Historical study of female anatomy

- Anatomy has its roots in the Renaissance Era
- Study of anatomy began in executed criminals
- First anatomy textbook, section on women, was based on 3 dissections

Viva la Vulva!

Betty Dodson, 2005
Intimate images of the vulvas of volunteers contributes to “Positive genital imagery” which Dodson believes is a cornerstone of self-acceptance and growth
Women

External genitalia
- Clitoris
- Mons pubis
- Labia minora
- Labia majora
- Vaginal opening (introitus)
- Perineum
- Bartholin’s glands
- Hymen

Internal genitalia
- Vagina
- Vestibular bulbs
- Uterus
- Fallopian tubes
- Ovaries
- Skene’s glands

Vulva

External genitalia
- Bartholin glands – just inside inner lips; involved in sexual arousal

- Vulvar vestibule = area enclosed by the inner lips and contains opening to vagina and urethra

- Hymen (aka: “cherry”) = thin membrane that partially covers the vaginal opening
Internal Sex Organs

- **Vagina** – 8-10cm when unaroused, has 3 layers (inner vaginal mucosa, middle muscular layer, outer layer), only lower 1/3 is most sensitive to touch and pain
- **Vestibular bulbs** – thought to be part of the clitoris, filled with spongy erectile tissue
- **Skene’s gland** – also known as G-spot, female prostate, paraurethral gland
Kegel exercises and the Pubococcygeus (PC) muscle

**In men too**

**Benefits of Kegel exercises**: (1) Conditioned muscles will make birth easier, and the perineum will more likely be intact (fewer tears and episiotomies); (2) Sexual enjoyment is enhanced for both partners; (3) can prevent prolapses of pelvic organs; (4) can help prevent leaking urine when you sneeze or cough

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What is the role of the uterus in sexual arousal?

- Studied in women pre- and post-hysterectomy
- **Answer**: It depends on the reason for the hysterectomy
  - Benign → usually an improvement in sexual function
  - Malignant → usually an impairment in sexual function

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The uterus

3 layers:
1. Endometrium is the inner layer
2. Myometrium is the muscular middle layer
3. Perimetrium is the outer, external cover

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Fallopian tubes

- Ectopic pregnancy = implantation of fertilized egg into the wall of the Fallopian tube
- Pelvic inflammatory disease = infection which blocks fallopian tube

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Internal sex organs cont...
Ovaries

- Outer layer: contains forming gametes in various stages of development
- Inner layer: contains large blood vessels and nerve supply

Men

- External genitalia
  - Penis
  - Scrotum
- Internal genitalia
  - Testes
  - Seminiferous tubules
  - Interstitial cells
  - Epididymis
  - Vas Deferens
  - Seminal vesicles
  - Prostate
  - Cowper’s glands

Penis

- Glans and corona (which separates glans from shaft) are most sensitive
- No bone. No muscle
- Foreskin = prepuce
- Tyson’s glans → smegma
Circumcision

- MEDICAL STATUS
- about 10 years ago: there are no valid medical indications for circumcision of young boys
- More recently data show conflicting results
  - Data in 3rd world countries show lower risk of HIV and lower risk of HPV in circumcised men; female partners of circumcised men also had lower rates of cervical cancer
  - Data in developed nations do not replicate these findings

Scrotum

- Loose pouch of skin → function is to contain the testes

Internal Organs: Testes

- Produce germ cells (sperm)
- Manufacture hormones (testosterone)
- Contains seminiferous tubules → produce and store sperm

Spermatogenesis
Internal Organs: Testes cont.

- Contains interstitial cells → AKA Leydig cells which produce testosterone
  - Cells produce the hormone then dump them into the nearby bloodstream

  - Seminal vesicles
    - Lies above prostate
    - Produces 70% of seminal fluid

  - Cowper’s glands
    - Secrete fluid during arousal
    - Pre-ejaculate
    - Contains few sperm

- Prostate
  - Produces 30% of seminal fluid
  - Basic (high pH) ideal for sperm to grow and it counters the acidic (low pH) vagina
  - Damage to prostate → affects sexual response and urination control

Contemporary issues in genital anatomy

“I am a 19 year old female and have recently become very interested about how my vagina compares to that of other women. What is considered tight? Should that labia majora cover the entire vulva? I was just wondering.”

Labia Plasty

Types of cosmetic genital surgery in women

- Liposculpting a mons pubis that is “too fat”
- Injecting fat into the labia
- Labiaplasty → reduction of large labia minora
- “Laser vaginal rejuvenation” → tightening of the vaginal opening or parts along the vaginal vault
- Reconstructing hymens (hymenoplasty)
- Cost: $3,500 - $10,000
- 44% increase in cosmetic surgeries in USA in 2004!
### Reasons why a woman might consider genital cosmetic surgery
- To improve self-confidence
- To improve sexual function
- Wanting to counter aging
- Wanting to look like a presumed ideal
- Severe distortions in self-image or sexual self-image
- Severe distortions in view of the body

### Cutting the suspensory ligament in men to lengthen the penis

![Suspenosory ligament](image)

### State of science in genital enhancement surgeries
- No data exist linking genital surgery outcomes and quality of life
- No data exist linking genital surgery outcomes and improved sexual function
- In fact…no data exist on outcomes of cosmetic genital surgeries

### Penile lengthening and widening

![Penis measurement](image)
Hormones

3 main classes of hormones to be discussed:
1. Estrogens
2. Androgens
3. Progesterone

Definitions

• Endocrine system = one of chemical mediation
• Endon = Greek for "within"
• Krinein = Greek for "to release"
• Hormon = Greek for "to excite"
• Endocrinology = the scientific study of the endocrine glands and their associated hormones

Features of the endocrine system

• Glands are ductless
• Glands have a rich blood supply
• Hormones are secreted into bloodstream
• Hormones travel through blood and can interact with any cell of the body
• Hormone receptors are specific binding sites

Organs of the endocrine system

• Hypothalamus
• Pituitary (anterior and posterior)
• Thyroid
• Pancreas
• Gastro-intestinal tract
• Adrenal glands
• Pineal gland
• Gonads (ovaries and testes)
Hypothalamus

- is located beneath the thalamus.
- It plays a role in regulating many vital behaviours; eg., breathing, eating, drinking, sex
- Releases “releasing hormones” that then stimulate the pituitary

Pituitary gland

Function of gonads

= ovaries and testes
- Regulated by tropic hormones from the anterior pituitary

- Function:
  – Production of gametes
  – Production of hormones
Steroid diffusion

- Leave cells where they were produced almost immediately
- Dissociates from a carrier molecule after travel
- Diffuses through cell membrane
- Binds to receptor in cytoplasm
- Transported to cell nucleus
- Stimulates mRNA transcription

C19 steroids: Androgens

- Produced in Leydig cells of testes
- Necessary for spermatogenesis
- Maintain the genital tract
- Support secondary sex characteristics
- Affects metabolism

- Testosterone → Dihydrotestosterone (male-pattern baldness)
  - Reduced by the 5-alpha-reductase enzyme (to discuss later)

Negative feedback with testosterone

- If T too high →
  - Inhibits release of GnRH from hypothalamus
  - Inhibits release of LH from anterior pituitary
  - The reduced LH → decreases production of T

In men:
Hypothalamic-pituitary-gonadal (testicular) axis

ABP – androgen binding protein
Negative feedback with testosterone

• If T too high →
  – Inhibits release of GnRH from hypothalamus
  – Inhibits release of LH from anterior pituitary
  – Decreases production of T

• If sperm count too high →
  – Sertoli cells in the testes release inhibin
  – Inhibits GnRH and FSH
  – Prevents spermatogenesis from going too fast

C18 Steroids: Estrogens

• Estradiol, Estrone, Estriol
• Produced from androgens
• Functions:
  – Initiate formation of corpus luteum at puberty
  – Affect vaginal canal
  – Correlate with uterine mass
  – Affect secondary sex characteristics (e.g., breast growth)
  – Affects water retention
  – Affects calcium metabolism (and therefore more bone production in the presence of estrogen)

In women

Activating vs organizing effects

• prenatal effects are “organizing effects” because they cause a relatively permanent change in the organization of some structures, usually during critical periods

• hormone effects that directly affect or inhibit behaviours are known as activating effects
Prenatal sexual development

- **Begins with chromosomes:**
  - XY chromosome contains a gene (located on the sex-determining region Y chromosome, also known as the testis determining factor) → antiMullerian hormone → Mullerian ducts degenerate and Wolffian ducts develop

- XX chromosome → no TDF → wolffian ducts degenerate → mullerian ducts develop → female default takes place

Homologous structures

- **Female**
  - Clitoris
  - Hood of the clitoris
  - Labia Minora
  - Labia Majora
  - Ovaries

- **Male**
  - Glans of the penis
  - Foreskin of the penis
  - Shaft of the penis
  - Scrotal sac
  - Testes

7 weeks post-conception:
- Embryo contains a pair of gonads
- Each gonad has 2 parts: outer cortex and inner medulla
- Each gonad also has Mullerian and Wolffian ducts

Prenatal sexual development

- **2nd step is hormonal:**
  - The male fetus testes produce androgens which stimulate development of male external structures
  - Testosterone supports development of the Wolffian ducts which then become the epididymis, vas deferens, and ejaculatory duct
  - In female, Mullerian ducts become fallopian tubes, uterus, and upper part of vagina
Gender

- When markers of gender (e.g., chromosomal gender, gonadal gender, hormonal gender, etc) conflict, the person is intersex or a pseudohermaphrodite.

- When a person’s assigned gender does not match their personal gender identity, they have a gender identity disorder.

Abnormal sex hormone conditions

- **XXY Klinefelters syndrome**
  - abnormal testes, no sperm production, T levels are low
  - 1 in 700 births

- **Congenital adrenal hyperplasia**
  - Overactivity of adrenal glands
  - genetic female, excessive androgens, masculinized (1 in 13,000 births)
  - Internal organs: female; external: can look more like male
  - Hines, 2004 examined CAH girls. More likely to show male-typical play behaviour
    - Childhood play behaviour strongly predicted later gender identity

- **Progestin-induced hermaphroditism**
  - genetic female
  - excessive progestins taken by mother
  - masculinized prenatally
  - looks similar to CAH girls
  - No recent cases since the drug stopped being given in the 1980s
Androgen Insensitivity Syndrome
- 1 in 13,000 births have complete or partial AIS
- genetic male, no androgen receptors, feminized
- Mazur, 2005 reviewed 156 cases of AIS and found none were gender dysphoric

5-α-reductase syndrome
(Guevodoces syndrome)
- genetic males, defect in 5-α-reductase enzyme preventing conversion of T to DHT
- feminized (i.e., clitoris-sized penis, vaginal pouch)
- change gender (to a male) at puberty when testes descend
- Estimates unknown
- Cohen-Kettenis, 2005. What determines the decision to change identity at puberty?
  1. Severity of the mutation
  2. Cultural or environmental pressures
  3. Person’s psychological reaction of the social environment to their genital appearance

Pheromones
- somewhat like hormones
- are biochemicals that are secreted outside the body (ectocrine mediation)
- through the sense of smell they are an important means of communication between animals
- Link to sexual behaviour in humans?

Pheromones cont.
- Rako et al., 2004. J Sex Research
- 44 postmenopausal women
- Double-blind study of synthesized pheromone, derived from underarms of heterosexually active young women, vs placebo
- More pheromone (68%) vs placebo (40%) users reported an increase in 1 intimate behaviour (kissing, petting, affection)
- More pheromone (41%) vs placebo (13%) users reported an increase in sexual activities (e.g., intercourse frequency)
- No difference in masturbation rates