

JULY 2008
QUESTION 04

Define basal metabolic rate and describe factors that influence it (70% of marks). How could you measure metabolic rate? (30% of marks)

Basal metabolic rate

rate of energy production under defined set of conditions
usually 12 hrs post meal, room temperature, at rest, not stressed

Normal values 70 kcals/hr for 70kg male (1700kcal/day)
 40 kcal/m²/hr when including body surface area (1.73m²)

Factors that influence BMR

Activity is the most important factor, and is hence controlled for in the measurement (at rest)

Body mass

Body surface area

Age

when growing actively the rate increases
neonates have double adult rate rate (per unit weight)
declines 2% annual as an adult

Gender (this is corrected when considering lean body mass)

Post prandial

increases by 10-15% for 4-6 hours,
variable depending on carbohydrate, fat and protein content

Starvation

the BMR drops in periods of starvation due to decreased RBC mass and tissue metabolism

Ambient temperatures

people in the tropics have a lower BMR

Hormones

thyroxine regulates the BMR
catecholamines, cortisol and corticosteroids increase BMR

Pregnancy and breastfeeding increase BMR

Pathology

Sepsis, malignancy and autoimmune diseases may increase the BMR

Measurement of BMR

Direct measurement

Atwater chamber measures the production of heat of an individual hourly
complicated method and rarely used

Indirect measurement

O₂ consumption is used to solve the conservation of mass equation
O₂ + glucose = CO₂ + H₂O + energy (excludes anaerobic metabolism)
uses a closed circuit ventilator to measure O₂ use (CO₂ is scrubbed)
1 litre of O₂ produces 4.82 kcal (therefore 15 L/hr = 70 kcal/hr energy)