

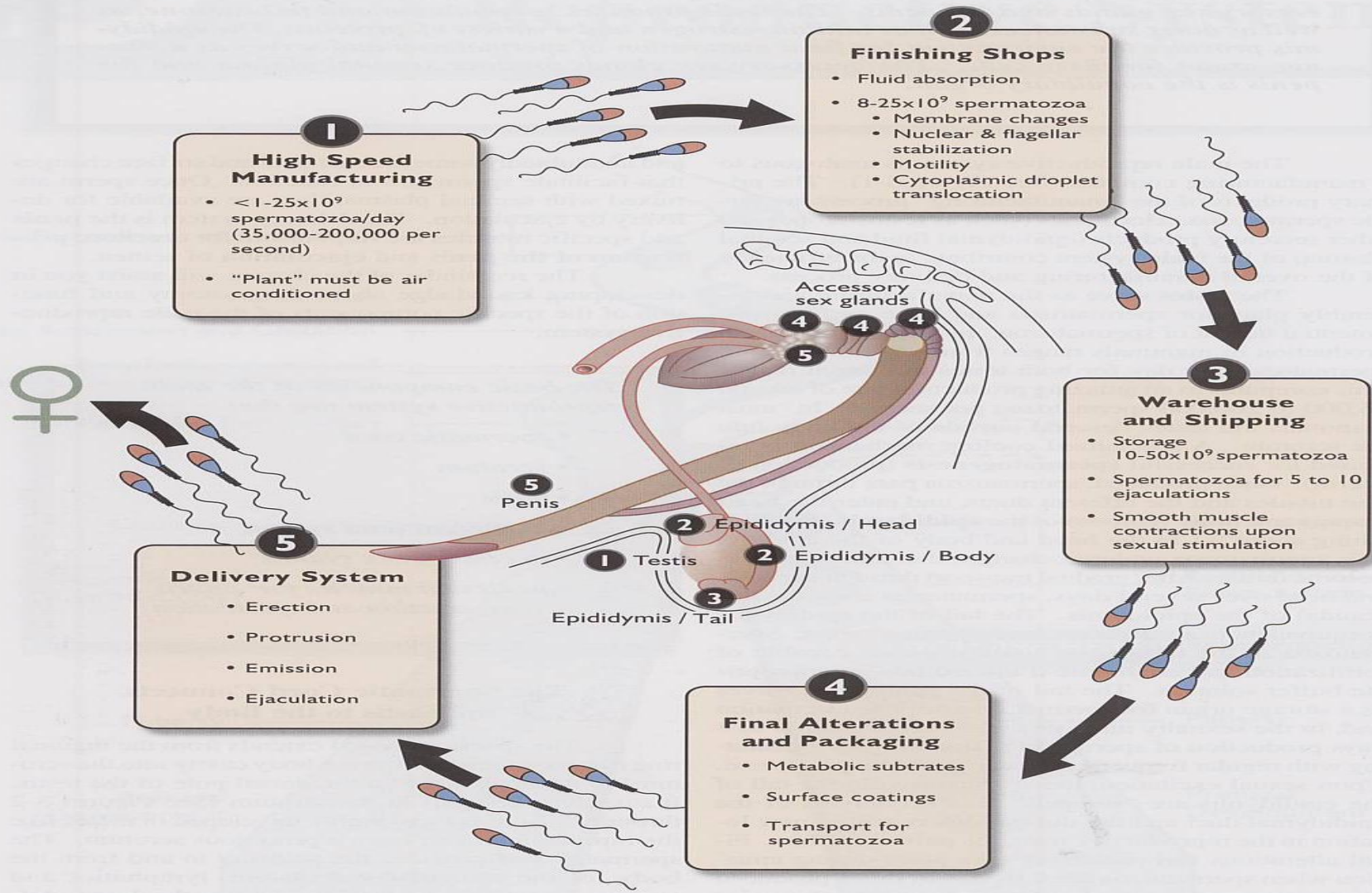
Development of Male Reproductive System

Outline of Male Reproductive System

- Gonads – Paired Testicles
- Spermatic Cord & Scrotum
- Execurrent Duct System/Male Reproductive Tract
Seminefrous tubules – Rete testes – Efferent Ductules – Epididymis > Ductus Deference > Urethra
- Accessory sex glands
Ampulla, Vesicular Gld, Prostate Gld, Bulbo-urethral Gld, Urethral Gld)
- Copulatory organs (Penis and Prepuce)
- **Supportive structures (Muscles, Blood &**

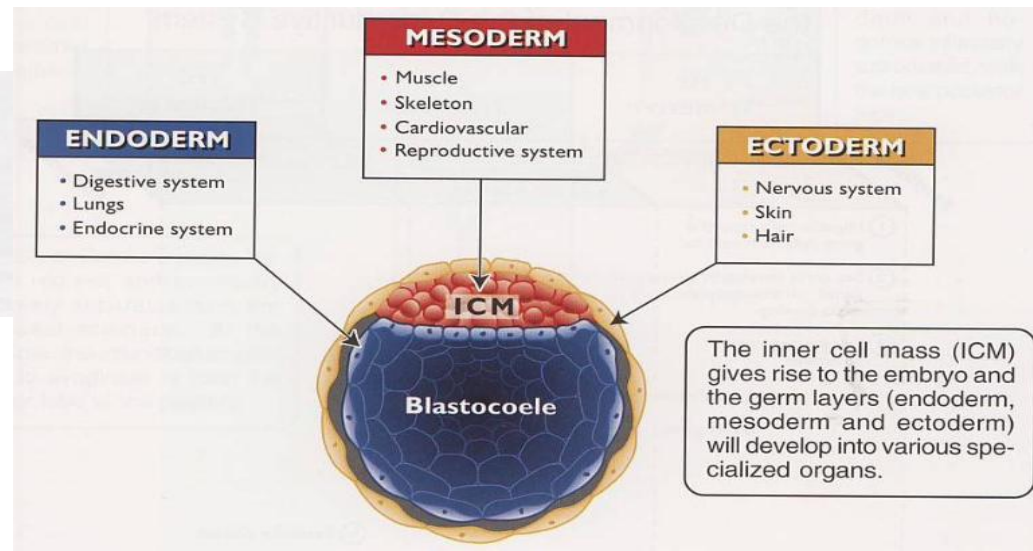
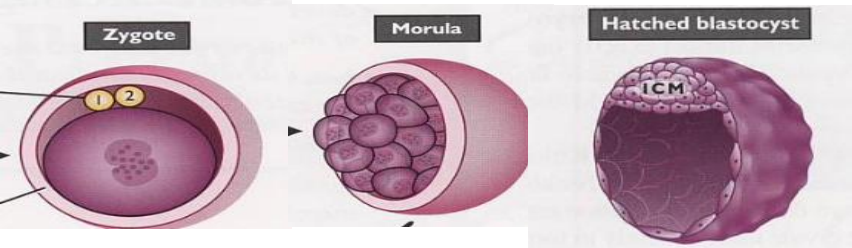
Cont ...

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Development of MRS

- Sex – Genetic Sex (GS), Morphological/Somatic Sex (SS), Behavioral Sex (BS)
- GS determined at fertilization based on the Sex Chromosome of Spermatozoa (X/Y) -
- Differentiation of SS (morphological) occurs during **Embryonic development**
- Fertilization - (**Zygote** – **XX/XY**) - Cleavage - **Morula**
– Trophoblast/ ICM formation - **Blastocyst** – Hatching
– Organogenesis



Cont ...

- Embryonic development of Reproductive and Urinary Systems occurs in close association

- **Early Embryo - Undifferentiated /Sexually Indifferent**

Primitive/Gonadal Ridge – primary sex chords (PSC) & interstitial cells – found medial to early kidney (**mesonephros**) under dorsal body wall - can develop in to testicle or ovary

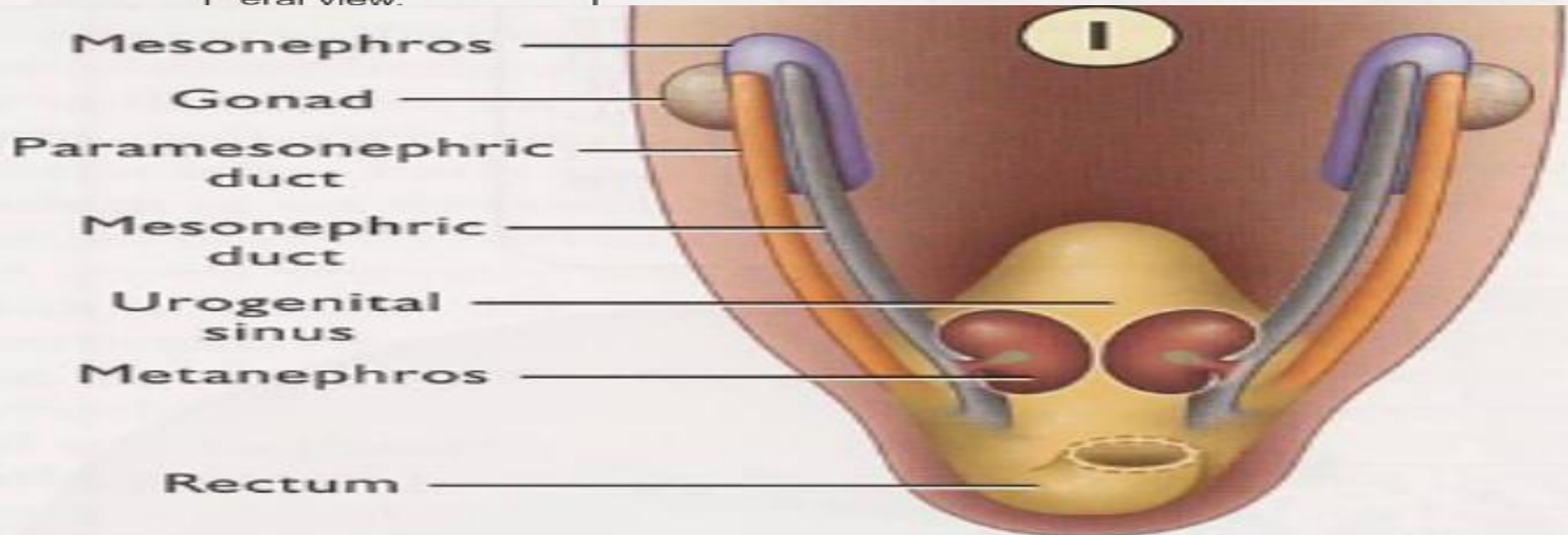
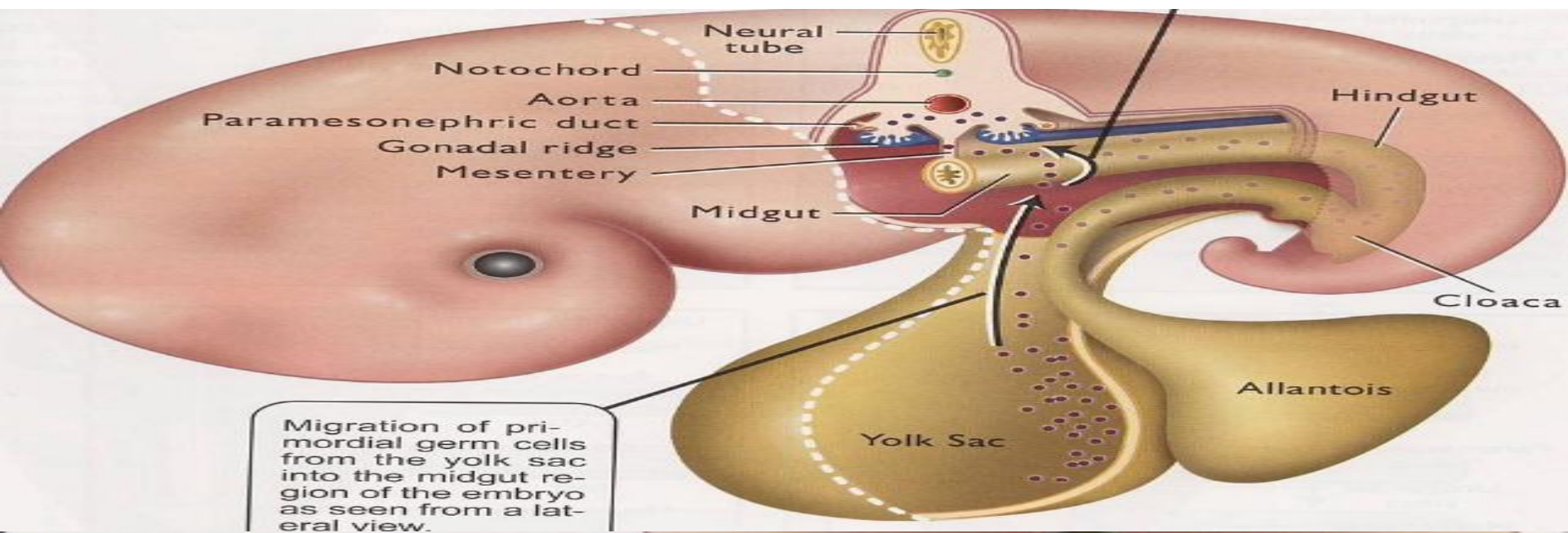
2 primitive duct systems - **Mesonephric** (Wolfian) and **Paramesonephric** (Mullerian) Ducts

Urogenital Sinus – Genital Tubercle, Genital Swelling & Urethral folds

- **Differentiation of Morphological Sex**

Timing –15% in to gestation length - 24 days (dog), 28 (cattle) – complete towards end of embryonic development (45 days cattle)

Embryonic Development of MRS



Cont ...

- PGCs – precursors of future gametes (spermatozoa or Oocyte) – Continuously dividing & increasing in number (millions)
- PGCs stimulate proliferation of CT & enlargement of primitive ridge
- If embryo carries Y chromosome (SRY gene) – **Testes Determining Factor (TDF)** – differentiation of **testes – stimulate male genital**
PSC – Seminiferous tubules & Rete testis,
PSC wall cells – Sertoli cells – produce Mullerian Inhibiting Hormone/Substance (MIH/S) - Regression of paramesonephric /Mullerian ducts
Interstitial cells – Leyding cells – produce Androgens – Development of Messonephric/Ducts & urogenital sinus structure



Male

XY Chromosomal Pair

Relative Percent of Elapsed Gestation

20%

Testis determining factor (TDF)

Testes develop

Sertoli cells secrete
anti-müllerian hormone (AMH)

27%

AMH causes leydig
cells to differentiate

Degeneration of
paramesonephric duct

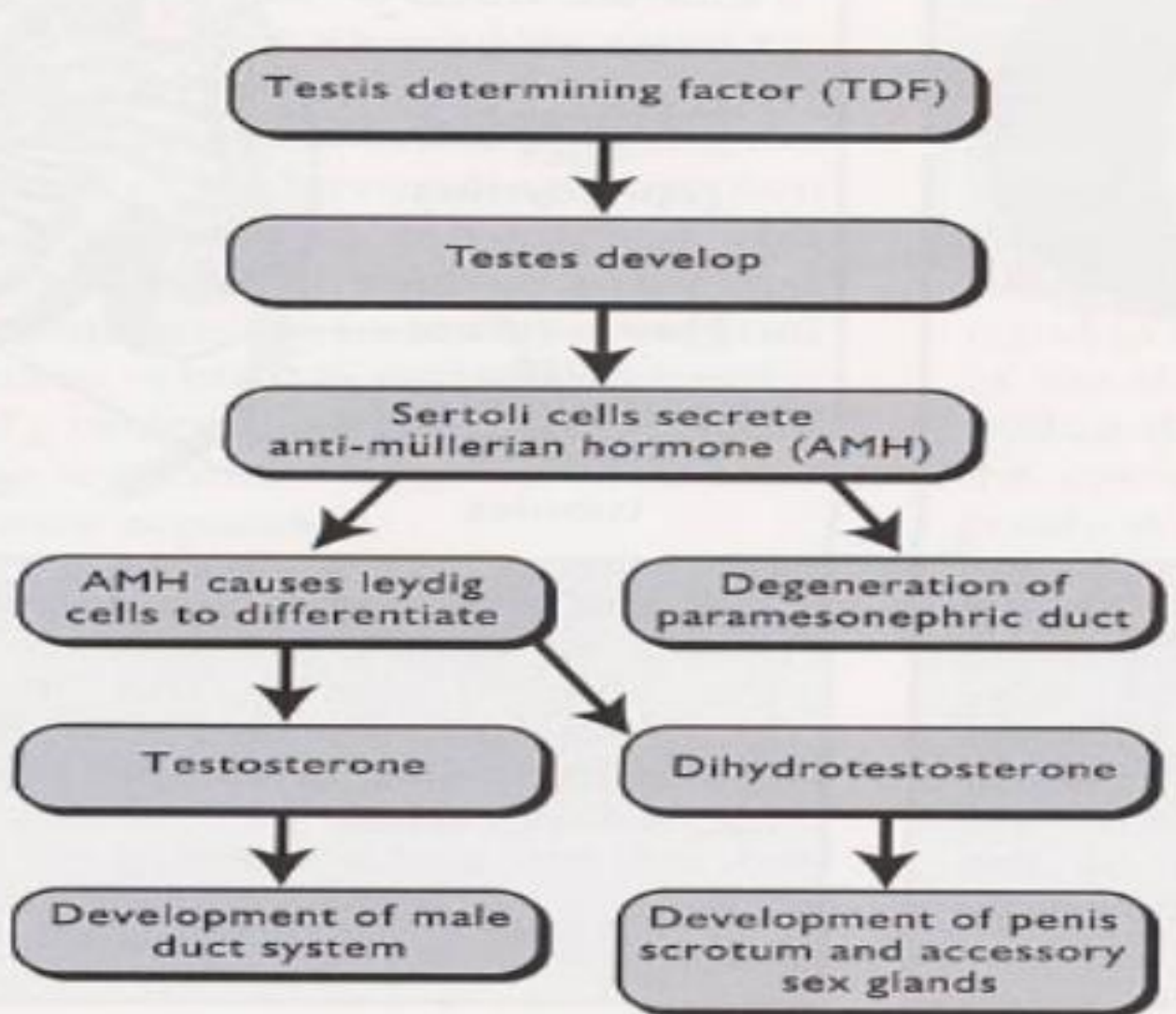
Testosterone

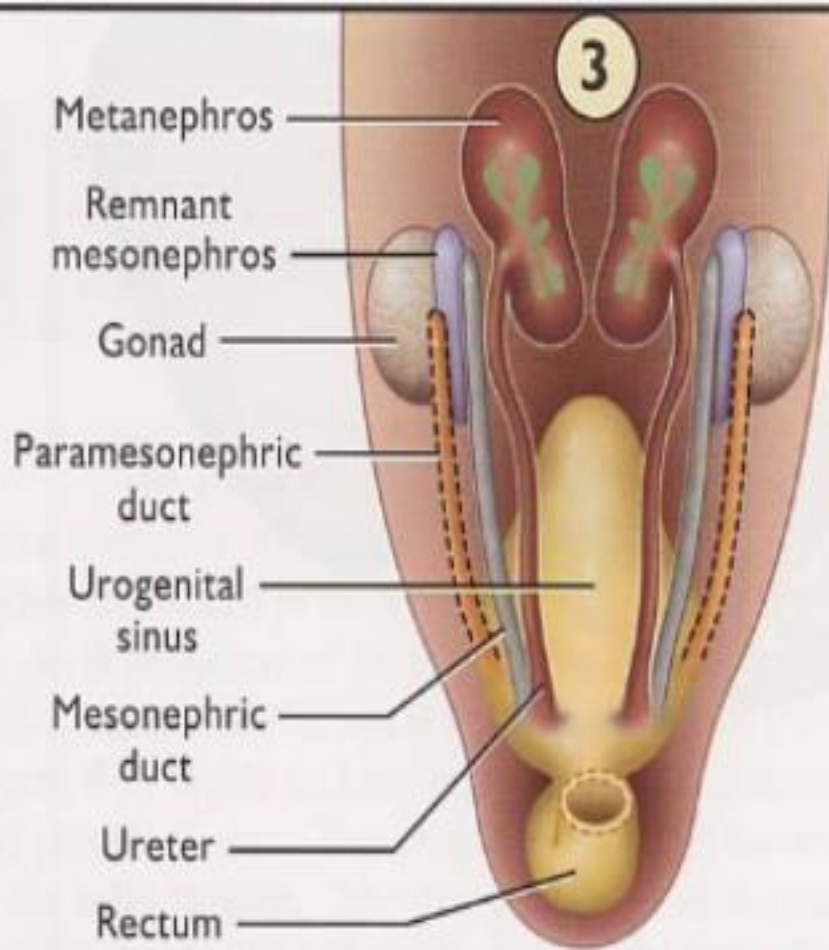
Dihydrotestosterone

33%

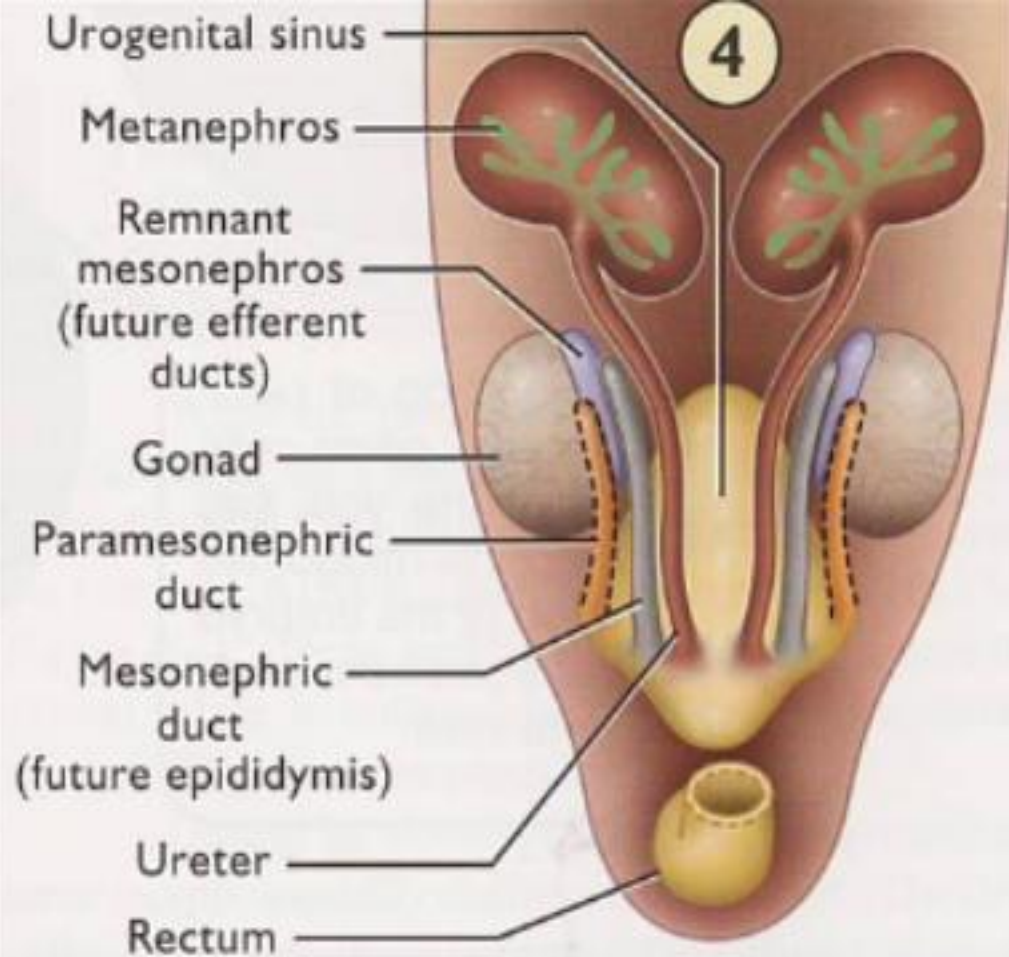
Development of male
duct system

Development of penis
scrotum and accessory
sex glands





The gonad continues its enlargement as does the metanephros. The metanephric duct will become the ureter.



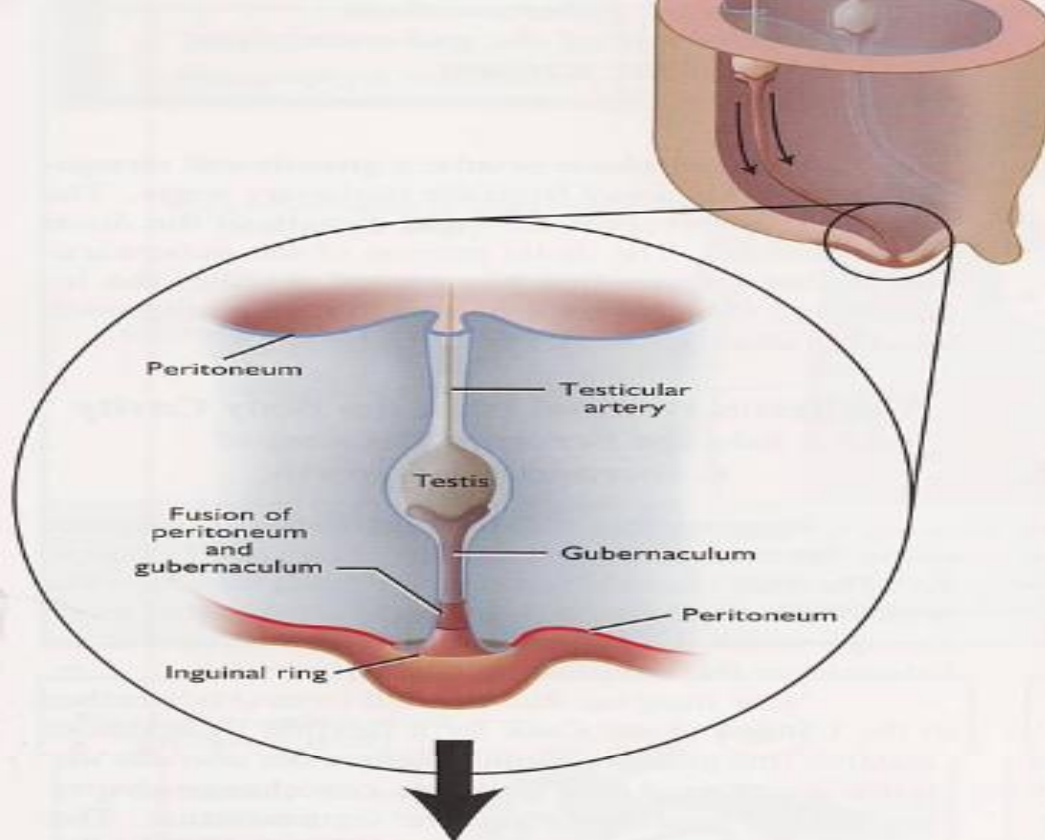
The metanephros becomes fully functional and the gonad becomes larger, while the mesonephros has almost completely regressed. In the male, some of the mesonephric tubules will form the efferent ducts and the mesonephric duct will form the epididymis and the ductus deferens. The paramesonephric ducts degenerate in the male.

Cont ...

- Distal portion of Mesonephric/ Wolfian Duct -vesicular gland
- Urogenital sinus - future bladder urethra, prostate and bulbo urethral glands
- Genital tubercle - elongated in to the phallus / penis
- Genital swelling - Scrotum
- Urethral fold - penile urethra

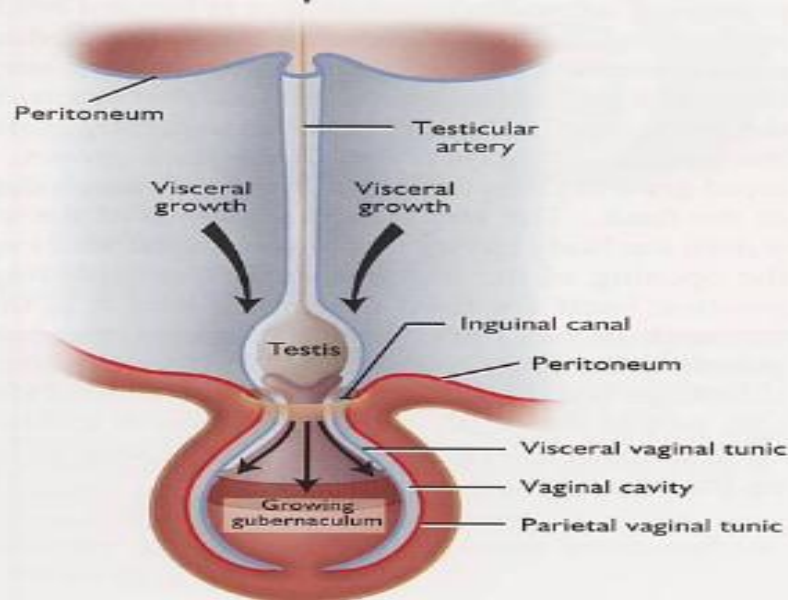
Descent of the testes

- Testis formed in abdominal cavity then descend in to the scrotal sack (**Exceptions – Birds, Elephants, Some Marsupials**)
- This descent from abdominal cavity via **Inguinal Ring/Canal** in to scrotum occurs **Before or After birth**, depending on species.
- Half gestation-** Bull and Ram: **Last quarter-** Boar; **After birth-** Stallion; **After birth-** dogs
- Testicular descent is made possible by **rapid growth and subsequent regression of the gubernaculum (ligament)**
- As each testicle descends in to scrotal sac it takes with it the peritoneal lining of the abdominal cavity.



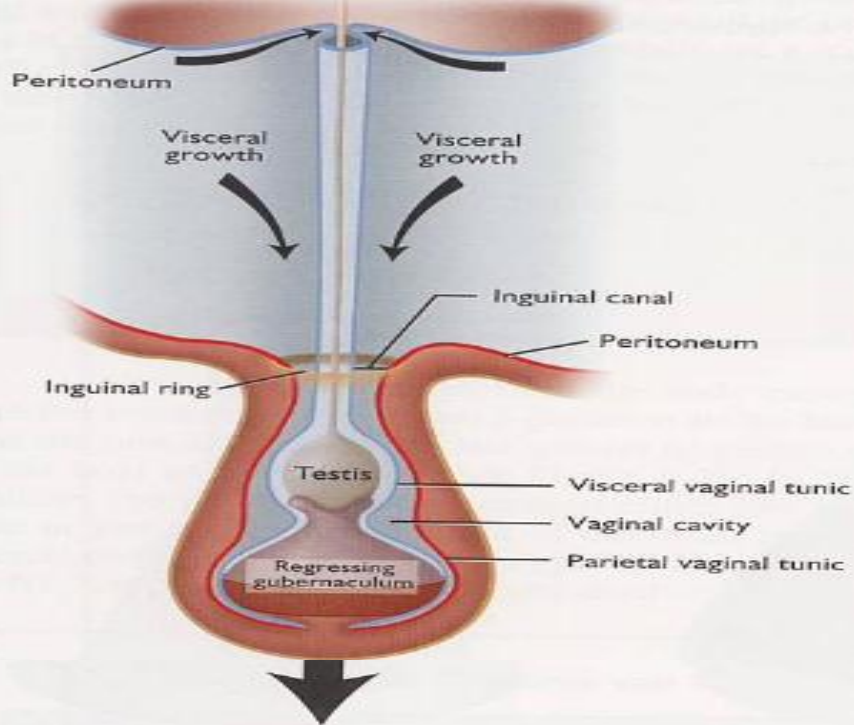
Step 1

Before descent occurs, the testes lie in a retroperitoneal position and are attached caudally to the ligamentous gubernaculum. Cells of the peritoneum infiltrate the gubernaculum in the inguinal region and form a junction with it. This fusion is important because it binds the peritoneum to the gubernaculum and will allow the vaginal process to form as the distal gubernaculum grows toward and into the scrotal region.



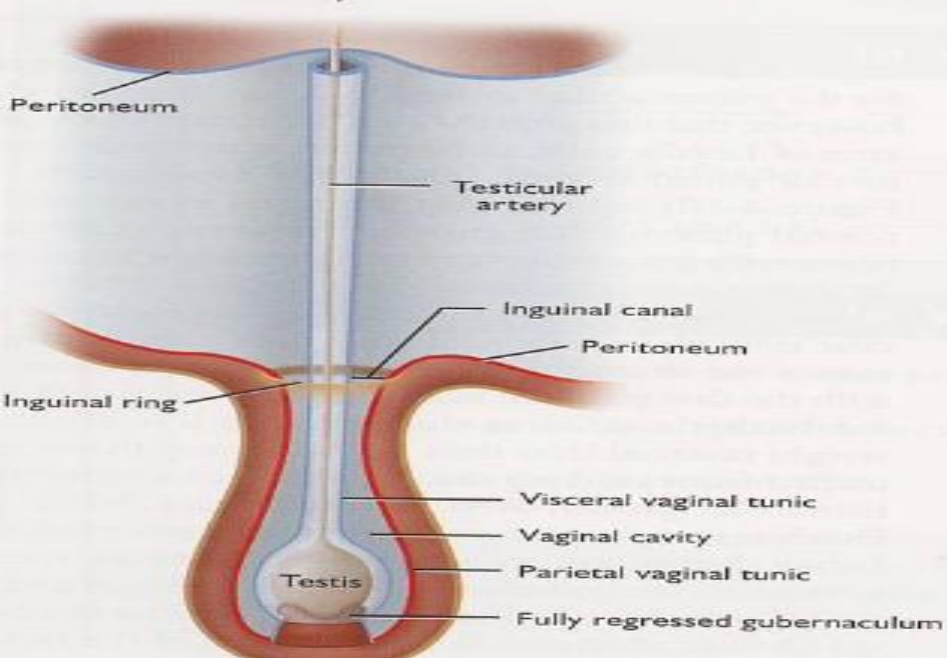
Step 2

After the gubernaculum penetrates the inguinal ring, there is rapid growth of the distal gubernaculum. This rapid growth of the gubernaculum in the scrotal region is the "force" responsible for mechanically moving the testes into the inguinal canal.



Step 3

Once the testes are in the inguinal region, they are moved through the inguinal opening because of regression of the gubernaculum. Also, it is possible that the pressure associated with visceral growth helps "push" the testis or at least hold it near the inguinal ring.



Step 4

The gubernaculum continues to regress. As this regression occurs, it continues to move the testes deeper into the scrotum and cause a complete encapsulation of each testis by the inner layer of the peritoneum known as the visceral vaginal tunic. The outer layer of the peritoneum is the parietal layer of the vaginal tunic. When the testis has fully descended, the gubernaculum has regressed to a small knot that attaches the testis to the bottom of the scrotum. The vaginal process contributes to the two tunicae of the testis. The inner (visceral) layer covers the testis, epididymis and spermatic cord and the outer (parietal) layer forms a continuous fold that lies directly adjacent to (but is not attached to) the visceral vaginal tunic. Together these two layers form the vaginal cavity (vaginal process).