

How About the Relationship of Early Hormones to Play Preferences of Females With Normal Prenatal Sexual Development?

- First: Sampled blood of pregnant women to determine level of testosterone present
- Then: When their daughters were 3 years old, observed play preferences
- Higher maternal testosterone was associated with higher preference for 'boy toys'
- [T levels at different ages](#)

Monkeys Show Same Sex Diff in Toy Preference



Reprinted from Alexander & Hines, *Evolution and Human Behavior* (2002) 23: 467-479

Human Variations in Sexual Development Also Support the Key Role of Prenatal Hormone Environment

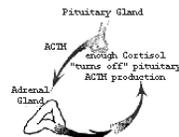
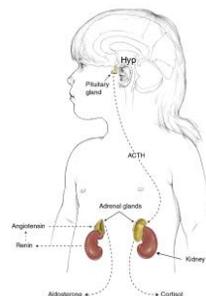
They also raise questions about how we decide the sex of a person.

Androgen Insensitivity Syndrome

- X-linked recessive defective variant of the androgen receptor gene
- Androgens ineffective → small testes, no male ducts, female genitalia but no female ducts. Have female identity
- (supports a role for androgen receptors in some aspects of masculinization of human brain)
- At puberty don't see pubic hair or darkening of nipples (normal androgen effects in females)
- If AIS is known to exist in a family, genetic testing can reveal whether a woman carries the recessive gene
- 1 in ~13,000 births have *complete* androgen insensitivity; in addition some are born with *partial* insensitivity (probably another mutation)
- <http://www.youtube.com/watch?v=ETixOQGVj0s>
- (Eden Atwood example in Garrett)

Congenital Adrenal Hyperplasia or Adrenogenital Syndrome

One cause of androgen exposure in females



- In CAH, genetically based deficiency in the enzyme (21 hydroxylase) needed to produce cortisol leads to excess adrenal androgen production. No cortisol feedback leads to continued hypothalamic stimulation of production.

- The effects of androgen exposure of a female fetus
- Degree of masculinization depends on amount of androgen and timing
- Also about 1 in 13,000 births



CAH is associated with

- Greater preference for boy toys and later for sports magazines, masculine sports, even male dominated professions like auto mechanic, truck driver
- Increased physical activity; increased aggression
- Low romantic interest in males at adolescence; less interest in infants
- Moderate increase in bisexuality or homosexuality, or continued low interest in sexual relationships
- Usually score intermediate between females and males and degree is correlated with androgen level (e.g. on tests of spatial ability)

- Masculinization of interests and abilities also seen in females exposed to **excess** estrogen because their mom's used the drug diethylstilbestrol (DES) to prevent miscarriage.

5-alpha-reductase deficiency → "Guevedoces" ("eggs@12")



Testosterone can't be converted to dihydrotestosterone which is most important androgen for masculinizing genitals before birth. Testosterone surge at puberty does stimulate growth of penis and scrotum. Most easily transition to male gender identity despite early upbringing



Can also be caused by deficiency in another enzyme (17 alpha-hydroxysteroid)

The Case of John/Joan or Brenda/Brandon

- <http://www.healthplace.com/gender/inside-intersexuality/the-true-story-of-john-joan/>
- An unsuccessful attempt to raise a normal male-differentiated baby as a female after penis was destroyed.

Activational Effects

- Secretion of sex hormones by the gonads is under this chain of command.
- In the presented case, a bump on the head in a car accident disrupted the release of hypothalamic gonadotropin-releasing hormone, resulting in a loss of the activational effects on sex motivation, gonad function and secondary sex characteristics.

