Lecture 3

MICROBIAL METABOLISM

Metabolism - The sum of all chemical reactions within a living cell either releasing or requiring energy.

Catabolism - Breaking down complex organic compounds into simpler ones. Usually release energy

Anabolism- The building of complex organic molecules from simpler ones. Reactions usually require energy from ATP

Enzymes: Proteins produced by living cells that that use them to catalyze chemical reactions names usually end in –ase

Oxidation is removing electrons; Reduction is gaining

Carbohydrate Metabolism

Most of a cell's energy is produced from the oxidation of carbohydrate - Most commonly glucose

Two major types of glucose catabolism are:

1-Respiration, in which glucose is completely broken down to CO2 and H20 creating much ATP. The final electron acceptor in this oxidation is usually 02, but may be other inorganic ions. This happens in the mitochondria of eukaryotes.

2-Fermentation in which it is partially broken down producing small amounts of ATP and using no 0_2.

Respiration without 02 is called anaerobic respiration.

anaerobic - inorganic molecule other than O2

Other Catabolic Reactions

1. Lipid - Lipases hydrolyze lipids into glycerol and fatty acids. Glycerol and the fatty acids are then broken down in the Krebs cycle.

2. Protein – Proteins are broken down by proteases and peptidases to amino acids that are converted to various substances that enter the Krebs cycle.
a) Amino acid is deaminated where an NH2 is removed so it can enter the Krebs cycle.
b) Also maybe decarboxylated where COOH is removed.

Metabolic Diversity among Organisms

A. Nutritional classification by energy and carbon source -
1. Energy

a) Phototrophs - Use light as their primary energy source

b) Chemotrophs - Depend upon oxidation-reduction reactions of inorganic or organic compounds for energy

2. Carbon Source
a) Autotrophs - Use carbon dioxide
b) Heterotrophs - Require an organic carbon source
3. Combination
a) Photoautotrophs
b) Photohererotrophs
c) Chemoautotrophs
d) Chemoheterotrophs - Most medically important organisms are in this group