

# Kidney Function

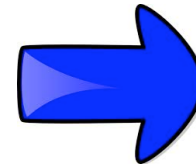
...a closer look



# **Kidney Function Animation**

<http://www.biologymad.com/resources/kidney.swf>

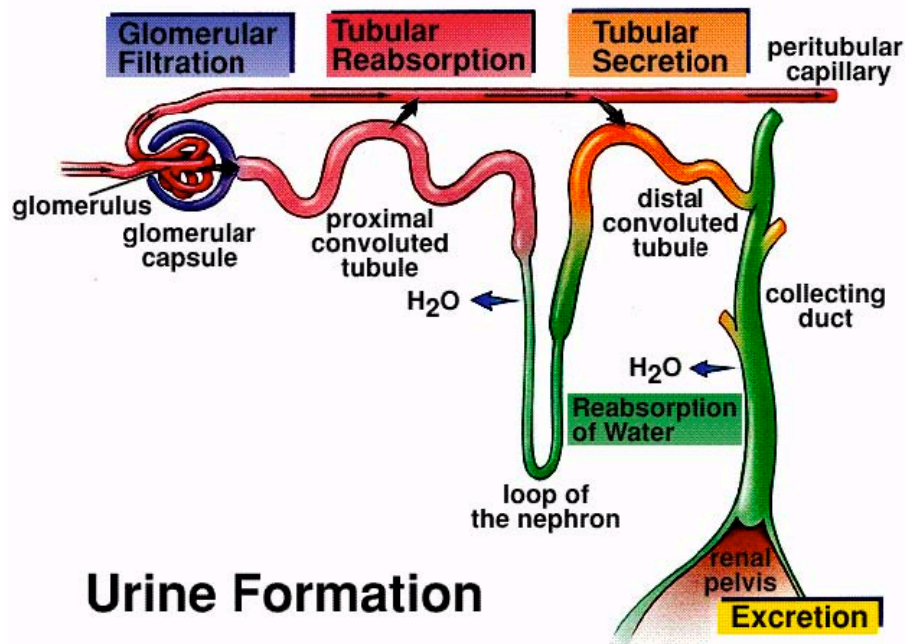
# Urine Formation



Three (3) things are involved during urine formation.

1. **Filtration** – blood and bodily fluids are filtered through a selectively membrane.

Fluids from blood → \_\_\_\_\_



Urine Formation

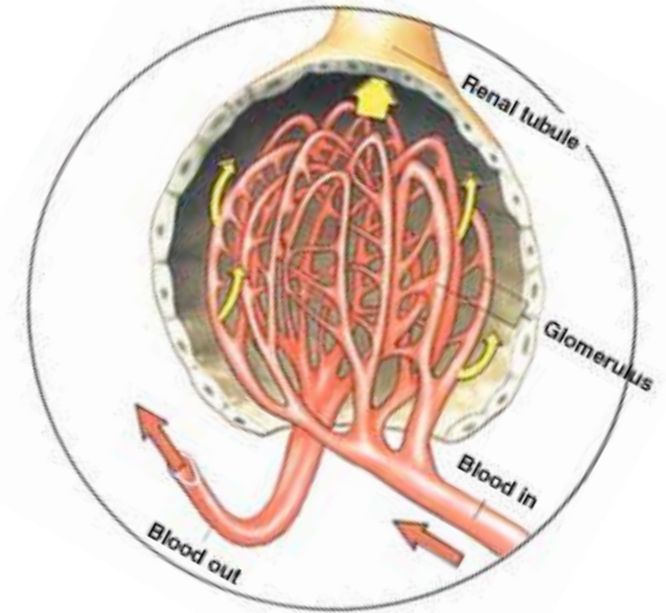
2. **Reabsorption** – transfer of glomerular filtrate from nephron → \_\_\_\_\_

3. **Secretion** – movement of materials such as ammonia or some drugs from blood → \_\_\_\_\_

# Filtration

## Where?

-very localized in the \_\_\_\_\_  
and \_\_\_\_\_



## How?

- \_\_\_\_\_ in the capillaries forces blood plasma through glomerulus walls into the Bowman's capsule thus filtering out water and dissolved solutes from the blood

## What?

-Blood cells remain behind in glomerulus capillaries while filtration squeezes out \_\_\_\_\_

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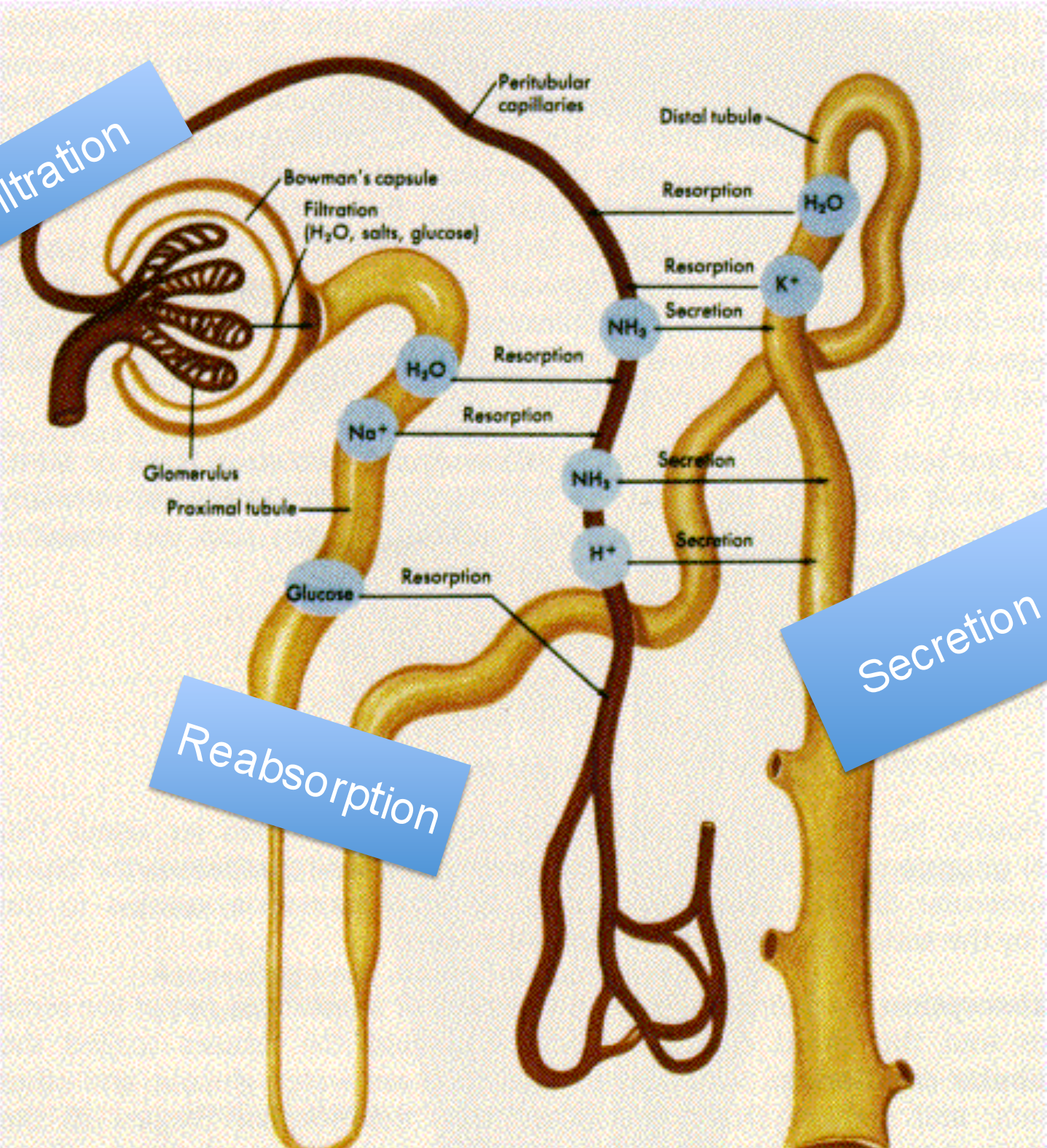
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\_\_\_\_\_ into the renal tube through the Bowman's capsule



Filtration



Reabsorption

Secretion

# Reabsorption

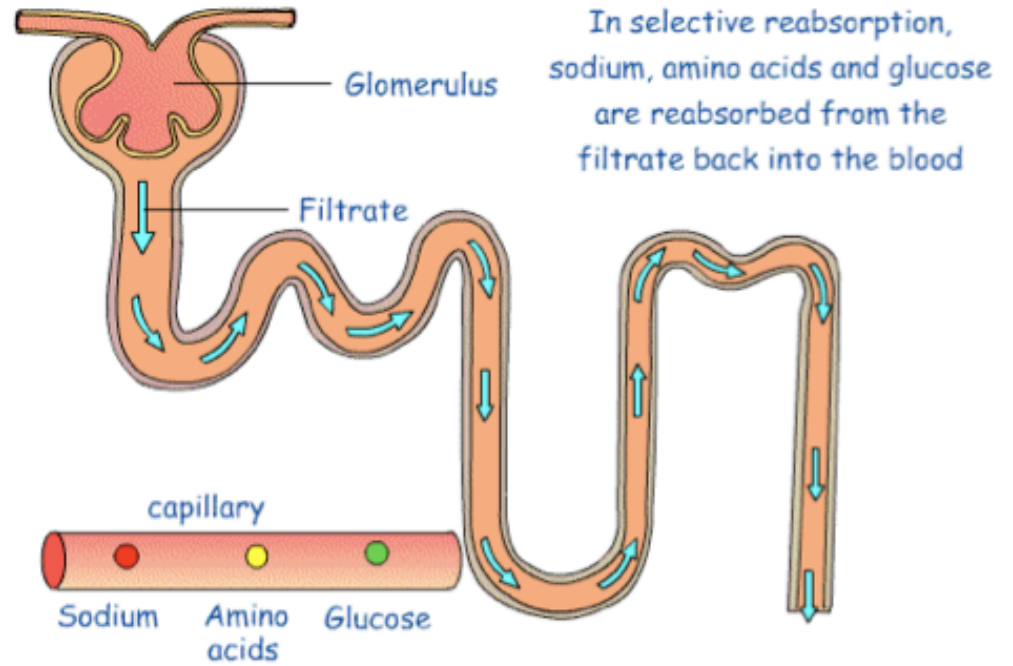
## How?

-selective reabsorption  
through \_\_\_\_\_  
and \_\_\_\_\_  
transport

-occurs until a

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of a substance is  
reached (i.e. the  
maximum amount of a  
material that can be  
moved across a  
nephron)





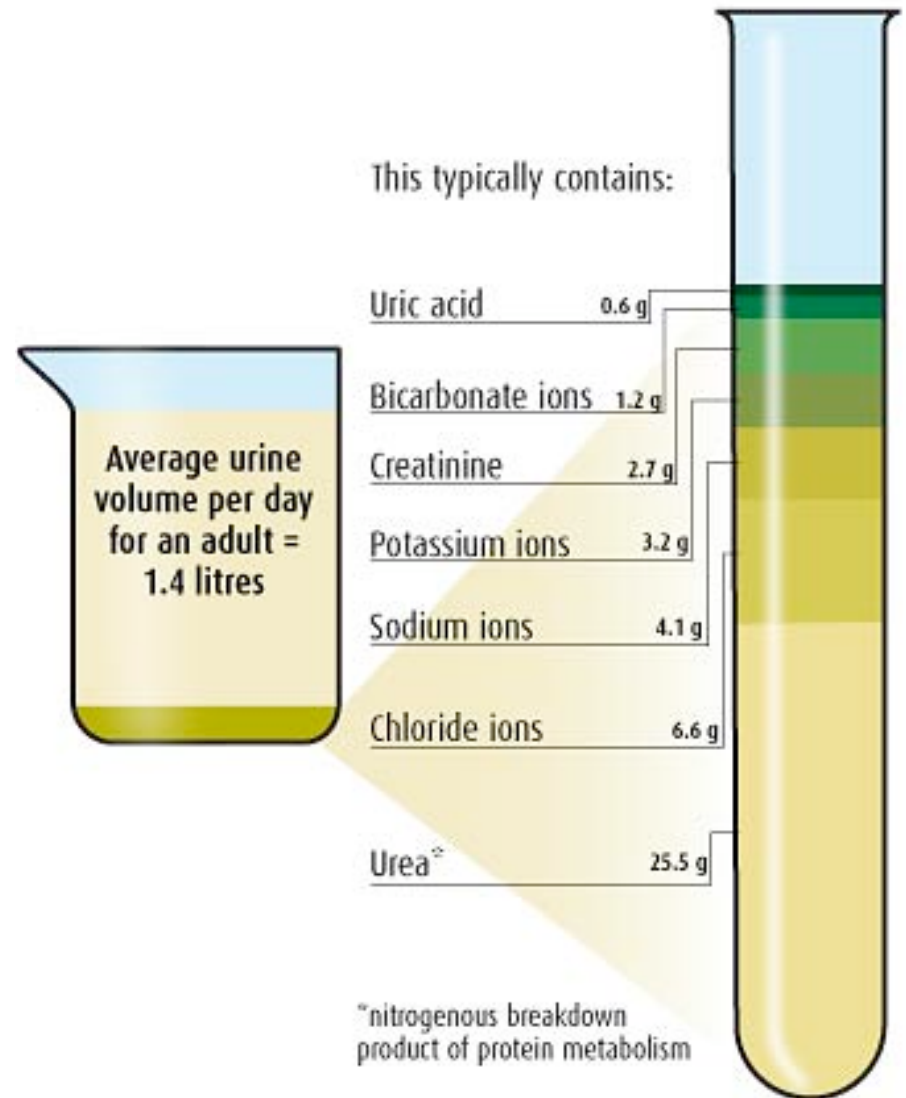
# Secretion!

## How?

-movement of wastes  
from blood →  
\_\_\_\_\_ by  
active transport

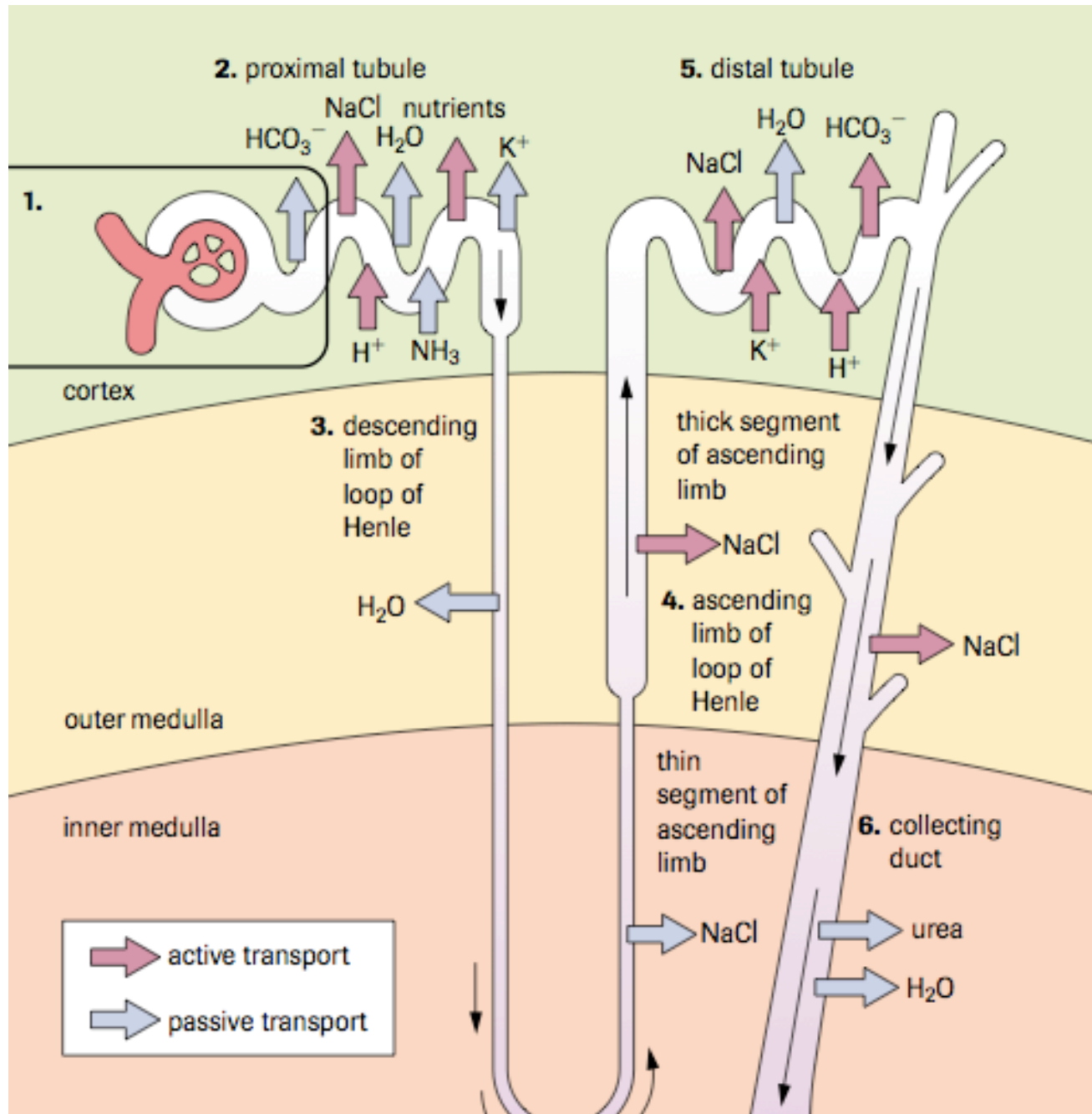
## What?

-get rid of \_\_\_\_\_  
containing waste, excess  
 $H^+$  and minerals, even  
some drugs



Site	Description of process	Substances transported
1. glomerulus and Bowman's capsule	<ul style="list-style-type: none"> <li>Filtration of water and dissolved solutes occurs as blood is forced through walls of glomerulus into Bowman's capsule by fluid pressure in capillaries.</li> </ul>	<ul style="list-style-type: none"> <li>sodium ions (<math>\text{Na}^+</math>), chloride ions (<math>\text{Cl}^-</math>), water (<math>\text{H}_2\text{O}</math>), hydrogen ions (<math>\text{H}^+</math>), glucose, amino acids, vitamins, minerals, urea, uric acid</li> </ul>
2. proximal tubule	<ul style="list-style-type: none"> <li>Selective reabsorption of nutrients from filtrate back into blood by active and passive transport.</li> <li>Within proximal tubule, pH is controlled by secretion of hydrogen ions (<math>\text{H}^+</math>) and reabsorption of bicarbonate ions (<math>\text{HCO}_3^-</math>).</li> </ul>	<ul style="list-style-type: none"> <li>bicarbonate ions (<math>\text{HCO}_3^-</math>), salt (<math>\text{NaCl}</math>), water (<math>\text{H}_2\text{O}</math>), potassium ions (<math>\text{K}^+</math>), hydrogen ions (<math>\text{H}^+</math>), ammonia (<math>\text{NH}_3</math>), glucose, amino acids, vitamins, urea</li> </ul>
3. descending limb of loop of Henle	<ul style="list-style-type: none"> <li>Descending limb of loop of Henle is permeable to water, resulting in loss of water from filtrate by osmosis.</li> <li>Salt (<math>\text{NaCl}</math>) becomes concentrated in filtrate as descending limb penetrates inner medulla of kidney.</li> </ul>	<ul style="list-style-type: none"> <li>water (<math>\text{H}_2\text{O}</math>)</li> </ul>
4. ascending limb of loop of Henle	<ul style="list-style-type: none"> <li>Thin segment of ascending limb of loop of Henle is permeable to salt, resulting in diffusion of salt out of ascending limb.</li> <li>Salt continues to pass from filtrate to interstitial fluid in thick segment of ascending limb.</li> </ul>	<ul style="list-style-type: none"> <li>salt (<math>\text{NaCl}</math>)</li> </ul>
5. distal tubule	<ul style="list-style-type: none"> <li>Selective reabsorption of nutrients from blood into nephron by active transport. Distal tubule helps regulate potassium (<math>\text{K}^+</math>) and salt (<math>\text{NaCl}</math>) concentration of body fluids.</li> <li>As in proximal tubule, pH is controlled by tubular secretion of hydrogen ions (<math>\text{H}^+</math>) and reabsorption of bicarbonate ions (<math>\text{HCO}_3^-</math>).</li> </ul>	<ul style="list-style-type: none"> <li>salt (<math>\text{NaCl}</math>), potassium ions (<math>\text{K}^+</math>), water (<math>\text{H}_2\text{O}</math>), hydrogen ions (<math>\text{H}^+</math>), bicarbonate ions (<math>\text{HCO}_3^-</math>), uric acid, ammonia (<math>\text{NH}_3</math>)</li> </ul>
6. collecting duct	<ul style="list-style-type: none"> <li>Urine formation.</li> </ul>	<ul style="list-style-type: none"> <li>water (<math>\text{H}_2\text{O}</math>), salt (<math>\text{NaCl}</math>), urea, uric acid, minerals</li> </ul>





**Let's look at that kidney function  
animation again**

<http://www.biologymad.com/resources/kidney.swf>

## WATER BALANCE

drink more = pee more  
sweat more = pee less

But its not that easy! How does our body know when to produce more/less urine?

# ADH

### Antidiuretic Hormone (ADH)

- causes the kidneys to \_\_\_\_\_ water reabsorption making more concentrated urine (very yellow)
  - hypothalamus sends signal to pituitary to \_\_\_\_\_ or \_\_\_\_\_
- ADH secretion based on the body's osmotic pressure

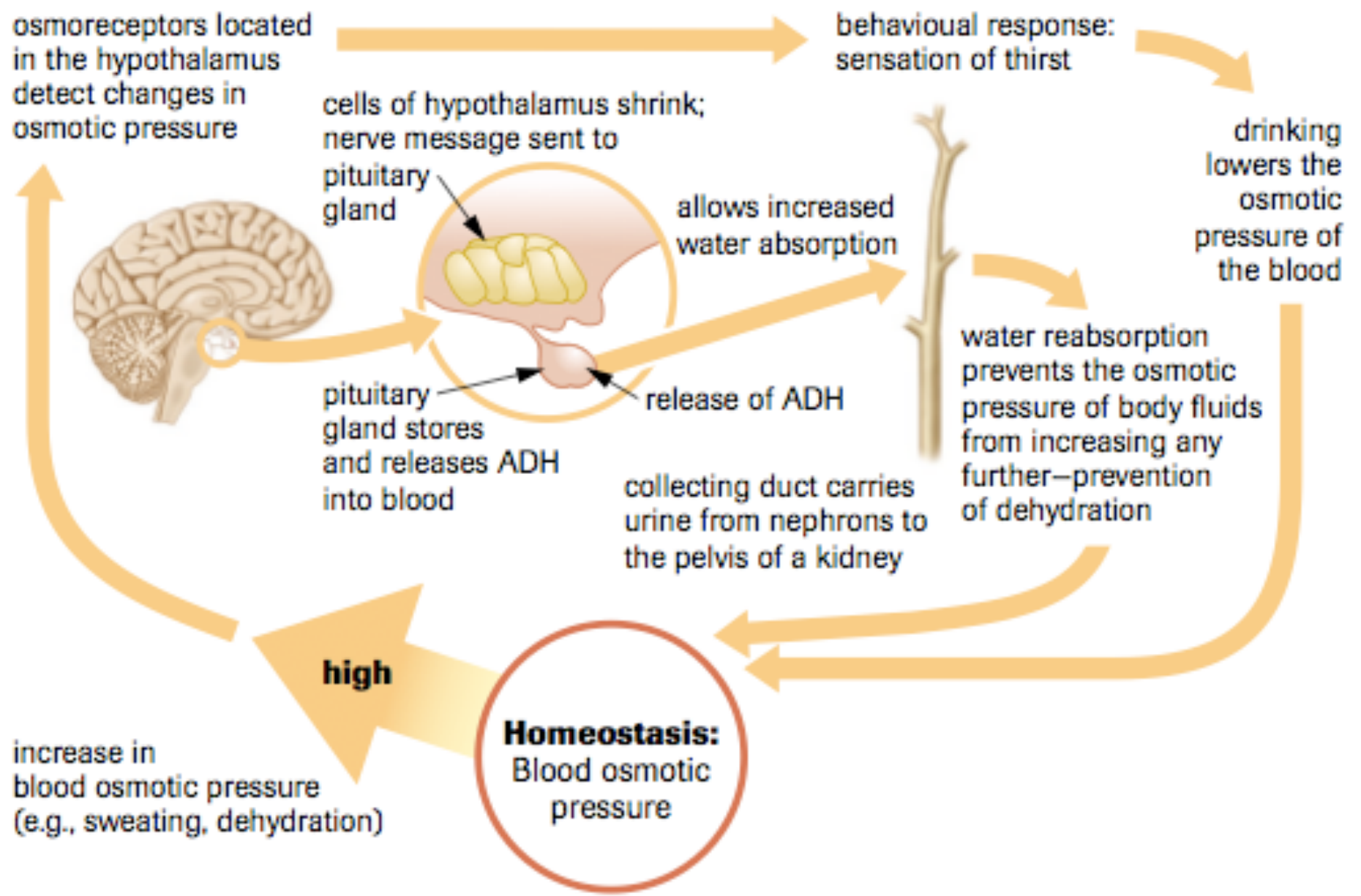


# HOW DID THE HYPOTHALAMUS KNOW!?

\_\_\_\_\_ located in the hypothalamus detect changes in osmotic pressure of the blood and surrounding extracellular fluids (ECF)

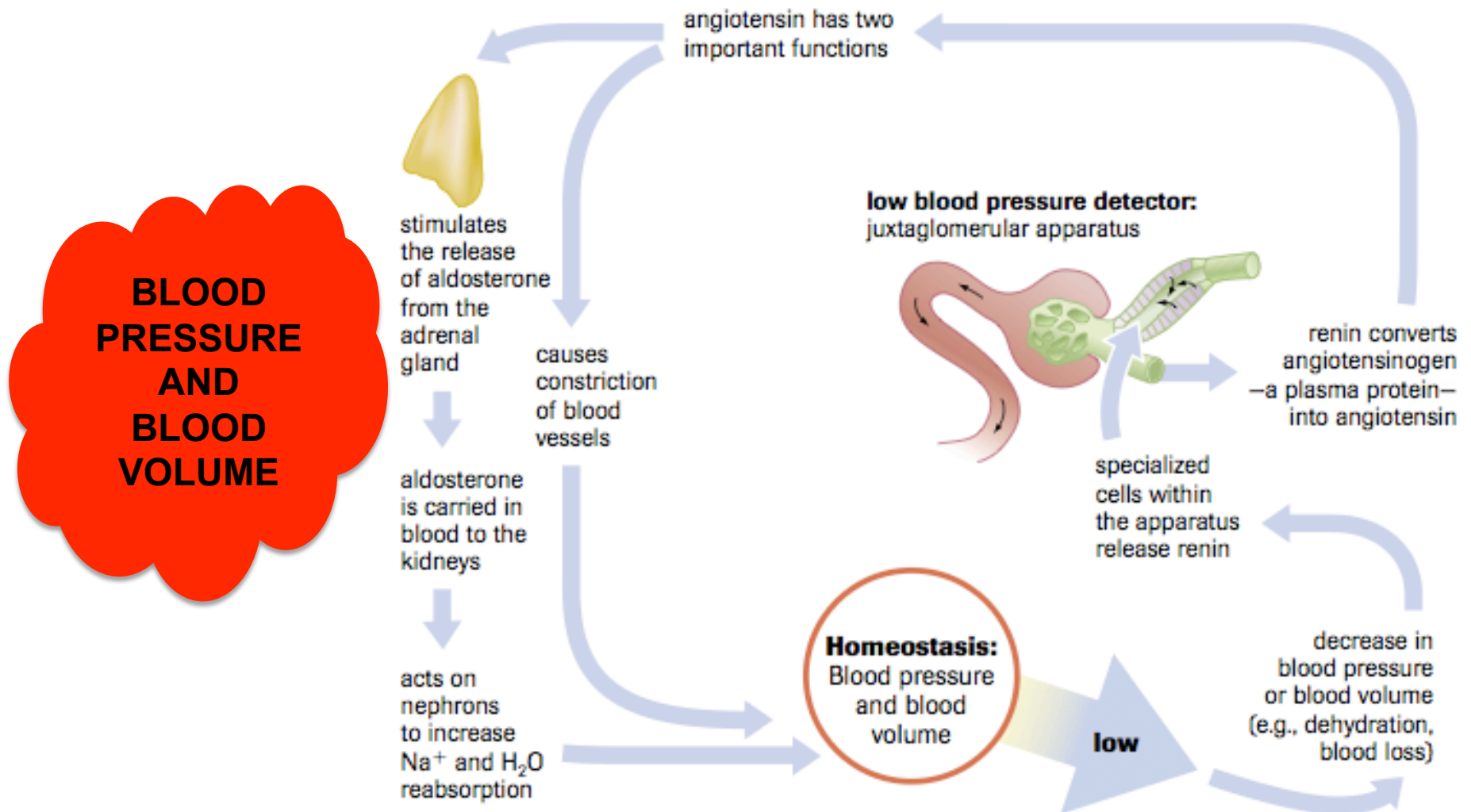
Ex. If you sweat a lot or decrease your fluid intake, the solutes in the blood become very concentrated thus \_\_\_\_\_ osmotic pressure and causing water to move into the bloodstream.

Water moving out of the bloodstream causes the hypothalamus to \_\_\_\_\_



**Aldosterone** is another \_\_\_\_\_ that helps fight dehydration and regulates blood pressure/volume.

**Aldosterone** increases \_\_\_\_\_ reabsorption from the distal tubule and collecting duct.



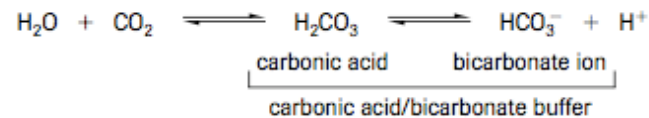


# pH Balance

The \_\_\_\_\_ maintains the pH balance in our bodies!

## GO KIDNEYS GO!

\*\*\*Optimal body pH is between 7.3 and 7.5\*\*\*



Bicarbonate ions,  $\text{HCO}_3^-$ , eliminate the excess  $\text{H}^+$  ions, preventing a change in pH.

