

LAB 8 - THE URINARY SYSTEM

I. SYSTEM COMPONENTS (p. 998 / 961 Figure 25.1)

KIDNEYS (FIGURE 25.3)

- Each kidney contains approx. 1,000,000 tubular **NEPHRONS** which produce **FILTRATE** from the plasma and then 'add to' or 'take from' this filtrate to produce **URINE**.
- Through this process the kidneys remove water soluble wastes & toxins from the blood.
- Through this process the kidneys control how much water and/or electrolytes is lost or retained

URETERS

- tubular passageways for urine to flow from kidneys down to bladder
- flow is active due to **peristaltic contractions** so flow from kidneys to bladder does not depend on gravity

BLADDER

- a storage container; walls contain visceral (smooth) muscle; receives urine from the ureters
- urine volume and concentration is not altered while stored in bladder
- distention (stretch) of the bladder creates the "urge" to pee
- Emptying is controlled by voluntary relaxation of an external sphincter at base of urethra and simultaneous involuntary contraction of smooth muscles in the bladder wall. A.k.a. **Micturition reflex**

URETHRA

- Tubular passageway for urine to flow from bladder to exterior of body.

II. THE KIDNEYS (p. 1000 / 964)

RENAL CAPSULE

- A sheet of fibrous connective tissue covering the surface of the kidney.

RENAL ARTERY AND VEIN

- Provides blood flow to and from the kidneys.
- at rest, approx. 21% of your total cardiac output passes through your kidneys.
- at rest, kidney metabolism accounts for approx. 20% of your oxygen consumption

RENAL CORTEX

- the outer layer of kidney tissue deep to the capsule but superficial to the pyramids
- It's not a specific structure. It's a "zone" or "region."
- 85% of nephrons exist totally within this layer as **cortical nephrons**

RENAL MEDULLA

- The deeper layer of kidney tissue consisting of 15-20 **RENAL PYRAMIDS**. On the models, each pyramid looks somewhat triangular.
- It's not a specific structure. It's a "zone" or "region."
- The tubular nephrons mentioned earlier exist in both the cortex and medulla **filtering, absorbing, and secreting** to produce urine.

RENAL (MEDULLARY) PYRAMIDS

- Subdivisions of the renal medulla. Each renal pyramid contains numerous nephron tubules where filtrate is processed with the end product being urine. The Papilla (tip) of each pyramid points inward toward the renal pelvis. Urine flows from each pyramid into the pelvis.
- 15% of nephrons have their loops of Henle extend down into the medulla and are referred to as **juxtamedullary nephrons**

RENAL PELVIS

- A cavity toward the medial border of each kidney which receives urine from the 15-20 renal pyramids.
- Peristaltic waves of contraction begin here and propel urine along the **ureters** to the bladder.

III. THE NEPHRONS

THE NEPHRONS - (text images p. 1002 & 1004 / 965 & 967) The tubular structures that receive FILTRATE produced at the glomerular capillaries. As the filtrate flows through the tubule water, electrolytes, drugs, and toxins are either taken from the filtrate and put back into the blood or added from the blood to the filtrate.

What's left over at the end of the tube is URINE. See film clip 29428→ on disc # 13

* Any time water or an electrolyte is pulled from the filtrate back into the blood this is called **REABSORPTION**.

* Any time an electrolyte, drug, or toxin is added to the filtrate from the blood this is called **SECRETION**.

* When you see the word 'reabsorbed' or 'secreted' you *know* whether it is moving into or out of the filtrate.

RENAL CORPUSCLE (frames 1354, 30221, 1368, and p. 1006 & 1008 / 970-971)

GLOMERULUS (a.k.a. Glomerular capillaries)

GLOMERULAR (BOWMAN'S) CAPSULE

PROXIMAL CONVOLUTED TUBULE (PCT) (frame 31382)

LOOP OF HENLE (frame 31454)
DESCENDING LIMB

ASCENDING LIMB

DISTAL CONVOLUTED TUBULE (DCT) (frame 34126)

COLLECTING TUBULE (frame 34194)

AFFERENT AND EFFERENT ARTERIOLES (frame 30221)

PERITUBULAR CAPILLARIES (frames 31675 & 31000)

Hemodialysis (a.k.a. Dialysis)

Define: Dialysis

What diffuses out of the blood into the dialysis fluid and why?

What does not move out of the blood and why not?

Does anything diffuse from the dialysis fluid into the blood? _____ Why?

OYO: What is **peritoneal dialysis**?

OYO – Kidney Topics

Upon which parts of the nephron does ADH have its effect? _____ and _____
What is the effect of ↑ADH and how will this affect the volume and concentration of the blood?

How will ↑ADH affect the volume and concentration of urine?

Both of the following are **diuretics**. They will both increase the production of urine. Explain how.

Alcohol

furosemide (Lasix)

Explain how and where **renal calculi (a.k.a. KIDNEY STONES)** form.

(See poster in lab on Kidney Stones)

Explain the **LITHOTRIPSY** procedure for treatment of kidney stones. **Film Clip 13:35926**