XXII. Measurement of basal metabolic expenditure (BME) using indirect calorimetry

XXIII. Calculation of energy expenditure

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- direct and indirect calorimetry
- metabolic expenditure: basal *vs.* resting
- basal conditions
- catabolism/anabolism
- energy balance
- nitrogen balance
- energetic equivalent of oxygen

Direct calorimetry

- Works on presumption that all metabolic actions are accompanied by heat production

- Technically demanding
- In practice, often not used

Indirect calorimetry

- Works on presumption that consumption of oxygen, CO_2 production and nitrate metabolites waste correspond to the energetic output

- Open or closed cycle setup
- In practicals: closed system setup using Krogh respirometer

Caloric (energetic) equivalent of oxygen (EE)

- For mixed diet
- = amount of energy released during consumption of 1 L of oxygen:

- EE = 20.19 kJ/L O_2

Basal metabolism

- Energetic expenditure of organism established in defined (basal) conditions:

- Thermoneutral environment
- 12-18 hours after the last meal containing proteins
- Psychological and social well-being, optimally in the morning before leaving the bed

Actual energy expenditure (AEE)

1) **at rest**
2) **at standing**
3) **after workload**

- estimate the oxygen consumption (l/s)
- correct the measured values to 0 °C and 101,325 kPa
  (for the formula see *Physiology and Neuroscience Practicals, 2013* – page 87*)*
- calculate AEE (kJ/s, kJ/day)
- explain differences in AEE observed in different conditions

Calculation of energy expenditure

1) basal energy expenditure (BEE)

- according to Harris-Benedict formula (*Physiology and Neuroscience Practicals, 2013* – page 89*)*
- kcal/day - transform to kJ/day (1 kcal = 4.18 kJ)

2) actual energy expenditure (AEE)

- may be calculated based on:
  - BEE
  - AF (activity factor)
  - TF (temperature factor)
  - IF (injury factor)