, meso-, and ectoderm)
- Gastrulation = differentiation into germ layers - occurs in ICM

Once the blastocyst enters the uterus between day 7-9 of gestation, the inner cell mass differentiates into three germ layers. Which germ layer does the reproductive system develop from?

Mesoderm = reproductive system, muscular, skeletal, and cardiovascular system, kidney, and urinary ducts

The ectoderm gives rise to the nervous system, skin, and hair. Which component of the reproductive system develops from this germ layer?

Ectoderm = hypothalamus, anterior, and posterior pituitary, CNS, sweat glands, hair, hooves

What organs are derived from the endoderm?

Endoderm = primordial germ cells, digestive/endocrine system, lungs, liver, pancreas

The Posterior Pituitary

a. Only stores oxytocin
b. Developed from the roof of the mouth - Develops from floor of brain
c. Uses the hypothalamo-hypopseal portal system
d. Is the neurohypophysis
(e.) Both A and D

The Anterior Pituitary

a. Produces LH and FSH
b. Develops from the roof of the mouth (gives rise to Rathke's pouch)
c. Receives chemical messengers via the hypothalamo-hypopseal portal system
d. Is the adenohypophysis
(e.) All of the above

Describe the development of the reproductive system in regards to trimesters

1st trimester: migration of primordial germ cells, sex cord develops in gonads, form evident sex structures
2nd trimester: Development of male duct/testes or female ducts/ovaries, formation of broad ligament
3rd trimester: testicular descent

Why does the y chromosome drive primary sex determination?

SRY gene on Y chromosome which stimulates male repro system to develop

- Sertoli cells: secrete AMH (Anti-Mullarian Hormone)
- Leydig cells: Produce Testosterone

NO SRY gene = NO AMH = female tract develops

Central Dogma: DNA —Transcription→ mRNA —Translation→ Protein

List some chromosomal sex defects that can occur:

- XX male syndrome = Phenotypically male (SRY gene on X chromosome)
- Swyer syndrome = Phenotypically female (XY but missing SRY gene)
- Klinefelter syndrome = XXY male
- Turner syndrome = female with only 1 X chromosome

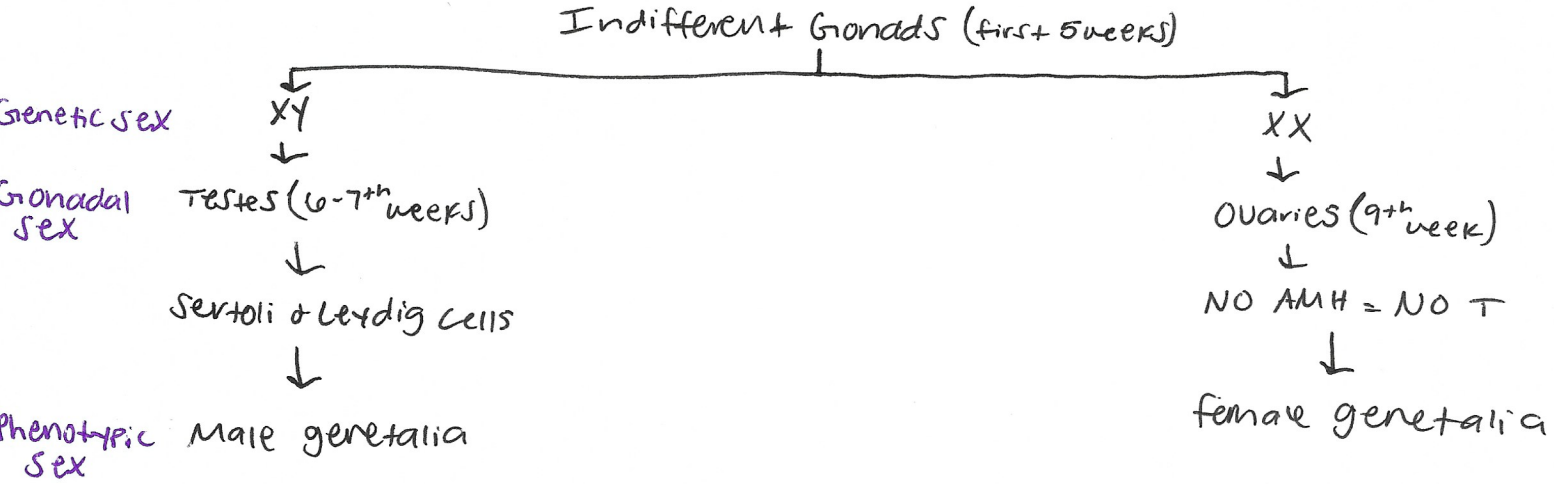
During the first 15% of gestation, the primordial germ cells develop while the yolk sac is still present. The primordial germ cells them migrate by ameboid movement to what location in the embryo?

a. Hindgut
(b.) Gonadal Ridge
c. Mesentery

List and describe the three distinct renal systems:

- Pronephros (Pronephric kidney): non-functional primitive form of kidney
- Mesonephros (Mesonephric kidney): functional intermediate kidneys - produce urine that drains into mesonephric ducts:
  - Mesonephric duct = Wolffian duct = forms epididymus/vas deferens in males
  - Paramesonephric duct = Mullerian duct = forms oviduct, uterus, cervix and portions of cranial vagina in females
- Metanephros (Metanephric kidney): final kidney form - gonads increase in size with this

Draw Phenotypical Sexual Differentiation



The reproductive system consists of three primary components. List them:

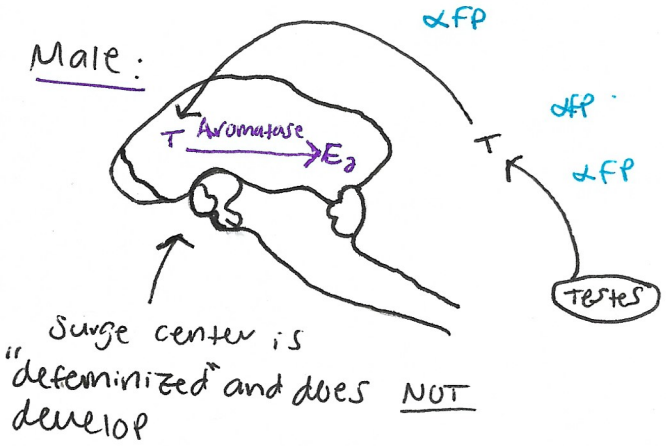
- Reproductive tracts
- Anterior and posterior Pituitary
- Hypothalamus

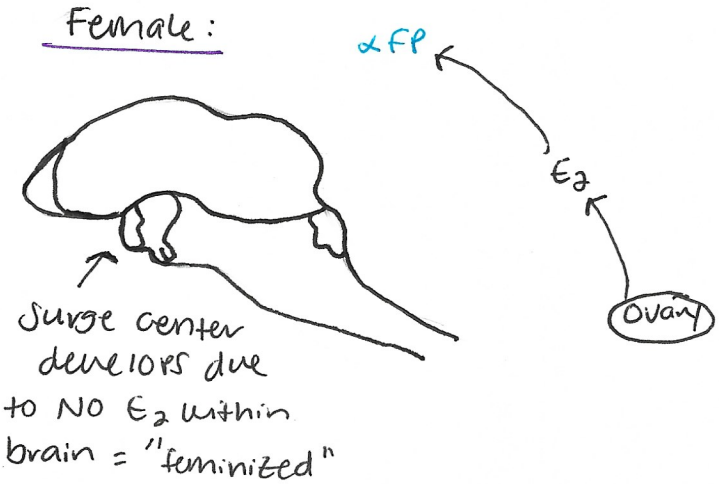
Explain Freemartins:

freemartin = heifer born twin to a bull

- bull = fertile heifer = sterile
- shared blood supply = heifer exposed to AMH = NO female genetalia

There are fundamental differences in the hypothalamus of the male and female. These differences are established prenatally and remain throughout the reproductive life of both sexes. In the area below, draw a diagram to explain the differences in the hypothalamus between a male and female:





- Testosterone does not bind to α-fetoprotein and is small enough to cross the blood brain barrier. T is then aromatized into E_2 = male brain is defeminized and surge center does NOT develop

- α-feto protein has a strong affinity for E_2 and binds to it. This prevents E_2 from entering the brain = hypothalamus is feminized and surge center develops