Lecture notes for Wednesday and Friday, November 20 & 22, 2002

Outline

• Urinary system
• Structure of nephron
• Function of nephron: glomerular filtration; tubular reabsorption; tubular secretion
• Regulation
• Kidney dialysis

Review

• What variables does the body need to be concerned about with regard to maintaining homeostasis?

Functions of urinary system

• Regulates composition and volume of blood
• Regulates the composition and volume of extracellular fluid
• Removes cellular metabolic wastes from blood to external environment

Structure

• 2 kidneys - produce urine
• 2 ureters - carry urine to
• 1 bladder - stores urine
• 1 urethra - transports urine to external environments

Terminology

• Ur = urine
• Urology; urologist
• Renal = kidney
• Nephr = kidney
• Nephrology; nephrologist

Gross structure
- Renal capsule
- Renal cortex
- Renal medulla
- Renal pelvis

**Microscopic structure**
- Nephron = functional unit of the kidney
- Nephron =
  1. renal corpuscle: glomerulus + Bowman’s capsule
  2. renal tubule

**Functions of nephron**
- **Glomerular filtration:** filtration of H2O & plasma sloutes from glomerular capillaries into Bowman’s caps. (not including formed elements & proteins)
- Glomerular Filtration Rate:
- Filtration = forcing fluid & solutes through a membrane by PRESSURE.
- GFR = amount of filtrate that flows into Bowman’s capsule every minute: 125 mL/min = 180 L/day
- Factors affecting GFR:
  - Size of afferent & efferent glomerular arterioles
  - Blood pressure

**Tubular reabsorption**
= reabsorption of important substances from the filtrate back to the blood.
- E.g. H2O, glucose, amino acids, Na, Ca, K……
- H2O reabsorption is regulated by ANTIDIURETIC HORMONE
- Decrease in blood osmolarity increase in ADH secretion
- Diuretics = substances that slow down the reabsorption of water in the nephron & collecting ducts. E.g. caffeine & alcohol
**Tubular secretion**

= Removal of certain chemicals from the blood back to the filtrate

• Rids body of certain chemicals (ammonia, H+)

• Controls blood pH

**Review**

• Kidneys produce 180 L/day of filtrate

• Kidneys filter entire volume of blood x60/day

• Kidney produces 1L/day of urine

**Kidney failure**

• Dialysis

  1. Hemodialysis

  2. Peritoneal dialysis