Reabsorption of water
After studying this lecture, you should be able to . . .

1. Describe active transport and osmosis in the loop of Henle and explain how these processes produce a countercurrent multiplier system.
2. Explain how the vasa recta function in countercurrent exchange.
3. Predict the role of urea in water osmosis.
4. Describe the role of antidiuretic hormone (ADH) in regulating the final urine volume.
The Countercurrent Multiplier System
Ascending Limb of the Loop of Henle and Descending Limb of the Loop of Henle
Renal interstitial fluid → Tubular cells

Paracellular diffusion

Tubular lumen (+8 mV)

Na⁺, K⁺, Mg²⁺, Ca²⁺

ATP

Na⁺, Cl⁻ → K⁺

Loop diuretics
- Furosemide
- Ethacrynic acid
- Bumetanide
Vasa Recta

Cortex

Medulla

Capillary

Descending limb
Passively permeable to water

Active transport of Na⁺, Cl⁻ follows passively; impermeable to water

Na⁺Cl⁻

H₂O

H₂O

Loop of Henle

Na⁺Cl⁻
The Role of Urea

\[ \text{H}_2\text{N} - \text{C} - \text{NH}_2 \]
Renal Water Regulation

- Osmoreceptors
  - Supraoptic neuron
    - Anterior lobe
    - Posterior lobe

- Baroreceptors
  - Cardiopulmonary receptors

- Paraventricular neuron

- Pituitary

- ADH

- Urine: decreased flow and concentrated
Water deficit → Extracellular osmolarity → Osmoreceptors → ADH secretion (posterior pituitary) → Plasma ADH → $H_2O$ permeability in distal tubules, collecting ducts → $H_2O$ reabsorption → $H_2O$ excreted
Diabetes insipidus

Normal

The pituitary gland sends a hormone (ADH) to the kidneys to help control how much urine is made.

Central Diabetes Insipidus

Because the pituitary gland doesn’t make enough ADH, the kidneys make a lot of urine.
Thirst and salt appetite:
Thank You!