Development of the Genital System

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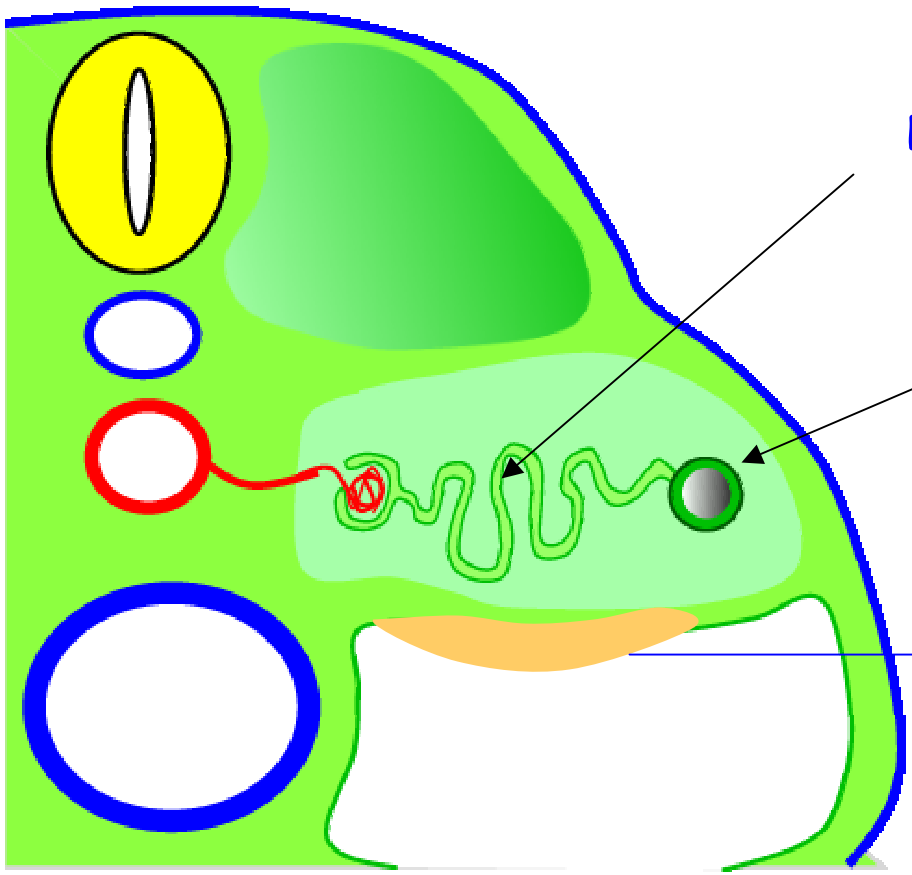
The mesonephros develops primitive nephrotomes draining into a mesonephric duct

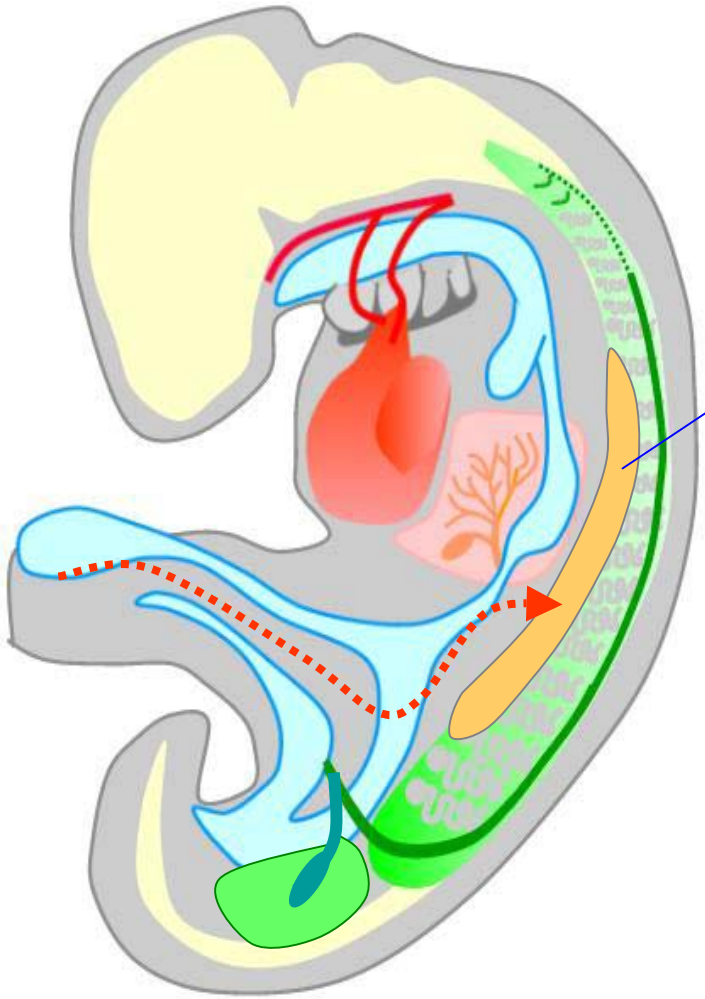


nephrotome

mesonephric duct

The gonadal ridge is a thickening on the mesonephros

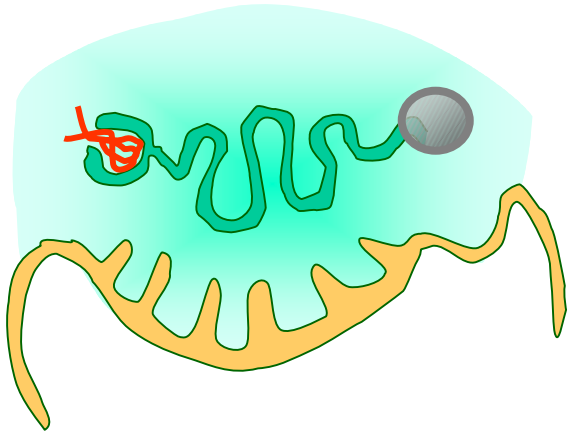
The gonads arise from two sources

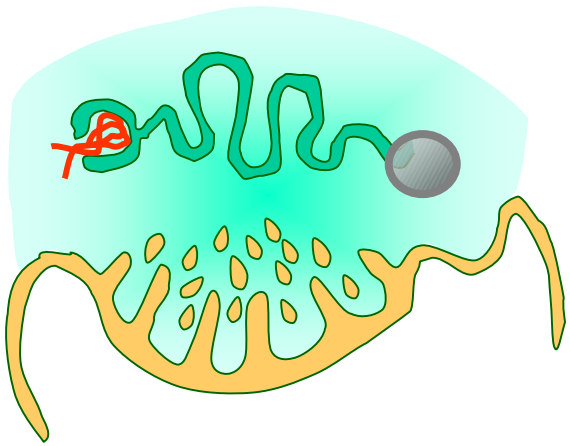


The gonadal ridge is a thickening on the mesonephros

Primordial cells arise in the morula stage. They are distinguishable in the region of the allantois and migrate into the gonadal ridge

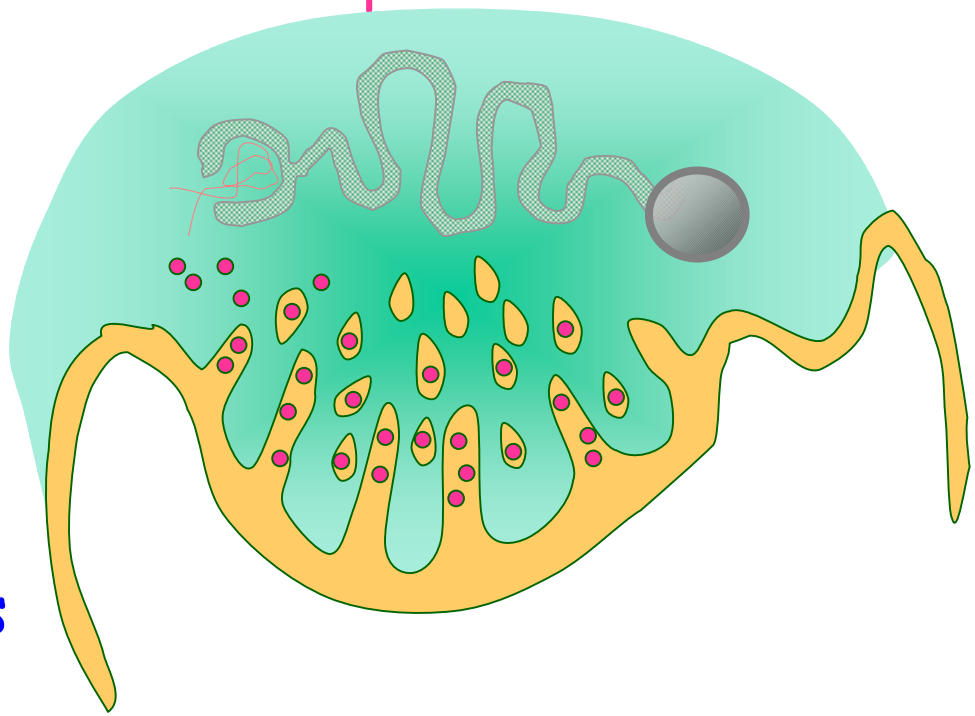
The Indifferent Gonad



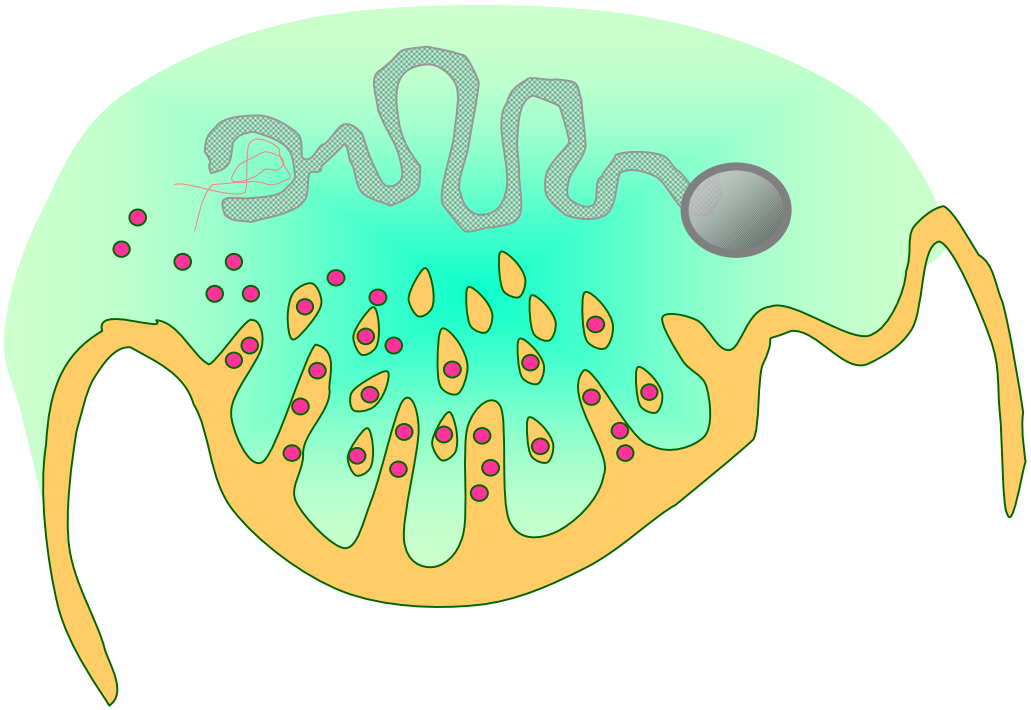


Primitive sex cords

Proliferation of coelomic epithelium over genital ridge gives rise to primitive sex cords



Primordial Germ cells invade the primitive sex cords in the 6th week



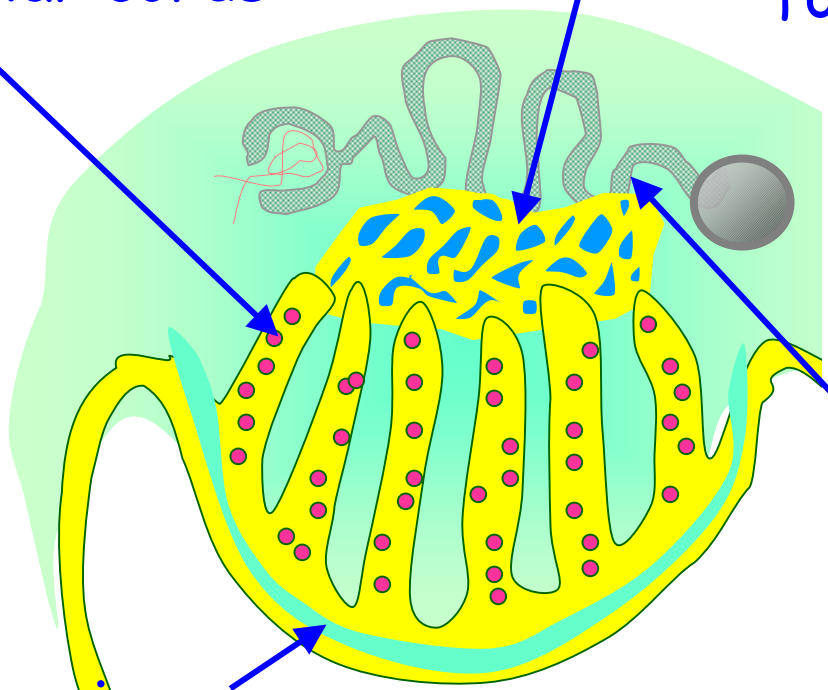
Differentiation of the testes

6th week

Sex cords organized radially to form testicular cords

Deep part of primitive sex cords form rete testis …

… and communicate with mesonephric tubules, which form efferent ductules



Tunica albuginea separates coelomic epithelium from testicular cords

Blood capillaries and myoid cells migrate between testicular cords

Histodifferentiation of testes occurs from 3 sources

Primordial germ cells → Spermatogonia

Coelomic epithelium → Sertoli cells

Mesonephric mesenchyme → Connective tissue & tunica albuginea

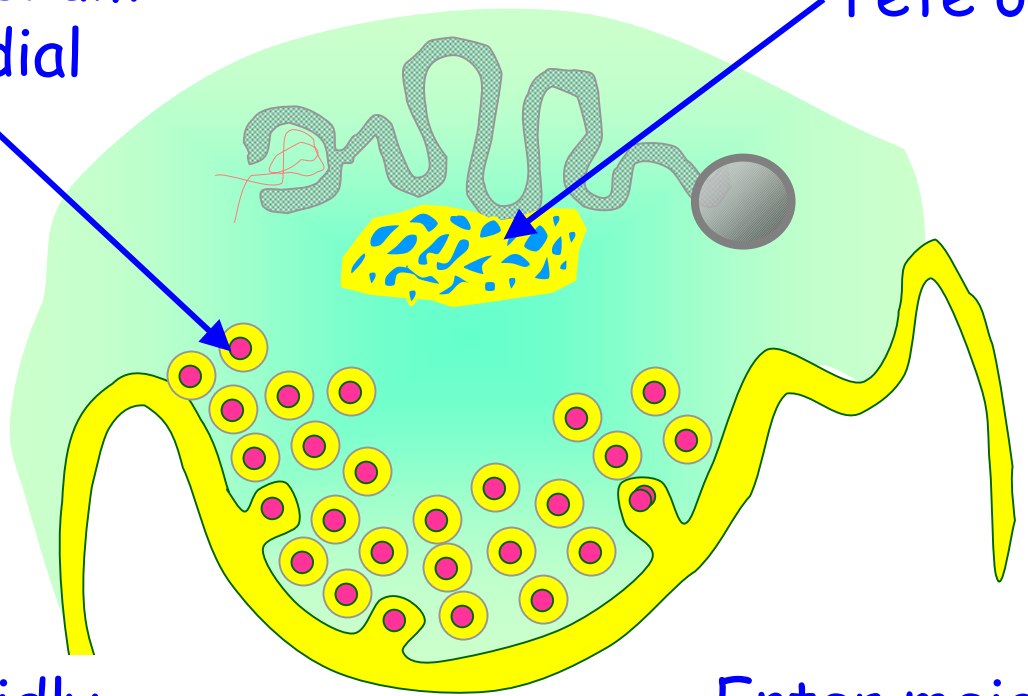
Mesonephric mesenchyme → Blood vessels

Mesonephric mesenchyme → Interstitial (Leydig) cells in 8th week

Differentiation of the ovary occurs in the 7th week

Second generation of cords from coelomic epithelium form primordial follicles

Primitive sex cords form rudimentary rete ovarii

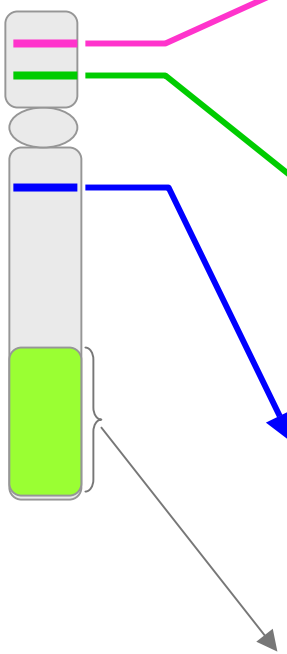


Proliferate rapidly 2nd - 4th months

Enter meiosis in 4th month

Genetic control of gender depends on the presence or absence of a Y chromosome

3 genes on the Y chromosome are related to testicular development



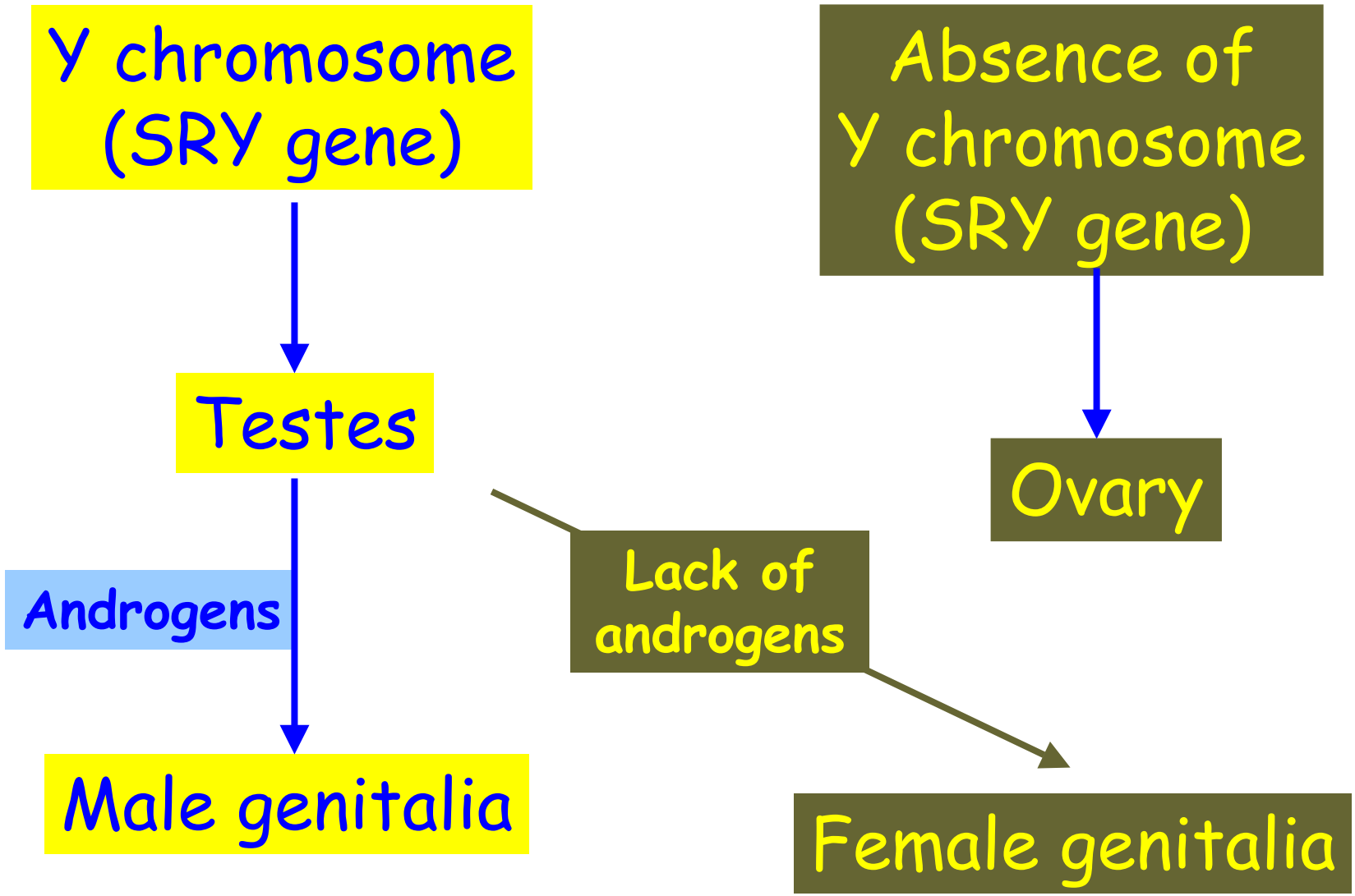
Sry locus on Yp → Testes determining factor

ZFY gene on Yp → Zinc finger transcription factor

HY antigen locus on Yq → Expressed on surface of cells

Fluorescent segment – unimportant; variable

Genetic Sex and Phenotypic Sex



Anomalies of Gonadal Development

Anomalies of Sex Chromosomes

- 45,X Turner Syndrome
- 47,XXY Klinefelter syndrome
- 47,XXX 48,XXXY etc.

True hermaphrodites

(presence of both testes and ovaries)

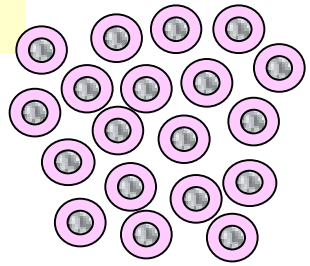
Anomalies of Receptors

Testicular Feminization Syndrome
(XY females)

Time frame for ovarian development

6 weeks: enter gonad

Primordial Germ Cells



6 to16 weeks
4 million oogonia

Mitosis

Oogonia

2 million oocytes at birth

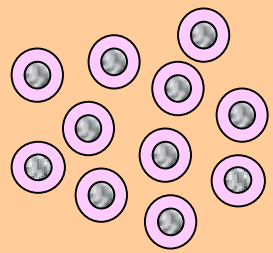
16 weeks foetal

puberty

Meiosis I

Meiotic Arrest

1° oocytes



Oocyte degeneration

Postpubertal cyclic development

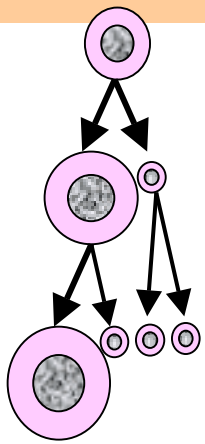
1° oocyte

Release from meiotic arrest

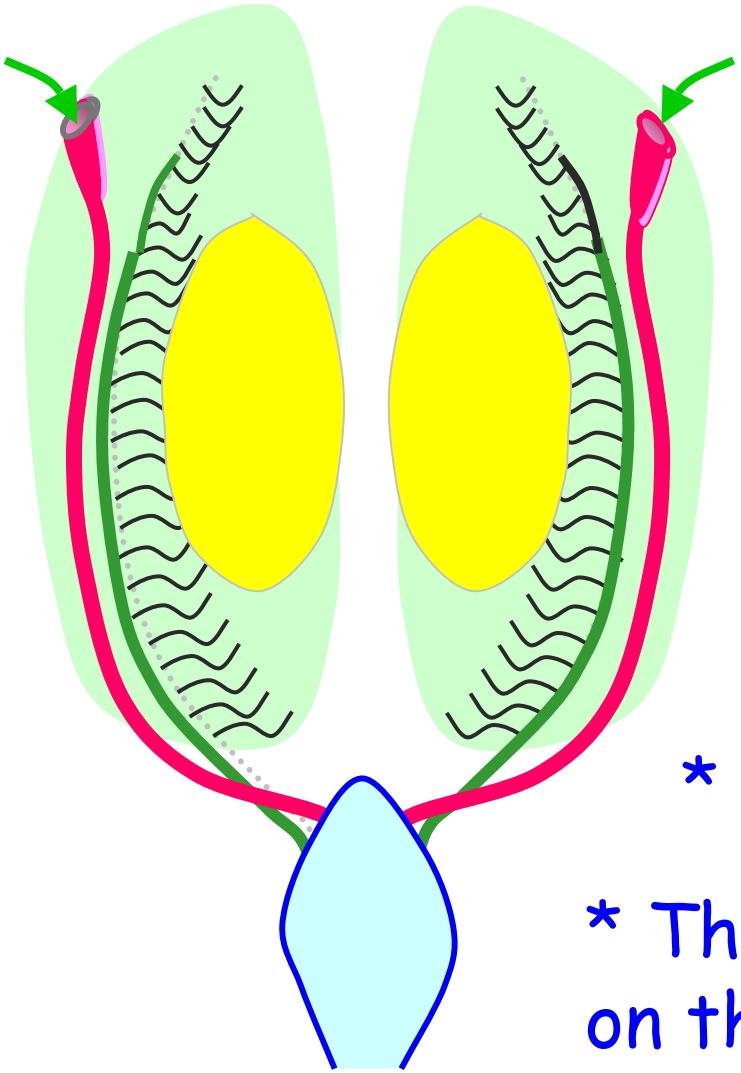
2° oocyte

Meiosis II

mature ovum

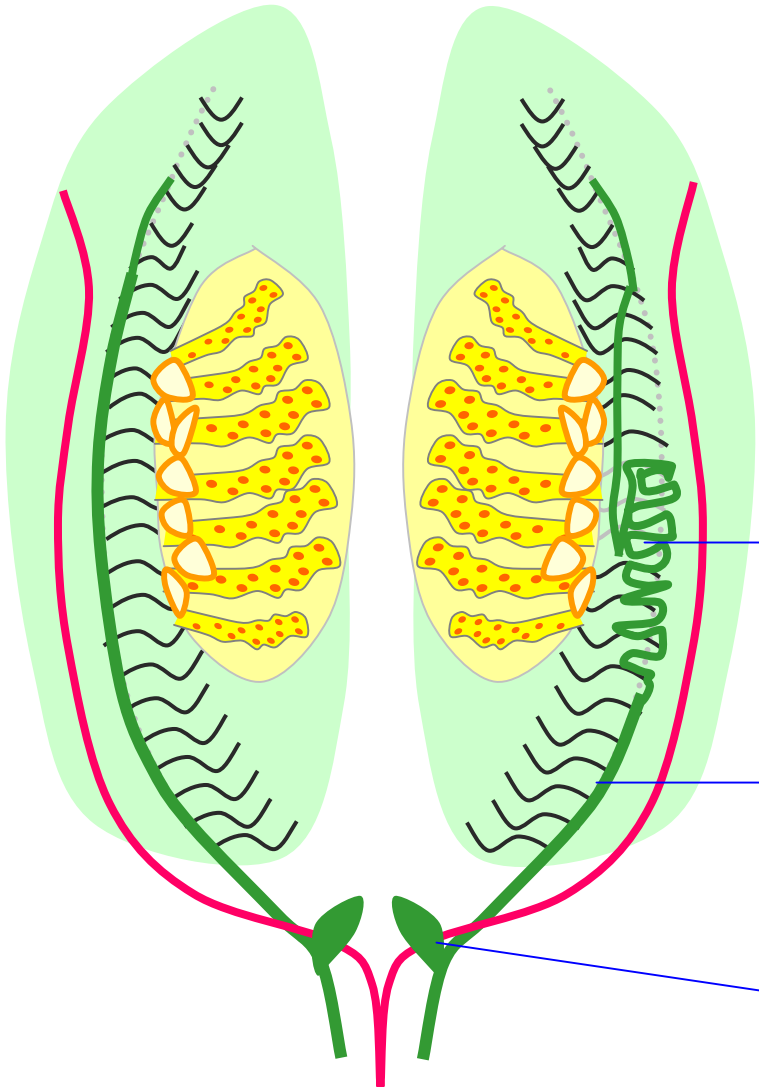


The parmesonephric ducts



* Develop as invaginations from the epithelium lining the urogenital ridges
    * Grow lateral to the mesonephric ducts
    * Cross ventral to the mesonphric ducts
* Fuse caudally in the midline
* The fused caudal tip projects on the posterior wall of the urogenital sinus

The male genital duct system is derived from the mesonephric tubules and duct



Mesonephric tubules

→ Efferent ductules

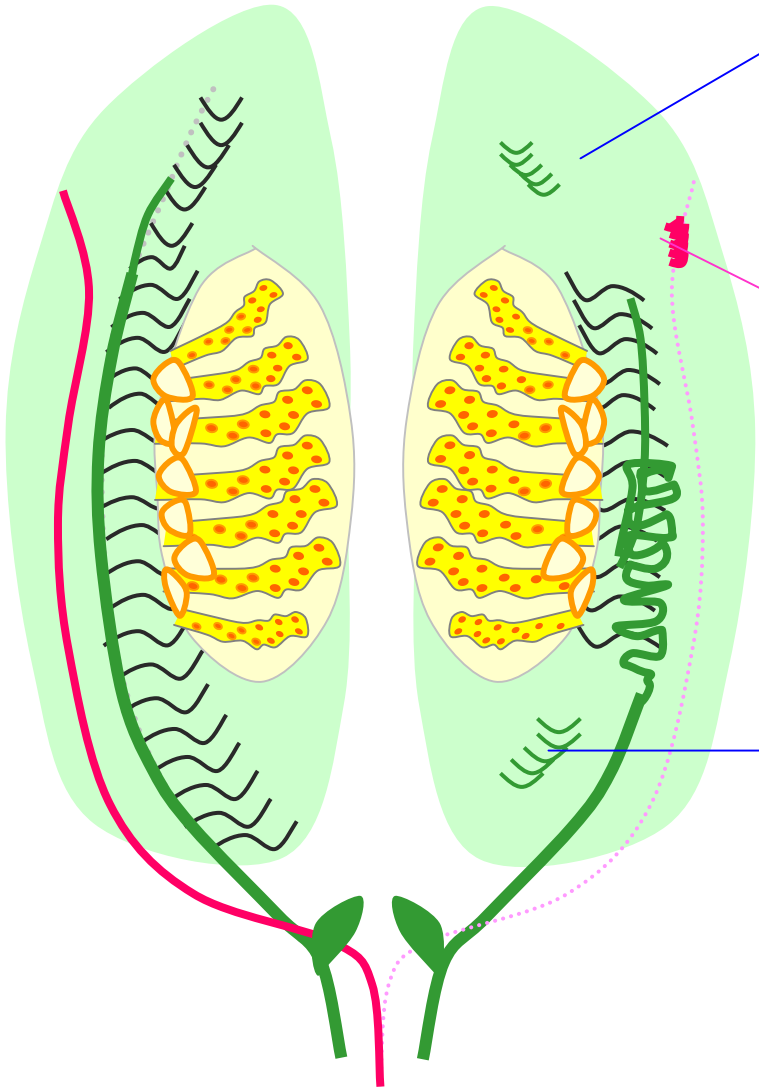
Mesonephric duct

→ Duct of epididymis (coiled)

→ Vas deferens (muscular)

→ Seminal vesicles

Some vestigial structures remain



Cranial mesonephric tubules

→ Appendix epididymis

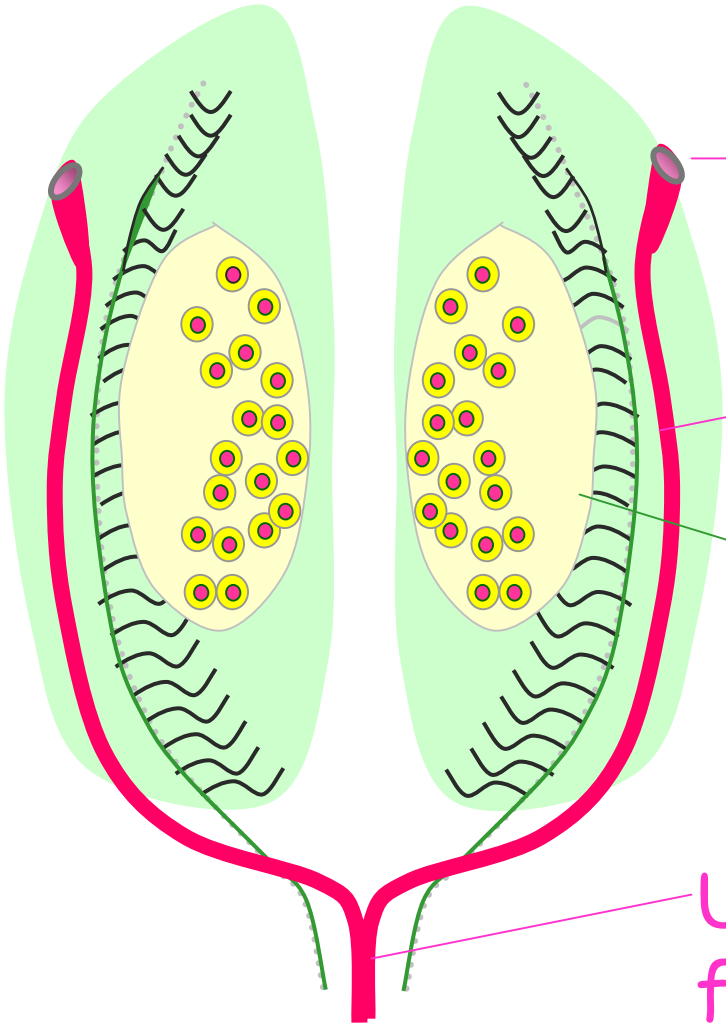
Parmamesonephric duct (cranial end)

→ Appendix testis

Caudal mesonephric tubules

→ Paradidymis

The female genital duct system is derived from the paramesonephric duct



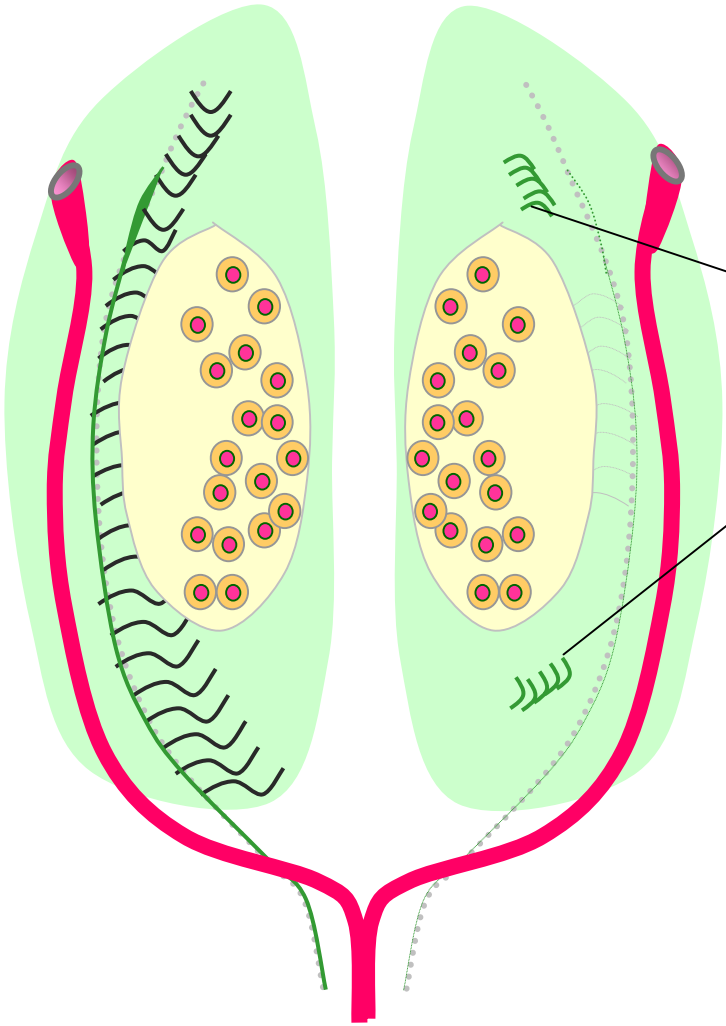
Fimbriated end of uterine tube

Uterine tube

Broad ligament with ovary in posterior wall

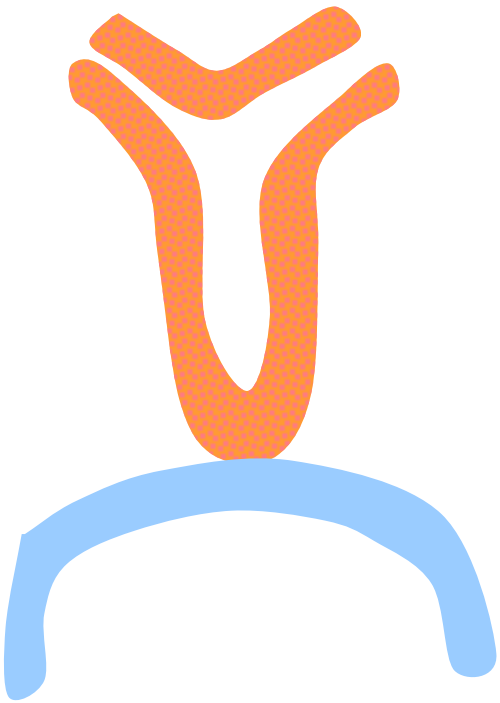
Uterus - body & cervix from fused paramesonephric ducts

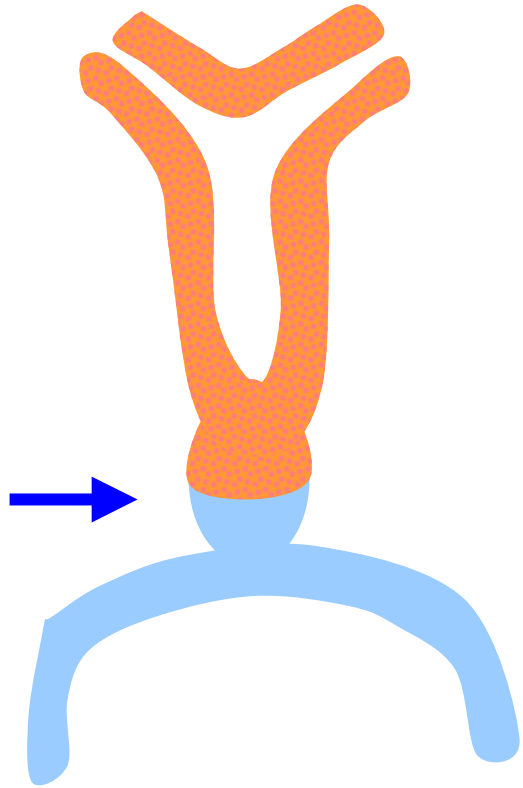
Vestigial structures derived from the mesonephric duct in the female



Epi-oophoron &
Para-oophoron in
broad ligament

The uterus is formed from the fused paramesonehric ducts, which contact the urogenital sinus





At the point of contact a sinu-vaginal bulb arise by cell proliferation from the paramesonephric duct and urogenital sinus

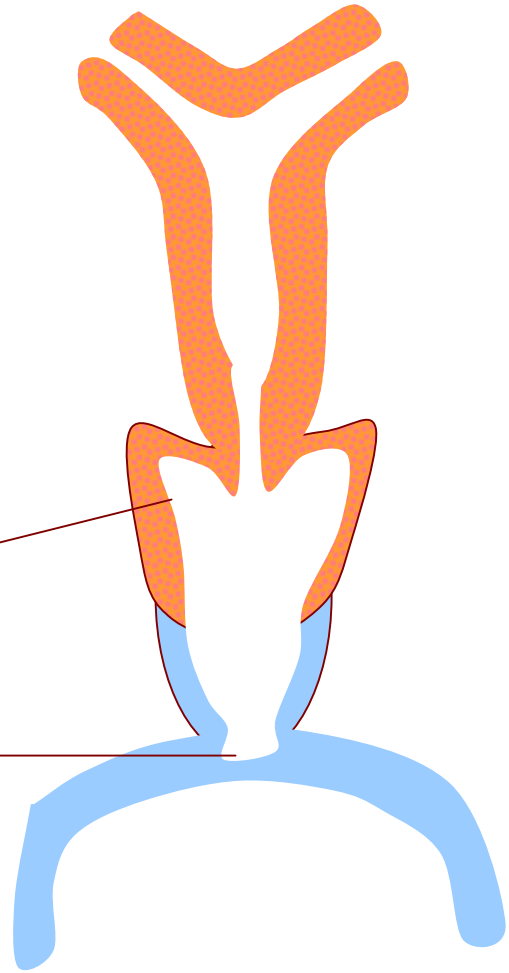
Development of the vagina

- Proliferation gives rise to the vaginal plate.

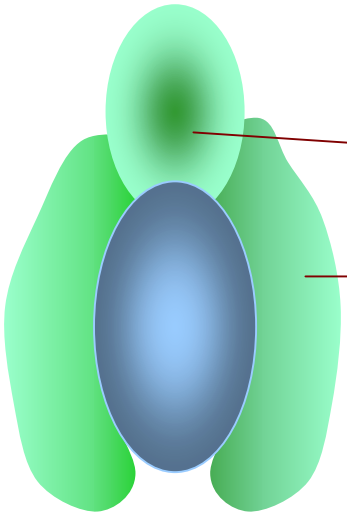
- Canalization of the vaginal plate occurs in the 4th month.

- The vaginal fornices form.

- The hymen remains as a thin plate between the vagina and urogenital sinus



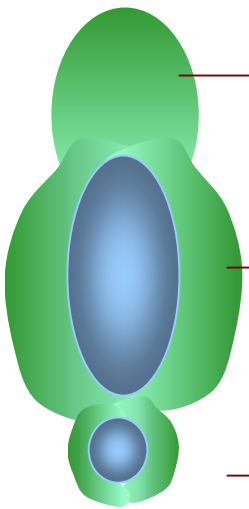
Mesodermal thickenings around the cloacal membrane



a genital tubercle cranially

Paired cloacal folds laterally

After separation of urogenital sinus by the urorectal septum

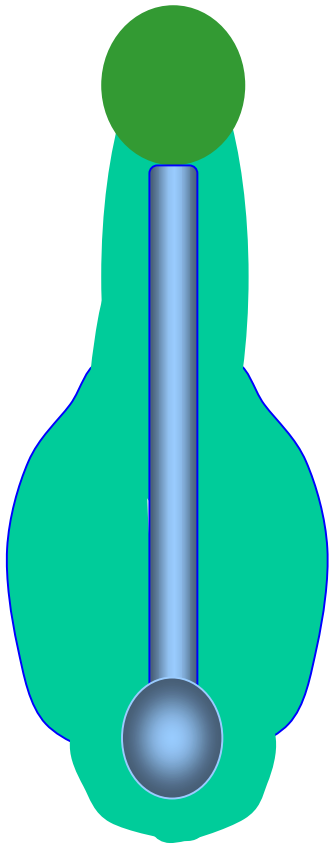


Genital tubercle

Urethral folds

Anal folds

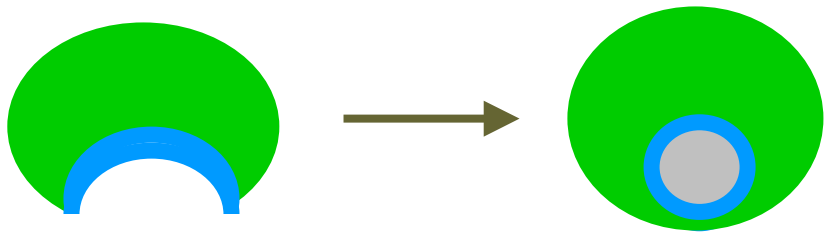
In the male

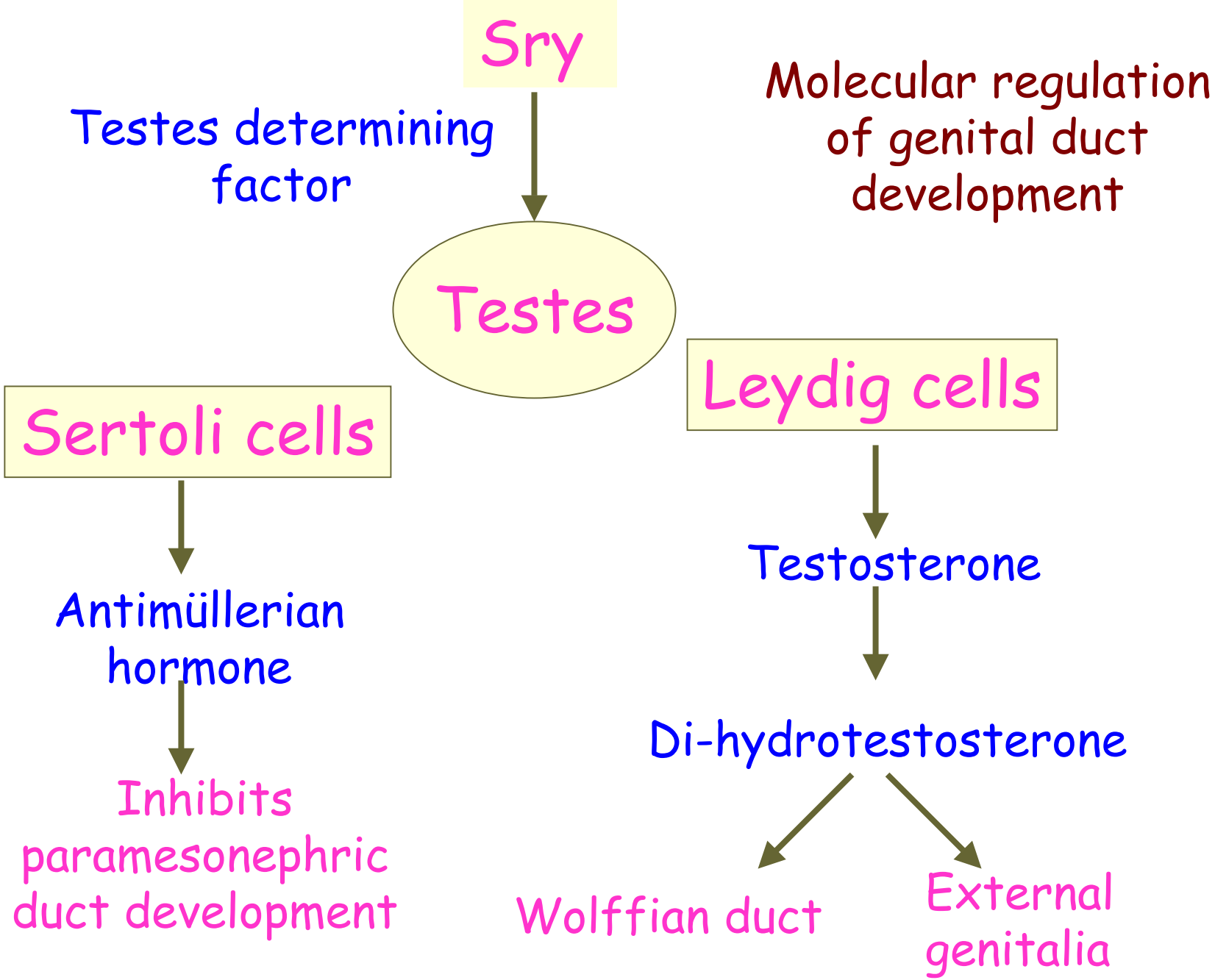


The genital tubercle (phallus) elongates

A solid cord of urogenital sinus epithelium (urethral plate) grows on its ventral surface

The urethral plate deepens to forms a urethral groove and a urethra




Sry
Testes determining factor
Molecular regulation of genital duct development
Testes
Sertoli cells
Leydig cells
Antimüllerian hormone
Testosterone
Inhibits paramesonephric duct development
Di-hydrotestosterone
Wolffian duct
External genitalia

Congenital anomalies in females

- Ovarian Dysgenesis
- Rudimentary uterus
- Bifid uterus
- Septate uterus
- Imperforate hymen

Congenital anomalies in males

- Testicular agenesis (rare)
- Undescended testes
- Hypospadias

Hypospadias

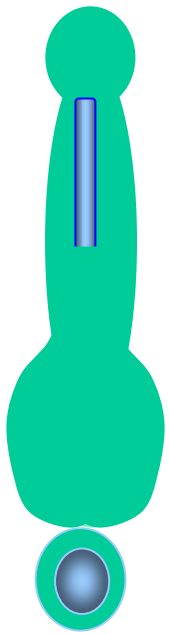
Defect of closure of the urethral groove

The commonest anomaly of the male genital system

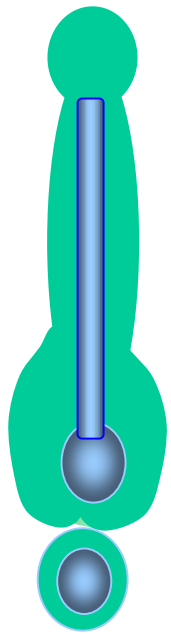
Three levels of abnormality

coronal

penile



Perineo-scrotal



The ureteric bud and metanephric blastema exert inductive effects on one another.