Nutrition and Human Welfare

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How Much To Eat.

One of the important functions of food is to supply energy to the living body. Carbohydrates, proteins and fats in the food provide energy. Energy from food is used by the body for three purposes.

1. To maintain the process of living such as heart beat ; circulation of blood, breathing and body temperature.

2. To meet the needs of every day activities such as standing, eating, moving dressing, sitting etc. and

3. To meet the greater needs of special active muscular work as in play, swimming etc.

The body uses energy every moment. Whether we sleep, or sit still there is no cessation of muscular activity in the body. When we work hard physically or play, the activities of the muscles increase and with that increase, the expenditure of energy also goes up. Throughout life, the internal work of the body goes on without any stop. The work of the heart and respiratory organs involves significant amounts of energy. The resting muscles spend energy for maintaining their tonus. It is difficult to measure these works separately, but it has been estimated that the heart alone does an amount of work each hour equivalent to that of lifting the entire body about 100 feet in the air. The breathing work and the tonus of muscles spend even more energy.

When one speaks of how much food to eat or the requirement of food, it is usually the body's energy requirement, *i.e.*, the number of calories needed per day, which comes to mind. If the intake of fuel in the body is inadequate, the body will burn some of its own substance as fuel to meet its energy needs. Hence the economy of other nutrients in the body is dependent on the meeting of body's energy requirement.

The Calorie.

How are we then to measure the energy requirement of the body ? Since the energy spent by the body appears in the form of heat, scientists have adopted the large 'Calorie' as the units of measurement of food. The large calorie is the amount of heat required to raise the temperature one Kilogram (2·2 lbs.) of water through one degree centigrade. It is 1,000 times greater than the small calorie used in physics and is written with a capital C.

Experimental work has shown that the carbohydrates and proteins make available in the body 4 calories per gram each and fats 9 calories per gram. For example, if an ounce of milk contains :

0.9 gram protein,

1.1 gram fat, and

1.4 gram carbohydrates

a cup of milk measuring 8 oz. will give :

$8 \times .9 \times 4 = 28.8$ calories through proteins,

$8 \times 1.1 \times 9 = 79.2$ calories through fats,

and $8 \times 1.4 \times 4 = 44.8$ calories through carbohydrates. Total 152.8 calories.

The apparatus which measures the energy released in the body by the essential constituents such as carbohydrates, fats and proteins is called the respiration calorimeter. It is both a respiration apparatus for the chemical determination of the Oxygen consumed and the carbon-

dioxide and water produced in the respiratory exchanges, and a calorimeter for the direct measurement of the heat given off by the body. It consists of a Chamber suitable for accommodating the individual to be studied, surrounded by water coils and other contrivances with thermometres to measure the production of heat. The Chamber is also provided with devices to register the amounts of oxygen used and carbondioxide produced. Such measurements have been made on a large number of people and the computations from these data on respiratory exchange help us to measure the energy metabolism indirectly without the direct calorimeter. Now, several forms of simplified portable respiration apparatus are available to measure the rate of energy metabolism in health and in sickness.

Metabolism.

This term metabolism is used broadly for all the chemical changes which take place in the body under the influence of the living cells. Some activities are concerned in creating or constructing substances from food, some are involved in maintaining the normal composition of body tissues while some others in breaking down food for yielding energy. The term "Energy Metabolism" is employed to designate those chemical processes which have to do with the combustion of fuel to run the human machine.

Basal Energy Metabolism (Basal Metabolic Rate—B.M.R.)

Basal energy metabolism is an expression often applied to the rate of expenditure of energy by a person, awake, lying still, who has taken little if any food during the past 12-14 hours, so that little digestion or absorption of food material is taking place at the time of observation (such condition is called the "post-absorptive stage"). In healthy individuals this basal energy metabolism average around one Calorie per Kilogram body weight per hour (1C/Kg. Body weight/hour). This is supposedly the minimum rate of expenditure of the normal man or woman when awake. This is the amount of energy needed to maintain the basic functions such as heart beat, breathing, pulse rate etc.

Additional allowances of energy are to be supplied with the Basal Metabolic requirements for the various activities of the individual. During sleep, the energy output is less, but when sitting erect it is more, and while standing it is even more. A normal person, however sedentary he may be, is almost sure to expend in the course of twenty hour day, more than 24 hours times his basal hourly number of Calories. Moreover in every case the basal rate can be maintained only by fasting and resting. Eating is always accompanied or followed by an increase in the rate of heat production, the extent of increase depending upon both the character and amount of food eaten.

(To be Continued)