NUTRITION AND EXERCISE PERFORMANCE

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ABSTRACT
As the Oxygen is vital for the human life so the food for giving the energy to that life. Food is not only limited to provide energy to the body but also to promote growth and development, prevent the body from different diseases, repair of the damaged cells or tissue. The need of the food exceeds during period of rapid growth, age, and Physical activity. Even a person who is in the ventilator needs minimum possible energy, called BASAL METABOLIC RATE (BMR). To enhance exercise performance one has to be very systematic with the nutrients coming from food. Each Athlete has a specific diet at their respective age and Sports.

INTRODUCTION

Nutrition science seeks to explain metabolic and physiological response of the body diet (Rao, 2016). Good Nutrition is therefore vital to optimal event performance. Physical activity is essential for normal development in early adolescents as well as during later life above all when bodies start to deplete hormones, muscle mass and bone density. Exercise alone cannot beneficial to the body. Proper exercise and balanced diet are the true basic necessities for a healthy man. On the other hand Nutrients are the substance that plants, animals and people need to live and grow. Essential Nutrients to the diet are Carbohydrates, Fats, Protein, Vitamins, Minerals and Water. Carbohydrates, Protein and Fat are the only source of energy hence they are called the Energy Nutrients.

Key words: Nutrition, BMR, Energy and Exercise.

IMPORTANT NUTRIENTS AND THEIR ROLE

Carbohydrates

The most abundant source of energy on the face of earth for the all life of the human beings are carbohydrates. Simple and complex sugars are chemical compound that comprise the nutritional group referred to be as carbohydrates. Simple carbohydrates render instant energy but energy content is less. A complex carbohydrate gives late energy but energy content is higher. Simple carbohydrates are monosaccharaides (glucose, fructose, galactose) while Disaccharides are sucrose, lactose and maltose and Polysaccharides (complex) such as starch and glycogen. All sugars are reduced to simple sugar i.e., glucose through digestion before being absorbed. Plants store sugar in the form of starch whereas human stored as glycogen in the muscles and liver.

As fuel carbohydrates serve as major food fuels for the metabolic production of Adenosine Triphosphate (ATP). Two forms of carbohydrates used for this purpose: 1) blood glucose 2) intramuscular stores of glycogen. Blood glucose levels are regulated mainly through the glycogen stored in the liver. For example when blood glucose is low, glycogen from the liver is broken down to glucose by a process called **glycogenolysis** and is dumped into the blood stream. From here, it is carried to the skeletal muscles and other organs that need it for metabolism. Just the opposite occurs when blood glucose is high i.e., glucose is taken up by the tissues with the help of a hormone called **insulin**. If taken up by the liver, it can either be used for metabolism or can be converted to glycogen through a process referred to as **glycogenesis**. After being converted to glycogen it is then stored in the liver. If the glycogen stores are filled excess glucose can be converted to fats and can be stored within the fat cells located throughout the body.

The muscular stores of glycogen are used directly by muscles for metabolism. As such, these stores do not contribute directly to the maintenance of the blood glucose levels. However the blood glucose levels can be affected by muscle glycogen metabolism indirectly as follows: when anaerobic glycolysis occurs within the muscles, some of the lactic acid formed diffuses into the blood. From there, some of it is carried to the liver where it is converted to glucose and is then (1) dumbed back into the blood as blood glucose, (2) used by the liver as a metabolic fuel or, (3) converted to glycogen and stored as liver glycogen. **One gram of carbohydrates gives 4 kilo Calories (Kcal).**

Fat

Fat or lipids are found in the body mainly as triglycerides, phospholipids and cholesterol. Triglycerides are stored in the fat cells located throughout the body and within skeletal muscles. They represent the fat form that is used as a food fuel in aerobically manufacturing of ATP energy. **One gram of fat gives 9 kilo Calories (Kcal).**

When fats are metabolized they must first be broken down from the triglycerides molecules consist of one molecule o glycerol and three molecules of free fatty acids (FFA). A free fatty acid whose carbon atoms are saturated with the hydrogen atoms referred to as *saturated fat*. Consumption of large amount of saturated fat is not recommended since this is thought to lead high blood cholesterol levels, atherosclerosis, cardiovascular disease and obesity. A free fatty acid whose carbon atoms are unsaturated with the hydrogen atoms referred to as *unsaturated fat*.

Protein

The role of protein in providing energy has not been considered important for most forms of muscular activity. It is becoming clear that protein catabolism is increased by endurance activity (greater than 60 minutes) and may contribute between 5-15% of the energy needs. In addition to carbon, hydrogen and oxygen protein contains nitrogen. Protein is building block of tissue. In addition all enzymes found in the body are proteins. The basic structural unit of protein is amino acids. In protein, the amino acids are chemically bonded into long chains by what are referred to as peptide linkages. There are 22 amino acids in the body. The nitrogen component of the amino acid ($NH2$) is referred to as amino acid radical. Of the 22 amino acids 9 are essential and 13 are non-essential. **One gram of protein gives 4 kilo Calories (Kcal).**

Protein requirement during Heavy Exercise and Training

The normal adult daily requirement is about 0.8 gram per kg of the body weight. For example the daily protein requirement of a person weighing 75 kg would be 75×0.8= 60 gram. This amount of protein is easily obtained from a well-balanced diet in which 10%-15% of the calories taken in are from protein sources. If a 75 kg person has a daily caloric requirement is 3000 Kcal, a well-balanced diet would supply between 75g and 112g of protein.

10% of the 3000 Kcal=300 Kcal and 15% = 450 Kcal. One gram of protein contains 4 Kcal.

Therefore 300/4= 75 grams and 450/4=112 grams of protein.

The requirement may be increased 1 to 1.5 g per kg of the body weight as compared with 0.8 g per kg of body weight. If the athlete is interested in promoting muscle growth, the only known stimulus is resistance training. It has been estimated that the increased protein intake required for this to occur is only 15 grams per day and an additional 400 Kcal per day. Ingested protein in excess of metabolic requirements will be stored as fat and will not result in any further increase in muscle mass.

Protein as an energy source during prolonged exercise

The role of protein metabolism as an energy source has mostly been ignored and declared insignificant. However, with prolonged exercise (60 minutes at 60-70% of aerobic capacity) some amino acids are oxidized during exercise to provide amino groups. 16 amino acids have been identified as glucogenic with leucine, Isoleucine and Valine the most readily available.

Vitamins and Minerals

Most vitamins serve as essential parts of enzymes or co-enzymes that are vital to the body metabolism of fat and carbohydrates. Vitamins are classified as water soluble and fat soluble. The water soluble vitamins are vitamin C (Ascorbic Acid) and vitamin B-complex. These are not stored in the body and therefore must be constantly supplied in the diet. Since they are not stored when taken in excess they will be passed in the urine. The fat soluble vitamins are vitamin A, D, E &K are stored in the body principally in liver but also in fatty tissues.

Minerals are inorganic compounds found in trace amount in the body and also important for proper body function. Calcium, Phosphorus, Potassium, Sodium, Iron and Iodine are few of the more important required minerals. Calcium help in the nerve impulse as well as health of the bone and teeth. Phosphorus in coordination with calcium also help to build bones and work as energy system for the body. Potassium is vital for muscular contraction and nerve impulse as seen in polarization and depolarization nerve impulse. Sodium if decreases lead to low blood pressure and cramp for the athlete. Iron on the other hand if taken with the foods rich in vitamin C can be absorbed very well and avoid drinking tea when taking iron as tannic acid present in the tea can reduce the iron absorption.

Total caloric intake for each of the three foodstuffs are:

Table-1

Protein	10 to 15%
Fat	29-30%
Carbohydrates	55-56%

For example, athletes requiring 5000 kcal per day could have their diet divided as follows:

Table-2

Protein	500 to 750 kcal
Fat	1450 to 1500 kcal
Carbohydrates	2750 to 2800 kcal

Conclusion

Carbohydrates, fats, proteins, vitamins, minerals and water are essential to the diet. An athlete can manipulate the diet keeping in view his volume and intensity of the activity. A long distance athlete will need more carbohydrates and fats as to get more energy for longer period. But a bodybuilder who is supposed to grow muscle mass will increase protein intake but manipulation cannot be happened one sided e.g., hundred percent carbohydrates is illogical for an endurance athlete. A well balanced diet is vital for all the athletes. Vitamins and minerals cannot be neglected even if its requirement is negligible e.g., for a muscle builder to build muscle need energy and that is only possible either through carbohydrates or fats and some vitamins like vitamin B-12 that breaks down fats and protein, vitamin B-1 breaks down fat, protein and carbohydrates.

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