Excretory System – Water Control

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Osmoreceptors

- **Hypothalamus** -> **Osmoreceptors** -> detect the concentration of the blood (water potential) as blood flows through the hypothalamus.
- If blood water is low, **osmoreceptors** release **ADH (anti-diuretic hormone)** -> this increases the membrane permeability of water -> more water is reabsorbed from collecting ducts.
- If blood water is high, osmoreceptors reduce the ADH release -> this reduces the membrane permeability of water -> less water is reabsorbed.

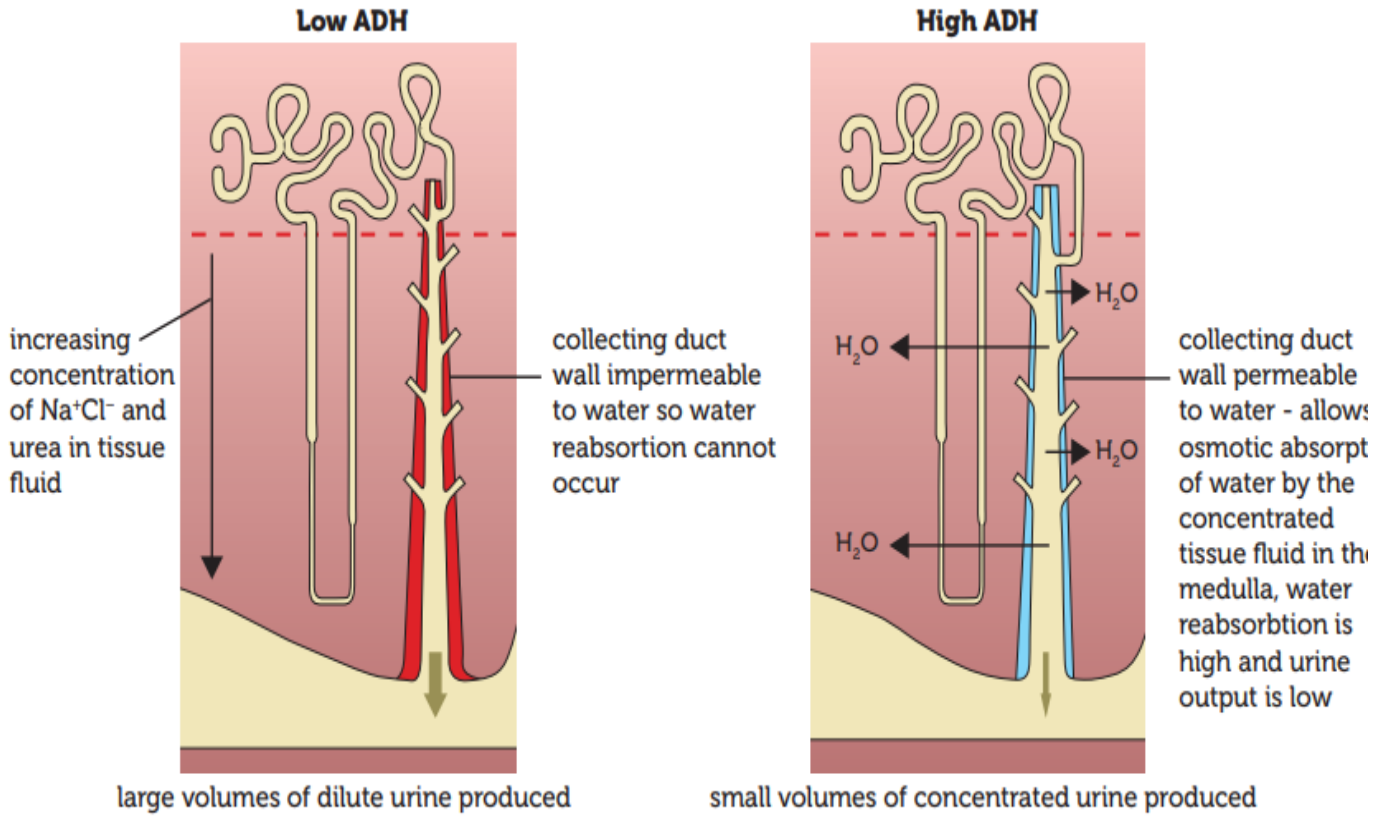
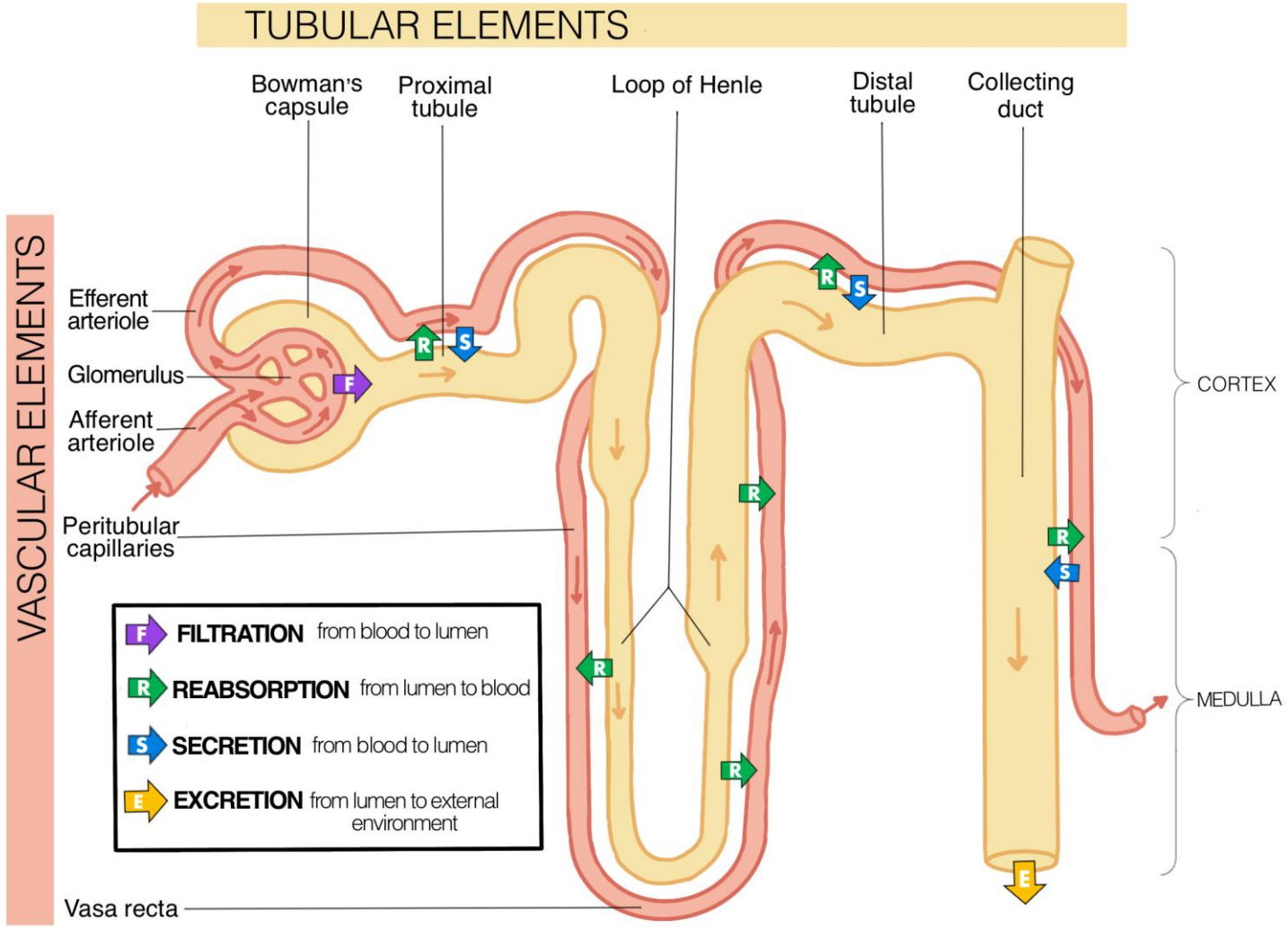


Figure 14: The effects of ADH on water reabsorption from the collecting duct.

Caffeine's mechanism of action

Caffeine -> causes Na+ ions to stay in the collecting duct -> this prevents reabsorption of water -> as a result more urine is produced!

This is why it is not recommended to drink caffeinated beverages when you are planning to go for a long trip, especially by bus.



Liver - Urea Synthesis

Liver functions:

- Produces **urea** from amino acids.
- Forms **ammonium ions** during amino acid breakdown.
- Converts excess ammonium ions to urea.
- Processes excess amino acids from ingested proteins.
- Initiates deamination, converting amino acids to ammonia.

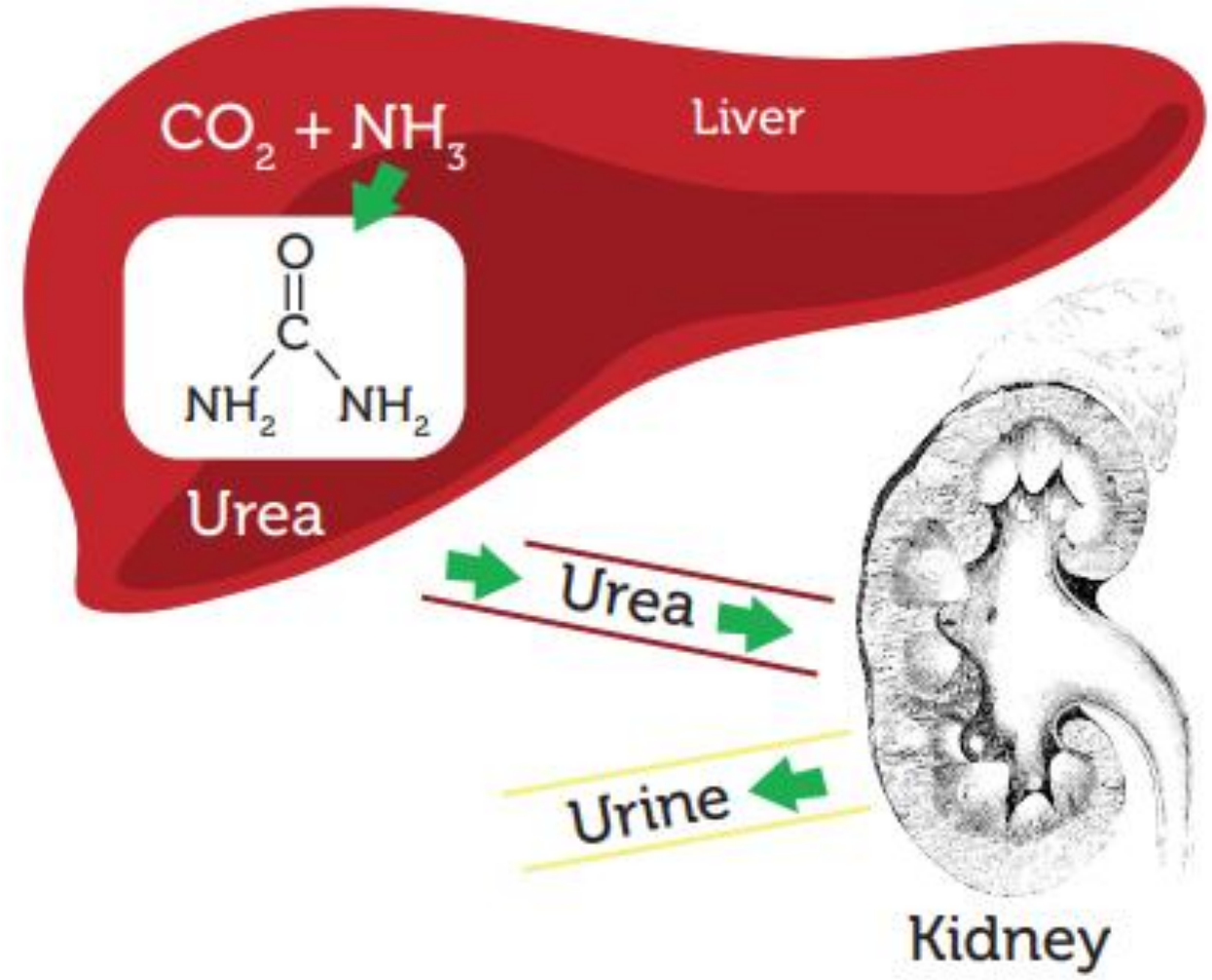


Figure 2: Ammonia removal as urea

Links

https://www.youtube.com/watch?v=FK-8p8DMv3Q&t=91s

https://www.youtube.com/watch?v=SZ3BZBBC-Qc&t=131s

Important Information & Fun Facts About Kidney Health

1. The Kidneys Filter Around 50 Gallons of Blood Daily!

Each kidney contains about **1.5 million nephrons**, working constantly to filter waste, balance electrolytes, and maintain hydration.

2. Water is Essential for Kidney Health

Drinking enough water (**around 2–3 liters per day**) helps the kidneys flush out toxins and prevents **kidney stones**.

3. High Blood Pressure and Diabetes Harm the Kidneys

Hypertension (high blood pressure) damages kidney blood vessels.

Diabetes leads to **diabetic nephropathy**, a major cause of kidney failure.

4. Too Much Salt Can Harm the Kidneys

Excess sodium leads to **high blood pressure** and **kidney strain**.

The **recommended daily sodium intake** is **less than 2,300 mg (about one teaspoon of salt)**.

5. Painkillers Can Damage the Kidneys

Overuse of **NSAIDs (like ibuprofen and aspirin)** can cause kidney damage over time.

6. The Kidneys Help Control Blood pH

They regulate **acid-base balance** by excreting hydrogen ions and reabsorbing bicarbonate.

7. Smoking Increases Kidney Disease Risk

Smoking reduces blood flow to the kidneys, increasing the risk of **chronic kidney disease (CKD)**.

8. The Kidneys Produce Hormones

Erythropoietin (EPO): Stimulates red blood cell production.

Renin: Helps regulate blood pressure.

Calcitriol (active Vitamin D): Maintains bone health by regulating calcium.

9. Dark Urine Might Indicate Dehydration or Kidney Issues

Pale yellow urine is a sign of proper hydration.

Dark or foamy urine could be a warning sign of dehydration, kidney problems, or protein loss.

10. Kidney Stones Can Be Extremely Painful

Formed by **minerals like calcium oxalate** in the urine.