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The Body's Energy Requirement; General Considerations

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Abstract

The fundamental problem in the field of human nutrition puts more and more emphasis on the prophylactic role of nutrition in ensuring health and especially to avoid metabolic imbalances that may occur in the body. Nutrient substances found in food must be utilized according to the physiological requirements of the body, its real needs based on the balanced metabolic balance. It is necessary to know the optimal ration and the consequences of an inadequate intake for each food. Such nutrition must be achieved with the help of reason and science. The objective of contemporary nutrition should be to preserve health. The harmony between the physical, psychic and mental is the key to maintaining health and balance in life. The fundamental problem in the field of human nutrition puts more and more emphasis on the prophylactic role of nutrition in ensuring health and especially to avoid metabolic imbalances that may occur in the body. Nutrient substances found in food must be utilized according to the physiological requirements of the body, its real needs based on the balanced metabolic balance. It is necessary to know the optimal ration and the consequences of an inadequate intake for each food. Such nutrition must be achieved with the help of reason and science. The objective of contemporary nutrition should be to preserve health. The harmony between the physical, psychic and mental is the key to maintaining health and balance in life.

Keywords: human nutrition; preserve health; optimal ration; prophylactic role; metabolic disorders.

Introduction

The human body needs energy for survival and the proper performance of daily, physical and/or mental activities. The main source of energy is the food they eat. In order to ensure an optimal nutritional status, it is necessary to have a balance between the energy and nutritional needs (consumption) of the body, on the one hand, and the energy and nutritional intake, on the other hand. Energy intake constitutes food intake and is discontinuous and variable. When energy intake (provided by food) corresponds to energy consumption, it can be said that the body is in energy balance, and energy stores do not change (Brock, 1972).

The Frenchman Lavoisier (1743-1794) is considered the founder of nutrition science, who discovered the principle of oxidation, heat production and combustion. The link between nutrition, health and disease has long been recognized. In the twelfth century, the scholar and physician Moses Maimonides wrote: "The knowledge of nutrition is perhaps the most important of all medicine, because the need for food never ceases, neither in health nor in sickness." In order to function normally, the human body requires a constant intake of energy, which is achieved through food principles (Jelliffe, & Jelliffe, 1975).

Since it is a homeothermic organism, i.e. without the ability to store heat and the possibility of transforming another form of external energy, the unique and indispensable source of human survival remains the energy obtained by breaking down the chemical bonds in the food structure. The existence of an optimal state of nutrition promotes the growth and development of the body, maintains the state of health, allows the daily activity to be carried out and participates in the protection of the body against various aggressions or diseases. In determining the nutritional status, a special role is held by the body's energy balance, which is the basis of weight stability and the balance of the internal environment (Garza, Scrimshaw, & Young, 1976).

Considering the scales of a scale, we place energy intake on one of them, and energy expenditure on the other. For a healthy, adult body, keeping the balance in balance means ensuring a balance between intake and expenditure, which will ensure the optimal maintenance of the body's functions and the performance of physical activity. The energy balance in human individuals is regulated primarily by modulating the energy intake. Insufficient food intake causes negative energy balance and weight loss, while excessive intake leads to positive

balance and weight gain. Both situations are states of energy imbalance (Crean, et al. 2024).

The negation of the balance can also be achieved through increased physical effort, which causes an increase in consumption relative to intake. However, the body's energy stores are determined by the existing balance between food intake and energy consumption. An active person who engages in significant physical activity will consume a greater amount of energy than a sedentary person (Bondyra-Wiśniewska, & Harton, 2023).

The energy balance equation can be expressed as follows

Changes in the body's energy deposits = energy intake - energy consumption

The nutritional needs of the human body and the energy value of food are expressed by indicating the number of kilocalories (kcal). In the international system of measurement, the unit of energy is the Joule, and in nutrition the kilojoule (K.J) is used. Calories allow replacing the energy spent by the body in its exchanges with the environment. The amount of energy we need every day must cover the body's basic expenses, as well as those related to muscular effort and fighting the cold.

The conversion factors between kilocalorie and kilojoule are:

1 Kcal = 4.185KJ 1 KJ = 0.239 Kcal;

The energy value of the body's caloric nutrients used in practice is as follows:

- 1g of carbohydrates provides 4.1kcal.
- 1g of protein provides 4.1 kcal.
- 1g of lipids provides 9.3 kcal.
- 1g of ethyl alcohol provides 7 kcal/g or 29.3 joules.

In practice, it is difficult to quantify exactly the energy input and consumption (Morris, & Mohiuddin, 2023).

The energy intake can be calculated following nutritional surveys (based on questionnaires), the total value of the energy consumed resulting from the summation of the calories provided by each food. The three groups of macronutrients (carbohydrates, lipids and proteins) are not equivalent in terms of ensuring energy requirements; however, each of these groups is necessary, within certain rather broad limits, compatible with survival. The importance of the changes that occur at the level of the body's energy deposits, changes that occur as a result of the imbalance between energy intake and consumption, depends on the duration of this imbalance. The daily energy requirement for most individuals is in the range of 1500-3000 kcal, due to the existence of the body's energy stores (Ulijaszek, 2023).

The short-term imbalance of this energy balance (as it occurs between meals or from one day to another) does not cause significant changes in terms of the body's total energy, so it does not change the body mass. Imbalances that appear and are maintained over a period of several days, weeks or months can lead to substantial changes in total energy and, therefore, to corresponding changes in body weight, but also to the appearance of metabolic disorders (Kiani, et al. 2022).

Estimation of Energy Requirements

The useful factors for calculating the energy requirement are: weight, height, age, profession, physical activity, physiological state (pregnancy, breastfeeding, puberty). In order to know the body's energy needs, it is necessary to know the components of the daily energy expenditure requirement, namely:

- Basal metabolism (MB) (can be defined as the minimum level of energy necessary to maintain life (it is about maintaining body functions and homeostasis) or energy consumption compatible with survival)
- Activity-related energy expenses
- Illness-related energy expenditure
- Thermogenesis (Tabh, Hartjes, & Burness, 2023)
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The amount of energy needed in a day differs for each person, but in general basal metabolism is the largest component of energy expenditure, and the thermic effect of food is the smallest. For a sedentary person, physical activities may account for less than half of the energy expended on basal metabolism, while an active person may expend as much energy on physical activity as on basal metabolism.

Even in conditions of absolute rest, the body consumes energy, because metabolic reactions continue to take place.

This minimum energy consumption, which represents the energy required for the body's vital function (breathing, blood circulation, synthesis of organic compounds, maintaining body temperature) represents the basal metabolism (Stephenson, 2023).

The measurement of the basal metabolism is done by putting the body in a state of total physical rest, at least 12 hours after eating, in muscle relaxation for 30-60 minutes, in convenient microclimate conditions. It is considered that one calorie per kilogram of body weight per hour is sufficient to ensure basal metabolism in an adult (Levy, & Bribiescas, 2023).

So, a male person with a body mass of 70 kg consumes in basal conditions approximately 1680 kilocalories in 24 hours (70x24=1680).

In a rational diet, food products must not harm health, but must be nutritious and have sensory properties corresponding to the consumer's requirements. The constant and essential feature of a food product is to satisfy the body's metabolic needs. But under certain conditions the food product can become harmful. In order to ensure the normal development of the body and increase its resistance to microbial and toxic agents, it is necessary to know not only the nutrients, but also the nutritional value of food (Sørensen, 2023).

Since no natural or industrially obtained food contains all the nutrients in amounts suitable for different groups of consumers, the foods were divided according to their origin and nutritional value into groups of food products. Combining products from different food groups can ensure the optimal supply of nutrients.

Conclusions and Remarks

When the ingested food does not provide the required amount of energy, the organism is forced to release it from its own tissues and first of all from the reserve adipose tissue, then from the muscle tissue. Food abuse and reduced energy expenditure have negative effects on the body's health. The first consequence is the increase in body mass; gradually, if the food intake is not correlated with the body's energy needs, obesity, diabetes, atherosclerosis, heart failure, etc. can set in. Practicing a diet based on an excessive intake of caloric nutritional principles leads to imbalances between energy intake and energy consumption. The existence of an optimal nutritional status promotes the growth and development of the body, maintains the state of health, allows the performance of daily activities and participates in the protection of the body against various diseases.

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