Biochemistry Of Macromolecules (BCH417)

Topic: Introduction to macromolecular structure and function I

Overview from last week

- ✓ Within cells, small organic molecules are joined together to form larger molecules

- ✓ These large macromolecules may consist of thousands of covalently bonded atoms and weigh more than 100,000 daltons

- ✓ The four major classes of macromolecules are carbohydrates, lipids, proteins, and nucleic acids

Overview from last week

- ✓ Three of the four classes of macromolecules—carbohydrates, proteins, and nucleic acids—form chainlike molecules called polymers

- ✓ A polymer is a long molecule consisting of many similar or identical building blocks linked by covalent bonds: the repeated units are small molecules called monomers

- ✓ Some of the molecules that serve as monomers have other functions of their own

Learning Objectives for today

- Remember the structures of macromolecules from our meeting of last week

- Today we shall study the functional roles of those macromolecules whose structures we studied last week

Carbohydrate structure and function

- Carbohydrates include sugars and their polymers.
- The simplest carbohydrates are monosaccharides, or simple sugars.
- Disaccharides, or double sugars, consist of two monosaccharides joined by a condensation reaction.
- Polysaccharides are polymers of many monosaccharides.

Carbohydrate structure and function

- Carbohydrates serve as fuel and building material
- Sugars, the smallest carbohydrates, serve as fuel and a source of carbon
- Polysaccharides, the polymers of sugars, have storage and structural roles

Lipids are a diverse group of hydrophobic molecules

- Unlike other macromolecules, lipids do not form polymers
- The unifying feature of lipids is that they all have little or no affinity for water
- This is because they consist mostly of hydrocarbons, which form nonpolar covalent bonds
- Lipids are highly diverse in form and function

Fats store large amounts of energy

The major function of fats is energy storage

- A gram of fat stores more than twice as much energy as a gram of a polysaccharide such as starch

- Because plants are immobile, they can function with bulky energy storage in the form of starch. Plants use oils when dispersal and compact storage is important, as in seeds

Fats store large amounts of energy

The major function of fats is energy storage

- Animals must carry their energy stores with them and benefit from having a more compact fuel reservoir of fat

- Humans and other mammals store fats as long-term energy reserves in adipose cells that swell and shrink as fat is deposited or withdrawn from storage

Adipose tissue also functions to cushion vital organs, such as the kidneys

A layer of fat can also function as insulation

This subcutaneous layer is especially thick in whales, seals, and most other marine mammals

Phospholipids are major components of cell membranes

Steroids include cholesterol and certain hormones

Further Reading

There are more details in the recommended textbooks and in the online material available at: https://www.course-notes.org/Biology/Outlines/Chapter_5_The_Structure_and_Function_of_Macromolecules (Copy and paste the link into your web browser)