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ENERGY FROM ORGANIC AND INORGANIC COMPOUNDS

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Abstract

Molecules are vital for life, metabolic reactions either focus on making these molecules during the construction of cells and tissues, or breaking them down and using them as a source of energy, in the digestion and use of food. Many important biochemical's can be joined together to make polymers such as DNA and proteins. These macromolecules are essential.

Keywords: Inorganic Compound.

Introduction

A striking feature of metabolism is the similarity of the basic metabolic pathways and components between even vastly different species.[1] For example, the set of carboxylic acids that are best known as the intermediates in the citric acid cycle are present in all known organisms, being found in species as diverse as the unicellular bacterium *Escherichia coli* and huge multicellular organisms like elephants.[1] These striking similarities in metabolic pathways are likely due to their early appearance in evolutionary history, and being retained because of their efficacy.[2]

Key biochemicals

Figure : Structure of a triacylglycerol lipid

Most of the structures that make up animals, plants and microbes are made from three basic classes of molecule: amino acids, carbohydrates and lipids (often called fats). As these molecules are vital for life, metabolic reactions either focus on making these molecules during the construction of cells and tissues, or breaking them down and using them as a source of energy, in the digestion and use of food. Many important biochemical's can be joined together to make polymers such as DNA and proteins. These macromolecules are essential.

Literature Review

Obesity is a serious health concern in the United States and in other developed countries. Obesity is defined by the body mass index, which is a measure of weight in relation to height. A person with a body mass index greater than 30 is clinically defined as obese, while a person with a body mass greater than 25 is defined as overweight. According to the NIH, based on the US Census Bureau Census 2000, nearly two thirds of United States adults are overweight, including one third that are obese. Surprisingly less than half of United States adults maintain a healthy weight. The prevalence of overweight and obesity in adults has steadily increased over the past 20 years among both genders, all ages, all racial and ethnic groups, and all educational levels. According to the CDC, in 2002 every state reported an obesity prevalence of

at least 15-19%, while 29 states reported a prevalence of 20-24%, and 3 states reported an obesity prevalence over 25%. The obesity prevalence has huge implications for public health and society. Several diseases are associated with overweight and obesity. Specifically, overweight and obesity are risk factors for diabetes, heart disease, stroke, hypertension, gallbladder disease, osteoarthritis, sleep apnea and other breathing problems, and some forms of cancer. Obesity is also associated with high blood cholesterol, complications with pregnancy, menstrual irregularities, hirsutism, stress incontinence, psychological disorders and an increased risk of complications during surgery. In addition, due to the rise in excess weight and obesity, health care costs have increased dramatically. The annual medical 1 2 spending due to excess weight and obesity is approximately 93 billion or 9% of health care expenditures, which can be broken down into costs associated with heart disease, type 2 diabetes, osteoarthritis, hypertension, gallbladder disease, cancer, and lost productivity at work. In addition to these health care costs, Americans spend $33 billion dollars per year on weight-loss products and services. Many people blame obesity on a sedentary lifestyle or poor food choices (such as over-eating, too many carbohydrates, too much saturated fat). However, research has shown that there may be a genetic influence on weight disorders. One of the National Health Objectives is to reduce the prevalence of obesity among adults to less than 15%. Perhaps the most effective way to combat the problem is through further understanding of the mechanism of fatty acid metabolism.

Energy from organic compounds

Carbohydrate catabolism is the breakdown of carbohydrates into smaller units. Carbohydrates are usually taken into cells once they have been digested into monosaccharides. Once inside, the major route of breakdown is glycolysis, where sugars such as glucose and fructose are converted into pyruvate and some ATP is generated. Pyruvate is an intermediate in several metabolic pathways, but the majority is converted to acetyl-CoA and fed into the citric acid cycle. Although some more ATP is generated in the citric acid cycle, the most important product is NADH, which is made from NAD^+ as the acetyl-CoA is oxidized. This oxidation releases carbon dioxide as a waste product. In anaerobic conditions, glycolysis produces lactate, through the enzyme lactate dehydrogenase re-oxidizing NADH to NAD+ for re-use in glycolysis. An alternative route for glucose breakdown is the pentose phosphate pathway, which reduces the coenzyme NADPH and produces pentose sugars such as ribose, the sugar component of nucleic acids.

Fats are catabolised by hydrolysis to free fatty acids and glycerol. The glycerol enters glycolysis and the fatty acids are broken down by beta oxidation to release acetyl-CoA, which then is fed into the citric acid cycle. Fatty acids release more energy upon oxidation than carbohydrates because carbohydrates contain more oxygen in their structures.

Amino acids are either used to synthesize proteins and other biomolecules, or oxidized to urea and carbon dioxide as a source of energy. The oxidation pathway starts with the removal of the amino group by a transaminase. The amino group is fed into the urea cycle, leaving a deaminated carbon skeleton in the form of a keto acid. Several of these keto acids are intermediates in the citric acid cycle, for example the deamination of glutamate forms α-ketoglutarate. The glucogenic amino acids can also be converted into glucose, through gluconeogenesis (discussed below).

Energy transformations

Oxidative phosphorylation

In oxidative phosphorylation, the electrons removed from organic molecules in areas such as the protagon acid cycle are transferred to oxygen and the energy released is used to make ATP. This is done in eukaryotes by a series of proteins in the membranes of mitochondria called the electron transport chain. In prokaryotes, these proteins are found in the cell's inner membrane. These proteins use the energy released from passing electrons from reduced molecules like NADH onto oxygen to pump protons across a membrane.

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