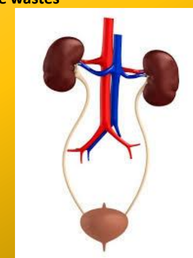
THE EXCRETORY SYSTEM

- <u>Function</u>

  = **maintains homeostasis of water, ions and soluble wastes (ie. nitrogenous wastes) in the body**

  -kidneys control the majority of this



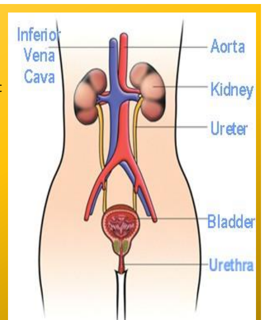
- **<u>PARTS OF THE EXCRETORY SYSTEM</u>**

a) <u>Kidneys</u>
- 2, each about fist size,
- located on the back wall of the body cavity near heart
  = blood pressure is high in the kidneys
- **responsible for filtering the blood**

b) <u>Ureter</u>
- 1 tube for each kidney
- **carries urine from the kidney to bladder**

c) <u>Urinary Bladder</u>
- **holds urine**

d) <u>Urethra</u>
- **tube leading urine from the bladder out of the body**

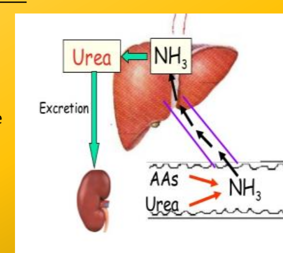


- **<u>REMOVING WASTE FROM THE BLOOD</u>**

1) As proteins are metabolized, **toxic NH_3 (ammonia)** is formed

2) The **liver** converts NH_3 to **urea** which is highly soluble & less toxic

3) Removal of urea from the blood is done by the **nephrons** in the kidney



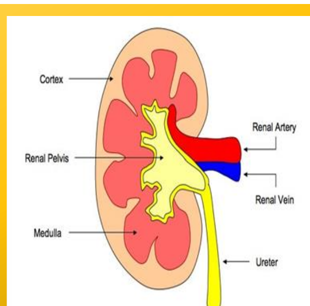
- **<u>PARTS OF THE KIDNEY</u>**

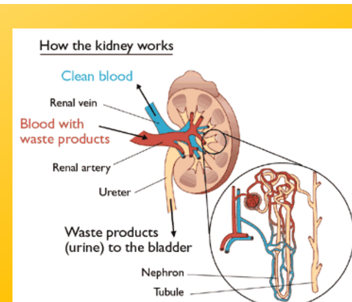
a) <u>cortex</u>
- **outer layer** of connective tissue

b) <u>medulla</u>
- **inner layer** of the kidney

c) <u>renal pelvis</u>
- central, **funnel-shaped** part

d) <u>nephron</u>
- **filtering units** which make up the cortex and medulla of the kidney





• **<u>THREE BASIC PROCESSES WITHIN THE KIDNEY</u>**

1. <u>Filtration</u>

= like a strainer

➢As the kidneys are near the heart the high blood pressure forces water, salt, glucose, amino acids, and urea out of **capillaries** into the **nephron**

➢large molecules (blood cells, proteins, lipoproteins) remain in the capillaries & continue to circulate through the body

2) <u>Reabsorption</u>

= to get back most of the **water** and some **nutrients**

➢occurs between the nephrons & the capillaries surrounding them

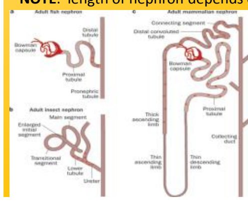
➢reabsorption is done until the **optimum** level of water & nutrients is reached

3) <u>Secretion</u>

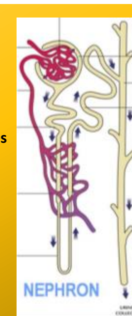
➢Wastes are moved into **collection tubules** to be removed from the body

➢Disposes of leftover urea, toxins, excess vitamins, and water

• **NOTE**: length of nephron depends on **where the animal lives**



- desert rat = long
- fish = short
- human = 168 miles



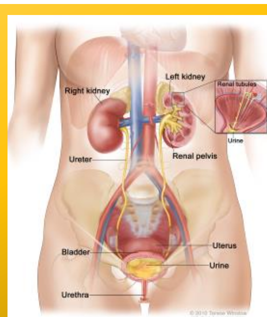
• **<u>URINATION</u>**

1) collection tubules carry wastes to the **renal pelvis** of the kidney

2) urine is funneled through the **ureter** to **bladder**

3) sphincter muscle relaxes

= urine passes out of the **urethra**



• **<u>HOW DO COFFEE & ALCOHOL INCREASE URINATION</u>?**

- coffee and alcohol are **diuretic agents**

= cause more fluid to be removed

- diuretics inhibit the amount of **Antidiuretic Hormone (ADH)** produced by the pituitary

: ADH controls the quantity of **water** left in the collecting tube by monitoring **salt (sodium)** levels in the blood

= increases water reabsorption

- less ADH = ↑ water in collection tubule

= ↑ urination

- result: body becomes more dehydrated

= **thirst, hangover**

• **<u>HOW KIDNEY FUNCTION CONTROLS BLOOD PRESSURE</u>**

- blood pressure depends upon:

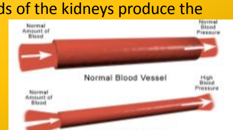
: hardness of blood vessels

: blood volume (amount of water in the blood)

- when blood pressure is **low** the adrenal glands of the kidneys produce the hormone **aldosterone:**

: ↑ salt reabsorption by causing **constriction of the blood vessels**

= raises blood pressure



- high salt content in the blood results in ADH being ↑

: water enters arteries = ↑ **blood volume & blood pressure** ↑

- normally, when blood pressure is increased to the correct level aldosterone production is stopped by the kidneys

** a high sodium diet can lead to **hardening of the arteries and high blood pressure**

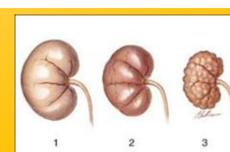
• **<u>KIDNEY PROBLEMS</u>**

a) <u>Defective Function of Certain Glands</u>

- can affect ADH production

: result = eliminate lots of water, thirsty, high concentrations of sugar in urine

: ie. pancreas = diabetes



b) <u>Kidney stones</u>

- uric acid or calcium deposits block tubules or ureter
- cause = don't drink enough water
- stones destroyed by chemicals, ultrasound waves or surgically removed

c) Kidney failure

- filtering capacity reduced or stopped
- various causes including infection, heredity, etc.
- good kidney will enlarge
- other treatments include dialysis, transplant