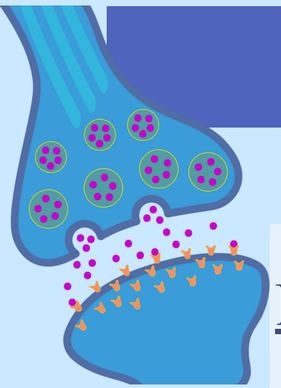
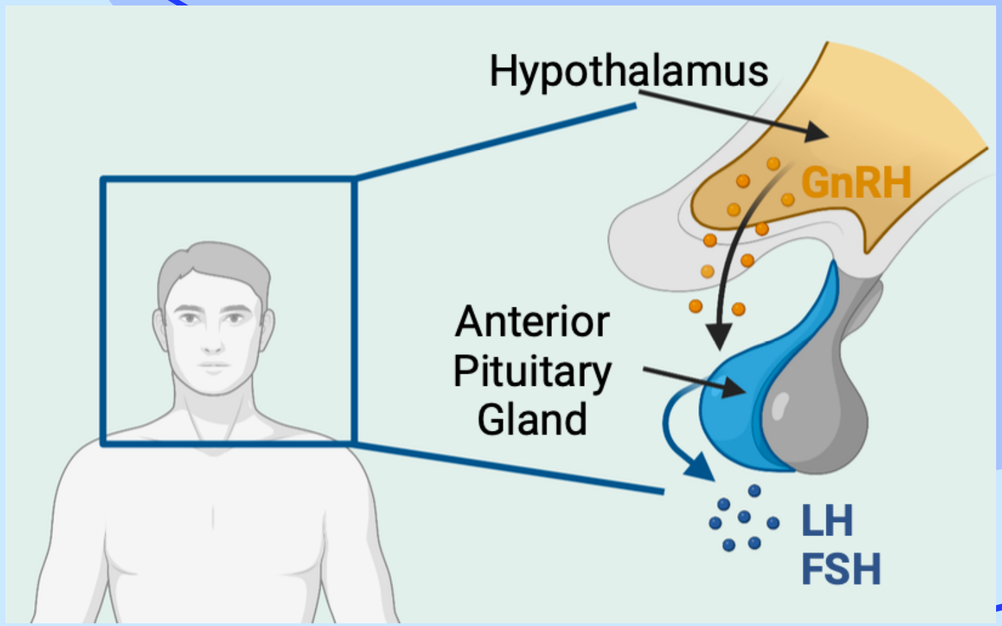
Asking Questions about the Male Reproductive System and Infertility

Hypothalamus-Pituitary-Gonad (HPG) Axis



How does it work?

- Male reproductive system is stimulated by brain cells in the hypothalamus
- The hypothalamus secretes GnRH and this stimulates the anterior pituitary gland to release reproductive hormones, LH and FSH
- LH and FSH stimulate testosterone production in the testes



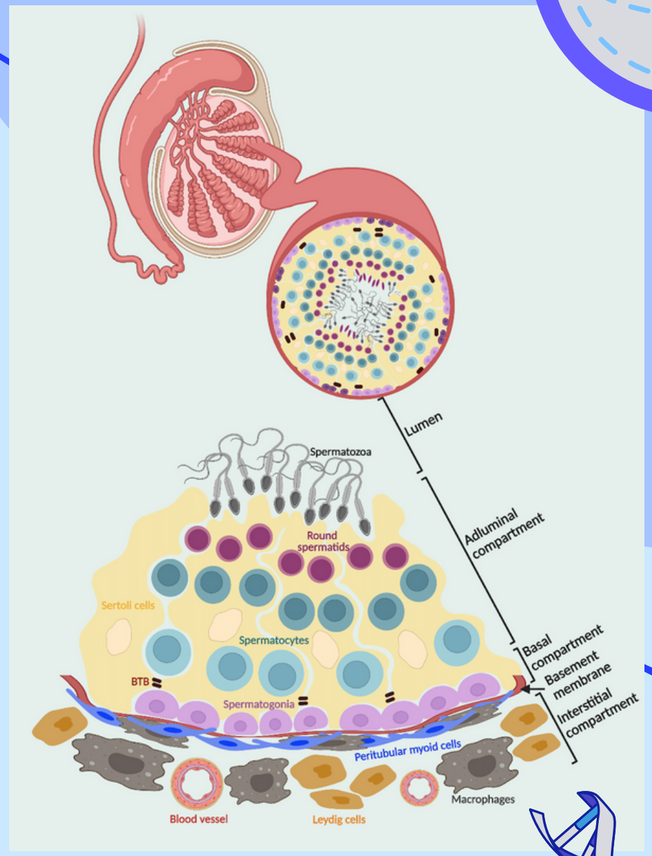
How do changes in the brain cause infertility?

- Without GnRH, LH, and FSH, the testis does not get the proper message to make sperm
- Examples:
  - Kallman Syndrome: GnRH neurons are not stimulating the pituitary LH and FSH
  - Hypogonadism: the pituitary does not make enough LH and FSH

Spermatogenesis

How does it work?

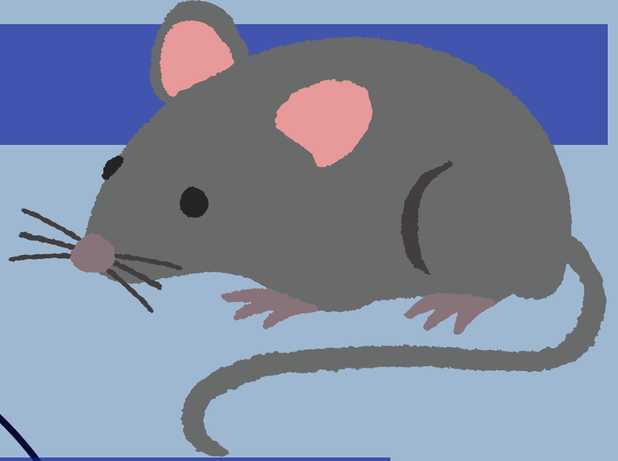
- The testes contain a lot of tightly coiled tubes called seminiferous tubules which produce sperm
- Cells in the seminiferous tubules are responsive to LH and FSH and initiate spermatogenesis by turning on genes
- Important cells:
  - Leydig cells: produce testosterone when stimulated by LH
  - Sertoli cells: stimulated by FSH to make important signals in spermatogenesis



Spermatogenesis and infertility?

- If a gene has a mutation, it can lead to a disruption in the steps of spermatogenesis and prevent sperm from being produced
  - Example genes: androgen receptor (AR), TEX11, LHCGR, MCM8

Mice and Men?



Why are mice so important?

- Researchers want to study male reproduction in a very specific way and we can't do that ethically in humans
- Mice can model infertility and help researchers find ways to treat it!

Check it Out!

Research Question:

Does the infertility rate vary between countries of different socioeconomic status?

Data Set: World Fertility Data

How to Use:

- Look at "Database Field Descriptions" sheet to understand what each column means
- "Fertility Indicators" sheet has all of the data, separated by country
- Data is separated by age group and year for each country

Research Question:

Has fertility in the US been on the decline in recent years?

Data Set: National Service of Family Growth Dataset

- Data sets are separated by year
- Each category of question has a different data set
- Have both male and female information but these are separate data sets

Research Question:

Do environmental contaminants impact human fertility rates?

Data Set #1: Fertility Rate by State

Data Set #2: Biological contaminant levels in soil

How to Use:

- State data is determined by the number of successful pregnancies of couples who are trying to have a child
- This is one example of an environmental contaminants and can be expanded to other