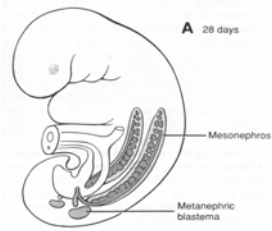


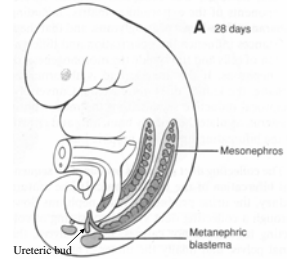
Mesonephros - in humans

- The Mesonephros first appears early in week 4
- In thoracic and lumbar segments of intermediate mesoderm.
- Urine is produced and drains along the mesonephric (Wolfian) duct to the cloaca/bladder
- In week 5 the thoracic segments regress but the mesonephric kidney continues functioning until week 10 to 12



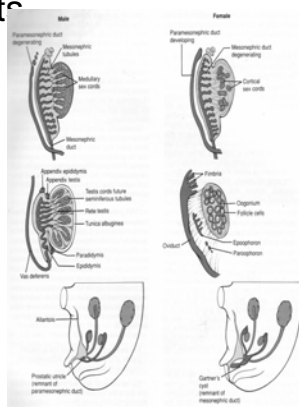
Metanephros – definitive kidney

- The metanephros or definitive kidney of higher vertebrates, begins when the metanephric ducts (ureteric buds) sprout from the distal end of the mesonephric duct at about 5 weeks.
- The ureteric buds induce intermediate mesoderm in the sacral region to form a metanephric blastema which forms the glomeruli and tubules of the nephrons.



Fate of the mesonephric (wolfian) ducts

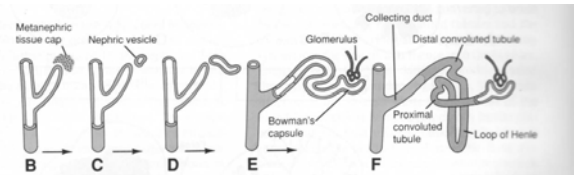
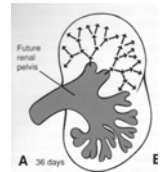
- The development of the metanephric kidney accompanied the changes in the reproductive system.
- The gonads of primitive vertebrates release their eggs and sperm into the coelom, from there they pass via small pores into the cloaca.
- In higher vertebrates the eggs are still released into the coelom, but the cloacal pores have become specialised uterine tubes which open adjacent to the ovary.
- In the embryo, this egg collecting tube (paramesonephric duct) lies parallel to the mesonephric duct.



Evolution of the Kidneys:

Metanephros

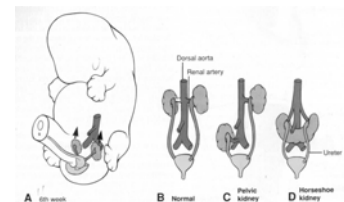
- The ureteric buds bifurcate again and again to form the calyces and collecting duct system of the definitive kidney.
- The kidneys begin producing urine by week 12, and it adds to the volume of the amniotic fluid. The fetus drinks this fluid *in utero*.
- The fetal kidneys are not responsible for excretion as the placenta serves this function



Male and Female genital ducts

- Initially both sexes have both mesonephric and paramesonephric ducts
- In females
 - Eggs are still released into the coelom (peritoneal cavity) but are gathered up in the uterine tubes.
 - The two paramesonephric ducts become the uterine tubes.
 - Distally the paramesonephric ducts fuse together to form the uterus and vagina.
 - The mesonephric duct degenerates completely.
- In higher vertebrates sperm is never released into the coelom but reaches the outside by passing through some derivative of the urinary system. In birds, reptiles and mammals the testis develops a connection with the mesonephric duct (at the time that the mesonephros is degenerating).
- In males
 - The mesonephric duct becomes the ductus deferens, seminal vesicle and parts of the prostate gland.
 - The paramesonephric duct degenerates completely.

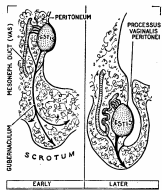
Ascent of the Kidneys



- In the 6th week the kidneys begin to ascend from the sacral region to their position in the upper abdomen.
- The metanephric ducts elongate and become the ureters.
- As the kidney ascends it receives new segmental arteries from the aorta and loses those vessels below ("climbing a ladder"). Thus sometimes there is more than one renal artery.
- Sometimes one kidney fails to ascend => pelvic kidney
- Sometimes the left and right kidneys become attached in the pelvis then the horseshoe kidney can't ascend above the inferior mesenteric artery.

Descent of the Gonads

In both Males and Females the the gonad develops in the upper abdomen, and is connected to the labioscrotal fold by the Gubenaculum. The growth of the fetus (but not the gubenaculum) causes the gonad to be drawn down.

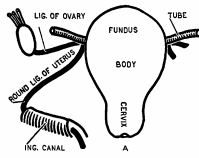


◆ In Males the testis is pulled through the inguinal canal into the scrotum.

◆ In adult males the gubenaculum is only a fibrous strand in the scrotum

◆ In Females the gubenaculum has a side attachment to the uterus so that the ovary is drawn down to lie beside the uterus

◆ In adult females the gubenaculum is represented by the ovarian ligament and the round ligament (which passes through the inguinal canal into the labium major).



Lecture summary

- Ontogeny recapitulates Phylogeny
 - Intermediate mesoderm
 - Pronephros
 - Mesonephros
 - Metanephros
 - Ascent of kidneys
 - Descent of gonads

