(XXII, XXIII)
Measurement of basal metabolic expenditure (BME) using indirect calorimetry
Calculation of energy expenditure

Basal metabolism
(*basal energy expenditure*, BEE)

- 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

Examined persons

Lay down on the examination bed
(to simulate basal conditions)

Actual energy expediture (AEE)

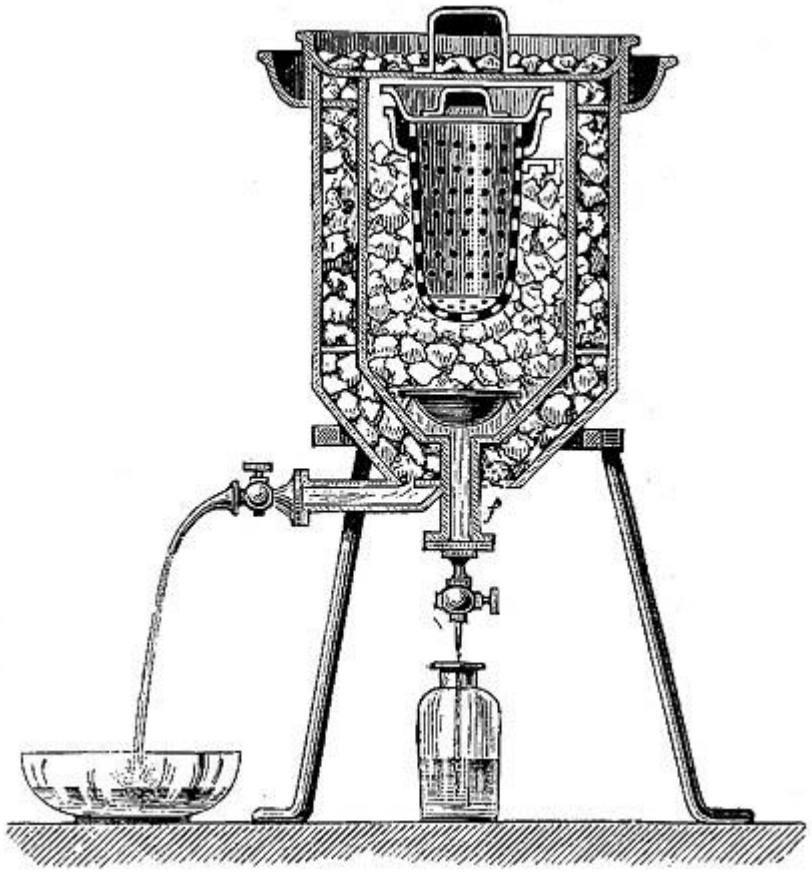
1) **at rest**
2) **at standing**
3) **after workload**

Determination of energy expediture

1) Measurement:
   - Direct calorimetry
   - Indirect calorimetry

2) Calculation

Direct calorimentry



Ice calorimetr – Lavoisier and Laplace, 1782

Zdroj: http://vlp.mpiwg-berlin.mpg.de/vlpimages/images/img10417.jpg

- 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)

- amount of energy released during consumption of 1 L of oxygen

Constant for mixed diet:

$EE = 20{,}19\ kJ/litr O_2$

Calculation of energy expediture

1) BEE

- According to Harris-Benedict equation
- kcal/day convert into kJ/day (1 kcal = 4,18 kJ)

2) AEE

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

Protocol

Indirect calorimetry – measurement and calculation of AEE:

1) at rest
2) at standing
3) after workload – steptest

- estimate the oxygen consumption (l/s)
- correct the measured values to 0 °C and 101,325 kPa
- calculate AEE (kJ/s, kJ/day)
- explain differences in AEE observed in different conditions

Protocol

Calculation of energy expediture

- Calculate BEE according to Harris-Benedict

- Compare calculated value of BEE with measured value of AEE at rest
- Explain differences