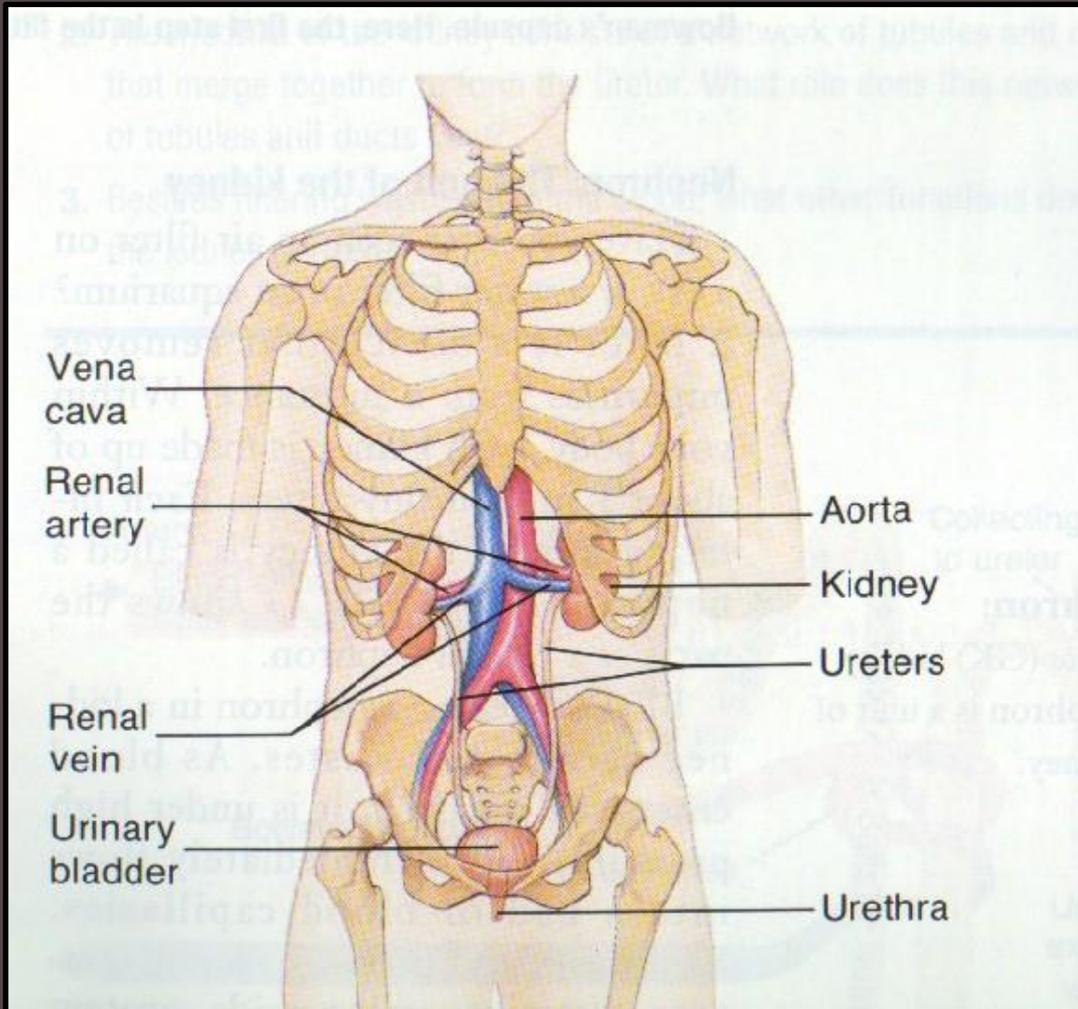


EXCRETORY SYSTEM



WHY DO WE NEED AN EXCRETORY SYSTEM?

Function:

- To eliminate waste
- To maintain water and salt balance
- To maintain blood pressure

WHAT KIND OF WASTES?

These wastes include:

- **Carbon dioxide**

- Mostly through breathing

- Mineral **salts**, Na, Cl, K

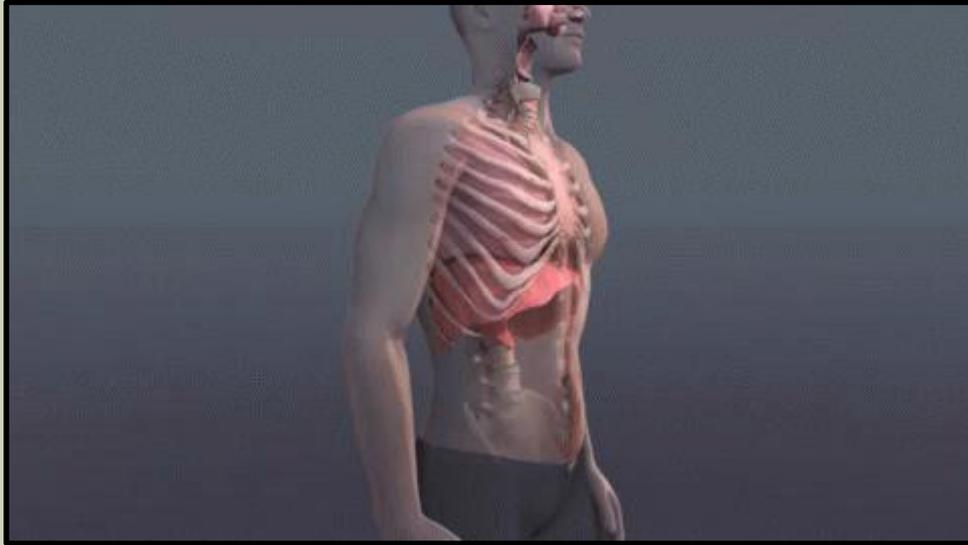
- Nitrogenous wastes from digestion

- like **urea** and **uric acid** (from breakdown of **proteins**)

- **Water**

- **Heat**

HOW DO WE GET RID OF WASTE?



1. Breathing

Get rid of: carbon dioxide
and water



2. Sweating

Get rid of: water,
salt and minimal
amount of urea

HOW DO WE GET RID OF WASTE?

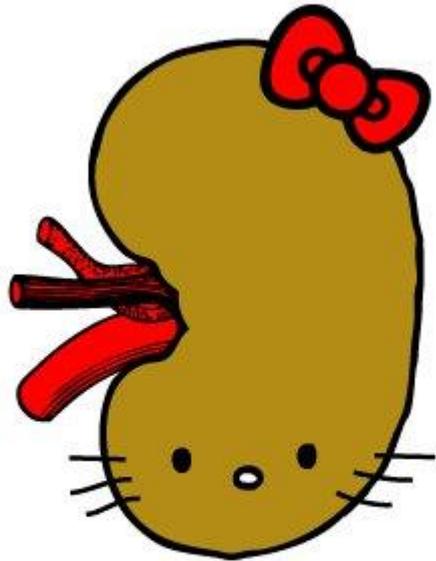


3. Liver

Gets rid of: toxins and poisons

Converts ammonia (from breakdown of amino acids) into urea

HOW DO WE GET RID OF WASTE?



Hello Kidney

memecenter.com 

4. Kidneys

- Responsible for helping our bodies to get rid of :
 - Urea and uric acid
 - Excess salt
 - Excess water

PARTS OF THE EXCRETORY SYSTEM

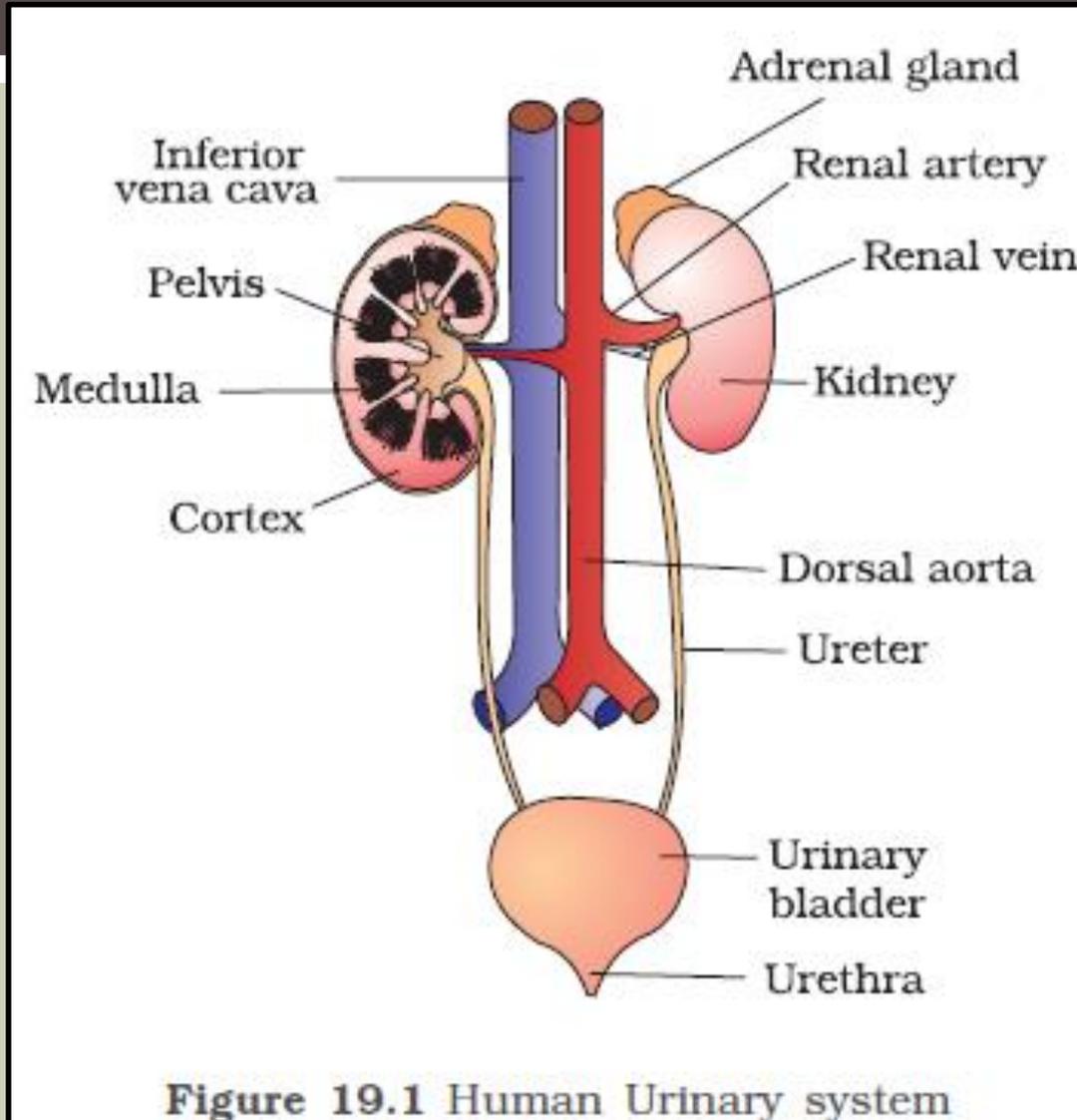
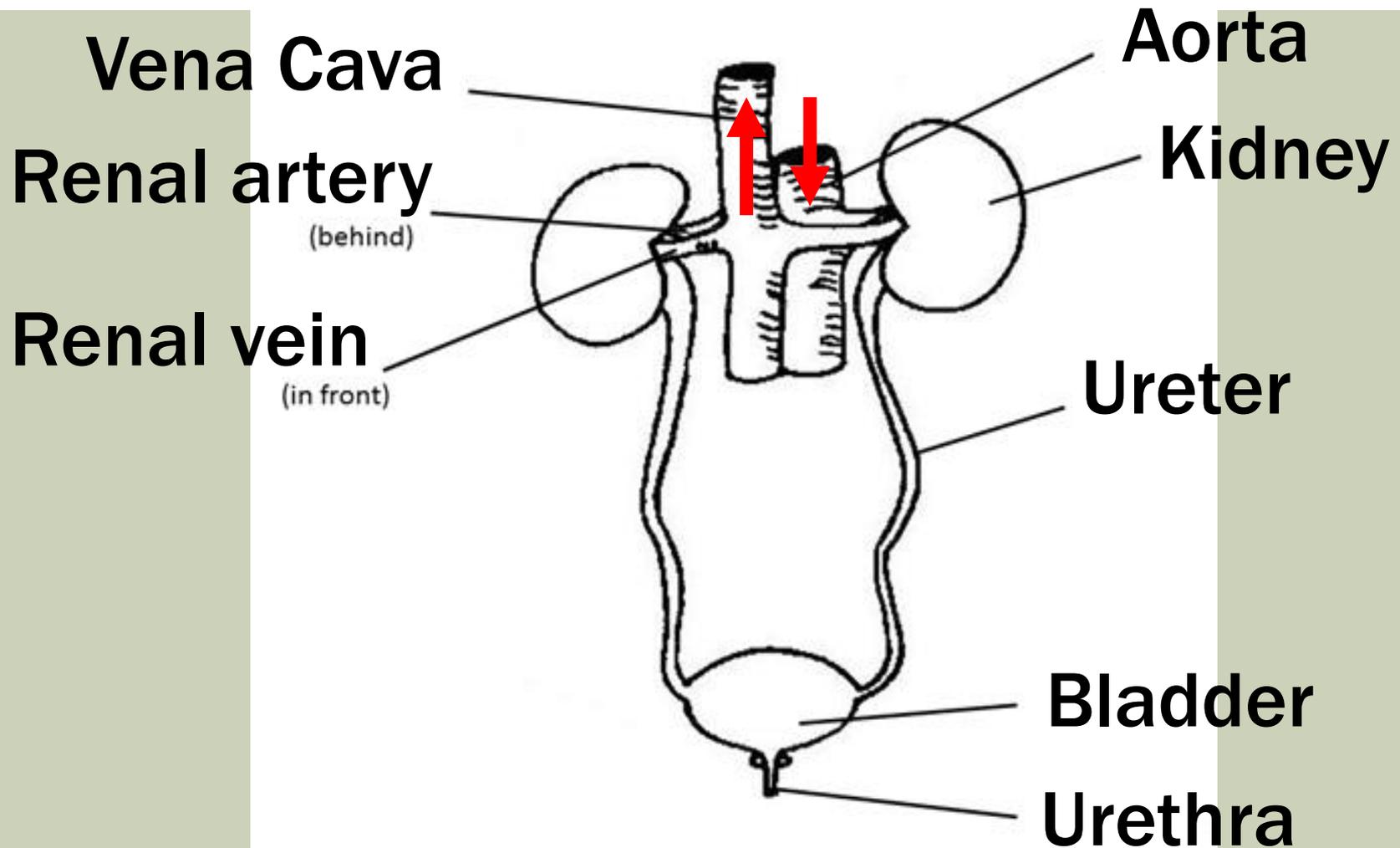
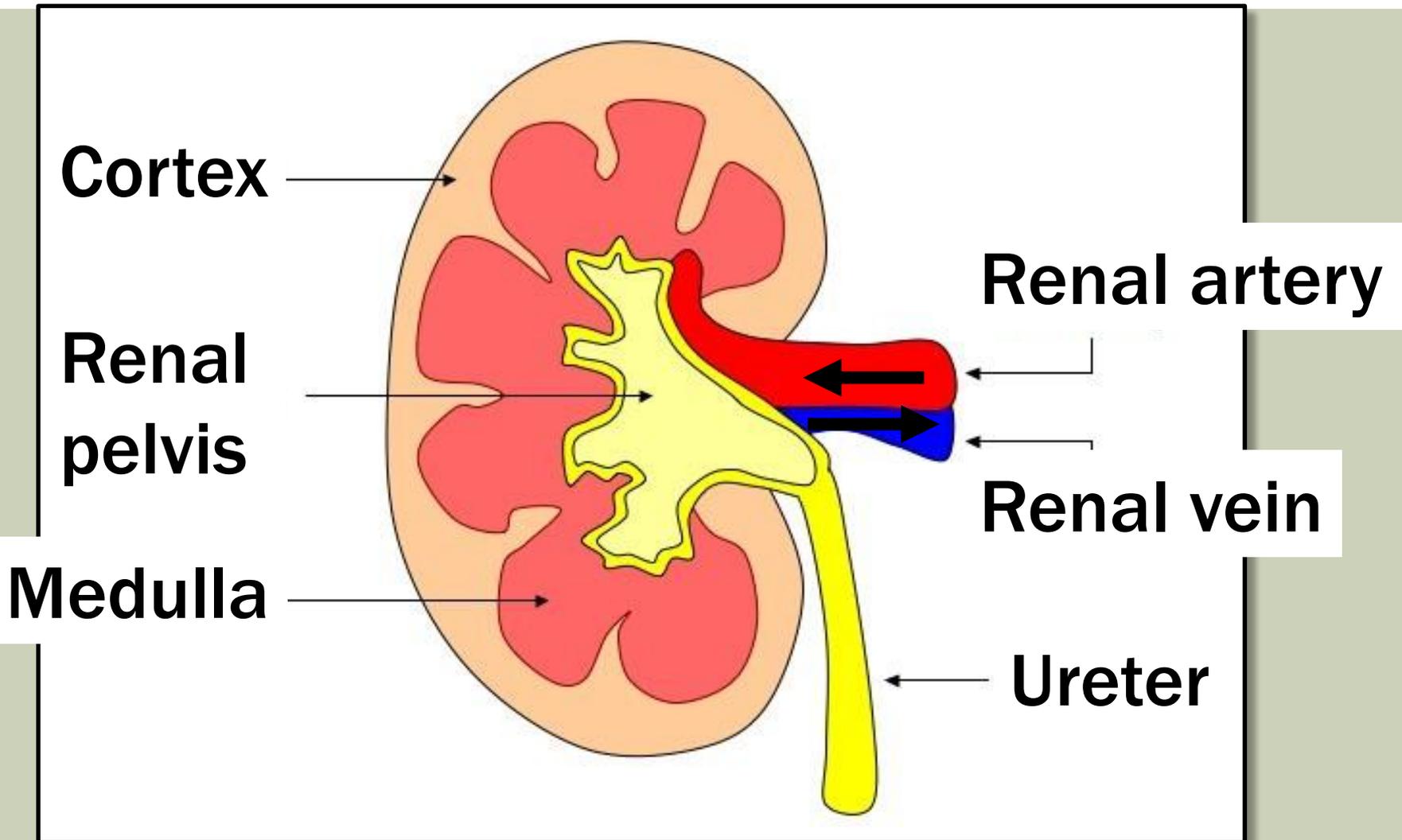


Figure 19.1 Human Urinary system

PARTS OF THE EXCRETORY SYSTEM



KIDNEYS



KIDNEYS

- Blood enters kidneys through renal artery
- Blood leaves kidneys through renal vein
- Urine (waste product) leaves kidneys through the ureters

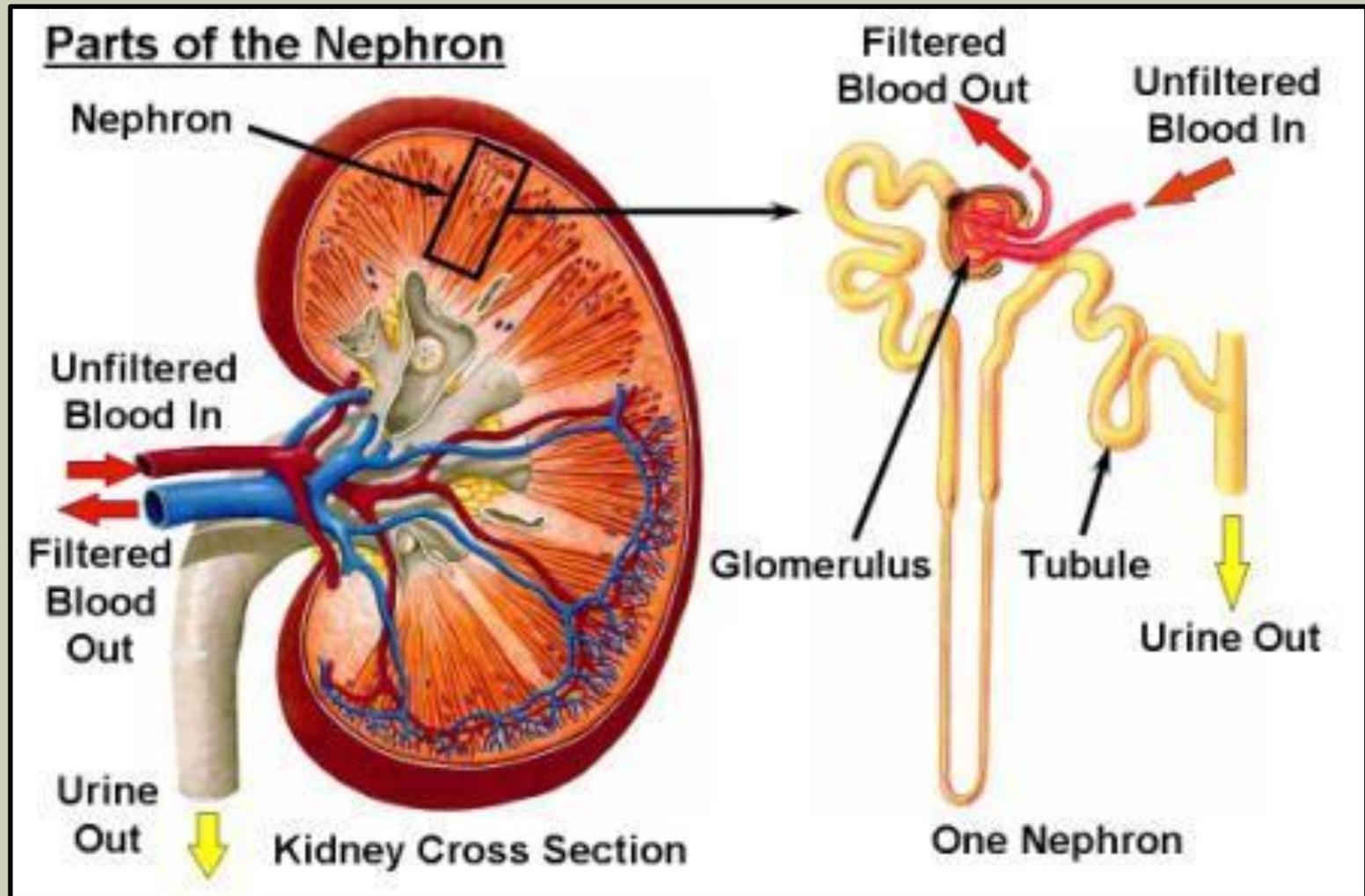
KIDNEY STRUCTURES AND FUNCTION

Structure	Function
Renal Capsule	Tough outer “skin” that <u>protects</u> the kidneys
Cortex	contains most of the nephron (<u>Bowman’s capsule</u> and twisted tubules). <u>Filters</u> the blood.
Medulla	Inside the cortex . Contains the <u>Loop of Henle</u> . Reabsorbs <u>water</u> and <u>salt</u> . Carries urine to the Calix .

KIDNEY STRUCTURES AND FUNCTION

Structure	Function
Calix and Renal Pelvis	<u>Collects urine</u> and carries it away to the Ureter
Ureter	2 <u>tubes</u> that drain the kidneys into the Bladder
Bladder	A muscular sac that <u>stores urine</u> and stimulates the urge to pee when it contains 0.5 to 1 litre of urine
Urethra	A tube that <u>empties the bladder</u> , to eliminate wastes from the body.

KIDNEYS -> NEPHRONS



NEPHRON STRUCTURES AND FUNCTION

Structure	Function
Glomerular Capillaries (Glomerulus)	Under high pressure from the arteries they <u>filter</u> out the plasma. (Squeeze the fluid out of the blood through the tiny holes in the capillaries).

NEPHRON STRUCTURES AND FUNCTION

Structure	Function
Proximal/ distal Convoluted renal tubule	This is where <u>glucose</u> , <u>amino acids</u> , <u>lipids</u> , <u>water</u> and <u>salt (minerals)</u> are <u>reabsorbed</u> into the blood stream. Secretes poisons, drugs and H ⁺ ions for pH control.

NEPHRON STRUCTURES AND FUNCTION

Structure	Function
Loop of Henle	<u>Reabsorbs water</u> and <u>salt</u> (NaCl)
Collecting ducts	<u>Carries urine</u> to the Ureters. More water and salt is reabsorbed into the blood here.

A NEPHRON

Bowman's capsule

Distal convoluted tubule

Glomerulus

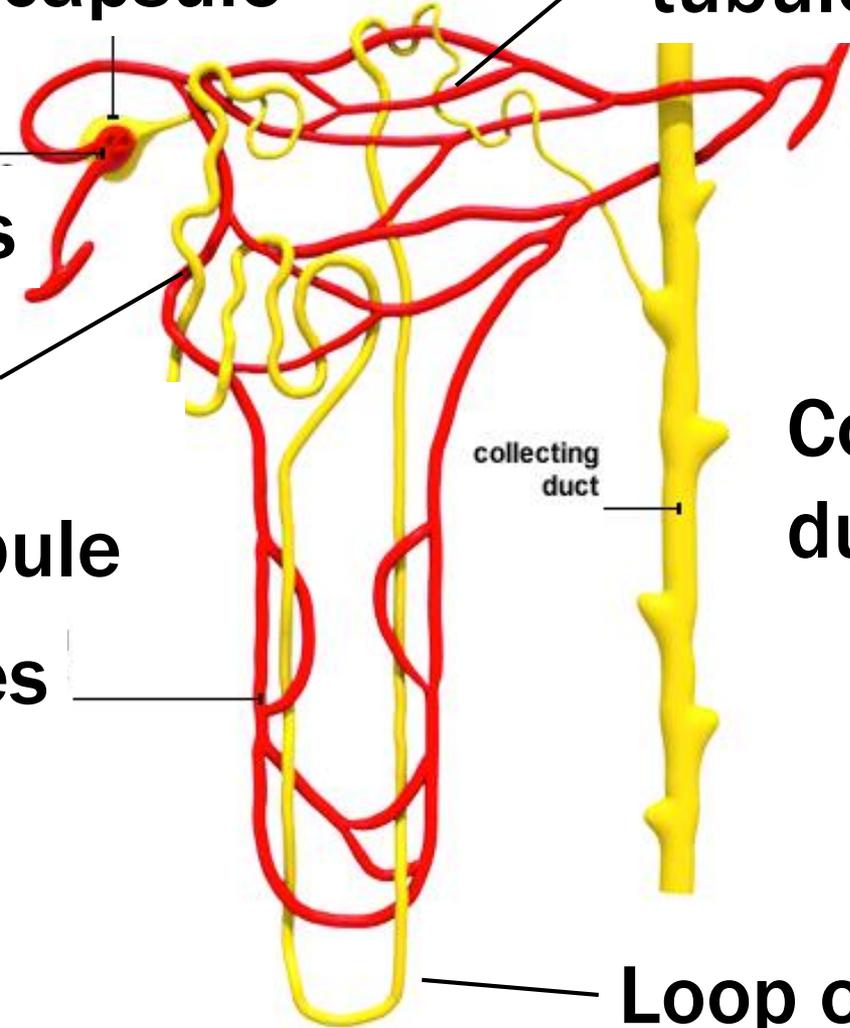
Proximal convoluted tubule

Collecting duct

Capillaries

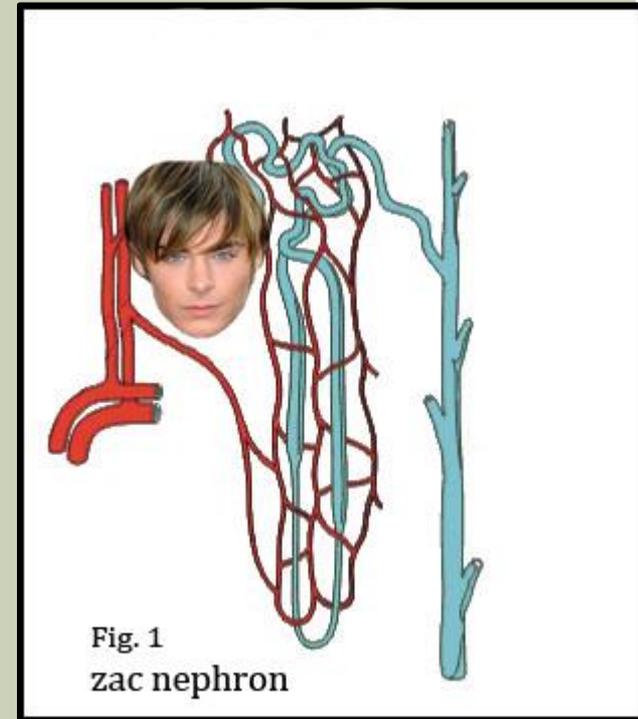
collecting duct

Loop of Henle



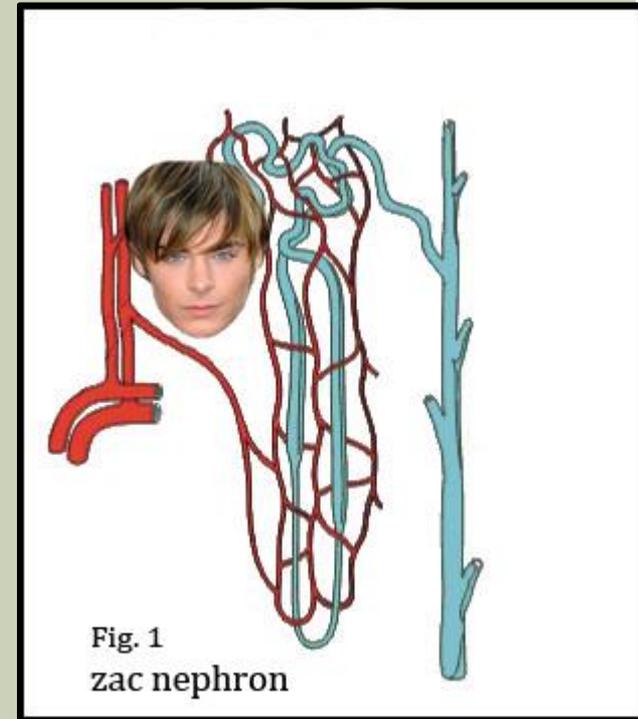
OVERVIEW: NEPHRON

- Nephrons:
 - Each kidney has **1,000,000 nephrons**
 - Bowman's Capsule **filters** the blood. It squeezes water, glucose, vitamins, salt, urea, uric acid out of the blood into the nephron.



OVERVIEW: NEPHRON

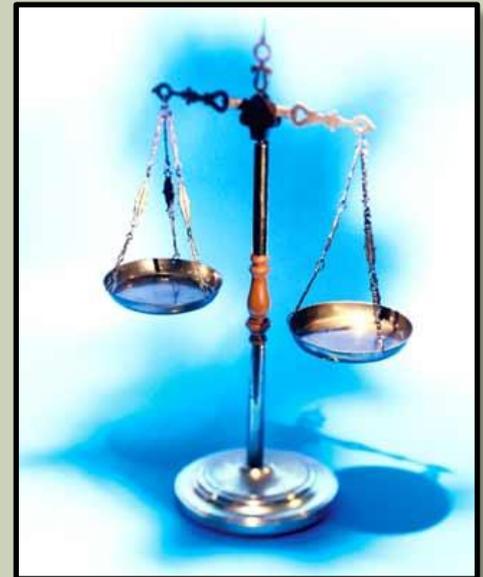
- Nephrons:
 - Loop of Henle reabsorbs any **glucose** and **salt** it needs . The water follows the salt by **osmosis**.



Functional unit of the kidneys: **nephron**

HOMEOSTASIS

- This is the control of the body's internal environment. It needs to be kept in balance.
- Need to control water levels
 - lungs, sweat, kidneys (urine)



HOMEOSTASIS

- Need to control electrolyte levels (salts)
 - sweat, urine
- Need to control body temperature
 - Controlling blood flow to skin, sweating, shivering, urine
- Need to control blood sugar levels
 - Release and storage of glucose controlled by insulin

EFFECTS ON WATER REABSORPTION & URINE PRODUCTION

- 1) Eating salty foods
 - High reabsorption
 - To balance salt levels
 - Low urination
 - Less water in blood



EFFECTS ON WATER REABSORPTION & URINE PRODUCTION

■ 2) Exercising

■ High reabsorption

■ To counteract water used and lost through sweating

■ Low urination

■ Less water in blood



EFFECTS ON WATER REABSORPTION & URINE PRODUCTION

■ 3) Drinking a 2L bottle of water?

- Low reabsorption

- Too much water

- High urination

- Need to get rid of excess water in blood



SOME FACTS ABOUT THE EXCRETORY SYSTEM

- The kidneys are about the size of a small bar of soap or your fist
- The kidneys are behind the liver and under the last two ribs for protection.
- They are surrounded by fat
- $\frac{1}{4}$ of your entire blood supply goes through the kidneys every minute.
- In 24 hours it filters 150 - 180 litres of blood.
- In 24 hours you only make 1 - 1.8 L of Urine

TOTAL VOLUME OF WATER IN THE BODY

Intracellular fluid	Extracellular fluid	
~40% of body weight (~25 L)	~20% of body weight (~15 L) Interstitial fluid Blood plasma ~12L ~3L	

AVERAGE DAILY INPUTS AND OUTPUTS

Average Daily Inputs	Average Daily Outputs
250 ml metabolism	100 ml feces
750 ml Food	200 ml sweat
1500 ml Beverages	700 ml lungs & skin
	1500 ml urine

<https://www.youtube.com/watch?v=5GIfISN4-G8>

WHAT'S IN PEE?

- **Excess Water**
- **Urea** (from digesting **proteins**)
- **Uric acid** (from digesting **nucleic acids**)

WHAT'S IN PEE?

- Excess electrolytes
(potassium, sodium, chloride)
- Excess vitamins (C, B complex)
- Urochrome (Yellow pigment)
- Heat

WHAT'S **NOT** IN PEE?

Glucose

Proteins

Blood cells

Lipids

If you have any of these substances in your urine it is likely an indication of a health problem!

POSSIBLE HEALTH CONCERNS

Proteinuria

When proteins (ex: albumin) are in the urine

- This can happen due to damage to the kidneys or an overproduction of proteins

POSSIBLE HEALTH CONCERNS

Diabetes

when the body does not produce enough insulin there may be excess blood sugar levels

- The glucose is then excreted in the urine

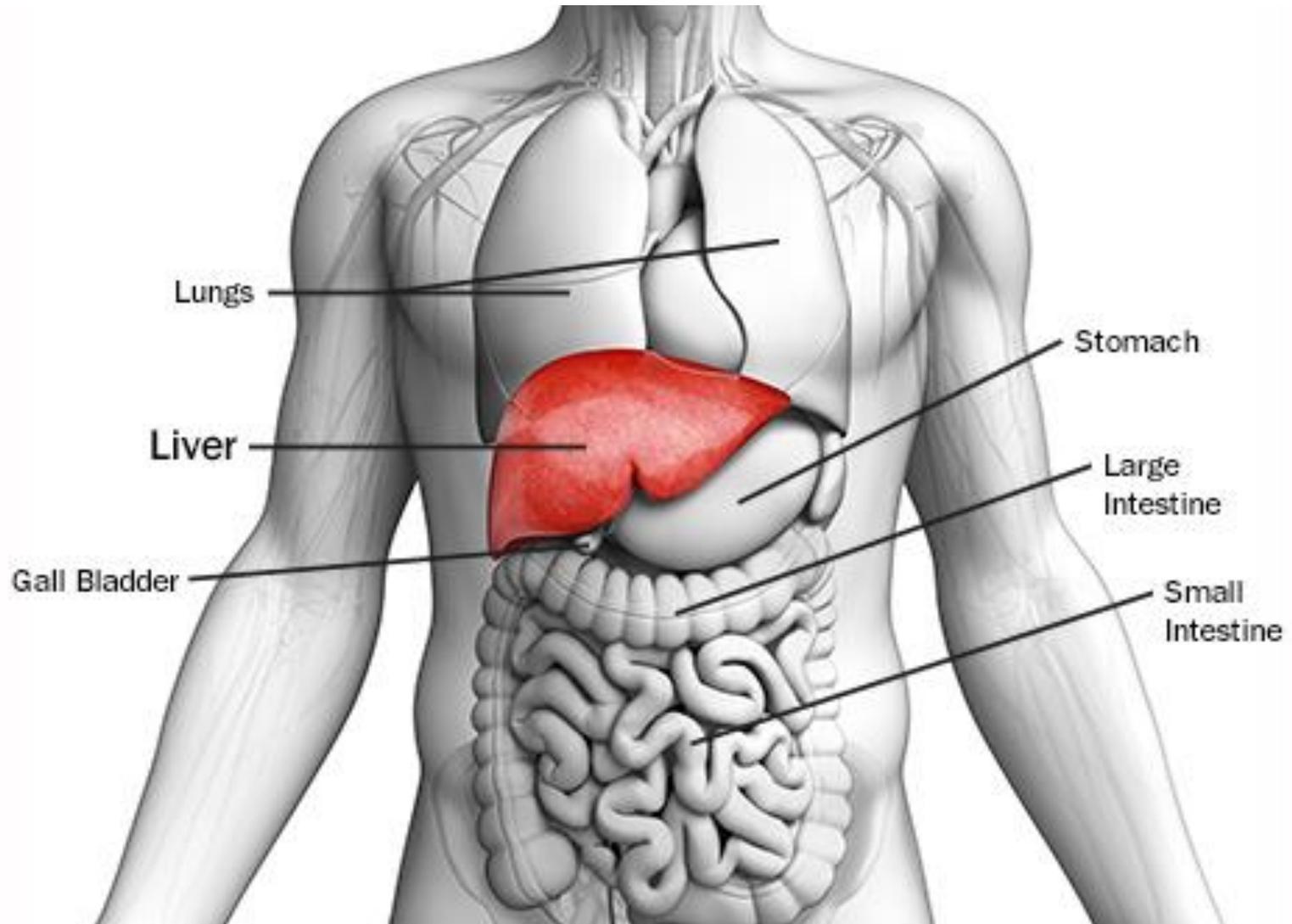
POSSIBLE HEALTH CONCERNS

Hyperuricosuria

too much uric acid in the urine will cause the pH to drop below 7

This could be a sign of kidney stones or gout

THE LIVER



THE LIVER

- Responsible for breakdown and removal of toxins from the body (detoxification)
- Nutrition: produces bile
 - Used in the emulsification of various nutrients (fats) and wastes (ammonia, ethanol)
 - Produces urea
 - Also helps regulate glucose levels in the blood

ALCOHOL AND THE LIVER

- **Alcohol** (ethanol) is considered a **toxin** to the body – it is the liver's job to **break it down and remove it**
- Too much alcohol can **damage the liver** though



ALCOHOL AND THE LIVER

- Alcohol can interfere with the function of the liver
 - It can cause inflammation of the cells and the buildup of fat in the liver
- The liver can also undergo oxidative stress
 - This is when it is working too hard to break down alcohol and results in cell damage and scar tissue

EXTRA VIDEOS

- How the kidneys work
 - <https://www.youtube.com/watch?v=ctGkLYuUCvU>
- How the kidneys filter blood
 - <https://www.youtube.com/watch?v=wWsdcfGta4k>
- How kidneys make urine
 - <https://www.youtube.com/watch?v=Vqce2dtg45U>
- How do we pee?
 - <https://www.youtube.com/watch?v=rhe01tVyB0U>