

Laboratory Exercise 9: Reproductive system anatomy

Introduction

During this lab you will carry out Exercises 42 and 43 in the Human Anatomy and Physiology Laboratory Manual.

Objectives

The specific objectives for the lab are the following:

Exercise 42 – Anatomy of the reproductive system

- To study the major structures of the male and female reproductive system using both models and diagrams
- To understand the major functions of major male and female reproductive system structures
- To examine basic histology of select male and female reproductive structures

Exercise 43 – Physiology of reproduction

- To review meiosis
- To study spermatogenesis and understand how sperm are produced the male
- To study oogenesis and understand events leading to ovulation and production of an ovum
- To study how ovarian cycle regulates uterine cycle (menstrual cycle)

The main objective of Exercise 40 is to familiarize you with the gross anatomy of the major structures of the urinary tract.

Preparation:

The following resources are available to prepare you for lab.

Required preparation:

- Read Exercises 42 and 43
 - Review relevant photomicrographs in the lab manual's histology atlas (plates 49 –57)

Optional preparation:

- Use Chapter 28 in your text (The Reproductive System) as reference as needed – it has a good review of mitosis in relation to spermatogenesis and oogenesis.

In-lab assignment

1. Complete Review Sheets, Exercise 42 and 43 and turn them in at end of lab.
2. Exercise 42: You are responsible for identification of the following structures in diagrams and/or models; you are responsible for histology only where indicated. You should also be familiar with the major function of each structure.

MALE

Testes

- Seminiferous tubules
- Seminiferous tubule histology: examine cross-section and identify: (use your textbook, provided slides, plates in lab manual)
 - Sertoli cells
 - Spermatogonium
 - Spermatids
 - Immature sperm
 - Interstitial cells

Epididymis

Ductus deferens

Ejaculatory duct

Urethra

- Prostatic urethra
- Membranous urethra
- Spongy (penile) urethra

Prostate gland

Seminal vesicles

Bulbourethral glands

External genitalia

- Scrotum
- Penis
 - Shaft
 - Glans penis
 - Prepuce
 - Histology of penis, cross-section
 - Corpora cavernosa
 - Corpora spongiosum
 - Penile urethra

Female

Ovaries

- Cortex
- Medulla
- Histology:
 - Primary follicle/primary oocyte
 - Secondary follicle/secondary oocyte

Uterine tubes

- Fimbriae
- Histology:
 - Folded mucosa with columnar cells
 - Muscular wall

Uterus

- Body, fundus, and cervix
- Histology:
 - Endometrium
 - Myometrium
 - Perimetrium

Vagina

- Vestibular glands
- Histology
 - Mucosa – stratified squamous epithelium and a thick lamina propria
 - Smooth muscle layer
 - Adventitial layer

External genitalia

- Labia majora
- Labia minora
- Clitoris

3. Exercise 43:

A. Familiarize you with meiosis

- First meiotic division – separation of homologous chromosomes
- Second meiotic division -- separation of chromatids
- Purpose
 - formation of four haploid cells from a diploid cell
 - genetic variability

B. Spermatogenesis

At puberty:

- Spermatogonium – $2n$
- Primary spermatocyte – $2n$
- Secondary spermatocyte – n
- Spermatids – n
- Sperm – n

C. Oogenesis

- note that in male gamete production begins at puberty; in female preparation for gamete production begins in fetus

- stem cells -- oogonia
- oogonia divide mitotically (several million) enlarge, mature -- before birth
- cells become primary oocytes when they begin first meiotic division (DNA replicated)
 - division is stalled prior to birth
- primary oocyte enclosed by follicular cells
- at puberty under appropriate stimulation
 - follicle growth
 - completion of first meiotic division
 - secondary oocyte and polar body
 - ovulation (of secondary oocyte)
 - when fertilized second meiotic division takes place
 - ovum and polar body

- thus at birth all of women's potential eggs formed: of about 2 million follicles, at birth about 700,000 remain; by puberty about 300-400,000 left

D. Ovarian cycle

- follicular phase: period of follicular growth, d1-d14
- luteal phase: period of corpus luteum activity, d14-d28

1. follicular phase

- starting at puberty a group of follicles stimulated to continue development every 28 days
- follicle cells divide
 - follicle cells begin to produce estrogen
- complete meiosis I
- ovulation
- meiosis II

2. luteal phase:

- remaining follicular cells begin producing progesterone, estrogen -- corpus luteum (CL)
- if fertilization occurs, the embryo produces human chorionic gonadotrophin (HCG) which maintains CL until placenta can kick in its own progesterone/estrogen production
- if fertilization does not occur, CL degenerates as no HCG

E. Hormonal regulation of ovarian cycle

- feedback inhibition patterns:
 - extremely low levels of estrogen stimulate FSH
 - moderate levels of estrogen inhibit FSH/LH
 - high level of estrogen stimulate LH/FSH release

F. Uterine cycle: menstrual cycle, regulated by ovarian hormones

- d1 of cycle, est/prog very low -- shed endometrium
 - FSH level begin to increase due to lack of feedback inhibition
- FSH stimulates follicle growth
 - follicles produce estrogen, moderate levels, FSH/LH inhibited

- uterine build up
- as estrogen levels increase, LH/FSH spike
 - ovulation
 - estrogen levels begin to drop
 - corpus luteum develops -- secretes progesterone/some estrogen
 - builds up endometrium and prepares it for implantation
 - depending if HCG present or not, CL maintained or degenerates and likewise endometrium