

Biology 20 Laboratory Life's Macromolecules

OBJECTIVE

- To observe and record reactions between three classes of macromolecules in the presence of simple chemical indicators.
- To be able to distinguish positive from negative test results.
- To study macromolecular composition of selected plant and animal products.
- To be able to indicate which of the tested substances are normally found in various biological extracts.

INTRODUCTION

Carbohydrates, lipids, proteins and nucleic acids are four classes of large organic molecules (macromolecules) found in living things. Each macromolecule is composed of many identical or similar subunits (monomers) bonded together. Each type of macromolecule has a characteristic shape and organization, which determines how they function. Knowing this, we can devise tests that relate to the differences of these macromolecules and identify these macromolecules accordingly.

Carbohydrates are the class of macromolecules called sugars. They can range from small simple sugars consisting of only a single monomer (monosaccharide) to larger and more complex polymers consisting of two monomers (disaccharide) or many monomers (polysaccharide). Glucose is a monosaccharide derived from sugars (fructose, sucrose, galactose, etc.). Glucose is the body's main preferred source of fuel for cellular respiration. As glucose is absorbed into the bloodstream as a result of digestion, it can be used immediately for cellular respiration or stored as glycogen in the liver and skeletal muscles for use later. Glucose is the only nutrient (as opposed to fats or proteins) utilized as a source of energy by the tissues in the brain. In plants, glucose can be used to form various storage or structural polysaccharides. Excess sugars in plants are stored as starch in roots and other tissues. Cellulose is the most abundant structural polysaccharide in plants and a major component of the cell wall for protecting and supporting the whole organism. Although cellulose is in great abundance, it is generally an inaccessible source of carbohydrates to most animals.

Lipids are a class of organic macromolecules composed primarily of carbon and hydrogen atoms; they include fats, phospholipids, waxes and steroids. Fats are stored in the body in the form of triglycerides (body fat) and provide a second source of energy utilized by the body for metabolic processes. Lipids also serve an important role as structural components in cell membranes, synthesis of lipoproteins, hormones, cushioning body organs against injury and insulating the body.

Proteins are polymers of amino acids and form the third group of organic macromolecules. Proteins are the least preferred source of energy by the body. This is because proteins are "expensive" to construct and better used for other metabolic processes. However, proteins are a vital component of an organism's anatomy and physiology. They are essential for biochemical reactions, necessary for metabolic processes to take place and are integral to the structure of DNA.