Urinalysis and Body Fluids

Unit 1 D

Anatomy of the Urinary System

Macroscopic Anatomy

- Urinary System Anatomical Overview
  - 2 Kidneys
    - Where urine is formed from filtration of blood
  - 2 Ureters
    - Tubes carrying urine to bladder
  - 1 Bladder
    - Elastic sac, holds urine until expulsion
  - 1 Urethra
    - Tube to transport urine outside of body
Macroscopic Anatomy

- **Ureters**
  - Tubules between kidneys and bladder.
  - Urine that collects in renal pelvis is periodically propelled by smooth muscle action (peristaltic). Transport takes @ 30 seconds.

- **Bladder**
  - Elastic muscular sac, stores urine.
  - When volume @ 200–400 mL, intra-bladder stretch receptors become excited.
  - **Cystitis** - inflammation of bladder wall, often associated with urinary tract infection (UTI)

- **Urethra**
  - Canal or portal that conducts urine from the body.
  - **Micturation** - process of removing urine from body
  - **Urethritis** - inflammation of the urethra, more often a problem with females
Kidney Internal Structure

- Capsule covering
- Internal structures
  - Cortex - outer layer, just below capsule.
  - Medulla - central area of kidney, contains renal pyramids/ renal columns
  - Renal pelvis - collects urine from renal pyramids; extends outside of kidney to merge with ureters.

Micro-Anatomy of the Urinary System

- Nephron
  - Functional unit of the kidney
  - @ 1 million / kidney
  - Where urine is formed during the process of clearing wastes from the blood
  - Nephrons are in both the renal cortex and the renal medulla

- Nephron
  - 2 major parts
    - Glomerulus - the specialized region where filtration takes place.
    - Renal Tubules - uniquely designed to allow the body to keep those things it wants and eliminate the rest.
Micro-Anatomy of the Urinary System

• The Glomerulus - the specialized region where filtration takes place.
  • Bowman's capsule surrounds glomerular capillaries
  • Collects the ultrafiltrate squeezed out

Micro-Anatomy of the Urinary System

• Renal Tubules
  • Proximal convoluted tubule
  • Loop of Henle
  • Distal convoluted tubule

Micro-Anatomy of the Urinary System

• Collecting Tubules
Micro - Anatomy

- Juxtaglomerular apparatus / JGA
  - Area of nephron where macula densa cells of the distal convoluted tubule are in close contact with the cells of the afferent arteriole.

Renal Blood Flow

- Renal artery – brings blood from aorta at rate of 1200 ml/min
- Renal vein – takes blood from the kidney to the vena cava
Renal Blood Flow

Nephron Anatomy
- Incoming blood supply
  - Afferent arteriole - carries blood from renal artery into the nephron

Glomerular capillaries - the specialized 'tuft' of capillaries where the non-selective filtration takes place.
- Water, glucose, electrolytes and other molecules < 70,000 daltons are allowed to pass out of the capillaries.

Efferent arteriole - carries the 'modified' blood out of the glomerulus. (It eventually enters renal vein.)
Renal Blood Flow

- Peritubular Capillaries

As blood leaves glomerulus, it passes through a web of capillaries surrounding the renal tubules where re-absorption takes place.