

Biochemistry Of Macromolecules (BCH417)

Topic: Introduction to macromolecular
structure and function II

Overview from last week

- ✓ Last week we studied the structure and function in carbohydrates and lipids
- ✓ Carbohydrates serve as fuel and building material
- ✓ Fats store large amounts of energy
- ✓ Phospholipids are major components of cell membranes

Learning Objectives for today

- Last week we studied the function of carbohydrates and lipids
- Today we shall study the functional roles of nucleic acids and proteins

Nucleic acids store and transmit hereditary information

- The amino acid sequence of a polypeptide is programmed by a unit of inheritance known as a gene
- A gene consists of DNA, a polymer known as a nucleic acid

- **Remember:** There are two types of nucleic acids: RNA and DNA
- A nucleic acid strand is a polymer of nucleotides
- Inheritance is based on replication of the DNA double helix
- We can use DNA and proteins to measure evolution (More distantly related species have more differences)
 - ✓ **Humans and mice differ in 27 amino acids**
 - ✓ **Humans and frogs differ in 67 amino acids**

Proteins have many structures, resulting in a wide range of functions

Proteins account for more than 50% of the dry mass of most cells. They are instrumental in almost everything that an organism does.

- Protein functions include structural support, storage, transport, cellular signaling, movement, and defense against foreign substances
- Most important, protein enzymes function as catalysts in cells, regulating metabolism by selectively accelerating chemical reactions without being consumed

Humans have tens of thousands of different proteins, each with a specific structure and function.

- Proteins are the most structurally complex molecules known
- Each type of protein has a complex three-dimensional shape or conformation.

All protein polymers are constructed from the same set of 20 amino acid monomers

- Polymers of proteins are called polypeptides
- A protein consists of one or more polypeptides folded and coiled into a specific conformation

Note

- Amino acids are the monomers from which proteins are constructed
- The amino acid sequence of a polypeptide can be determined
- Protein conformation determines protein function

Further Reading

There are more details in the recommended textbooks and in the online materials (Copy and paste the link into your web browser)

<http://hhmi.missouri.edu/assets/docs/prep/Macromolecules.pdf>

https://www.course-notes.org/Biology/Outlines/Chapter_5_The_Structure_and_Function_of_Macromolecules