Sexual Differentiation
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Why have sexes?

NEWS ITEM: SCIENTISTS HAVE LEARNED HOW TO CLONE CATS

KNOCK IT OFF!
What determines sex?

• Environment

• Genetics

• Hormones
What causes these differences?

The true story of
JOHN / JOAN

By John Colapinto
The Rolling Stone, December 11, 1997. Pages 54-97

After suffering the complete loss of his penis to a botched circumcision when he was 8 months old a sex-change operation was performed that involved clinical castration, genital surgery and a 12-year program of social, mental and hormonal conditioning.
Or Genotype?

Men and women are similar in genetic make up except for 1 chromosome....

Professor Victor Axiak
Forget The Budget! - WHAT ABOUT SEX?
Dossier Science 27 November 2002
http://www.maltastar.com/pages/msDossierDetailN.asp?id=6918&po=2
The X and Y chromosome

- Women have 2 X
- Men have X and Y
- Men and women differ by about 1% of their genetic make up
Does Genotype alone confer Phenotype?

Genotype XY

Genotype XX
Genes regulate hormones: hormones regulate differentiation

XY → testis

XX → ovary

Testosterone

no hormones
Sexual Differentiation: Internal Organs

Male
- Testis form at 7 weeks of gestation and secrete testosterone (T) and anti müllerian hormone (AMH).
- In response to T the Wolffian ducts become the vas deferens and the seminal vesicles
- In response to AMH the müllerian ducts regenerate

Female
- Ovaries form after the 2nd month.
- In the absence of testis: the Wolffian ducts degenerate and the müllerian ducts form the fallopian tubes uterus and part of the vagina

http://www.wisc.edu/ansci_repro/lec/lec5/lec5diag.html
Male:
Dihydrotestosterone, a metabolite of T causes the fusion of the genital folds forming the penis.

Female:
In the absence of T genital folds develop into the labial lips and vaginal opening.

http://www.wisc.edu/ansci_repro/lec/lec5/lec5diag.html
Congenital Adrenal Hyperplasia

• Caused by a genetic deficiency in the enzyme 21-hydroxylase which produces cortisol in the adrenal gland.

• Production begins in the 2nd month of gestation.

• Decreased cortisol production increases ACTH.

• Increased ACTH increases the activity of steroid-producing cells of the adrenal cortex.

ACTH \rightarrow\text{Cortisol, (aldosterone, androgens)}}
Which patient suffers from CAH?
Testicular feminization (tfm) or androgen insensitivity syndrome (AIS)

Genotype XY
Testicular feminization (tfm) or Androgen Insensitivity Syndrome

- Genetic defects in the androgen receptor
- X-linked trait
- Phenotypic female
- Internal organs:
  - Testis often undescended
  - No seminal vesicles or vas deferens
  - No uterus, fallopian tubes or ovaries.
5 Alpha reductase deficiency

- Genetic deficiency in 5- alpha reductase
- 5- alpha reductase reduces testosterone to dihydrotetosterone
- Phenotype: Internal genetalia - male
  External genetalia - female
"I am the third sex, not a man trying to be a woman. It is your society's problem that you only recognize two sexes." (Hijra Mona Ahmed to author Dayanita Singh)
Source: wikipedi
Gender assignment

“Gender identity development is the result of a complex interaction between genes and environment. It is impossible to predict with complete confidence what gender any child will eventually come to identify with. Like all other children, children with DSDs are given an initial gender assignment as boys or girls. But team members should be aware—and advise parents in relevant instances—that children with certain DSDs are more likely than the general population to feel that the gender assignment given to them at birth was incorrect.”

CLINICAL GUIDELINES FOR THE MANAGEMENT OF DISORDERS OF SEX DEVELOPMENT IN CHILDHOOD
Consortium on the Management of Disorders of Sex Development