

# Cell Metabolism

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# Cell Metabolism

- Cell takes in raw material (food) and uses it to carry on its function.
- Once inside the cell:
  - Metabolism: chemical reactions necessary for use of raw material.
- Occurs in two parts:
  - Anabolism
  - catabolism

# Cell Metabolism

- Anabolism: reactions build larger complex substances from simpler ones. Requires energy in the form of ATP

Example: Building of adipose tissue from fat

- Catabolism: reactions that break down larger , more complex substances into simpler substances.

Example: Glucose & O<sub>2</sub> = CO<sub>2</sub> & energy

# Cell Metabolism

- Raw Material:
  - Carbohydrate
    - Monosaccharides
    - Disaccharides
    - polysaccharides
  - Lipids
  - Protein
    - Essential amino acids
    - Non-essential amino acids

# Cell Metabolism

- Carbohydrates are organic compounds composed of carbon, hydrogen, and oxygen.
  - Monosaccharides: single sugar compounds
  - Disaccharides: double sugars
  - Polysaccharides: made of many glucose moleculesExamples: Bread, Pasta, Potatoes, Rice

# Cell Metabolism

- Glucose is primarily used as fuel and provides energy in the form of ATP for the cells to do its work.
- Stored in liver and skeletal muscles as glycogen

# Cell Metabolism

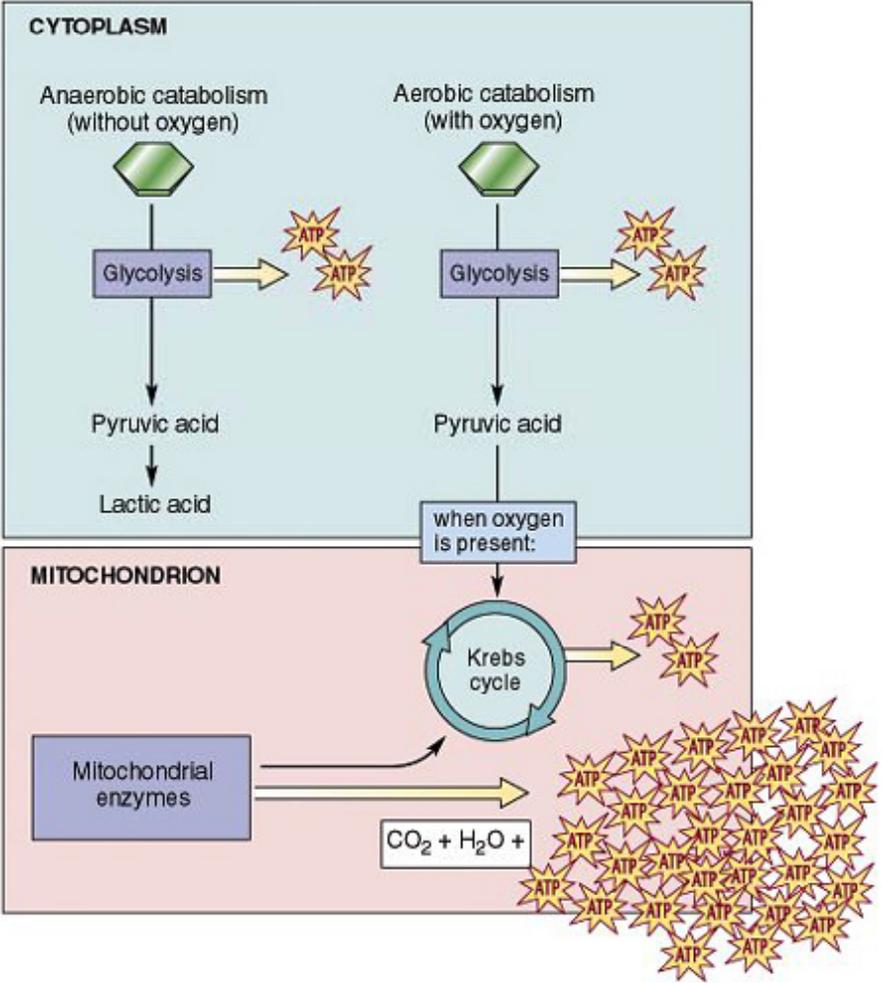
- Used in three ways:
  1. Can be burned immediately and used as fuel
  2. Can be stored as glycogen and burned as fuel later
  3. Can be stored as fat and be burned as fuel later

# Cell Metabolism

- Glucose is broken down under two conditions:
  1. Anaerobic Catabolism
    - Breakdown in the absence of oxygen
    - Occurs in cytoplasm
    - Called **glycolysis**
    - Broken down in series of chemical reaction, first into pyruvic acid, then lactic acid & produces only small amount of ATP

# Cell Metabolism

- Aerobic Catabolism:
  - Occurs in presence of oxygen
  - Glucose completely broken down to form carbon dioxide, water and ATP
  - Large amount of ATP released due to complete breakdown occurring in the mitochondria
  - Called the **Krebs Cycle**



# Cell Metabolism

- Lipids (Fats)
  - Found in fatty meats, egg yolks, dairy products & oils
  - In body found as triglycerides, phospholipids & steroids
  - Breakdown is similar to glucose (Krebs cycle)
  - Broken down to produce energy, synthesis of steroids, component of cell membrane & myelin sheath

# Cell Metabolism

- Protein:
  - Most abundant organic matter in the body
  - Amino acids are the building blocks
  - Found in lean meats, milk, eggs
  - These dietary sources are considered essential amino acids
  - Non-essential amino acids are synthesized in the liver therefore not needed in diet

# Cell Metabolism

- Use of Proteins:
  - Synthesis of hormones, enzymes, antibiotics, plasma proteins, muscle protein, hemoglobin, cell membrane
  - Breakdown and used as fuel, energy for ATP production
  - Can be broken down & converted to glucose

# Cell Metabolism

- Amino Acids are composed of nitrogen, carbon, hydrogen & oxygen
- The nitrogen needs the liver to either synthesize different amino acids or be converted into urea to be excreted by the kidneys.

# Cell Metabolism

- Protein plays crucial role in every body function
- There is a protein synthesizing mechanism in every cell
- The information as to how protein (amino acids) is to be assembled is coded & stored in the nucleus of each cell – DNA (deoxyribonucleic acid)

# Cell Metabolism

- Since protein synthesis (correct assembly) takes place in ribosomes, message must get from nucleus to ribosomes. Accomplished by RNA (ribonucleic acid)
- 3 Types: 1 messenger  
2 transfers

# Cell Metabolism

- In nucleus, DNA gives directions for protein assembly to RNA, mRNA leaves nucleus & travels to ribosomes in cytoplasm & transfers information to protein (amino acids). 2<sup>nd</sup> RNA picks up amino acid & transports them to their proper sites. They line up in the proper order. A bond forms & a complete protein has been created.

# Protein Synthesis

