Examination of nutritional status (pathobiochemistry)

Calculations

- **Quetelet index = BMI** (body mass index) = weight in kg / (height in m) ^{2}
- Calculation according to **Harris and Benedict equations** - energy expenditure at rest (REE) in kcal / day
  1. for women = 655 + 9.6 × (weight in kg) + 1.7 × (height in cm) - 4.7 × (age in years)
  2. for men = 66 + 13.7 × (weight in kg) + 5.0 × (height in cm) - 6.8 × (age in years)
  - factors influencing resting energy expenditure:
    1. **Stress factors**:
       - fasting: 0.85
       - surgery: 1.0–1.2
       - sepsis: 1.4–1.8
       - Fever: 1.0 + 0.13 per degree Celsius
       - peritonitis: 1.2–1.5
       - cancer: 1.1 - 1.45
    2. **Physical Activity Factors**:
       - patient all day in bed - 1.15
       - patient lying on the toilet - 1.20
       - patient walking around the room - 1.25
       - patient walking after ward - 1.30
  - **Calculation of total energy expenditure = REE × stress × activity**

Tab.: Výdej a potřeba energie u novorozenců a malých dětí

Tělesná hmotnost (v kg)	Výdej (potřeba energie) v kcal/kg/den
Do 10	100 kcal/kg
10–20	1000 kcal + 50 kcal/na každý 1 kg nad 10 kg hmotnosti
Více než 20	1500 kcal + 20 kcal/na každý 1 kg nad 20 kg hmotnosti

Energy expenditure (need) in children varies **according to age and certain conditions**. The average energy expenditure of a 6-12 year old child is 50% basal metabolic, 12% growth needs, 25% physical activity, 13% various losses (eg unabsorbed fat). The so-called The thermal effect of food is caused mainly by ingested proteins (30% above basal output), while fat and carbohydrates 4%. The energy supply **best corresponds to the size of the body surface**. However, it is possible to count about 80-120 kcal / kg of weight for the first year of life and then reduce it by 10 kcal / kg every 3 years. The period of rapid growth and development around puberty requires a proportionally higher income. Each 1 g of proteins or carbohydrates received yields 4 kcal, 1 g of short-chain fatty acids 5.3 kcal, medium-chain 8.3 and long-chain fatty acids 9 kcal.

Calculator

MediaWiki:Lékařská kalkulačka/Nutrice

Nutrition tests

Anthropometric tests

- weight loss - refers to total body weight
- measurement of skin lashes over:
  1. triceps
  2. shovel
  3. pelvic christ - refers to the evaluation of total fat
- measurement of the circumference around the middle part of the arm - refers to body weight without fat

Laboratory tests

- **Biochemical**
  1. albumin (does not fall below 35 g / l)
  2. prealbumin (does not fall below 0.10 g / l)
  3. transferrin (should not be below 1.7 g / l)
  4. IGF binding protein 3
  5. fibronectin
  6. S-Fe, Cu, Zn
  7. S-urea, dU-urea
  8. glucose

- **Hematological**
  - hemoglobin, hematocrit, number erythrocyte, number leukocyte, number lymphocyte, number platelet
- **Immunological**
  - humoral immunity (IgG, IgA, IgM)
  - cellular immunity (delayed hypersensitivity skin tests)

Calorimetry

The most objective determination of energy expenditure is examination using **indirect calorimetry**. However, this is not a commonly used technique. Far more is the estimate of energy expenditure by calculation based on empirical equations (see above). The device enables non-invasive monitoring of respiratory gas exchange with continuous expression of the value of oxygen consumed and carbon dioxide produced in time intervals of 1 minute.

Nitrogen balance

There is a dynamic balance between the production (anabolism) and degradation (catabolism) of tissue proteins. In healthy individuals on a balanced diet, nitrogen intake and output are in balance. Under pathological situations leading to damage to the body, after surgical procedures or during prolonged stress, a metabolic response occurs in which catabolism predominates over anabolism. A negative nitrogen balance is created. The simplest approximate calculation is obtained by comparing the N-supply contained in proteins with the N-content of urea excreted in 24 hours in the urine (dU-urea):

- **N-equilibrium (in g)** = (protein supply / 6,25) - (dU-urea in g) + 2,5
- **Protein balance** = protein intake - protein loss (= (dU-urea in g + 4) x 6.25)

Note: The body is not able to store proteins in stock, as is the case with glycogen for carbohydrates or triacylglycerols for fats. There is only a so-called amino acid pool, which is about 70-80 g in an adult, which is depleted in a few hours during starvation.

The recommended minimum intake protein per day for a 70 kg individual is 1 g / kg body weight, which corresponds to 11 g N per 24 h.

Tab. Nitrogen and protein losses in various postoperative conditions according to Frey, 1975

Surgery	N losses in 24 h (in g)	Body protein losses (in g / 24 h)
Abdominal surgery	10–18	62,5–112,5
Gastric resection	15–20	93,75–125,0
Cholecystectomy	do 15	do 93,75
Lung resection	do 22	do 137,5
Abdominal hysterectomy	6–15	37,5–93,75
Total exenteration	až 32	až 200

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