Basal Metabolic Rate

- The amount of energy required for any individual varies directly with the degree of activity and environmental conditions , but the rate of energy production in an individual is more or less constant under some standard conditions ,basal conditions and is known as basal metabolism .

Definition

- The basal metabolic rate is the energy required by an awake individual during physical, emotional and digestive rest .
- It is the minimum amount of energy required to maintain life or sustain vital functions like the working of heart, circulation ,respiration and functions of brain .

- BASAL CONDITIONS ARE
- Person should be awake but at complete rest both physical and mental .
- Person should be without food at least 12 to 18 hrs , i.e in the “post absorptive state”

- Post absorptive state

  This period is allowed to pass for avoiding

  effects of digestion and absorption

  The effects of SDA (Specific Dynamic Action) of foodstuffs

- To prevent any chances of starvation .

Person should be in recumbent position in bed

- Person should remain in normal condition of environment , i.e at normal temperature , pressure and humidity , environmental temperature should be between 20°c to 25° c.

- The metabolic rate during sleep is less than BMR.
- Resting metabolic rateRMR is the measure of energy required to maintain life or vital functions. The subject is awake and non fasting. It is approximately about 3 percent higher than the BMR

DIFFERENCES BETWEEN BMR AND RMR

BASAL METABOLIC RATE

Basal metabolic rate is the rate that an organism gives off heat while at complete rest .

It is measured while the person is awake but at complete rest .

- It is often conducted in a darkened room upon a person,s waking up after at least 8 hours of sleep .
- To get the BMR of a person, it is important that he does not exert any extra energy while doing

the test. This is why a person who is being subjected to a BMR test is required to stay at the

testing facility the night prior to the test .

- He is in a reclining position, resting completely .
- He is required to fast for 12 hours before testing to ensure that his digestive system is not working during the procedure .
- During this time the energy released by his body should only be sufficient to let his vital body organs to function .

- **RESTING METABOLIC RATE**
- Resting Metabolic Rate is measured under less restrictive conditions than Basal Metabolic Rate.
- It does not require the person to spend the night in the testing facility to ensure at least 8 hours of sleep and rest before testing .

BMR is measured directly by the heat

- Evolved or indirectly by the volume of oxygen consumed and carbon dioxide evolved per unit time

Measurement of BMR

- Procedure; Atawater Benedict Roth basal metabolism apparatus (closed circuit method) is used.The person should be awake, but at physical and mental rest.The temperature of surroundings should be comfortable

The subject breathes in oxygen from a metal cylinder .The carbon dioxide

- produced is absorbed in soda lime.The subject is asked to breathe through a mouthpiece for 6 minutes.The oxygen present in the cylinder is utilized during this time.The volume of oxygen consumed is recorded

Calculation; The BMR is calculated from oxygen consumption , calorific

- Value and surface area.Let oxygen consumed in 6 minutes be “Y “liters,it is shown that calorific value of oxygen is 4.8, that is when 1 liter of oxygen is utilized 4.8 kilocalories are generated .Therefore heat produced in 6 mints=4.8*y or heat produced in 24 hours =4.8*10* y ×24kilocalories

Indirect calorimetry; when deuterium

- (^2H) and 18 o labelled water is given these isotopes are eliminated at different rates. Deuterium is eliminated only as water while oxygen is eliminated as CO_2as well as water. The difference between the two elimination rates is therefore a measure of co_2production

The double labelled water method

- Provides a measure of total CO_2production over 2to 3 weeks. T he method is useful to measure alteration in energy requirements during growth ,pregnancy, lactation etc.

Factors Affecting BMR

- AGE; During the period of active growth BMR is high it reaches a maximum by 5 years of age. In old age BMR is lowered
- SEX Males have a higher BMR than females

Exercise ; The increase in BMR during exercise is due to increased cardiac

- Output.Starvation lowers BMR
- Temperature; BMR increases in cold climate as a compensatory mechanism to maintain body temperature

Fever;12% increase in BMR is noticed

- Per degree centigrade rise in temperature.
- Thyroid harmones; Since thyoid harmones have a general stimulant effect on rate of metabolism and heat production .BMR is raised in hyperthyroidism and lowered in hypothyroidism

Normal Value For BMR

- Since BMR is affected by body surface area it is usually expressed in kilocalories per hour /square meter of body surface.Body surface area is calculated using the formula A=W*H x 71.84 where as A is area in sq cm H is height in cm and W is weight in kg . The BMR is then calculated from the values of oxygen consumption calorific value and surface area

For adult men normal value for BMR is

- 34 to 37 kcal/square meter/hour and for women 30 to 35 kcal/sq m /hour
- BMR for an adult is fixed as 25 kcal/kg body weight /day

- IMPORTANCE OF BMR
- As a diagnostic aid
- For calculation of caloric requirement
- Effects of food and drugs