

BIOL 341
Protein Chemistry/Chemical Reactions

Reading: pp. 47-53; 55-56

I. Structure

A. Amino acid subunits

1. 20 commonly found in natural proteins (9 essential)
2. 3 components
 - a. amino group
 - b. carboxyl group
 - c. R group (residue) side chain

B. AA's linked together by **peptide bonds**

1. NH_2 group **covalently** bonded to COOH of another aa
2. end groups still available
3. H_2O is released
4. polypeptide is created (> 100 aa's = protein)

C. Size: can be immense

D. Primary structure

1. order in which aa's are bonded together to form chain
2. determined by DNA

E. Secondary structure

1. due to H-bonds between AMINO H of one aa & CARBOXYL O of another in the same or other chain
2. within same chain can form alpha-helix (most common)

F. Tertiary structure

1. due to interaction of R groups
2. 3-D folding or "wadding" of helix
3. covalent and H bonds

G. Quaternary structure

1. 2 or more folded polypeptide chains bonded together
2. hemoglobin, insulin

II. Importance of protein structure

A. Many more biological functions than carbs or lipids

1. Enzymes
2. Structural molecules
3. Regulatory molecules (hormones)
4. Transport (hemoglobin, membrane proteins)
5. Protection (antibodies, keratin)

B. 20 aa's can combine to form thousands of different proteins

1. like letters of alphabet
2. generally, each protein performs one specific function
3. shape of the protein determines which molecules can bind to it
4. thus, 3-D shape determines function

III. Chemical Reactions in Body

A. Enzymes act as biological catalysts

1. increase rate of chemical reactions (enzyme unchanged)
2. decrease activation energy
3. 3-D shape critical
4. lock and key model
5. proximity lowers activation energy
6. enzymes are very specific (catalyze one type of chemical reaction)

B. Proteins may undergo reactions

1. denaturation- bonds holding 2° or 3° structure broken
 - a. high temps
 - b. chemicals
 - c. extremes of pH
 - d. protein shape is altered

2. hydrolysis

IV. High-Energy Molecules

A. Certain molecules store energy (from catabolism of nutrients)

B. These molecules make energy available to cells

1. ATP (adenosine triphosphate)
2. Energy stored in the phosphate bonds
3. Phosphate bond reacts with water ---> energy released (hydrolysis)
 $ATP + H_2O \rightarrow ADP + Pi + \text{energy}$



4. dehydration synthesis

