Biological functions of carbohydrates pdf

There are five main functions of carbohydrates in the human body. This is energy production, energy storage, construction of macromolecules, sparing protein and help in the metabolism of lipids. Energy production The main role of carbohydrates is to supply energy to all cells in the body. Many cells prefer glucose as an energy source compared to other compounds like fatty acids. Some cells, such as red blood cells, are able to produce only cellular energy from glucose. The brain is also very sensitive to low blood glucose levels because it uses only glucose to produce energy and function (if only in extreme fasting conditions). About 70 percent of the glucose ingested from digestion is redistributed (by the liver) back to the bloodstream for use by other tissues. Cells that require energy remove glucose from the blood with a transport protein in their membranes. Glucose energy comes from chemical bonds between carbon atoms. Solar energy was needed to produce these high energy connections during photosynthesis. The cells in our body break these bonds and capture energy to perform cellular respiration. Cellular respiration is basically controlled by glucose burning compared to uncontrolled burning. The cell uses many chemical reactions in several ensimatic steps to slow down the release of energy (without explosion) and more effectively capture the energy captured in the chemical bonds in glucose. The first stage of glucose breakdown is called glycolysis. Glycolysis, or glucose cleavage, occurs in a complex series of ten steps of an enzymatic reaction. The second stage of glucose decay occurs in the plant's energy organelles, called mitochondria. One carbon atom and two oxygen atoms are removed, giving more energy. The energy from these carbon bonds is carried into another area of the mitochondria, making cellular energy available in the form cells can use. Figure 4.10 Cellular Breath Cellular Breath is the process by which energy is captured from glucose. Energy Storage If the body already has enough energy to support its functions, excess glucose is stored as glycogen (most of which is stored in the muscles and liver). The glycogen molecule can contain over fifty thousand units of glucose and is heavily branched, allowing the rapid spread of glucose when needed to make cellular energy. The amount of glycogen in the body at any given time is equivalent to about 4,000 kilocalories-3000 in muscle tissue and 1000 in the liver. Prolonged muscle use (e.g. exercise for longer than a few hours) can deplete glycogen energy. Remember that this is called a kick on the wall or bonking and is characterized by fatigue and decreased performance Weakening muscle sets because it takes longer to convert the convert energy in fatty acids and proteins to use energy than glucose. After prolonged exercise, glycogen is gone, and the muscles should rely more on lipids and proteins as an energy source. Athletes can increase their glycogen stock modestly by reducing the intensity of workouts and increasing their carbohydrate intake between 60 and 70 percent of the total calorie intake three to five days before the event. People who don't have hardcore training and decide to run a 5-kilometer race for fun don't need to consume a large plate of pasta before the race, since without long-term intensive training the adaptation of elevated muscular glycogen will not happen. The liver, like the muscles, can store glucose energy in the form of glycogen, but unlike muscle tissue it will sacrifice its energy-stored glucose to other tissues in the body when blood glucose levels are low. Approximately a quarter of the total glycogen content in the body is in the liver (equivalent to about four hours of glucose supply), but this is highly dependent on the level of activity. The liver uses this glycogenic reserve as a way to keep blood glucose levels in a narrow range between meal times. When the liver glycogen is exhausted, glucose is made from amino acids derived from the destruction of proteins to maintain metabolic homeostasis. Construction of Macromolecula Although most absorbed glucose is used to generate energy, some glucose is converted into ribose and deoxyribose, which are important building blocks of important macromolecules such as RNA, DNA and ATP. Glucose is additionally used to make the NADPH molecule, which is important to protect against oxidative stress and is used in many other chemical reactions in the body. If all the energy, glycogen storage capacity, and the body's building needs are met, excess glucose can be used to produce fat. This is why a diet too high in carbohydrates and calories can add to the fat pounds-a topic that will be discussed soon. Figure 4.11 The chemical structure of Deoxyribose Sugar Deoxyribose molecule is used to build the basis of DNA. Image rozeta / CC BY-SA 3.0Figure 4.12 Double DNA image Forluvoft / Public DomainSparing Protein In a situation where there is not enough glucose to meet the needs of the body, glucose is synthesized from amino acids. Since there is no amino acid storage molecule, this process requires the destruction of proteins, primarily from muscle tissue. The presence of sufficient glucose basically eliminates the breakdown of proteins from use to make glucose necessary for the body. Lipid Metabolism As blood glucose levels rise, the use of lipids as an energy source is inhibited. Thus, glucose additionally has Effect. This is because an increase in blood glucose stimulates the release of the hormone insulin, which tells cells to use glucose (instead of lipids) to make energy. Adequate glucose glucose blood also prevent the development of ketosis. Ketosis is a metabolic condition resulting from the rise of ketone bodies in the blood. Ketone bodies are an alternative source of energy that cells can use when glucose supply is insufficient, for example, during fasting. Ketone's body is acidic and high blood heights can cause it to become too acidic. This is rare in healthy adults, but can occur in alcoholics, people who are malnourished, and those who have type 1 diabetes. The minimum amount of carbohydrates in the diet required for ketosis inhibition in adults is 50 grams per day. Carbohydrates are crucial to support life's most basic function of energy production. Without energy, none of the other life processes is performed. Although our body can synthesize glucose, it is due to the destruction of protein. Like all nutrients though, carbohydrates should be consumed in moderation, as having too much or too little in the diet can lead to health problems. Study of an objective list of four main functions of carbohydrates in the human body. There are five main functions of carbohydrates in the human body. This is energy production, energy storage, construction of macromolecules, sparing protein and help in the metabolism of lipids. The main role of carbohydrates is to supply energy to all cells in the body. Many cells prefer glucose as an energy source compared to other compounds like fatty acids. Some cells, such as red blood cells, are able to produce only cellular energy from glucose. The brain is also very sensitive to low blood glucose levels because it uses only glucose to produce energy and function (if only in extreme fasting conditions). About 70 percent of the glucose ingested from digestion is redistributed (by the liver) back to the bloodstream for use by other tissues. Cells that require energy remove glucose from the blood with a transport protein in their membranes. Glucose energy comes from chemical bonds between carbon atoms. Solar energy was needed to produce these high energy connections during photosynthesis. The cells in our body break these bonds and capture energy to perform cellular respiration. Cellular respiration is basically controlled by glucose burning compared to uncontrolled burning. The cell uses many chemical reactions in several ensimatic steps to slow down the release of energy (without explosion) and more effectively capture the energy captured in the chemical bonds in glucose. The first stage of glucose breakdown is called glycolysis. GlycolysisFirst stage of glucose breakdown; a ten-step ensimatic process that divides glucose into two three-carbon molecules and gives two ATP molecules, or glucose occurs in a complex series of ten stages of an enmity reaction. The second stage of glucose breakdown occurs in energy energy organelles called mitochondria. One carbon atom and two oxygen atoms are removed, giving more energy. The energy from these carbon bonds is carried into another area of the mitochondria, making cellular energy available in the form cells can use. Figure 4.5 The glycogen structure allows it to quickly mobilize into free glucose to the feeding cells. If the body already has enough energy to support its functions, excess glucose is stored as glycogen (most of which is stored in the muscles and liver). The glycogen molecule can contain more than fifty thousand units of glucose and is highly branched, allowing glucose to be distributed quickly when necessary for cellular energy (Figure 4.5). The amount of glycogen in the body at any given time is equivalent to about 4,000 kilocalories-3000 in muscle tissue and 1000 in the liver. Prolonged muscle use (e.g. exercise for longer than a few hours) can deplete glycogen energy. Remember also from Chapter 3 Nutrition and human body that it is called a kick on the wall or bonking and is characterized by fatigue and decreased exercise performance. Muscle weakening sets up because it takes longer to convert chemical energy into fatty acids and proteins into suitable energy than glucose. After prolonged exercise, glycogen is gone, and the muscles should rely more on lipids and proteins as an energy source. Athletes can increase their glycogen stock modestly by reducing the intensity of workouts and increasing their carbohydrate intake between 60 and 70 percent of the total calorie intake three to five days before the event. People who don't have hardcore training and decide to run a 5-kilometer race for fun don't need to consume a large plate of pasta before the race, since without long-term intensive training the adaptation of elevated muscular glycogen will not happen. The liver, like the muscles, can store glucose energy in the form of glycogen, but unlike muscle tissue it will sacrifice its energy-stored glucose to other tissues in the body when blood glucose levels are low. Approximately a quarter of the total glycogen content in the body is in the liver (equivalent to about four hours of glucose supply), but this is highly dependent on the level of activity. The liver uses this glycogenic reserve as a way to keep blood glucose levels in a narrow range between meal times. When the liver glycogen is exhausted, glucose is made from amino acids derived from the destruction of proteins to maintain metabolic homeostasis. Although most absorbed glucose is used for energy, some glucose is converted into ribose and deoxyribose, which are important building blocks of important macromolecules such as RNA, DNA and ATP (Figure 4.6). Glucose extra to make the NADPH molecule, which is essential for protecting against oxidative stress and used in many other chemical reactions in the body. If all the energy, glycogen storage capacity, and the body's building needs are met, excess glucose can be used to produce fat. This is why a diet too high in carbohydrates and calories can add to the fat pounds-a topic that will be discussed soon. Figure 4.6 The deoxyribose sugar molecule is used to build the basis of DNA. In a situation where glucose is not enough to meet the needs of the body, glucose is synthesized from amino acids. Since there is no amino acid storage molecule, this process requires the destruction of proteins, primarily from muscle tissue. The presence of sufficient glucose basically eliminates the breakdown of proteins from use to make glucose necessary for the body. As blood glucose levels rise, the use of lipids as an energy source is suppressed. Thus, glucose additionally has a fat-sparing effect. This is because an increase in blood glucose stimulates the release of the hormone insulin, which tells cells to use glucose (instead of lipids) to make energy. Adequate blood glucose levels also prevent the development of ketosis. Ketosis is a metabolic condition resulting from the rise of ketone bodies in the blood. Ketone bodies are an alternative source of energy that cells can use when glucose supply is insufficient, for example, during fasting. Ketone's body is acidic and high blood heights can cause it to become too acidic. This is rare in healthy adults, but can occur in alcoholics, people who are malnourished, and those who have type 1 diabetes. The minimum amount of carbohydrates in the diet required for ketosis inhibition in adults is 50 grams per day. Carbohydrates are crucial to support life's most basic function of energy production. Without energy, none of the other life processes is performed. Although our body can synthesize glucose, it is due to the destruction of protein. Like all nutrients though, carbohydrates should be consumed in moderation, as having too much or too little in the diet can lead to health problems. Key Takeaway Four are the main functions of carbohydrates in the body to provide energy, store energy, build macromolecules, and spare proteins and fats for other purposes. Glucose energy is stored as glycogen, with most of it in the muscles and liver. The liver uses its glycogen supply as a way to keep blood glucose levels in a narrow range between meal times. Some glucose is also used as building blocks of important macromolecules such as RNA, DNA and ATP. Having enough glucose levels in the body eliminates the breakdown of proteins from use to provide the glucose needed Discussion Snacks Discuss two reasons why it is important to include carbohydrates in your diet. Why would the body spare protein? Protein? Protein? biological functions of carbohydrates pdf. three biological functions of carbohydrates. four biological functions of carbohydrates. what are the main biological functions of carbohydrates. what are the functions of carbohydrates in biological systems. structures and functions of biological molecules carbohydrates. carbohydrates and lipids structures and functions of biological molecules