**Mading Nhial Wal**

ASSIGNMENT 2

I am happy to do the kind of study under your college and it’s enrich with a lot of information. As I started my first assignment I have found out that it’s helpful and will help me on my future career. I hope we will be interacting on any matter concerning this course am taking. I will listen and be open to you for anything you want me to do or to improve

I am writing to let you aware that, I will go to a place where I will have no access to the internet, I am sending you the second assignment as you may know that here in South Sudan if you go to a village you may end up where there is no internet for over 2 to three months. Hope you will not surprise if I send you the three assignment all at one. Hope you will forgive me to send them at this stage.

I thanks the academic team to bear with me in this situation of South Sudan.

Concerning these questions I just quickly answer based on the below questions you have sent to me

1. Giving two examples for each, define the following terms:
   1. Food

The foods we eat contain nutrients. Those nutrients that contain carbon are called organic while those that do not contain carbon are called inorganic. Nutrients are substances required by the body to perform its basic functions. Since the human body does not synthesize nutrients, they must be obtained from the diet, making them essential. Eating inadequate amounts can cause poor health.

Nutrients are used to produce energy, detect and respond to environmental surroundings, move, excrete wastes, respire (breathe), grow, and reproduce. There are six classes of nutrients required for the body to function and maintain overall health. These are carbohydrates, lipids, proteins, water, vitamins, and minerals. Foods also contain nonnutrients that may be harmful (such as cholesterol, dyes, and preservatives) or beneficial (such as phytochemicals like antioxidants and zoochemicals like omega-3 fatty acids).

* 1. *Nutrients*

**Macronutrients**

Nutrients that are needed in large amounts (grams) are called macronutrients. There are three classes of macronutrients: carbohydrates, lipids, and proteins. These can be metabolically processed into cellular energy. The energy from macronutrients comes from their chemical bonds. This chemical energy is converted into cellular energy that is then utilized to perform work, allowing our bodies to conduct their basic functions. A unit of measurement of food energy is the calorie. On nutrition food labels the amount given for “calories” is actually equivalent to each calorie multiplied by one thousand. A kilocalorie (one thousand calories, denoted with a small “c”) is synonymous with the “Calorie” (with a capital “C”) on nutrition food labels. Water is also a macronutrient in the sense that you require a large amount of it, but unlike the other macronutrients it does not yield calories.

Micronutrients are nutrients required by the body in lesser amounts but are still essential for carrying out bodily functions. Micronutrients include all the essential minerals and vitamins. There are thirteen vitamins and sixteen essential minerals (See Table 1.3.1 and Table 1.3.2 for a complete list and their major functions). In contrast to carbohydrates, lipids, and proteins, micronutrients are not directly used for making energy, but they assist in the process as being part of enzymes (i.e., coenzymes). Enzymes are proteins that catalyze chemical reactions in the body and are involved in all aspects of body functions from producing energy to digesting nutrients to building macromolecules. Micronutrients play ma

* 1. Nutrition. definition A triangle is often used to depict the equal influences of physical, mental, and social well-being on health. Disease is defined as any abnormal condition affecting the health of an organism, and is characterized by specific signs and symptoms. Signs refer to identifying characteristics of a disease such as swelling, weight loss, or fever. Symptoms are the features of a disease recognized by a patient and/or their doctor. Symptoms can include nausea, fatigue, irritability, and pain. Diseases are broadly categorized as resulting from pathogens (i.e., bacteria, viruses, fungi, and parasites), deficiencies, genetics, and physiological dysfunction. Diseases that primarily affect physical health are those that impair body structure (as is the case with osteoporosis), or functioning (as is the case with cardiovascular disease). Mental illnesses primarily affect mental and social well-being.

Food is any nutritious substance that people or animals eat or drink, or that plants absorb, in order to maintain life and growth. Americans are bombarded with television programs that show where to find the best dinners, pizzas, and cakes, and the restaurants that serve the biggest and juiciest burgers. Other programs feature chefs battling to prepare meals, and the top places to burst your belly from consuming atomic chicken wings and deli sandwiches longer than a foot. There are also shows that feature bizarre foods from cultures around the world. How do you use the information from popular network food shows to build a nutritious meal? You don’t—these shows are for entertainment. The construction of a nutritious meal requires learning about which foods are healthy and which foods are not, how foods and nutrients function in your body, and how to use scientific resources. This text is designed to provide you with the information necessary to make sound nutritional choices that will optimize health and help prevent disease.

The foods we eat affect all three aspects of our health. For example, a teen with Type 2 diabetes (a disease brought on by poor diet) is first diagnosed by physical signs and symptoms such as increased urination, thirstiness, and unexplained weight loss. But research has also found that teens with Type 2 diabetes have impaired thinking and do not interact well with others in school, thereby affecting mental and social well-being. Type 2 diabetes is just one example of a physiological disease that affects all aspects of health—physical, mental, and social.

1. Distinguish between dispensable and indispensable nutrients

It has been the convention to divide amino acids into two categories: indispensable (or essential) and dispensable (or nonessential). This categorization provides a convenient, and generally useful, way of viewing amino acid nutrition. However, despite the longevity of the convention, as more information has become available, the distinctions between dispensable and indispensable amino acids, at least at the metabolic level, have become increasingly blurred. Indeed, W. C. Rose, who was responsible for the initial definition of the two terms, was not especially enamored with the way in which they were applied by others and wrote the following (Womack and Rose, 1947):

“We have emphasized on several occasions… that the classification of an amino acid like arginine or glutamic acid as dispensable or indispensable is purely a matter of definition.”

I wish to consider this “matter of definition” by examining the terms from a nutritional, metabolic and functional perspective.

**Nutritional definitions of indispensable and dispensable amino acids**

It is important to remember that the terms “indispensable” and “dispensable” were originally defined not only in dietary terms but also in relation to the role of amino acids in supporting protein deposition and growth. In fact, as far as I can ascertain, the original nutritional definition of an indispensable amino acid (Borman et al. 1946) was, “One which cannot be synthesized by the animal organism out of materials *ordinarily available* to the cells *at a speed* commensurate with the demands for *normal growth.*“

The key phrases in this definition, and phrases that were, in fact, italicized by the authors, are “ordinarily available,” “at a speed” and “normal growth.” Each is an important qualifier.

The phrase “ordinarily available” is important because a number of nutritionally essential amino acids, e.g., the branched-chain amino acids, phenylalanine and methionine, can be synthesized by transamination of their analogous α-keto acids. However, these keto acids are not normally part of the diet and hence are not “ordinarily available to the cells.” The phrase “at a speed” is important because there are circumstances in which the rate of synthesis of an amino acid can be constrained, e.g., by the availability of appropriate quantities of metabolic nitrogen. Indeed, the rate of synthesis becomes of specific importance when we consider a group of amino acids, exemplified by arginine, cysteine, proline and perhaps glycine, that are frequently described as conditionally essential. For example, Womack and Rose (1947) made the important point that the degree to which arginine could be regarded as indispensable was very much a function of the quantities of its natural precursors, proline and glutamate, in the diet. Finally, the phrase “normal growth” is critical in two respects. First, it serves to emphasize that the definitions were originally constructed in the context of growth. For example, it is possible to show (Table 1) that the ingestion of diets completely devoid of glutamate, which in some ways can be regarded as the doyen of dispensable amino acids, leads to a small but statistically significant slower rate of growth. Second, constraining the definition of essentiality to growth does not encompass the importance of some amino acids to pathways of disposal other than protein deposition, a subject that I discuss later.

**Amino acid biosynthesis**

It is also possible to define amino acid essentiality and nonessentiality in chemical and metabolic terms. An examination of the amino acids that are generally considered to be nutritionally essential indicates that each has a specific structural feature, the synthesis of which cannot be catalyzed by mammalian enzymes (Table 2). In this regard, it is very important to note that the loss of the ability to carry out these biosyntheses appeared early in evolution and is a common feature of the metabolism of eukaryotic organisms in general, and not just of mammals. However, within this view, the important term is de novo synthesis. This is because some indispensable amino acids can be synthesized from precursors that are structurally very similar. For example, methionine can be synthesized both by transamination of its keto acid analogue and by remethylation of homocysteine. In this sense, then, the mammal is capable of synthesizing leucine, isoleucine, valine, phenylalanine and methionine. However, this is not new synthesis, because the branched-chain keto acids and homocysteine were originally derived from branched-chain amino acids and methionine, respectively. According to this restricted metabolic definition of essentiality, threonine and lysine (and perhaps tryptophan) are the only truly essential amino acids.

The reverse applies to dispensable amino acids. Strictly speaking, a truly nonessential amino acid is one that can be synthesized de novo from a non–amino acid source of nitrogen (e.g., ammonium ions) and an appropriate carbon source. According to this metabolic definition, the only truly metabolically nonessential amino acids are glutamic acid and serine. If this is so, then these two amino acids are the ultimate precursors of the other nonessential amino acids. This conclusion leads to the prediction that the contribution of endogenous synthesis to the systemic fluxes of glutamate and serine should be higher than its contribution to the fluxes of other nonessential amino acids. This appears to be so (Table 3). Interestingly, there is a reciprocal relationship between the contribution of endogenous synthesis to the plasma flux of a given nonessential amino acid and the degree to which the intestine metabolizes the dietary amino acids in first pass

1. Suggest a reason why protein deficiency/inadequacy would interfere with the process of digestion.

## Definition of deficiency

1 **:** the quality or state of being defective or of lacking some necessary quality or element **:** the quality or state of being [deficient](https://www.merriam-webster.com/dictionary/deficient#h1) **:** [inadequacy](https://www.merriam-webster.com/dictionary/inadequacy) suffers from a deficiency of critical thinking

2 **:** an amount that is lacking or inadequate **:** [shortage](https://www.merriam-webster.com/dictionary/shortage) staffing deficiencies: such as

a **:** a shortage of substances necessary to health a vitamin C deficiency hormone deficiencies

approximately one billion people worldwide have inadequate protein intake. This would mean we are eating less protein than your body needs, according to nutrition. Since your body requires a sufficient amount of protein, not consuming enough can potentially lead to poor health.

The recommendation is approximately 10-20 percent of your total calories come from protein or about .8-1g of protein per kg of body weight each day. For example, a person weighing 150 pounds who needs 1800 calories per day would intake 55-68 grams of protein daily to meet a 15 percent daily protein requirement

1. Giving specific examples, explain what you understand by the term enzyme specificity.

Enzymes help speed up chemical reactions in the human body. They bind to molecules and alter them in specific ways. They are essential for respiration, digesting food, muscle and nerve function, among thousands of other roles.

In this article, we will explain what an enzyme is, how it works, and give some common examples of enzymes in the human body.

**The basics**

The enzyme amylase (pictured), breaks down starch into sugars.

Enzymes are built of proteins folded into complicated shapes; they are present throughout the body.

The chemical reactions that keep us alive - our metabolism - rely on the work that enzymes carry out.

Enzymes speed up ([**catalyze**](https://www.khanacademy.org/science/biology/energy-and-enzymes/introduction-to-enzymes/a/enzymes-and-the-active-site)) chemical reactions; in some cases, enzymes can make a chemical reaction millions of times faster than it would have been without it.

A [**substrate**](http://www.rsc.org/Education/Teachers/Resources/cfb/enzymes.htm) binds to the [**active site**](https://www.ncbi.nlm.nih.gov/books/NBK21166/) of an enzyme and is converted into **products**. Once the products leave the active site, the enzyme is ready to attach to a new substrate and repeat the process.

[](https://www.medicalnewstoday.com/whitelist-mnt)

**What do enzymes do?**

**The digestive system** - enzymes help the body break down larger complex molecules into smaller molecules, such as glucose, so that the body can use them as fuel.

**DNA replication** - each cell in your body contains DNA. Each time a cell divides, that DNA needs to be copied. Enzymes help in this process by unwinding the DNA coils and copying the information.

**Liver enzymes** - the liver breaks down toxins in the body. To do this, it uses a range of enzymes.

**The perfect conditions**

Enzymes can only work in certain conditions. Most enzymes in the human body work best at around 37°C - body temperature. At lower temperatures, they will still work but much more slowly.

Similarly, enzymes can only function in a certain pH range (acidic/alkaline). Their preference depends on where they are found in the body. For instance, enzymes in the intestines work best at 7.5 pH, whereas enzymes in the stomach work best at pH 2 because the stomach is much more acidic.

If the temperature is too high or if the environment is too acidic or alkaline, the enzyme changes shape; this alters the shape of the active site so that substrates cannot bind to it - the enzyme has become **denatured**.

**Cofactors**

Some enzymes cannot function unless they have a specific non-protein molecule attached to them. These are called cofactors. For instance, carbonic anhydrase, an enzyme that helps maintain the pH of the body, cannot function unless it is attached to a zinc ion.

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**Inhibition**

To ensure that the body's systems work correctly, sometimes enzymes need to be slowed down. For instance, if an enzyme is making too much of a product, there needs to be a way to reduce or stop production.

Enzymes' activity can be inhibited in a number of ways:

**Competitive inhibitors** - a molecule blocks the active site so that the substrate has to compete with the inhibitor to attach to the enzyme.

**Non-competitive inhibitors** - a molecule binds to an enzyme somewhere other than the active site and reduces how effectively it works.

**Uncompetitive inhibitors** - the inhibitor binds to the enzyme and substrate after they have bound to each other. The products leave the active site less easily, and the reaction is slowed down.

**Irreversible inhibitors** - an irreversible inhibitor binds to an enzyme and permanently inactivates it.

**[Caffeine may ward off dementia by boosting protective enzyme](https://www.medicalnewstoday.com/articles/316257.php?iacp" \o "Caffeine may ward off dementia by boosting protective enzyme" \t "_blank)**

[Caffeine may have the potential to protect against dementia and other neurodegenerative disorders.](https://www.medicalnewstoday.com/articles/316257.php?iacp" \o "Caffeine may ward off dementia by boosting protective enzyme" \t "_blank)

**Examples of specific enzymes**

There are thousands of enzymes in the human body, here are just a few examples:

* **Lipases** - a group of enzymes that help digest fats in the gut.
* **Amylase** - helps change starches into sugars. Amylase is found in saliva.
* **Maltase** - also found in saliva; breaks the sugar maltose into glucose. Maltose is found in foods such as potatoes, pasta, and beer.
* **Trypsin** - found in the small intestine, breaks proteins down into amino acids.
* **Lactase** - also found in the small intestine, breaks lactose, the sugar in milk, into glucose and galactose.
* **Acetylcholinesterase** - breaks down the neurotransmitter acetylcholine in nerves and muscles.
* **Helicase** - unravels DNA.
* **DNA polymerase** - synthesize DNA from deoxyribonucleotides.

**In a nutshell**

Enzymes play a huge part in the day-to-day running of the human body. By binding to and altering compounds, they are vital for the proper functioning of the digestive system, the nervous system, muscles, and much, much more.

1. Explain what you understand by the term.
2. ant nutrients.

Antinutrients are natural or synthetic compounds that interfere with the absorption of nutrients. Examples include the following:

•Protease inhibitors (e.g., Bowman–Birk [trypsin](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/trypsin) inhibitor in [soybeans](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/soybeans) (Birk, 1985)), which inhibit trypsin, [pepsin](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/pepsin), and other [proteases](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/protease) in the gut, preventing digestion and absorption of proteins and amino acids

•Lipase inhibitors (e.g., tetrahydrolipstatin), which interfere with enzymes, such as [lipases](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/lipase), which catalyze hydrolysis of some lipids and fats

•Amylase inhibitors in beans, which prevent the action of enzymes that break the glycosidic bonds of starches and other complex carbohydrates, preventing the release of simple sugars and absorption by the body

•Phytic acid in the [hulls](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/hulls) of nuts, seeds, and grains, which has a strong binding affinity for calcium, magnesium, iron, copper, and zinc, preventing their absorption

•Oxalic acid and oxalates, which are present in many plants, particularly members of the spinach family, bind calcium to prevent its absorption

1. Explain three functions of bile in the digestion of lipids.

## Secretion of Bile and the Role of Bile Acids In Digestion

Bile is a complex fluid containing water, electrolytes and a battery of organic molecules including bile acids, cholesterol, phospholipids and bilirubin that flows through the biliary tract into the small intestine. **There are two fundamentally important functions of bile in all species:**

* Bile contains bile acids, which are critical for digestion and absorption of fats and fat-soluble vitamins in the small intestine.
* Many waste products, including bilirubin, are eliminated from the body by secretion into bile and elimination in feces.

Adult humans produce 400 to 800 ml of bile daily, and other animals proportionately similar amounts. The secretion of bile can be considered to occur in two stages:

* Initially, hepatocytes secrete bile into canaliculi, from which it flows into bile ducts. This hepatic bile contains large quantities of bile acids, cholesterol and other organic molecules.
* As bile flows through the bile ducts it is modified by addition of a watery, bicarbonate-rich secretion from ductal epithelial cells.

In species with a gallbladder (man and most domestic animals except horses and rats), further modification of bile occurs in that organ. **The gall bladder stores and concentrates bile during the fasting state.** Typically, bile is concentrated five-fold in the gall bladder by absorption of water and small electrolytes - virtually all of the organic molecules are retained.

Secretion into bile is a major route for eliminating cholesterol. Free cholesterol is virtually insoluble in aqueous solutions, but in bile, it is made soluble by bile acids and lipids like lecithin. [Gallstones](http://www.vivo.colostate.edu/hbooks/pathphys/digestion/liver/gallstones.html), most of which are composed predominantly of cholesterol, result from processes that allow cholesterol to precipitate from solution in bile.

#### Role of Bile Acids in Fat Digestion and Absorption

Bile acids are derivatives of cholesterol synthesized in the hepatocyte. Cholesterol, ingested as part of the diet or derived from hepatic synthesis is converted into the bile acids cholic and chenodeoxycholic acids, which are then conjugated to an amino acid (glycine or taurine) to yield the conjugated form that is actively secreted into cannaliculi.

Bile acids are facial amphipathic, that is, they contain both hydrophobic (lipid soluble) and polar (hydrophilic) faces. The cholesterol-derived portion of a bile acid has one face that is hydrophobic (that with methyl groups) and one that is hydrophilic (that with the hydroxyl groups); the amino acid conjugate is polar and hydrophilic.

Their amphipathic nature enables bile acids to carry out two important functions:

* **Emulsification of lipid aggregates:** Bile acids have detergent action on particles of dietary fat which causes fat globules to break down or be emulsified into minute, microscopic droplets. Emulsification is not digestion per se, but is of importance because it greatly increases the surface area of fat, making it available for digestion by lipases, which cannot access the inside of lipid droplets.
* **Solubilization and transport of lipids in an aqueous environment:** Bile acids are lipid carriers and are able to solubilize many lipids by forming **micelles** - aggregates of lipids such as fatty acids, cholesterol and monoglycerides - that remain suspended in water. Bile acids are also critical for transport and absorption of the [fat-soluble vitamins](http://www.vivo.colostate.edu/hbooks/pathphys/topics/vitamins.html).

#### Role of Bile Acids in Cholesterol Homeostasis

Hepatic synthesis of bile acids accounts for the majority of cholesterol breakdown in the body. In humans, roughly 500 mg of cholesterol are converted to bile acids and eliminated in bile every day. This route for elimination of excess cholesterol is probably important in all animals, but particularly in situations of [massive cholesterol ingestion](http://www.vivo.colostate.edu/hbooks/pathphys/digestion/liver/eateggs.html).

Interestingly, it has recently been demonstrated that [bile acids participate in cholesterol metabolism by functioning as hormones](http://www.vivo.colostate.edu/hbooks/pathphys/digestion/liver/bacid_hormones.html) that alter the transcription of the rate-limiting enzyme in cholesterol biosynthesis.

#### Enterohepatic Recirculation

Large amounts of bile acids are secreted into the intestine every day, but only relatively small quantities are lost from the body. This is because approximately 95% of the bile acids delivered to the duodenum are absorbed back into blood within the ileum.

Venous blood from the ileum goes straight into the portal vein, and hence through the sinusoids of the liver. Hepatocytes extract bile acids very efficiently from sinusoidal blood, and little escapes the healthy liver into systemic circulation. Bile acids are then transported across the hepatocytes to be resecreted into canaliculi. The net effect of this enterohepatic recirculation is that each bile salt molecule is reused about 20 times, often two or three times during a single digestive phase.

It should be noted that liver disease can dramatically alter this pattern of recirculation - for instance, sick hepatocytes have decreased ability to extract bile acids from portal blood and damage to the canalicular system can result in escape of bile acids into the systemic circulation. Assay of systemic levels of bile acids is used clinically as a sensitive indicator of hepatic disease.

#### Pattern and Control of Bile Secretion

The flow of bile is lowest during fasting, and a majority of that is diverted into the gallbladder for concentration. When chyme from an ingested meal enters the small intestine, acid and partially digested fats and proteins stimulate secretion of cholecystokinin and secretin. As discussed previously, these [enteric hormones](http://www.vivo.colostate.edu/hbooks/pathphys/digestion/basics/gi_endocrine.html) have important effects on pancreatic exocrine secretion. They are both also important for secretion and flow of bile:

* **Cholecystokinin**: The name of this hormone describes its effect on the biliary system - cholecysto = gallbladder and kinin = movement. The most potent stimulus for release of cholecystokinin is the presence of fat in the duodenum. Once released, it stimulates contractions of the gallbladder and common bile duct, resulting in delivery of bile into the gut.
* **Secretin**: This hormone is secreted in response to acid in the duodenum. Its effect on the biliary system is very similar to what was seen in the pancreas - it simulates biliary duct cells to secrete bicarbonate and water, which expands the volume of bile and increases its flow out into the intestine.

1. Explain how proteins differ structurally from carbohydrates and lipids.

**Proteins**

Proteins are macromolecules composed of chains of subunits called amino acids which are the called the building blocks of protein. Amino acids are simple subunits composed of carbon, oxygen, hydrogen, and nitrogen. The food sources of protein come from animals such as meats, dairy products, seafood, and a variety of different plant-based foods, for example, soy, beans, and nuts. The word protein comes from a Greek word meaning “of primary importance,” which is an apt description of these macronutrients; they are also known colloquially as the “workhorses” of life. Proteins provide four kilocalories of energy per gram; however providing energy is not protein’s most important function. Proteins provide structure to bones, muscles, and skin, and play a role in conducting most of the chemical reactions that take place in the body. Scientists estimate that greater than one-hundred thousand different proteins exist within the human body.

**Carbohydrates**

Carbohydrates are molecules composed of carbon, hydrogen, and oxygen. The major food sources of carbohydrates are grains, milk, fruits, and vegetables, including starchy vegetables like potatoes. Nonstarchy vegetables also contain carbohydrates but in lesser quantities. Carbohydrates are broadly classified into two forms based on their chemical structure: fast-releasing carbohydrates often called simple sugars, and complex or slow-releasing carbohydrates also called polysacchrides.

Fast-releasing carbohydrates consist of one or two basic units. Examples of simple sugars include sucrose, the type of sugar you would have in a bowl on the breakfast table, and glucose, the type of sugar that circulates in your blood.

Slow-releasing or complex carbohydrates are long chains of simple sugars that can be branched or unbranched. Starch is an example of a slow-releasing carbohydrate. During digestion, the small intestine breaks down all slow-releasing carbohydrates to simple sugars, mostly glucose. Glucose is then absorbed and transported to all our cells where it is stored in the form of glycogen, used to make energy, or used to build macromolecules. Fiber is also a slow-releasing carbohydrate, but it cannot be broken down in the human body and passes through the digestive tract undigested unless the bacteria that inhabit the gut break it down.

One gram of carbohydrates yields four kilocalories of energy for the cells in the body to perform work. In addition to providing energy and serving as building blocks for bigger macromolecules, carbohydrates are essential for proper functioning of the nervous system, heart, and kidneys. As mentioned, glucose can be stored in the body for future use. In humans, the storage molecule of carbohydrates is called glycogen and in plants, it is known as starches. Glycogen and starches are slow-releasing carbohydrates.

**Lipids**

Lipids are also a family of molecules composed of carbon, hydrogen, and oxygen, but unlike carbohydrates, they are insoluble in water. This class of molecules may be visible (for example vegetable oil) or invisible (for example, cream) in the food you eat. Lipids are found predominately in butter, oils, meats, dairy products, nuts, and seeds, and in many processed foods. The three main types of lipids are triglycerides (also called triacylglycerols), phospholipids, and sterols. The main job of lipids is to store energy. Lipids provide more energy per gram than carbohydrates (nine kilocalories per gram of lipids versus four kilocalories per gram of carbohydrates). In addition to energy storage, lipids serve as cell membranes, surround and protect organs, aid in temperature regulation, and regulate many other functions in the body. The main job of lipids is to store energy. Lipids provide more energy per gram than carbohydrates (nine kilocalories per gram of lipids versus four kilocalories per gram of carbohydrates). In addition to energy storage, lipids serve as cell membranes, surround and protect organs, aid in temperature regulation, and regulate many other functions in the body.