



URINARY SYSTEM

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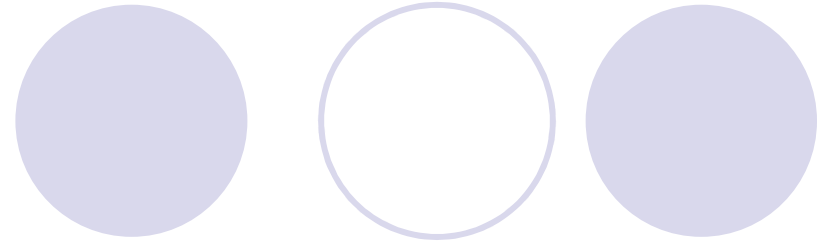
Functions of the urinary system

- Homeostatic regulation of blood plasma
 - Regulating blood volume and pressure
 - Regulating plasma ion concentrations
 - Stabilizing blood pH
 - Conserving nutrients

Organization of the Urinary System

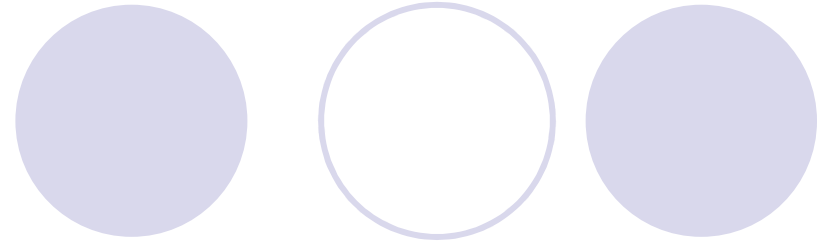
- Kidneys – produce urine
- Ureters –transport urine to bladder
- Urinary bladder - stores urine
- Urethra- transports urine to exterior

KIDNEYS



- FILTRATION
- RESORPTION
- EXCRETION
- Produces 2-2,5 lt of urine from 1700 lt blood/24 hours

KIDNEYS

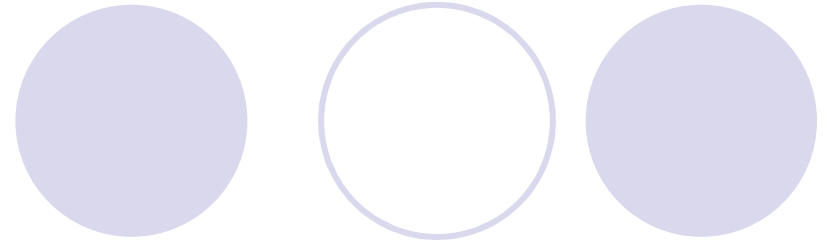
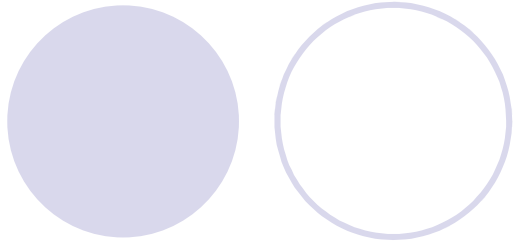


- Located **retroperitoneally**
- Lateral to T₁₂–L₃ vertebrae
- Average kidney
 - 12 cm tall, 6 cm wide, 3 cm thick

Internal Gross Anatomy of the Kidneys



- Frontal section through the kidney
 - Renal cortex
 - Renal pyramids
 - Renal pelvis
 - Major calicies
 - Minor calicies
- Gross vasculature
 - **Renal arteries**
 - Branch into **segmental arteries**



- %20-25 of cardiac output
- 1,2 lt/min – 1700 lt/day
- 170 lt/day glomerular filtrate
- 1,7-2 lt/day urine
- **Renal artery**
 - Abdominal aorta
 - L1-L2



Nephron – The Functional Unit of Kidney

- Nephron consists of:
 - Renal corpuscle
 - Renal tubule:
 - Proximal convoluted tubule (PCT)
 - Loop of Henle
 - Distal convoluted tubule (DCT)
- Nephron empties tubular fluid into a system of collecting ducts and papillary ducts

Renal Corpuscle



- Consists of:
 - Glomerulus – tuft of *fenestrated* capillaries
 - Glomerular (Bowman's) capsule
 - Parietal layer – simple squamous epithelium
 - Visceral layer – consists of podocytes
- Blood travels from efferent arteriole to peritubular capillaries
- Blood leaves the nephron via the efferent arteriole

Glomerulus anatomy



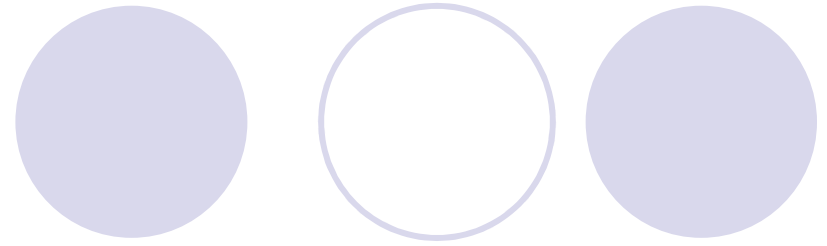
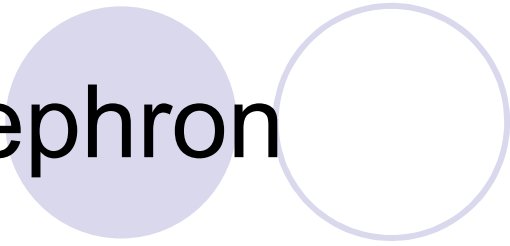
- Podocytes cover lamina densa of capillaries
 - Project into the capsular space
 - Pedicels of podocytes separated by filtration slits

Two types of nephron



- Cortical nephrons
 - ~85% of all nephrons
 - Located in the cortex
- Juxtamedullary nephrons
 - Closer to renal medulla
 - Loops of Henle extend deep into renal pyramids

Nephron



- Proximal convoluted tubule (PCT)
- Loop of Henle
 - Descending limb
 - Ascending limb
 - Each limb has a thick and thin section

Nephron



- Distal convoluted tubule (DCT)
 - Actively secretes ions, toxins, drugs
 - Reabsorbs sodium ions from tubular fluid

Collecting Tubules (Collecting ducts)

- Collecting tubules - Receive urine from distal convoluted tubules

Types Of Capillary Beds In Nephron

- **Glomerulus** - Fed and drained by afferent and efferent arterioles
- **Peritubular capillaries**
 - Arise from efferent arterioles
 - Low-pressure, porous capillaries
 - Absorb solutes
- **Vasa recta**
 - Thin-walled looping vessels
 - Part of the kidney's urine-concentrating mechanism

Mechanisms of Urine Production

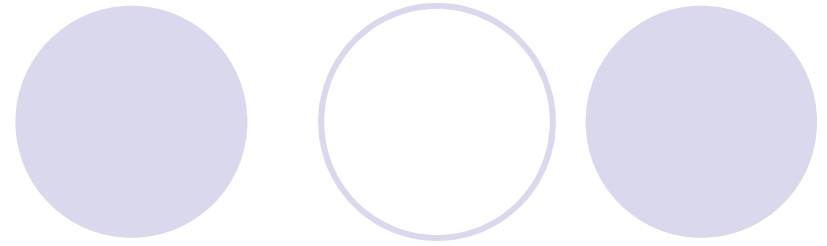
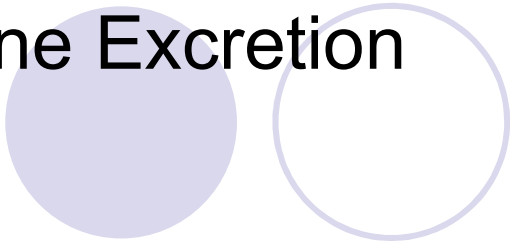
- **Filtration** - filtrate of blood leaves kidney capillaries
- **Reabsorption** – most nutrients, water, and essential ions reclaimed
- **Secretion** - active process of removing undesirable molecules

Summary of Nephron Function



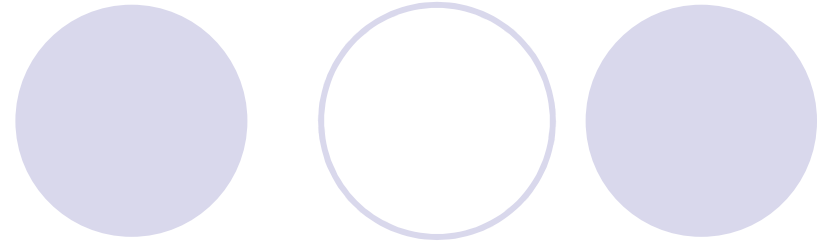
- Each segment of nephron and collecting system contribute
 - Glomerulus
 - PCT
 - Descending limb
 - Thick ascending limb
 - DCT and collecting ducts
- Concentrated urine produced after considerable modification of filtrate

Urine Excretion



- Leaves Collecting System
- Enters renal pelvis
- Rest of urinary system transports, stores and eliminates
 - Ureters
 - Bladder
 - Urethra

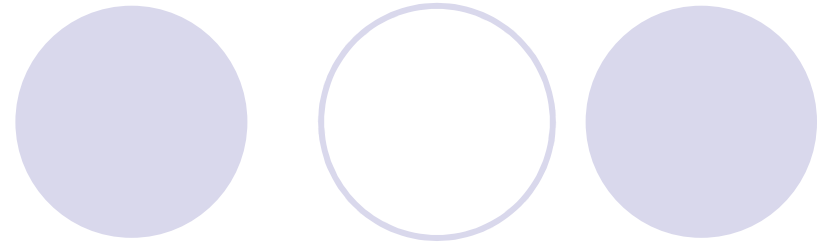
Histology of Ureter



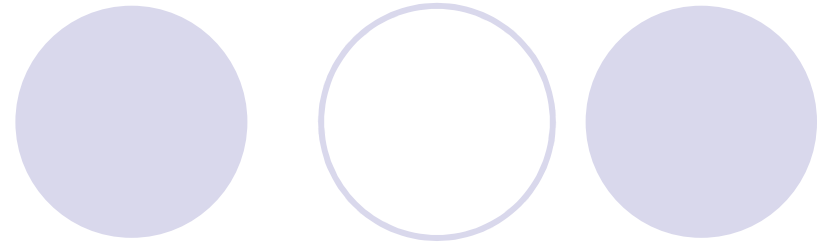
- Mucosa – **transitional epithelium**
- **Muscularis** – two layers
 - Inner longitudinal layer
 - Outer circular layer
- **Adventitia** – typical connective tissue

URETERS

- Abdominal part
- Pelvic part
- Intramural part
 - 1,5-2 cm



Urinary Bladder



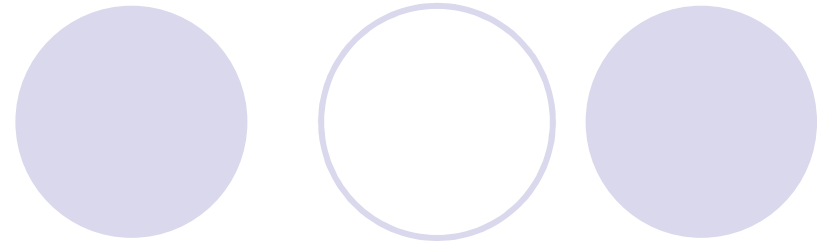
- A collapsible muscular sac
- Stores and expels urine
 - Full bladder – spherical
 - Expands into the abdominal cavity
 - Empty bladder – lies entirely within the pelvis

BLADDER

A decorative graphic at the top of the slide consists of six circles. The first two circles are on the left, with the word 'BLADDER' in orange text overlaid on the first one. The remaining four circles are on the right, arranged in a horizontal line. The circles alternate in color: a solid light purple circle, an empty light purple circle, a solid light purple circle, and another empty light purple circle.

- 350-500 ml
- Posterior to pubic symphysis
- Pelvis floor
- Retroperitoneal
- Male
 - Anterior to rectum, superior to prostate
- Females
 - Anterior to uterus and vagina

BLADDER



Apex

Fundus

- Trigone
- Corpus
- Cervix
- Internal urethral opening

URETHRAE



- URETHRAE MASCULINA
- URETHRAE FEMININA

Urinary Bladder and Urethra - Male

- Males – 20 cm in length
- Three parts
 - Prostatic urethra
 - Membranous urethra
 - Spongy (penile) urethra

Urinary Bladder and Urethra - Female

- 3–4 cm
- **trigone**