

# Embryology Team



## *Development of the Urinary Bladder and Urethra*

Team Members:

1-Nawaf Modahi

2-Abdulrahman Ahmed Al-Kadhaib

3-Khalid Al-Own

1- Sara Al-Mutairi

2-Nora Al-Refai

3-Sara Al-Khelb

✚ *Anomalies* and everything labeled as **important** is of course **important**.

✚ the questions in the last page are **very important**.

# Objectives

**At the end of the lecture the student is able to;**

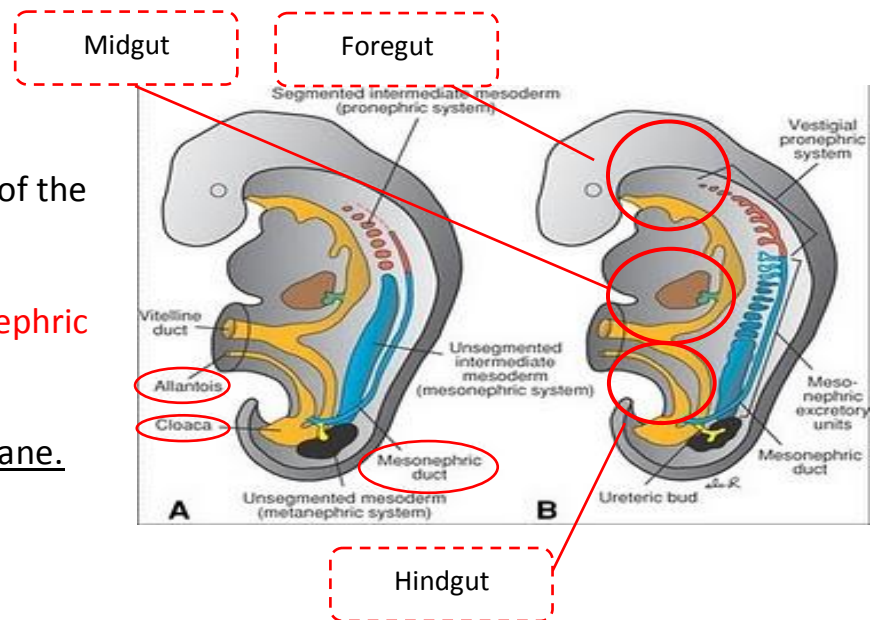
- Describe the cloaca and the formation of the urogenital sinus.
- Discuss the division of the urogenital sinus into various parts and name the adult organs that are derived from each part.
- Describe how the caudal parts of the mesonephric ducts and ureters are absorbed into the urogenital sinus and the significance of this embryonic event.
- Discuss the position of the urachus and its significance and fate.
- Describe the various anomalies concerned with the urinary bladder and urethra.

# Cloaca

The cloaca is the dilated terminal part of the **hind gut**.

It receives the **allantois** and the **mesonephric ducts**.

Its floor is closed by the cloacal membrane.



- Allantois + mesonephric duct = in Cloaca
- hind gut : large intestine
- Mesonephric ducts are parts of urogenital sinus

Cloaca is divide by mesodermal urorectal septum into

**Ventral Part**  
the primitive urogenital sinus that communicates with the allantois and the mesonephric ducts.  
  
Its floor is the urogenital membrane.

**Dorsal part**  
forms the rectum and upper part of anal canal.  
\*Its floor is the anal membrane.

- The dorsal part of the Cloaca is continuous with midgut
- Mesoderm : Up = ventral > urogenital system , Down = dorsal > anorectal system down  
so the cloacal membrane divides into urogenital membrane (ventral) and anal membrane (dorsal).

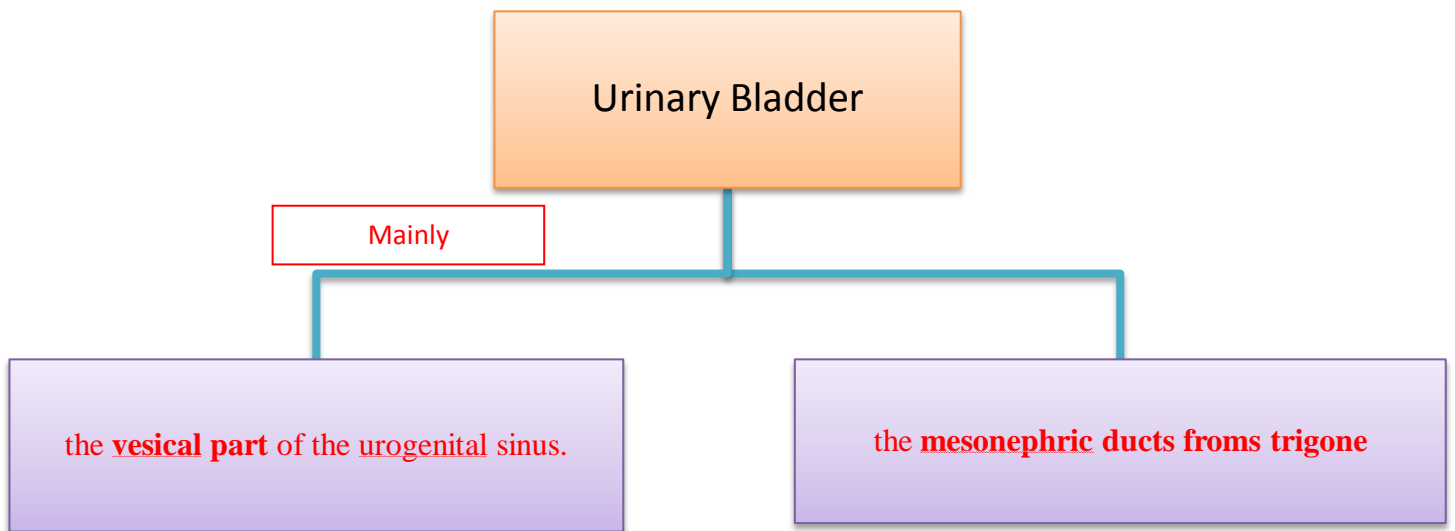
### Primitive urogenital

A cranial; vesical part; forms most of the bladder and continuous with the allantois.

A caudal; phallic part grows towards genital tubercle.

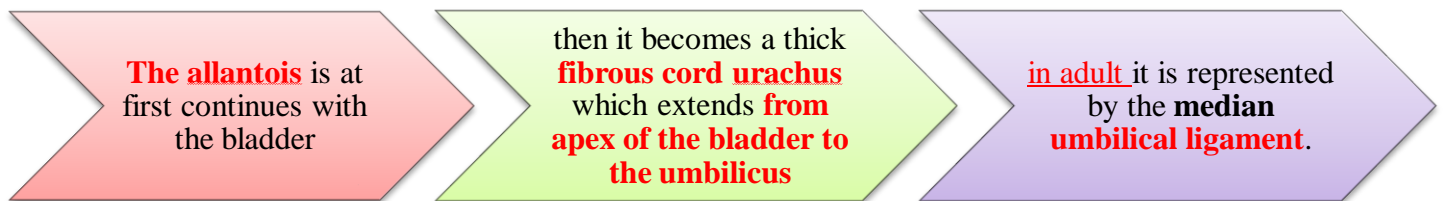
A middle; pelvic part; forms main part of male urethra and entire female urethra.

Phallic part gives the genital system.



**IMPORTANT:**

- ❑ The **epithelium** is **endodermal** in origin. ( bladder originates from endoderm )
- ❑ The **other layers** are derived from **the splanchnic mesoderm**. (surrounding muscles and blood vessels )
- ❑ The **apex of the bladder** is formed from the proximal part of allantois



**IMPOTANT:**

In **infants and children** the bladder is an **abdominal organ**, it begins to enter the greater pelvis at about 6 years and becomes a **pelvic organ** until **after puberty**.

After absorption of the **mesonephric ducts** to form the trigone, the **ureters** open separately in the bladder.

- Trigon = posterior wall = base of the urinary bladder
- First abdominal > then in adults It becomes one of the pelvis organs
- urachus → median umbilical ligament

## Urethra

### Indifferent stage ;

- The **genital tubercle** (mesenchymal elevation) develops at the cranial end of the cloacal membrane.
- **Two urethral folds**, develop on either side of the urogenital membrane.
- Laterally **two labioscrotal** folds develop on either side of the urethral folds.
- **Two urethral folds in male** fuse with each other to **close** the penile urethra.
- **Two urethral folds in female remain separate** to form labia minora.

## Female Urethra

The external urethral orifice opens dorsal to the glans clitoris.

### IMPORTANT:

The entire female urethra is derived from endoderm of the pelvic part of the urogenital sinus. The phallic part degenerates

## Male Urethra

The **genital tubercle** elongates forming the phallus, which is the precursor of the penis.

### IMPORTANT:

Most of the male urethra : **prostatic, membranous and spongy parts** is derived from endoderm of the pelvic part of urogenital sinus.

**The distal part of male urethra in glans penis** starts as **ectodermal** solid cord that grows towards the root of penis to meet the spongy urethra , later it canalizes.

- The genital tubercle forms the head of the penis in males and the clitoris in females
- Urethra : the cranial end of the cloacal membrane
- folds in male : close , folds in female remain separate .
- Genital tubercle at the cloacal membrane → urogenital membrane→2 urethral folds
- Fold = swelling

## Anomalies

- **Urachal anomalies**
- **Urethral anomalies**
- **Exstrophy of the bladder** (Ectopiae vesica); exposure **of the posterior wall of the bladder** due to a defect in the anterior abdominal wall and anterior wall of the bladder.

## Urachal anomalies

**A, Urachal cyst**, persistence or remnant of epithelial lining of urachus.

**B, Urachal sinus**, **discharge serous fluid** from the umbilicus.

**C, Urachal fistula**, the entire urachus remains patent and allows **urine to escape from the umbilicus**.

## Urethral Anomalies

**1-Hypospadias** : is the **most common** anomaly, with **incomplete fusion of the urethral folds**, and abnormal openings of the urethra occur along the **ventral (inferior)** aspect of the penis. hypo (common) = inferior = ventral

**2-Epispadias** : is a **rare** abnormality, in which the urethral meatus is **found on the dorsum of penis**, it is most often **associated with exstrophy of the bladder**. epi (rare) = superior = dorsal

- Ectopiae vesica = trigone

**Urachal cyst** : below umbilicus + tissue form a cyst

**Urachal sinus** : cyst + infection > sinus > discharge > opens into umbilicus

**Urachal fistula** : a canal between + opens out (there is no formation of any fibrous tissue)

**\*VERY IMPORTANT ( in general ):**

- The **trigone** (= posterior wall of bladder = base of urinary bladder ) is derived from the absorbed caudal ends of the **mesonephric ducts**.

- The **urethra in glans penis** (the last part of male urethra ) is developed from :The **ectoderm**.

- **Main urethra in male : middle pelvic part**

- caudal **phallic part** grows towards **genital tubercle**.

- Important slides : 5-6

# Questions

Q1: The urinary bladder is mainly formed from:

- A) Pelvic part of urogenital sinus
- B) Vesical part of urogenital sinus
- C) Phallic part of urogenital sinus
- D) All of the above

Q2: Male urethra is formed by:

- A) Pelvic part of urogenital sinus
- B) Phallic part of urogenital sinus
- C) Ectoderm
- D) All of the above

Q3: Female urethra is formed by:

- A) Pelvic part of urogenital sinus
- B) Phallic part of urogenital sinus
- C) Ectoderm
- D) All of the above

Answers :

B,D,A

# Dr. Sanaa questions

1. The urinary bladder is mainly developed from :

- a. Vesical part of the urogenital sinus.
- b. Pelvic part of the urogenital sinus.
- c. Pallic part of the urogenital sinus.
- d. Allantois.

2. Which one of the following forms the entire female urethra ?

- a. Genital tubercle.
- b. Allantois.
- c. Vesical part of the urogenital sinus.
- d. Pelvic part of the urogenital sinus.

4. The trigone of the urinary bladder is developed from :

- a. Paramesonephric ducts.
- b. Mesonephric ducts.
- c. Allantois.
- d. Urogenital sinus.

5. The urethra in glans penis is developed from :

- a. The vesical part of urogenital sinus.
- b. The pelvic part of urogenital sinus.
- c. The ectoderm.
- d. The splanchnic mesoderm.