



Excretion & Waste management

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Objectives

- Introduction
- What is excretion?
- Excretion vs defecation?
- What do you excrete? Why?
- Organs involved in excretion.



Excretion & Waste Management

- What is excretion?

- Removal of *metabolic* waste from the body

- What is metabolic?

- All the chemical processes (with molecules) that occur in the cell and organism

Let's imagine...

- If we ate a whopper with cheese for lunch
- Here are the nutritional values

| Nutrition Facts | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Serving Size 1 item 316g (316 g) | |
| Amount Per Serving | |
| Calories 790 | Calories from Fat 436 |
| % Daily Value* | |
| Total Fat 48g | 75% |
| Saturated Fat 18g | 91% |
| Trans Fat 1g | |
| Cholesterol 114mg | 38% |
| Sodium 1432mg | 60% |
| Total Carbohydrate 53g | 18% |
| Dietary Fiber 3g | 13% |
| Sugars 13g | |
| Protein 35g | |
| Vitamin A 0% • Vitamin C 1% | |
| Calcium 26% • Iron 35% | |
| <small>*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.</small> | |
| ©www.NutritionData.com | |



● ● ● | What kind of waste products do you think we will produce?

Composition

- The bun is basically carbohydrates
- The meat is basically proteins
- The vegetables are carbohydrates
- Others are fat and sodium (salt)





In our cells

- When our cells in our body break these materials down...
 - Here are some of them

| Waste Product | Origin of Waste product | Excretory organ |
|--------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------|
| Ammonia (Nitrogenous compound) NH_3 | Break down of amino acids from <i>proteins</i> in the meat by the liver | Kidneys |
| Urea (Nitrogenous compound) $(\text{NH}_2)_2\text{CO}$ | Conversion of ammonia from the amino acids | Kidneys, skin |
| Carbon Dioxide | Cellular respiration | Lungs, intestines, skin |
| Mineral salts (NaCl) | Food, water, salt | Kidneys and skin |
| Water | Cellular respiration | Kidneys, lungs, skin, intestines |



Question

- Why is excrement (feces) not included in the list of metabolic wastes?
 - Poop or excrement is not a product of cellular metabolism (happening in the cells).
 - After the body absorbs all the necessary nutrients, the left over becomes the excrement

Excretion vs defecation

- Excretion – is the elimination of metabolic waste (Urea, ammonia, sodium etc) from the body
- Defecation is the elimination of feces from the body (from the digestive system).
 - Ex. Bacteria and undigested food were never in cells



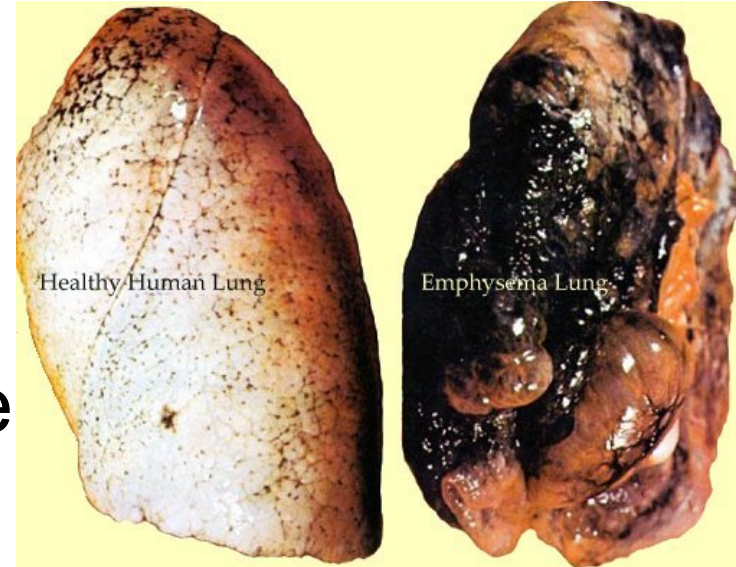


Organs involved in waste management

- Lungs
- Skin
- Liver
- Kidneys (Urinary system)

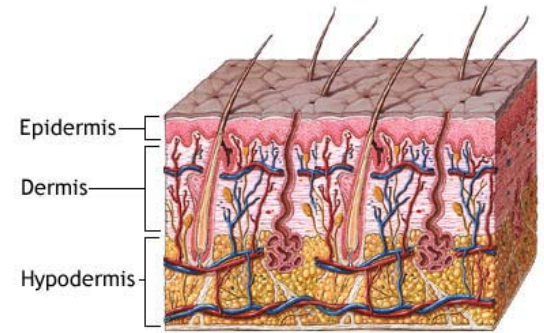
Lungs

- When you breathe in and out
- Your lungs exchange CO₂ and O₂
- Toxic CO₂ is eliminated while O₂ is taken in
- Alcohol can also be eliminated – breathalyzer test



Skin

- What happens when you get hot?
 - You sweat
 - By sweating you are cooling your body
 - Salt, water and CO₂ can be evaporated from your body



Liver

3 functions

1. Detoxification

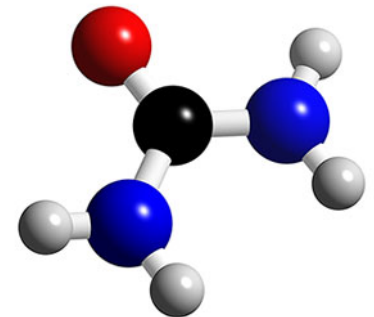
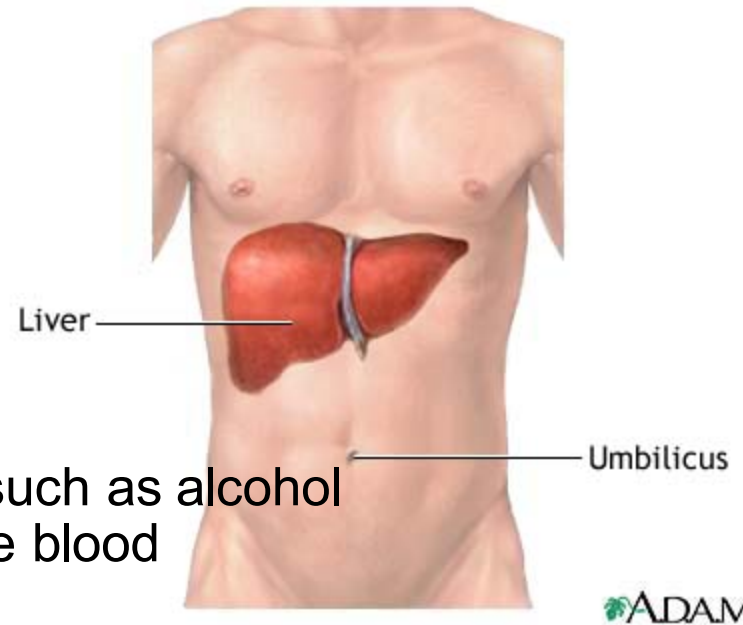
- Removes harmful substances such as alcohol and drugs and bacteria from the blood

2. Production of bile

- Produced by the liver
- Help in emulsifying (breaking down) fats so they can be absorbed easier in the small intestines

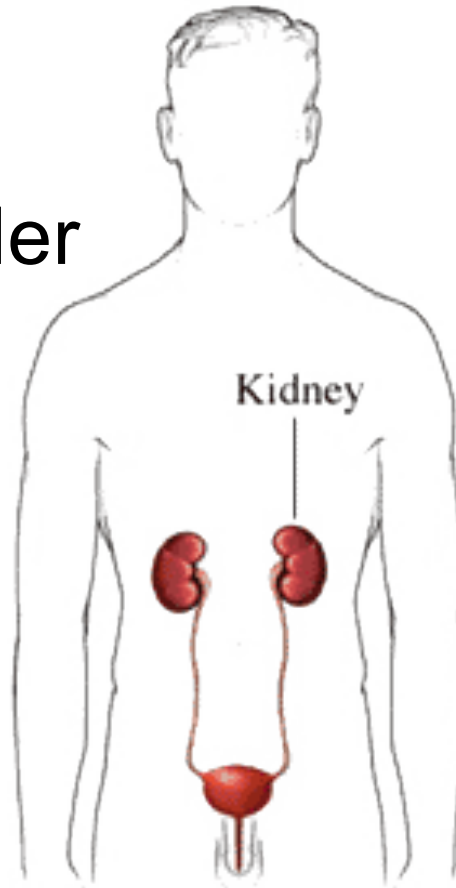
3. Formation of urea

- Breaking down amino acids and fats into urea.
- $(\text{NH}_2)_2\text{CO}$
- Toxic ammonia is converted to UREA and excreted in our urine (yellow)

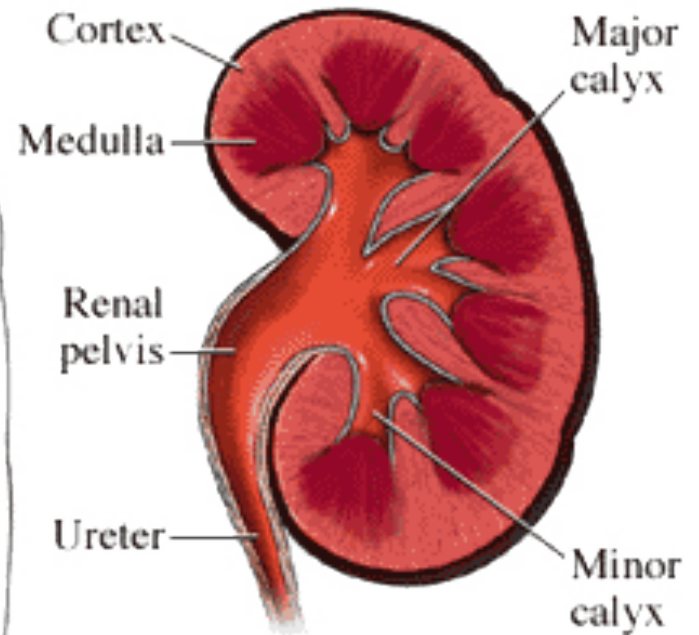


Urinary system

- 2 kidneys
- 2 ureters
- 1 urinary bladder
- 1 urethra



Cut-away of kidney





Urinary system

- Excrete metabolic wastes
 - Urea
- Maintain water-salt balance
 - Maintain the appropriate water-salt balance of the blood
- Maintain acid-base balance
 - Regulates the acid-base balance of the blood
- Secretion of hormones
 - Assist the endocrine system in hormone secretion
 - Activation of vitamin D
 - Ex: aldosterone, erythropoietin,



Summary

- Excretion vs defecation
- What is metabolic waste?
- Types of metabolic waste?
- Organs involved
 - Lungs
 - Skin
 - Liver
 - Urinary system