

This viva will test your knowledge on temperature control and measurement. Candidates were asked about temperature and thermoregulation, various means of measuring temperature and metabolic rate and factors that influence metabolic rate.

“What is the 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 kcal/hr for 70kg male (1700kcal/day)
40 kcal/m²/hr when including body surface area (1.73m²)

“How is BMR measured?”

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)

What factors affect 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 (neonates have double adult by 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 carbo, 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

What are the consequences of mild post operative hypothermia?

this is a core temperature 34.5-36
physiological mechanisms to compensate include
vasoconstriction
non shivering thermogenesis
shivering
increased O₂ demand and CO₂ production, increased sympathetic tone
increased heart rate, BP, CO and intraocular pressure
associated with increased incidence of MI and arrhythmias
haematological consequences
inhibits platelet function and coagulation factor activation
leads to increased bleeding and requirement for increased blood productions
drug metabolism is reduced
prolongs neuromuscular blockade
prolongs emergence from anaesthesia
causes lengthened hospital stays