

Sex Determination

Read pp65-75 in text

Outline

1. Different mechanisms for sex determination

2. Mammalian Y chromosome

3. SRY

4. Testosterone

Chromosomal sex determination in mammals and flies

| | | |
|----|----------------|-------------------|
| | <u>mammals</u> | <u>Drosophila</u> |
| XX | female | female |
| XY | male | male |

Sex is determined differently in mammals and flies

| | <u>mammals</u> | <u>Drosophila</u> |
|------------|----------------|-------------------|
| XX | female | female |
| XY | male | male |
| XO | female | male |
| XXY | male | female |
| XYY | male | male |

Mechanisms of sex determination

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.

Environmental sex determination

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



Clownfish live in small groups inhabiting a single anemone. The group consist of a breeding pair, which cohabit with a few non-reproductive, smaller male clownfish. When the female dies, the dominant male changes sex and becomes the female.

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The Y chromosome is necessary and sufficient for male development!

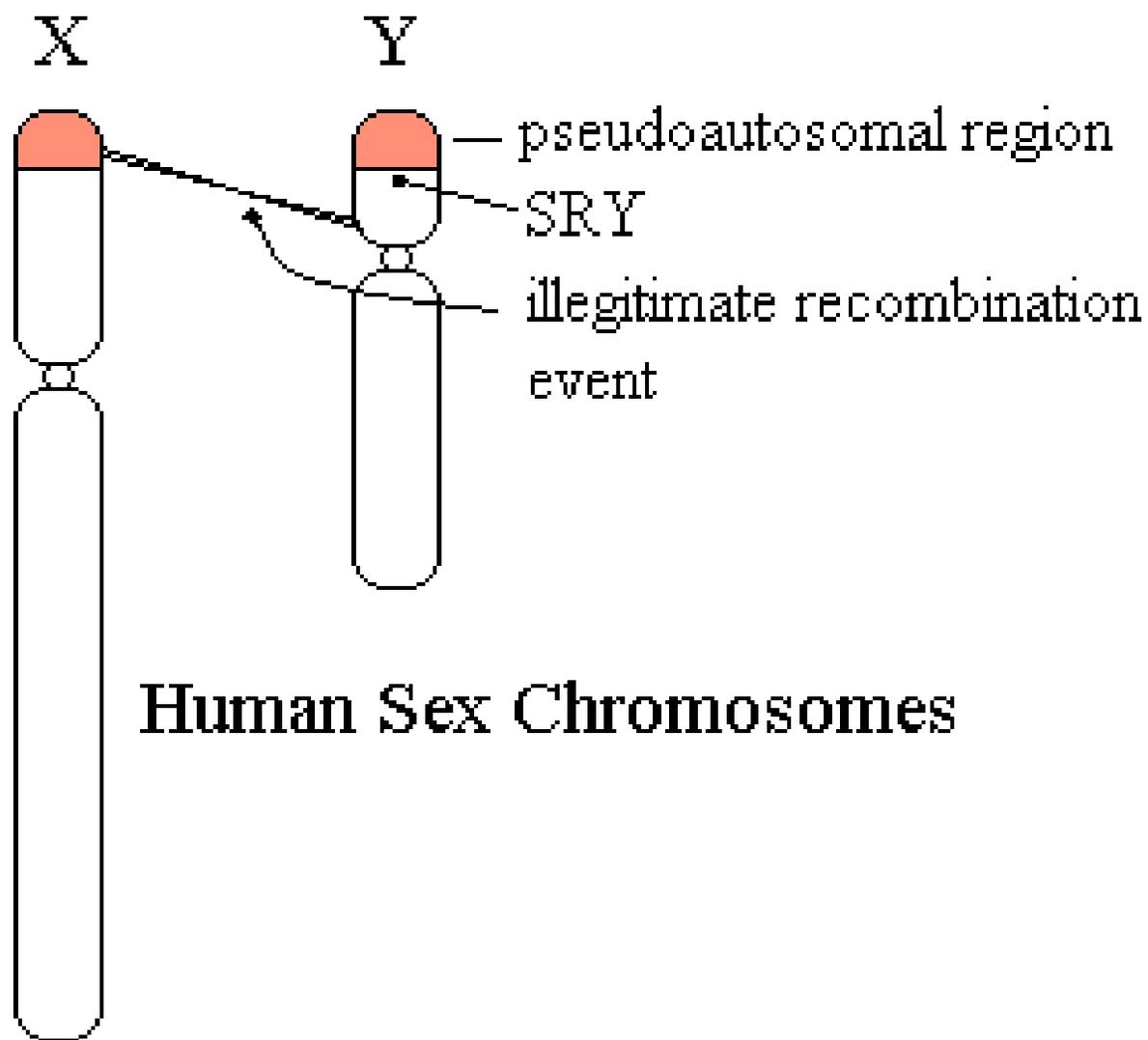


28 Mb

But what on Y is important for male development?

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

Which one controls maleness.



Outline

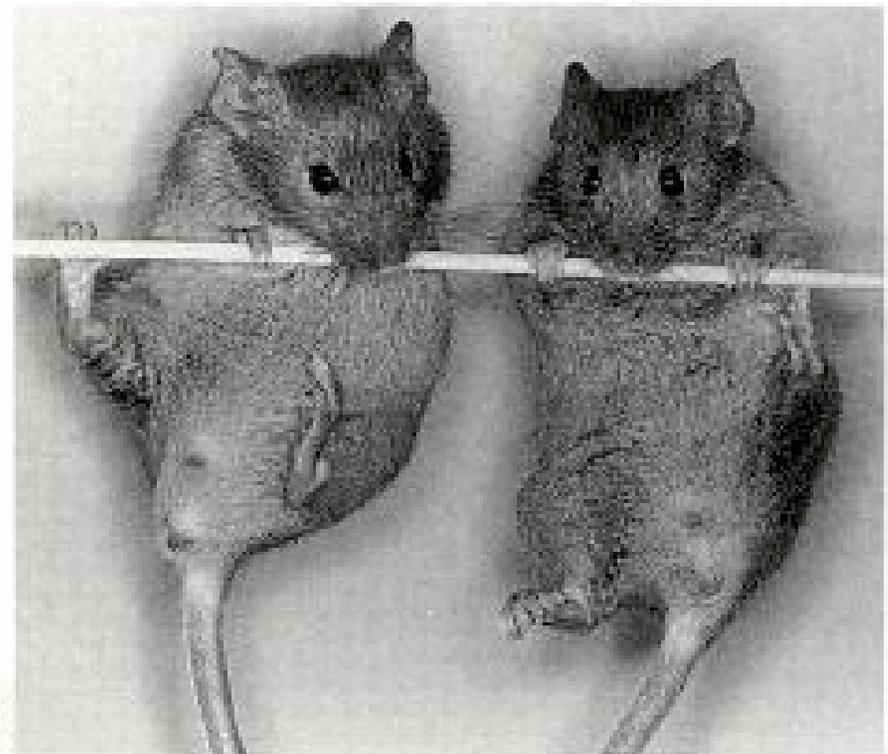
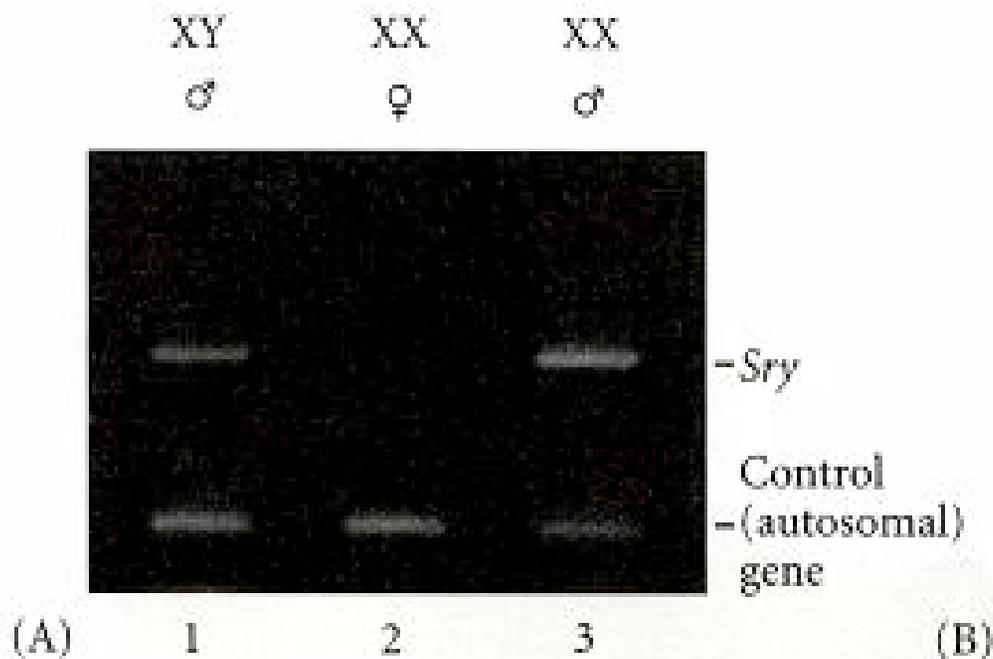
1. Different mechanisms for sex determination

2. Mammalian Y chromosome

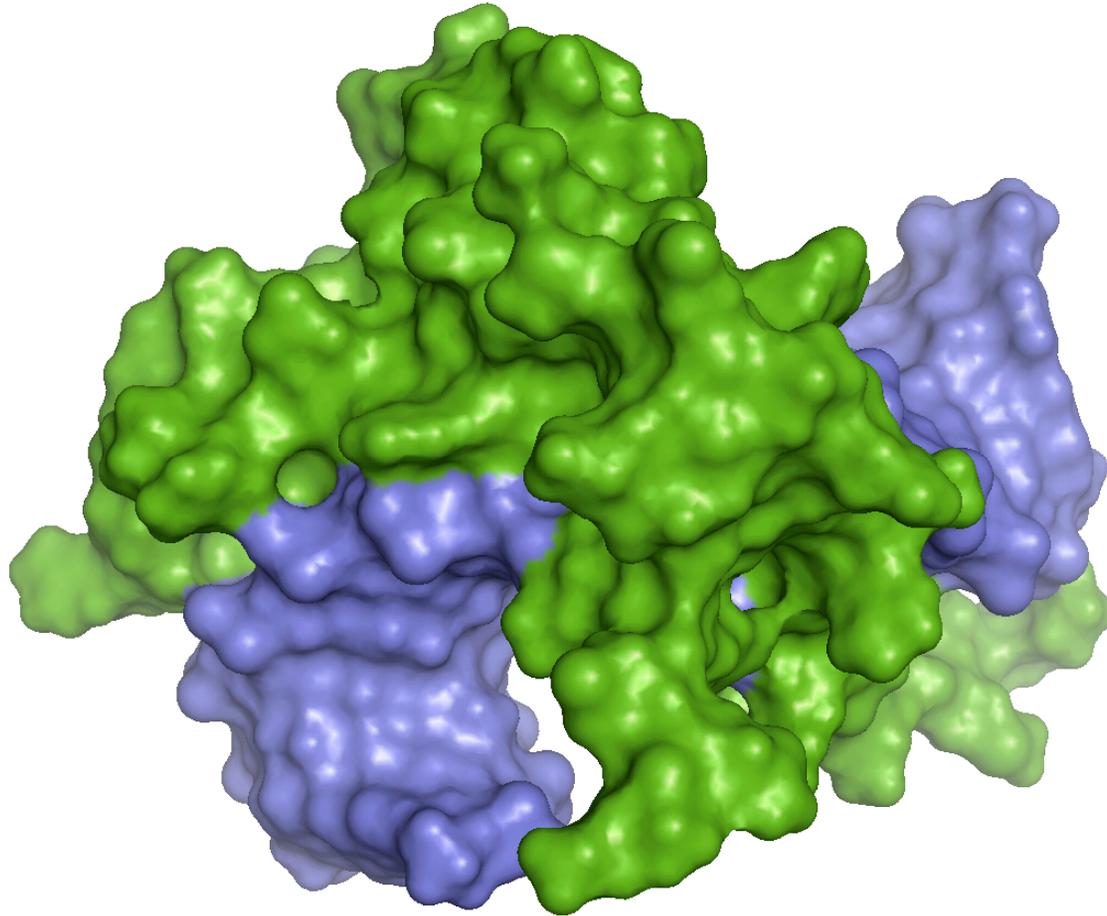
3. SRY

4. Testosterone

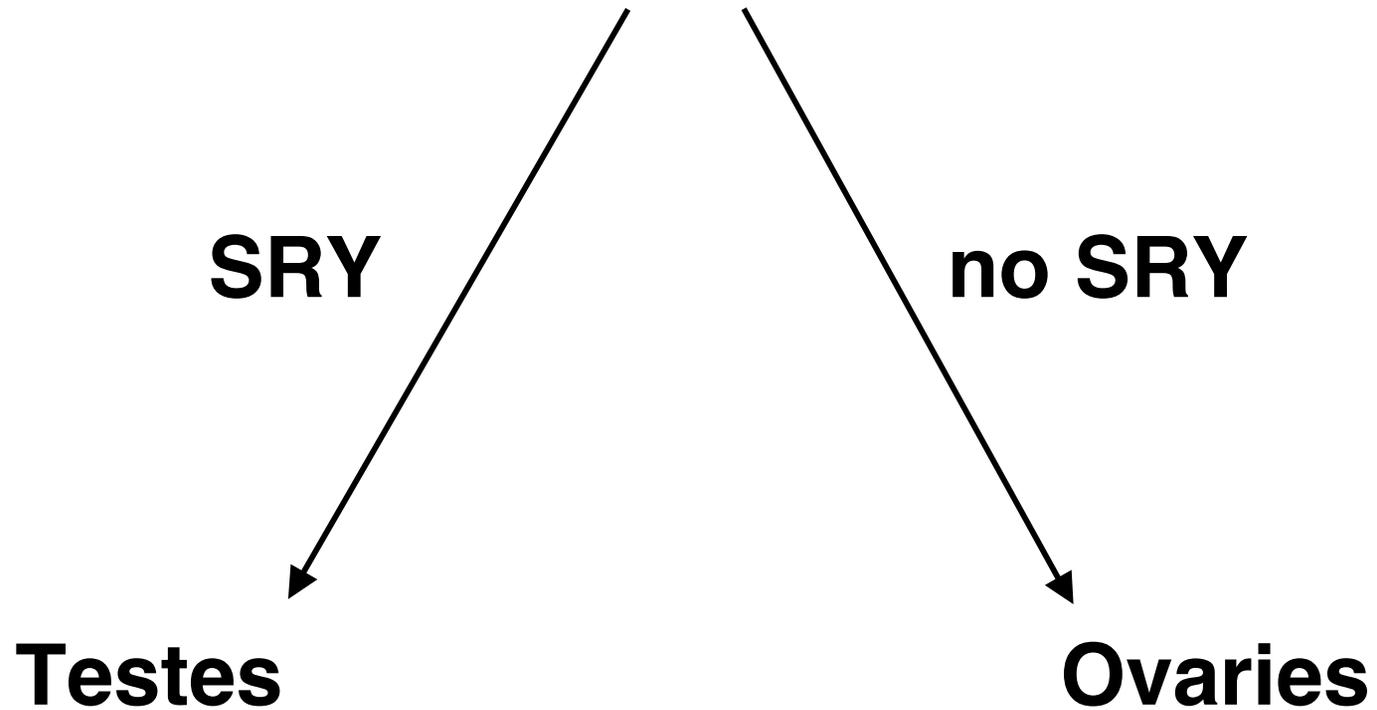
SRY is both necessary and sufficient for male development



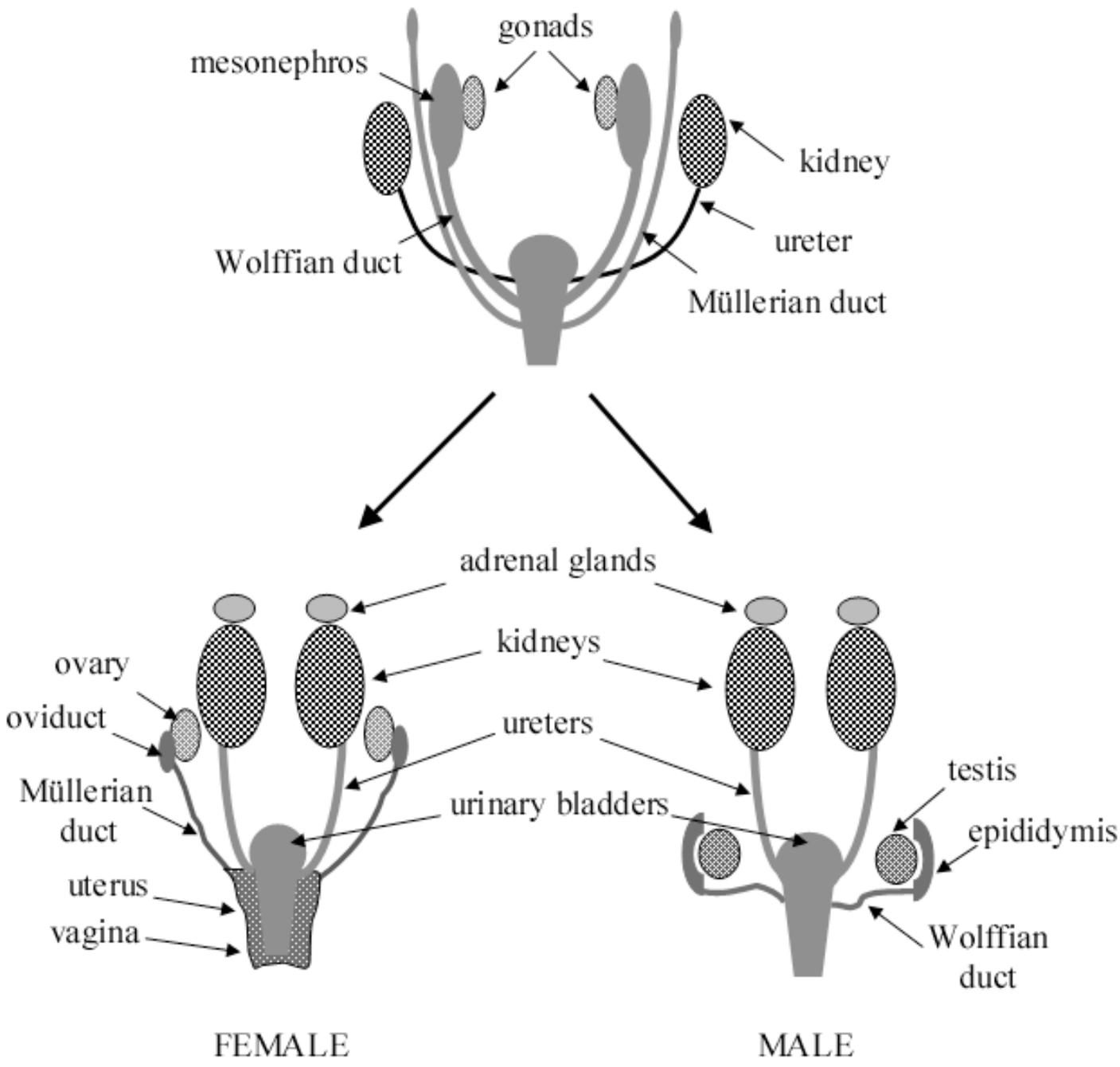
SRY is a transcription factor



Indifferent gonad



BIPOTENTIAL GONAD



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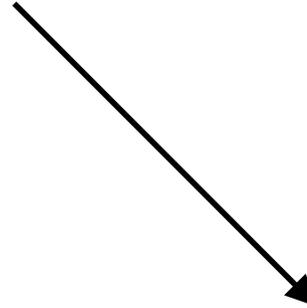
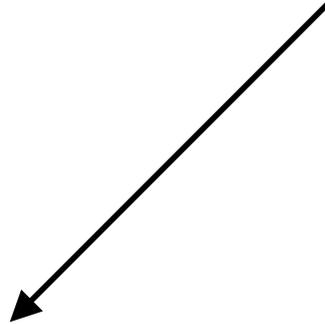
3. SRY

4. Testosterone

Sry



Testes form from gonad



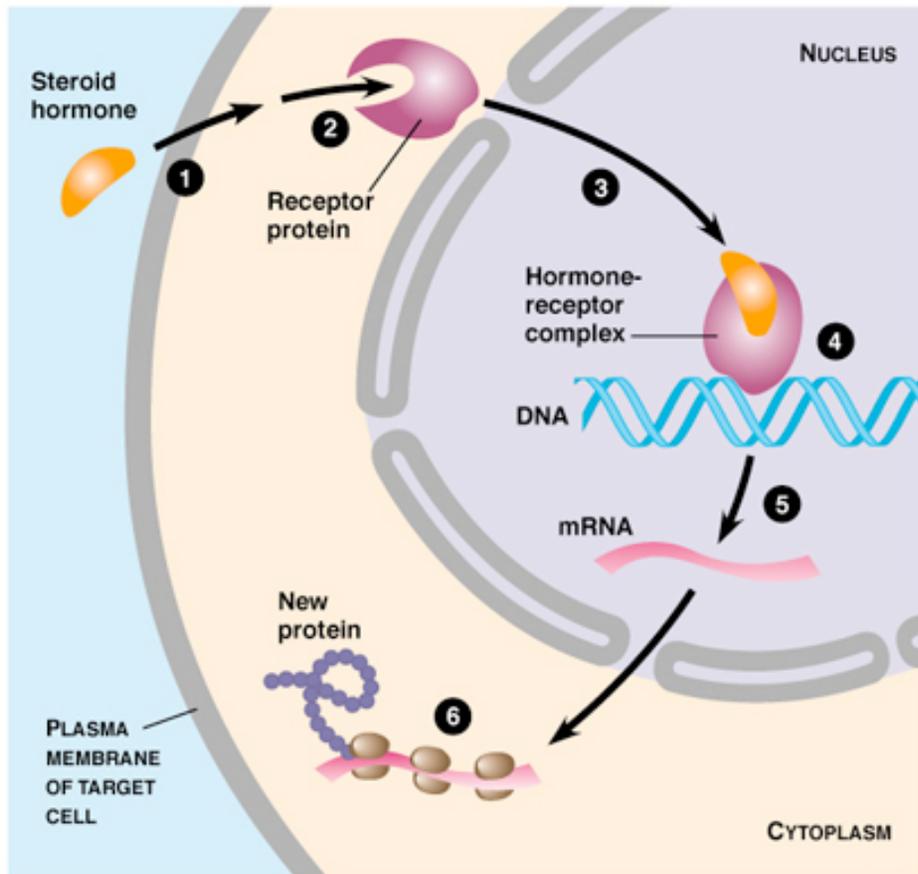
Testosterone

anti-Mullerian hormone



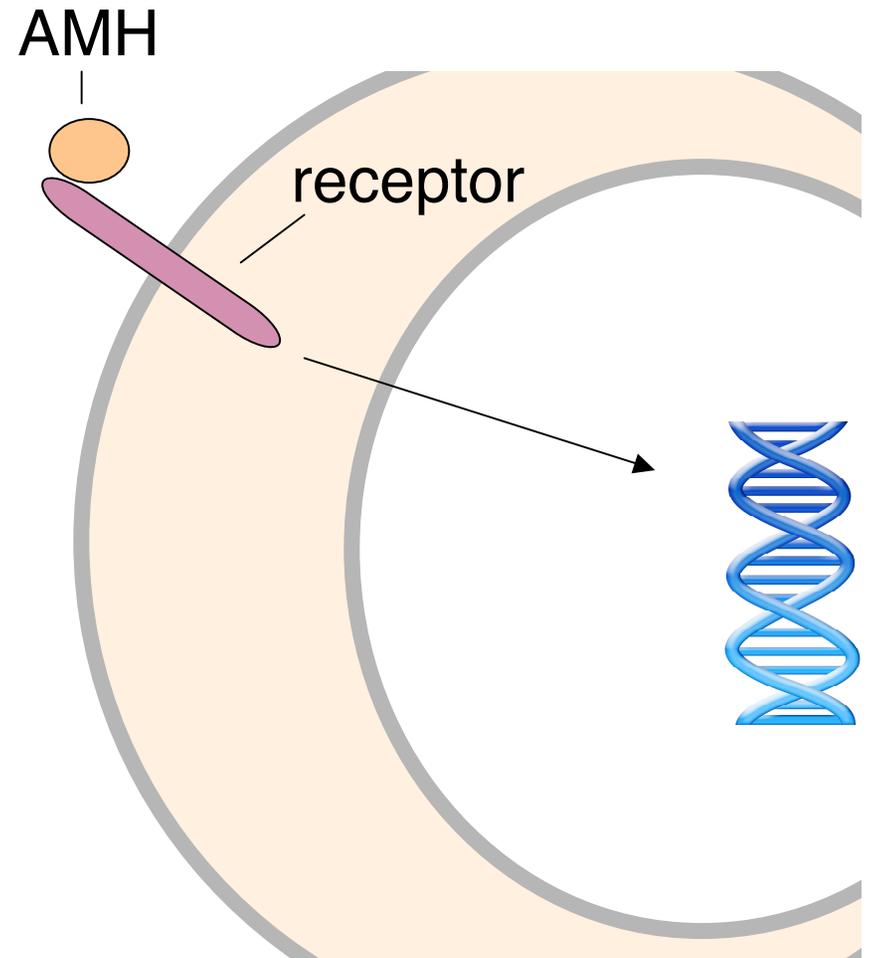
Mullerian ducts degenerate

Testosterone (steroid) and anti-Mullerian hormone (peptide) both regulate transcription



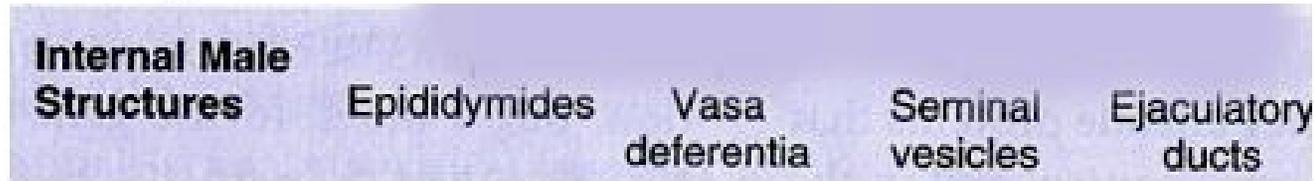
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Steroids are lipid soluble and can pass through the plasma membrane. Their receptors are in the cell.



Peptide hormones cannot pass through the plasma membrane. Their receptors are in the cell membrane.

Testes



Sry OFF

Ovaries form from gonad

No AMH

No testosterone

No DHT

Mullerian ducts

**Wolffian ducts
degenerate**



Internal female structures
Oviduct, cervix, uterus, upper vagina

External female structures
**Uterus, lower vagina,
clitoris, labia**