Neuroendocrinology
Hormones

- Background
- "endocrine" - ductless, into blood stream
- release - cells with blood vessels
steroids

- from cholesterol.
- They can have
- permanent perinatal organizing effects
- (e.g. neonatal testosterone will make heavier adult female [males eat more])
- in addition to sustained or adult effects
John -> Joan -> John

- Bruce -> Brenda -> David
- Electrocautery mishap during circumcision
- Sex change operation.
- Money (Hopkins) upbringing predominant as chromosomal make-up in gender identity.
- Poorly adjusted, demanded to know truth at age 14.
- Change back to guy eventually
- Money's research seemed interesting at first but was infamous with hindsight
Hypothalamus (peptides)

- (1) Posterior pituitary (magnocellular neurosecretory cells)
- oxytocin (milk, delivery) synthetic to induce labor
- vasopressin (ADH), H2O and blood pressure
- ADH action on kidney
- alcohol, caffeine inhibit anti [diuresis] hormone
More

• also low blood pressure -> renin (kidney) -> angiotensinogen (from liver) - renin -> angiotensin I ->II affects kidney, blood vessels, subfornical organ to lateral hypothalamus (for thirst)
Anterior pituitary

- Master gland portal system etc.
- Hypothalamus parvocellular neurosecretory cells to anterior pituitary
- releasing factors, inhibiting factors
- Example: CRF-> ACTH->cortisol feeds back to body, hypothalamus, brain
- Adrenal cortex - Glucocorticoids, metabolism, inflammation
- negative feedback in stress response
Steroids

• obviously hormones (estradiol shown here) must bind to brain,
• known for a long time
• (note the reference to McEwen and Pfaff, famous names in this work from the 1970's
• recall that steroids affect transcription
Odd things

• testosterone 17-beta-estradiol
• androgen receptor mutation (androgen insensitivity syndrome [AIS]) -> testicular feminization, children think they are females until there is no menstruation
• There are androgens from adrenal, so with Congenital adrenal hyperplasia, CAH, clitoris is large and behavior is "tomboy"
• lack of 5-alpha-reductase -> "testes-at-twelve" (at puberty, testes descend, clitoris becomes penis etc when there is enough testosterone to overcome deficit)
more

- pedigree in the Dominican Republic.
- typed "five alpha reductase" into search engine, get hits on hair loss, concerning male pattern hair loss (androgenetic alopecia)
- accelerated by DHT and alleviated by a drug, Propecia
- Steroids are involved in photomorphogenesis in plants, and there is a mutant (in Arabidopsis) of a gene with homology to 5-alpha reductase.
sex organ development

- Sry on Y TDF (testicular determining factor)
- In female, Wolffian ducts degenerate and Mullerian ducts develop into oviducts, uterus, and cervix (default pathway).
- In male, testes make testosterone and MIH (Mullerian inhibiting factor), Mullerian ducts degenerate, Wolffian ducts become epididymus, vas deferens and seminal vesicles (active, not default) urogenital groove becomes external genitals
(A) Urogenital fold

Genital tubercle

4–7 weeks

(B) Phallus

Urogenital membrane
neural dimorphism

- famous example of the part of the bird brain controlling song which is male-specific
- motor neuron count in spinal cord of Onuf's nucleus controlling perineal muscles which function differently in male and female rats
- (This is in many ways parallel to the Fig. 23.9 example of spinal motor neuron count being influenced by limb bud ablation or supranumerary limb buds.)
Brain

- INAH interstitial nuclei, anterior hypothalamus
- LeVay, homosexual heterosexual males differ
- homosexual resemble females in
- specific details in differences in cognitive function (a fairly controversial topic and one where it is sometimes difficult to get robust, unconfounded data)
- cortical representation and receptive field of female ventrum changes during lactation
(A) INAH-3

Heterosexual male

Homosexual male
(B) Suprachiasmatic nucleus

**Volume**

- Heterosexuals (No AIDS)
- Homosexuals (AIDS)
- Heterosexuals (AIDS)

**Number of neurons**

- Heterosexuals (No AIDS)
- Homosexuals (AIDS)
- Heterosexuals (AIDS)
(B) Nonlactating rat (18 days postpartum)
(C) Lactating rat (19 days postpartum)