Outline

Review sex determination

Genetic syndromes

Sex-specific behaviors

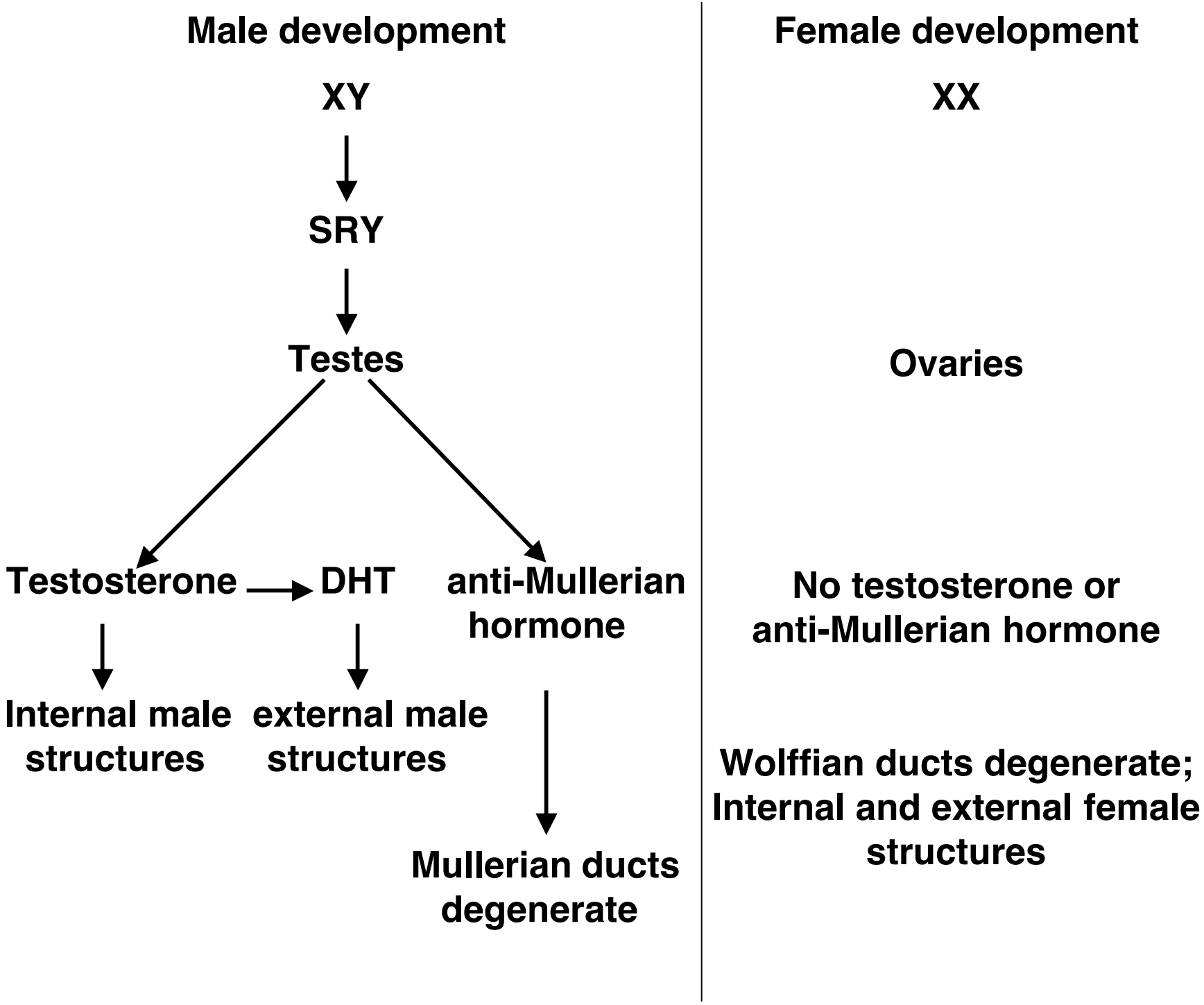
sexual orientation and identity

Flies

Rodents

Sheep

Humans


Male development
XY
SRY
Testes
Testosterone
DHT
anti-Mullerian hormone
Internal male structures
external male structures
Mullerian ducts degenerate
Female development
XX
Ovaries
No testosterone or anti-Mullerian hormone
Wolffian ducts degenerate; Internal and external female structures

Mutations that affect sexual phenotypes

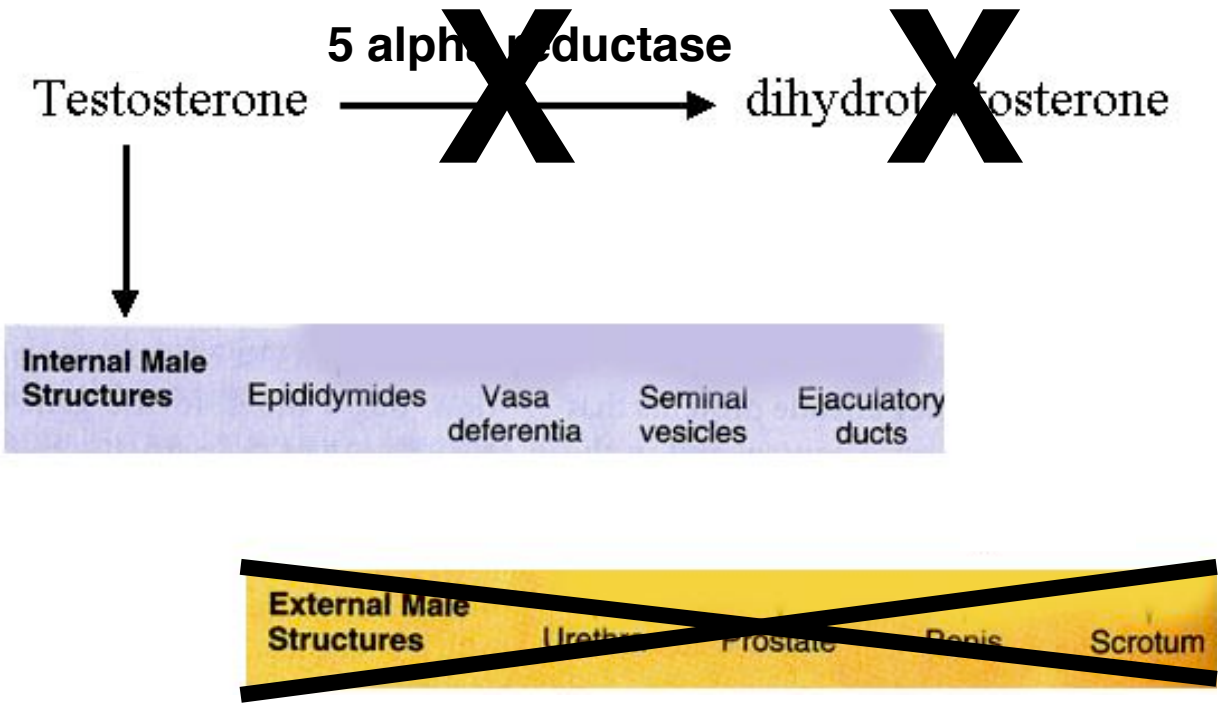
5-alpha-reductase deficiency

Androgen insensitivity syndrome

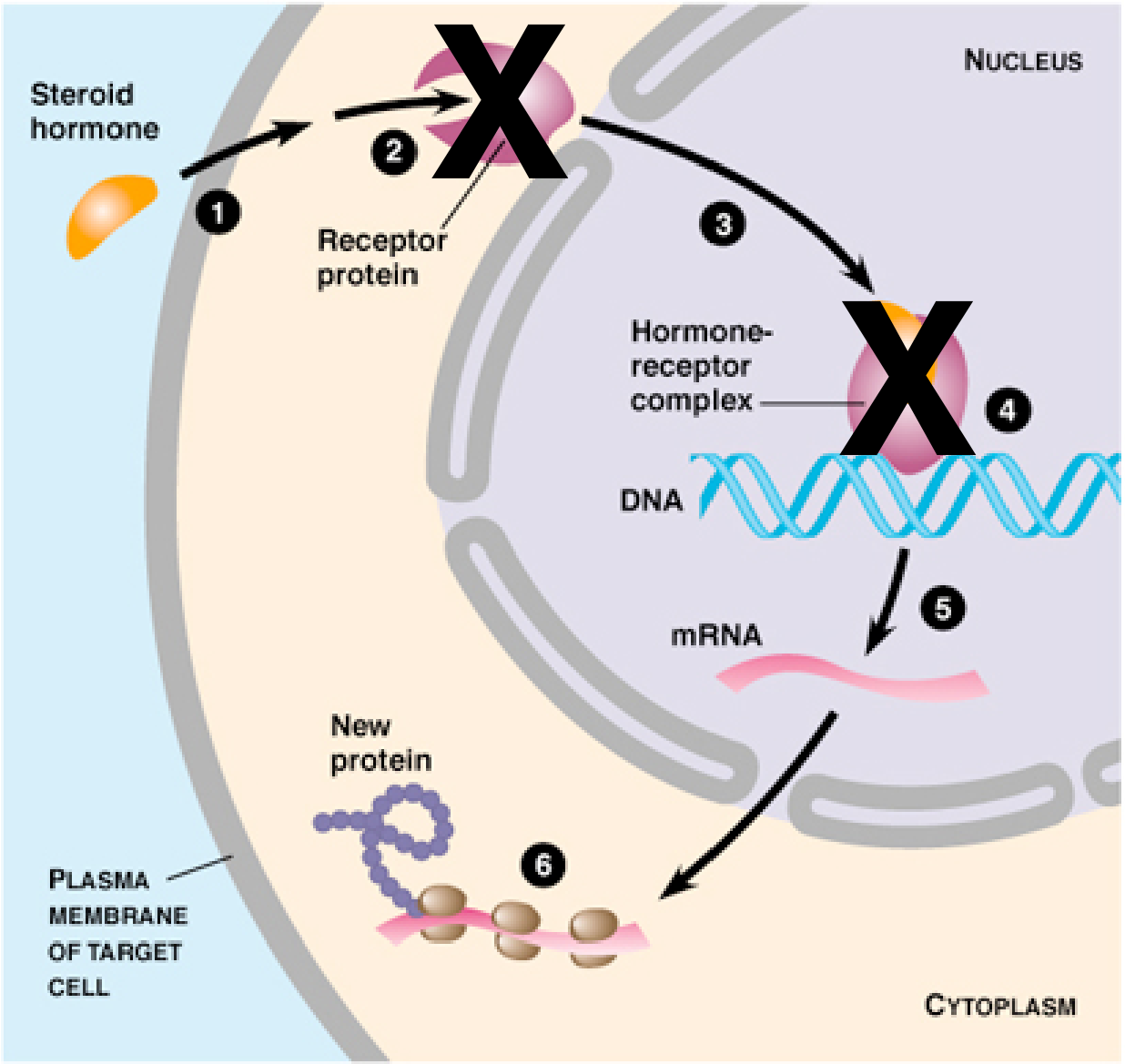
Congenital adrenal hyperplasia

5-alpha-reductase deficiency

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

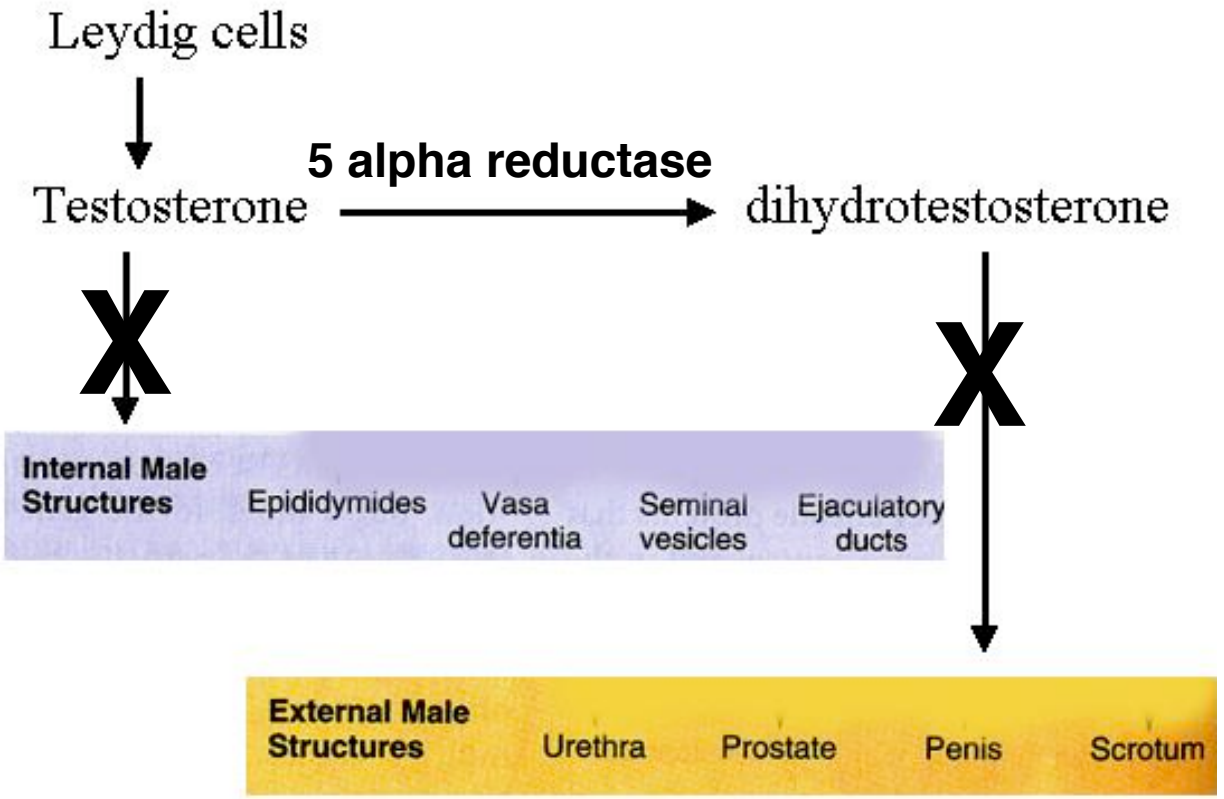


Androgen insensitivity syndrome (AIS)



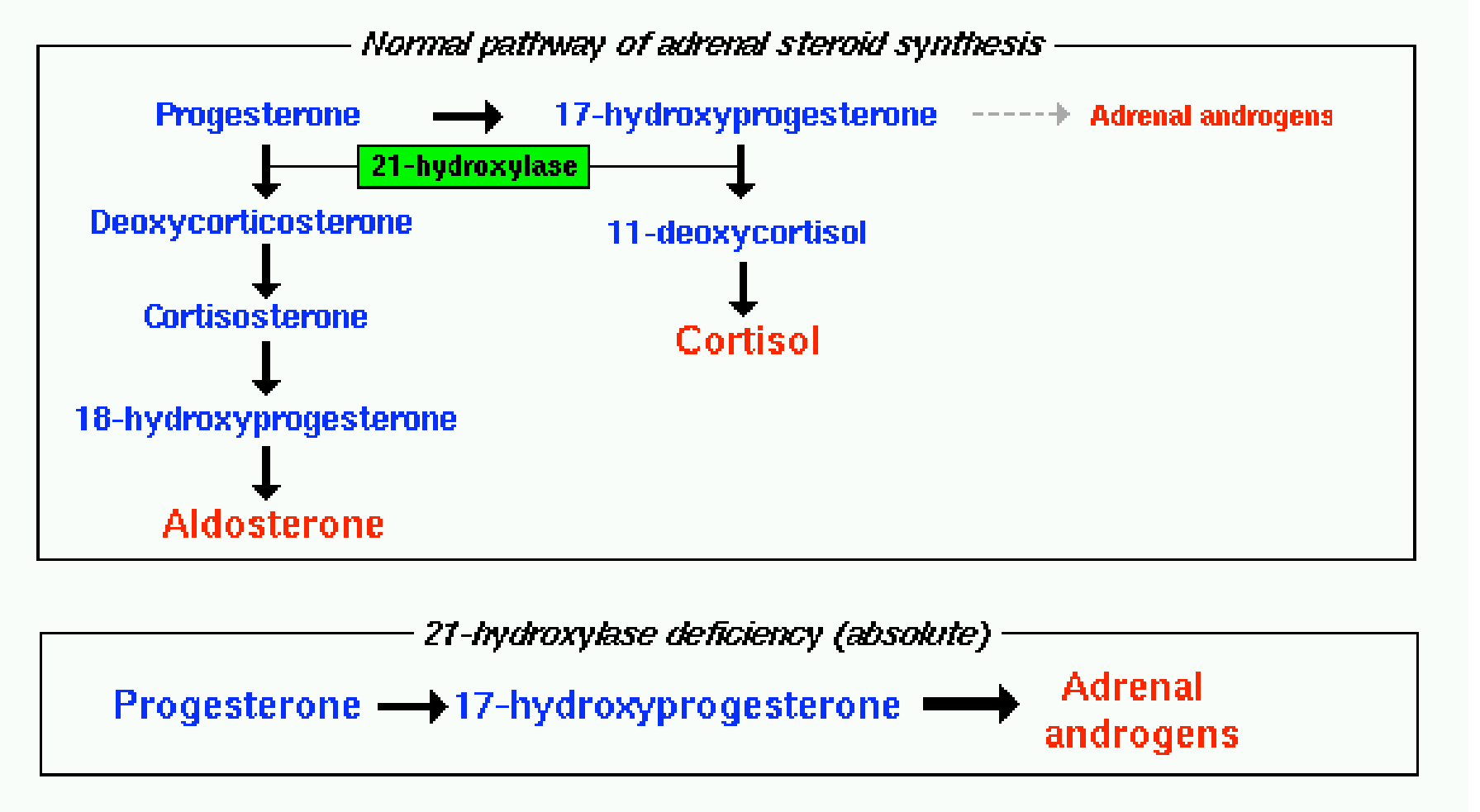
Androgen insensitivity syndrome (AIS)

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 hyperplasia

Enzyme that produces aldosterone and cortisol is missing. XX individuals are masculinized.



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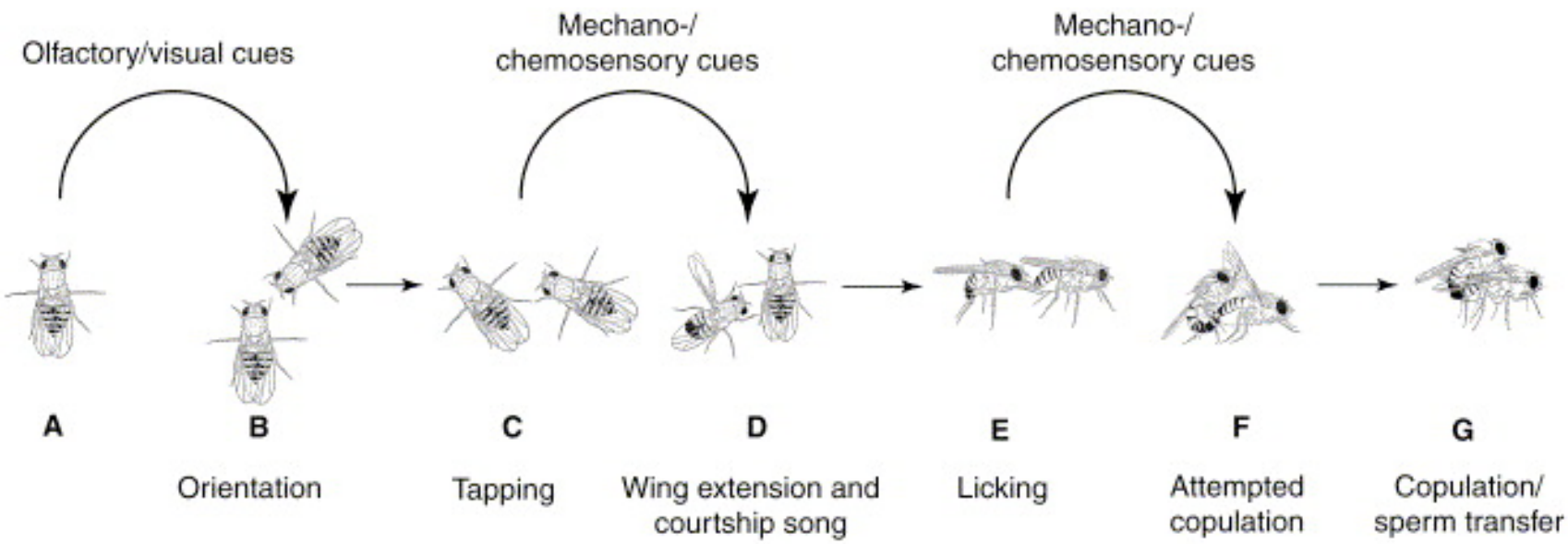
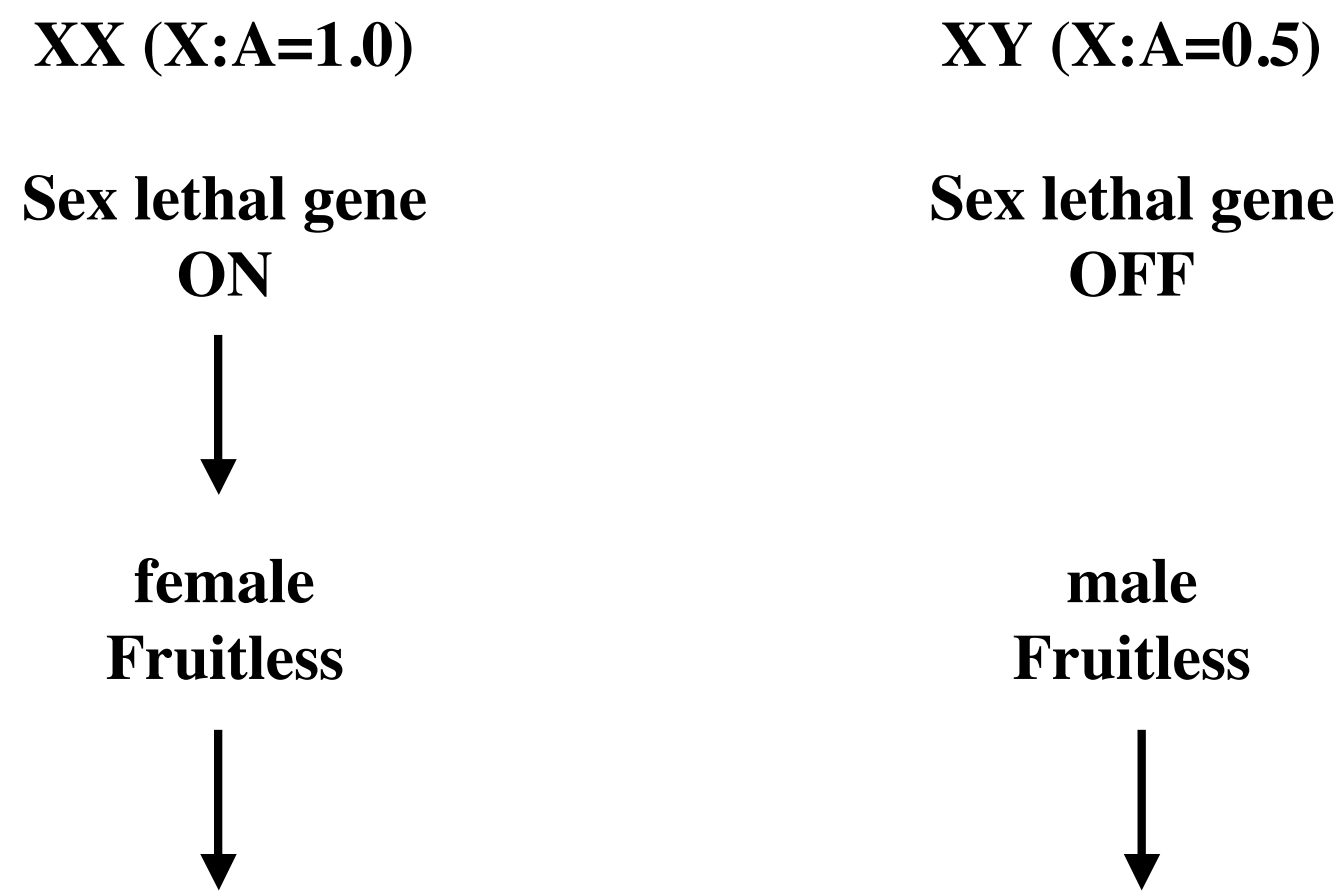
Sexual orientation
Sexual identity

Let’s start with flies

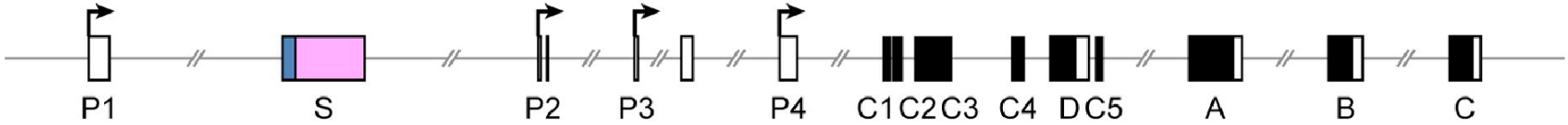


Drosophila sexual development

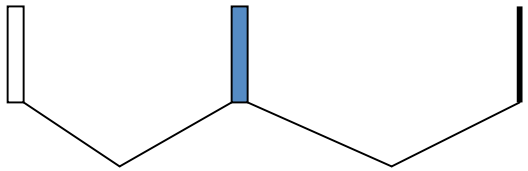


Drosophila Fruitless (Fru) is regulated by alternate RNA splicing

Fru gene

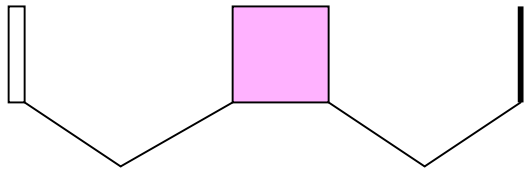


male RNA splicing



male Fru protein

female RNA splicing



female Fru protein

Fruitless controls male sexual behavior!

Fruitless mutant males lack courtship behavior.

Females that express male Fruitless exhibit male courtship behavior.

Fruitless is a transcription factor

Females expressing male Fruitless exhibit male mating behavior.

Male and female flies fight differently

males box

females push

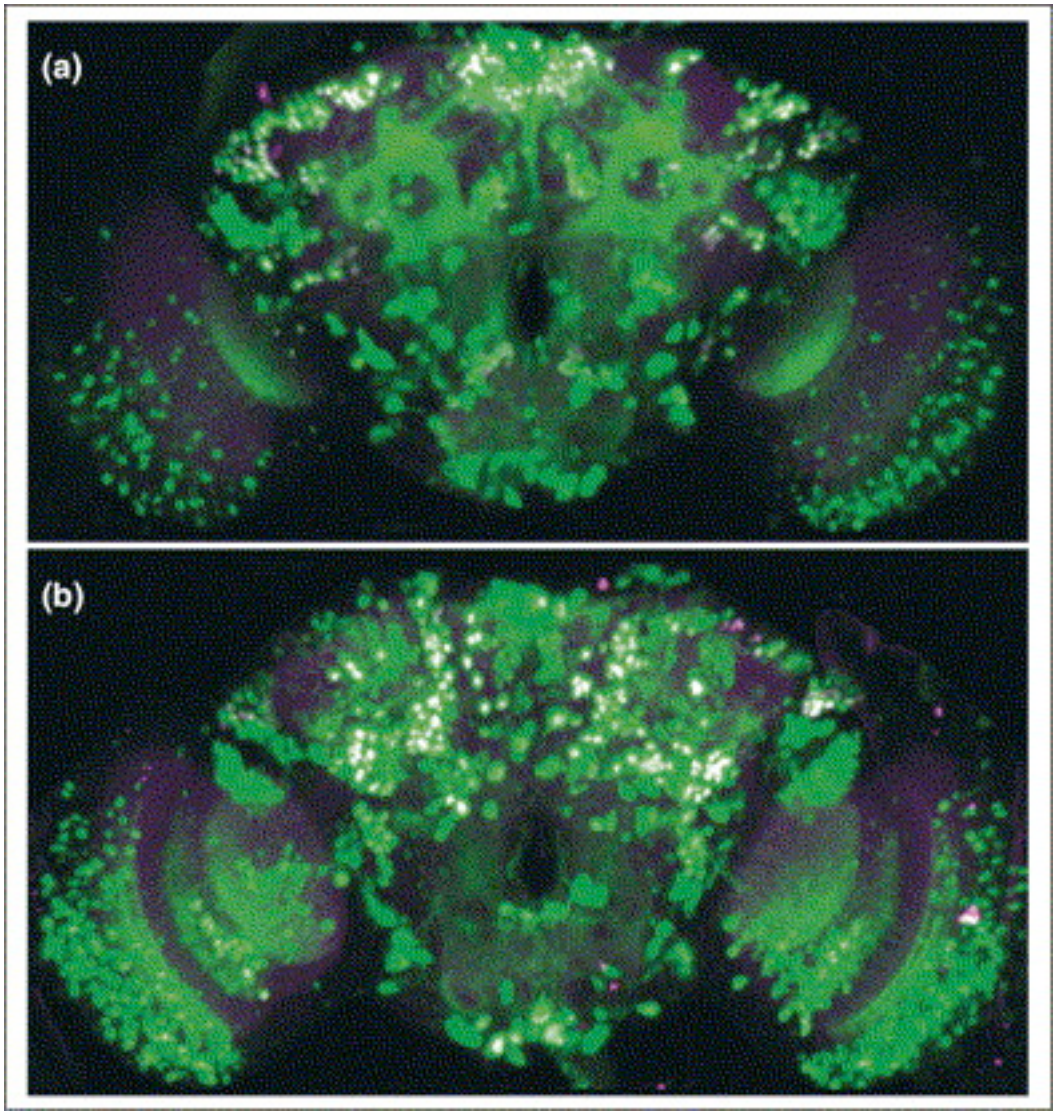
Male and female fighting behavior is regulated by Fruitless

males expressing female Fru push

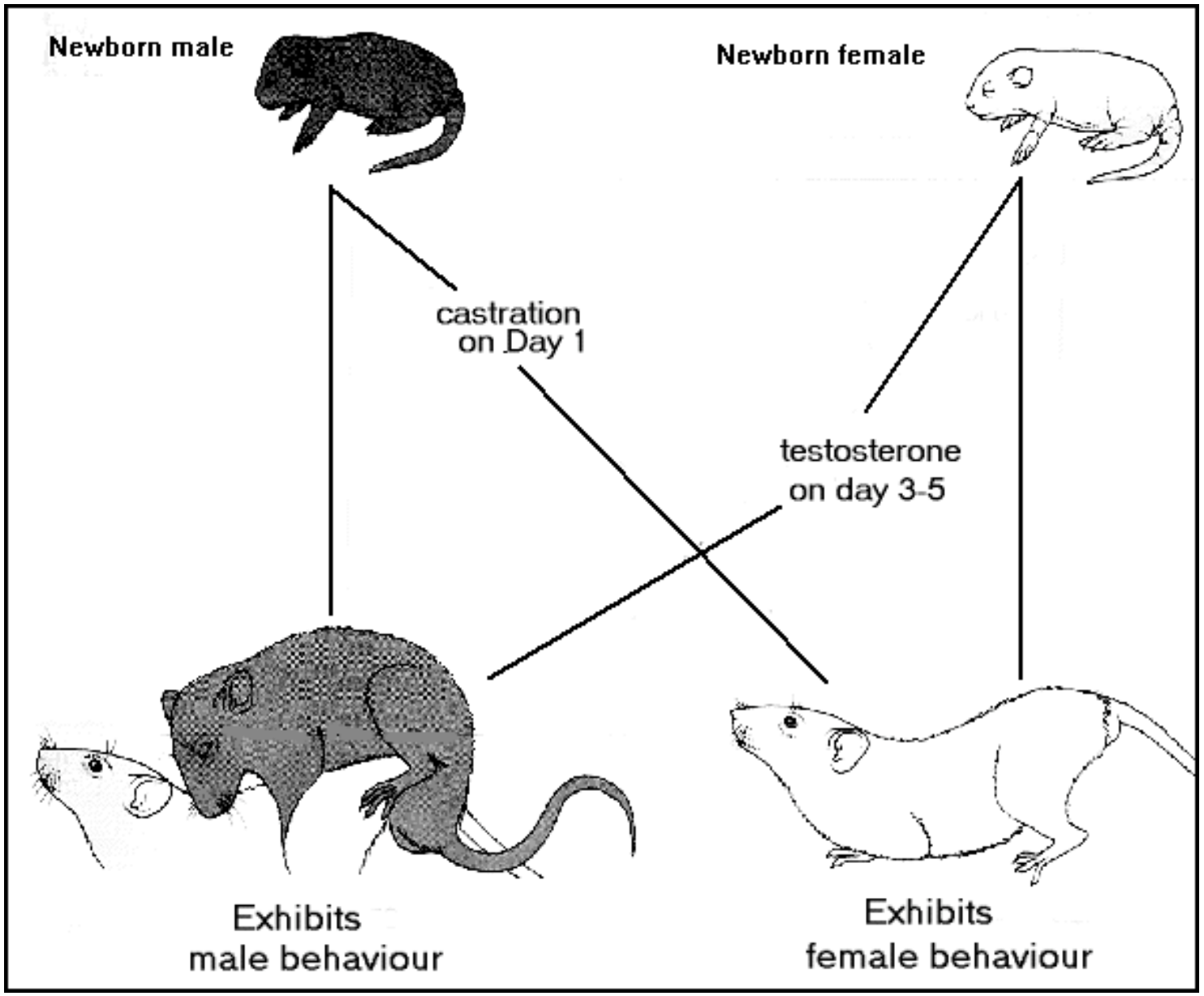
Dominance relationships are also regulated by Fruitless

Pairing	Probability of winning: Overall	As prior winner	As prior loser	Dominance index (DI)	*n*
fru^C males	(0.50)	0.88	0.12	0.75	306
fru^C females	(0.50)	0.61	0.39	0.22	156
fru^F males	(0.50)	0.69	0.31	0.39	197

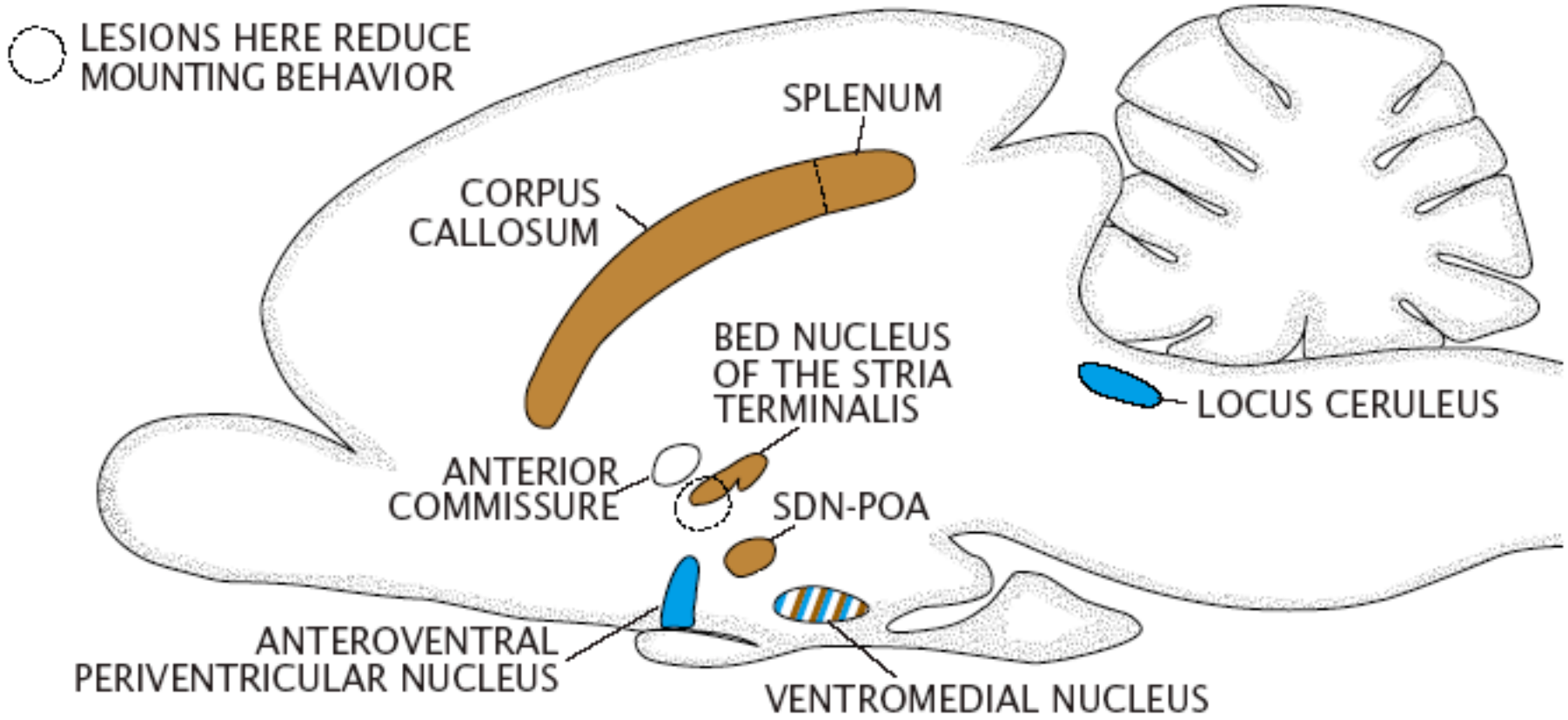
Fruitless is expressed in a subset of CNS neurons



During early development testosterone regulates mating behavior in rats



Sexually dimorphic regions of the rat brain



Sexual orientation in sheep

8% of rams are male oriented; *i.e.*, they attempt to mate with rams.
Male-oriented rams have a sexually dimorphic part of the brain that is similar in size to that in females.

The sheep SDN is sexually dimorphic