FOOD AND NUTRITION NEWS

Acharya N.G. Ranga Agricultural University

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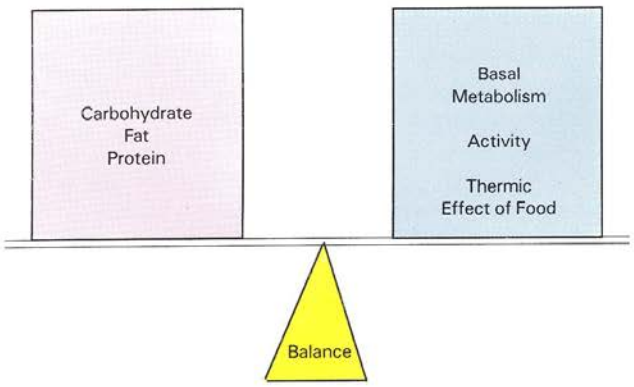
ENERGY BALANCE



Energy cannot 'disappear' - this is a fundamental principle of thermodynamics. Thus, if a group of adult men eat on an average 2510 kcal energy daily then that energy has to be further excreted in feces, or absorbed by the body. Once absorbed, a small amount of energy is excreted in the urine as the by-product of protein metabolism and the rest of the absorbed fuel has to be metabolized for energy or stored in tissues as protein, fat or as carbohydrate in the form of glycogen. The energy derived from the absorbed fuel is used for the multiplicity of chemical processes within the body (utilization of food, maintenance of body temperature) and for maintaining the tone of muscles and then movement of the body. If the energy absorbed is not used up by metabolism, then it has to be stored.

Energy is the basic nutritional requirement of man who is a homeotherm and endotherm, with ability to produce and regulate heat. Heat production is a by-product of this dynamic boilogical activity characterized by several chemical changes mostly oxidation, through which energy from food is liberated and converted to mechanical work and heat. The energy providing nutrients of food are carbohydrates, fat, protein and alcohol. The energy requirement of an individual as defined by FAO/WHO Committee of 1985 is the level of energy intake (EI)

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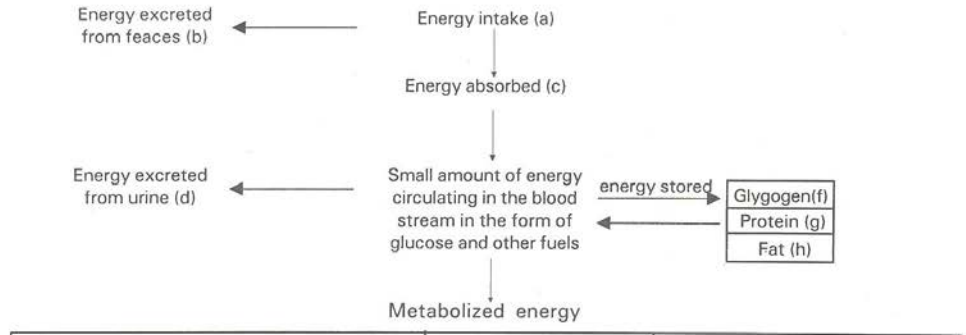
from food that wil balance energy expenditure (EE) when the individual has a body size and composition and the level of physical activity consistent with the long term good health, that will allow for the maintenance of economically necessary and socially desirable physical activity.

In order to be in energy balance which is assumed to be in a steady state, the energy input must be equal to energy output, a situation only possible if regulatory mechanisms exist to maintain the steady state, we will have energy balance.

Fig 1: Principles of energy balance



Energy intake		KJ	Kcal
a.	Total energy intake	10500	2510
b.	Energy loss in feces (-4% of intake)	420	100
c.	Absorbed energy	10080	2410
d.	Energy excreted in urine (-5% of intake)	525	125
e.	Energy available for metabolic processes or storage	9555	2285
	Total body stores		
f.	Glycogen	7600	1820
g.	Mobilizable energy	82000	19600
h.	Triglycerides	47000	112330

FLUCTUATING ENERGY BALANCE

There is a cycle in energy storage during the day and night. After eating during the day, energy is stored temporarily and then used up while fasting during the night. Spontaneous energy intake fluctuates markedly from day to day, with a coefficient of variation of about 16%. Energy expenditure also fluctuates but to a smaller degree of about 10%, despite the variety of daily activities. Without the fine matching of intake and output, there is often a state of temporary imbalance which may last for several days. This occurs normally in a group of people who are, over a period of a month, in a stable energy state.

If there is a food shortage for a period of several weeks, then the individuals within a community will adjust to a deficit in food intake by both drawing out the body reserves of energy and by reducing the components of energy expenditure. The BMR can fall by about 15% after 2-3 weeks of semi - starvation but this will only reduce total energy expenditure by about 8-10%, because the BMR contributes 50-60% to total energy expenditure. This fall in BMR, reflects a metabolic adaptation in adults and children when they are fed on an energy intake which is substantially reduced. eg: by about 50%.

The assessment of energy expenditure is a logical approach where one can specify the requirement value as being that energy needed for specific components of energy output., such as work and leisure time activity. A number of studies have been conducted on the various aspects of energy metabolism. It is clear that many nutritional and non-nutritional factors like genetic make-up, mental and psychological factors etc. may influence energy intake and or energy output and consequently energy balance.

The main components of energy expenditure are

1. The basal or resting metabolic rate which is the minimal rate of energy expenditure at rest and accounts for between 50-60% of daily energy expenditure.

2. Thermogenesis which is defined as energy expenditure above basal or resting metabolic rate and includes the effects of food intake, cold exposure, thermogenic agents and psychological influence such as stress.

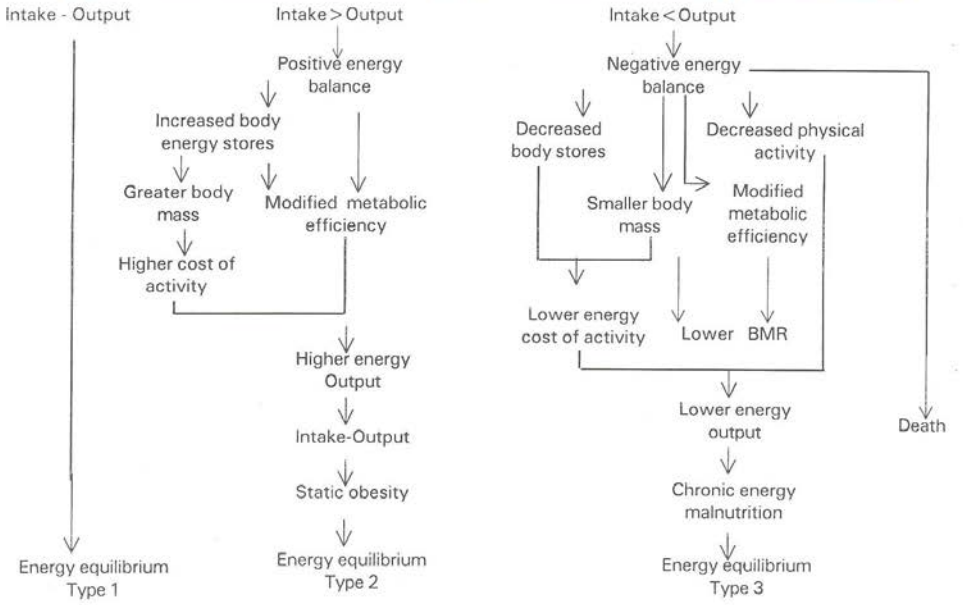
3. Physical activity, the contribution of which the total daily energy expenditure will depend on the duration and intensity of the physical activity.

The energy balance of adolescent girls of 13-15 years with different grades of anaemia was studied in the rural area of Rajendranagar. The results showed that the severely anaemic girls were able to spend equal amount of energy as that of normal at VO_2 max. The mean energy intake was 1608Kcal/day and the energy expenditure was 1781Kcal/day with a positive energy balance of 173Kcal/day.

(V. Vijaya Lakshmi & D.Sharada)
1997

The ways in which an organism responds to energy unbalance are summarized in Fig 2.

Fig 2 : Postulated mechanisms to achieve energy equilibrium under different energy balance conditions



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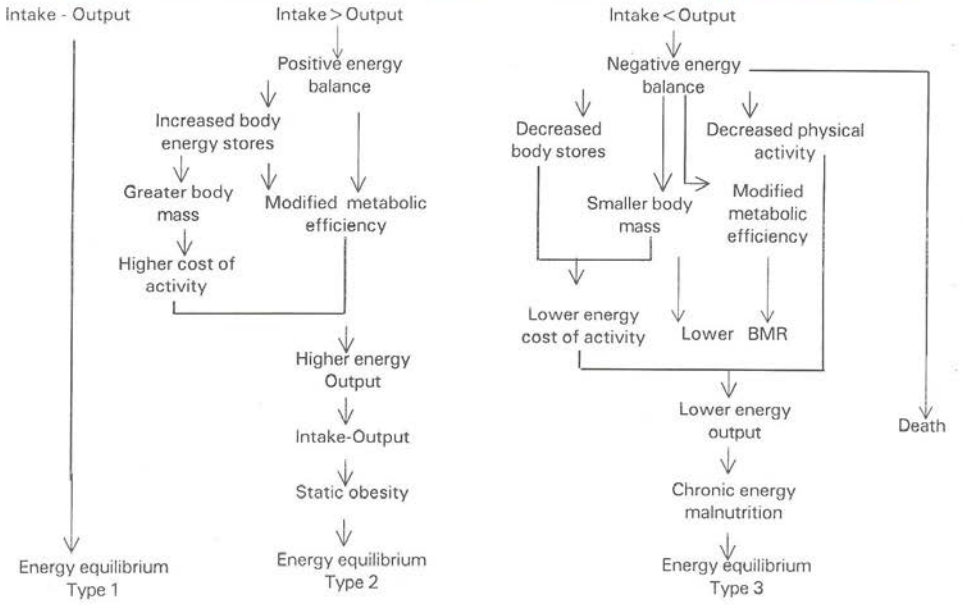

Seven female undergraduate students between 18-21 years of SNDT College of Home Science, Pune were selected for the study. Energy expenditure of the subjects was determined by factorial method (Borel et al 1984). Food intake was recorded for a period of 7 days. The food samples were analysed for gross energy in bomb calorimeter.

Though the energy intake was less than RDA the subjects were very active and healthy. Their energy expenditure was also low (Table 1).

Table 1 : Energy balance of under radiate students

S.No.	Body weight (Kg)	Energy intake (Kcal)	Energy expenditure (Kcal)	Energy balance Kcal)
1.	52	1643	1628	+15
2.	52	1261	1310	-49
3.	53	1495	1437	+58
4.	53.5	1389	1481	-92
5.	54	1625	1691	-66
6.	55	1519	1576	-57
7.	53	1467	1435	+32

Padmaja Prasad & P. Geervani (1988)

Women engaged in sorghum farming, dairy farming and rice farming were selected as subjects from Palem Village in Mahaboobnagar district of A.P. The energy expenditure of the subjects was estimated by factorial method of Bouchard et al (1992).

Energy intake was estimated by recording food intake for three days by the subjects and estimating energy value of food samples by bomb calorimeter.

A negative correlation was found between total energy intake and total energy expenditure of all subjects of different groups leading deficit (Table 2). Women of rice farming had more calorie deficit, followed by dairy farming and sorghum farming . The calorie deficit in this study was much more than the other studies. It was observed that energy balance differs with seasons and different population groups. Inspite of large energy deficit the women did not show any weight loss which may be due to drinking of toddy before bedtime which may have madeup the calorie deficit. The study time was too short to show any changes in body weight due to calorie deficit.

Table 2 : Energy balance of women engaged in agriculture

Group	Body weight (Kg)	BMR (Kcal/day)	Energy intake (Kcal)	Energy expenditure (Kcal)	Energy balance (K cal)
Sorghum					
Farming	47.5	1140	1571	2391	-819.8
Dairy					
Farming	42.0	1017	1396	2323	-927
Rice					
Farming	44.42	1066	1634	2691	-1056.7

S. Rachana & P.Geervani (1989)

Thirty boys of 13 and 14 years belonging to athletic group were randomly selected from Boys sports company situated in Artillery center, near Golconda, Hyderabad. The food intake of the subjects was estimated by food weighment for 3 days. The energy intake was calculated using food composition table. The energy expenditure of the subjects was estimated using factorial method of Bouchard et al (1983) before and after giving nutrition education.

Table 3 : Means energy balance before and after nutrition education

	Body weight	Energy intake	Energy expenditure	Energy balance
Before	46.4	2883	2369.4	+526
After	49.6	3550	3513	+37

The total daily energy expenditure increased after the dietary modification (Table 3). The increase in energy expenditure may have increased due to increase in the body weight of the subjects. Therefore the energy balance which was positive by 526 Kcal/day initially decreased to 37Kcal/day after dietary modification and nutrition education.

Asma Sultana & K. Chittemma Rao (1993)

Women working in four different farms were selected- agriculture, forage, dairy and poultry within the University campus in Rajendranagar. The energy expenditure was recorded for 24 hrs for 3 days and total energy expenditure per day was calculated by factorial method. The energy intake was calculated by taking the food intake for 24 hrs (Table 4).

Table 4 : Energy intake, energy expenditure and energy balance of farm women in two seasons

Name of farm	Agriculture		Forage		Dairy poultry		Poultry	
	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
Energy Intake	2934	2725	3165	2925	2649	2615	2713	2517
Energy Expenditure	3065	3165	3353	3015	2660	2728	2702	2786
Energy Balance	-388	-439	-173	-70	-34	-113	+11	-268

All the women engaged in agriculture, forage and dairy farm had negative energy balance where as women working in poultry farms had positive balance of 11Kcal in the first season (S_1). In the second season (S_2) all the women engaged in all four farms had negative energy balance as their energy expenditure was greater than actual energy intake. They were able to maintain energy balance by taking alcohol which provides empty calories and by decreasing pace of work.

T. Prabha & D. Sharada (1994)

Dr. P. Rajyalakshmi, Associate Professor, Department of Foods & Nutrition, PG & Research Center was one of the invited speakers in the 88th **Session of the Indian Science Congress** held from 3-7, January, 2001 at Indian Agricultural Research Institute, New Delhi. She presented a paper on ***"OBESITY IN SCHOOL CHILDREN IN DEVELOPING SOCIETIES-AN EMERGING HEALTH PROBLEM"*** in section of ENVIRONMENTAL SCIENCES.

Dr(Mrs) Vijaya Khader receiving Bharatamata award from Dr. V.T. Patil, Vice-Chancellor, Pondicherry University

Dr. (Mrs.) Vijaya Khader, Assoc. Dean, College of Home Science, Hyderabad, had received the "BHARATAMATA" award at the 24th International Astrogical Conference held on 8th January 2001 in Kolkata. This award, which was instituted jointly by the Astrological Research Project and Vishwa Jyotisha Peeth, was given away by Dr. V.T. Patil, Vice-Chancellor, Pondicherry University. The award was conferred on Dr. Vijaya Khader for her contribution in Food & Nutrition.

Recent Advances in Mineral Nutrition
11-02-2001 to 3-3-2001

The Centre of Advanced Studies in Foods & Nutrition conducted a three week training programme on " ***Recent Advances in Mineral Nutrition"*** at the PG & Research Centre, ANGRAU, Hyderabad from 11th February to 3rd March 2001. The course was planned and conducted by the course coordinators, Dr. D. Sharada, Assoc. Prof., and Dr. S. Shobha, Asst. Prof. under the overall supervision of the Course Director, Dr. Vijaya Khader, Director, CAS.

The Participants were Associate and Assistant Professors from State Agricultural Universities like UAS, Karnataka, TAU, Madurai, Gujarat Agril. University, Sardar Krushi nagar, CS Azad University of Agril. Science, Kanpur, Kerala Agril. University, Vellnikkara and ANGRAU.

The programme dealt with the latest developments in the fields of requirements, functions, bio-availability, analysis, deficiencies and excess of intake of minerals. The topics of special interest were those related to new concepts in mineral functions Practical demonstrations and exposure to the estimation of minerals by using Atomic absorption and emission spectroscopy, estimation of serum ferritin by ELISA, estimation of Iodine and Fluoride by

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using Ion Selective Electrode meter were organised. A field visit to see the functioning of the Defluoridation plant and interaction with officials as well as fluoride affected rural population in two villages of Nalagonda district was an important aspect of the programme.

The Valedictory function of the training programme was held on 3rd March, 2001. Dr. Vatsala, Dean, Faculty of Home Science, presided over the function. Dr. Vijaya Khader, Director, CAS welcomed the guests and presented a report of CAS activities. Dr. D. Sharada, course coordinator gave a report on the training programme. The Chief Guest Dr. Kamala Krishna Swamy, Director, NIN distributed the certificates and course material and to the participants delivered the keynote address. Dr. S. Shobha, course coordinator proposed vote of thanks.

Participant receiving certificate and course material from Chief Guest Dr. Kamala Krishna Swamy, Director, NIN.

Achievements & Awards

1. Paper Presentation

Dr. G. Sarojini, Unit Coordinator & Senior Scientist (Food & Nutrition), All India Coordinated Research Project in Home Science, Post Graduate & Research Centre, Acharya N.G. Ranga Agricultural University, Hyderabad, has attended & presented a research paper on the "Effect of Intervention with Coconut Protein Concentrate on the Blood Glucose levels in hyperglycemic subjects" in an International Symposium held at Cairns, Australia from November 26th to 1st December, 2000.

2. Award

Dr. G. Sarojini, Unit Coordinator & Senior Scientist All India Coordinated Research Project in Home Science, Post Graduate & Research Centre, Acharya N.G. Ranga Agricultural University, Hyderabad, was awarded Rai Bahadur Swaika Memorial Award for 1998, for Excellence in developing oil

Dr. G. Sarojini receiving the Award from Sri Bandaru Dattatreya, Hon'ble Minester of State for Urban Development

blends using Red Palm Oil, for the work carried in the last three calendar years. The award was presented during the 55th Annual Convention of Oil Technologists Association of India, convened by the India Institute of Chemical Technology, Hyderabad from 18th to 19th November, 2000. The award consists a cash prize of Rs. 2000/- and a Citation.

FOOD AND NUTRITION NEWS

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