Sex Determination

Mechanisms
Mammalian Y chromosome
SRY

pp65-75

Mechanisms of sex determination

Environmental sex determination
In some reptiles, the temperature of embryonic development determines sex.

Chromosomal sex determination:
In flies and mammals females are the homogametic sex (XX) and males the heterogametic sex (XY).
In butterflies and birds males are the homogametic sex (ZZ) and females the heterogametic sex (ZW).

*Drosophila melanogaster* (fruit fly)
XX females; XY males
X:autosome ratio determines sex
1.0 female; 0.5 male

Mammals
The single Y-linked gene SRY determines the male phenotype.

SRY is both necessary and sufficient for male development

The Y chromosome is a wasteland; it contains very few genes

SRY

Testes genes

SRY is a transcription factor that binds DNA and regulates the expression of other genes.
Mutations that affect sexual phenotypes

Pseudohermaphroditism: XY individuals that lack 5 alpha reductase and produce testosterone but not DHT. AMH causes Mullerian ducts to degenerate, and testosterone induces Wolffian duct formation, but external genitalia are female (or more female than male). At puberty, massive amounts of testosterone cause the individuals sex to change.

Androgen insensitivity: XY individuals can’t respond to androgens (testosterone or DHT). Testes form and produce AMH, so Mullerian ducts degenerate, but tissues don’t respond to androgens, so Wolffian duct degenerates and external genitalia develop as female structures.

Congenital adrenal hypoplasia

Enzyme that produces cortisol missing

XX individuals masculinized