Nutrition

SZTE ÁOK Biokémiai Intézet

Purpose

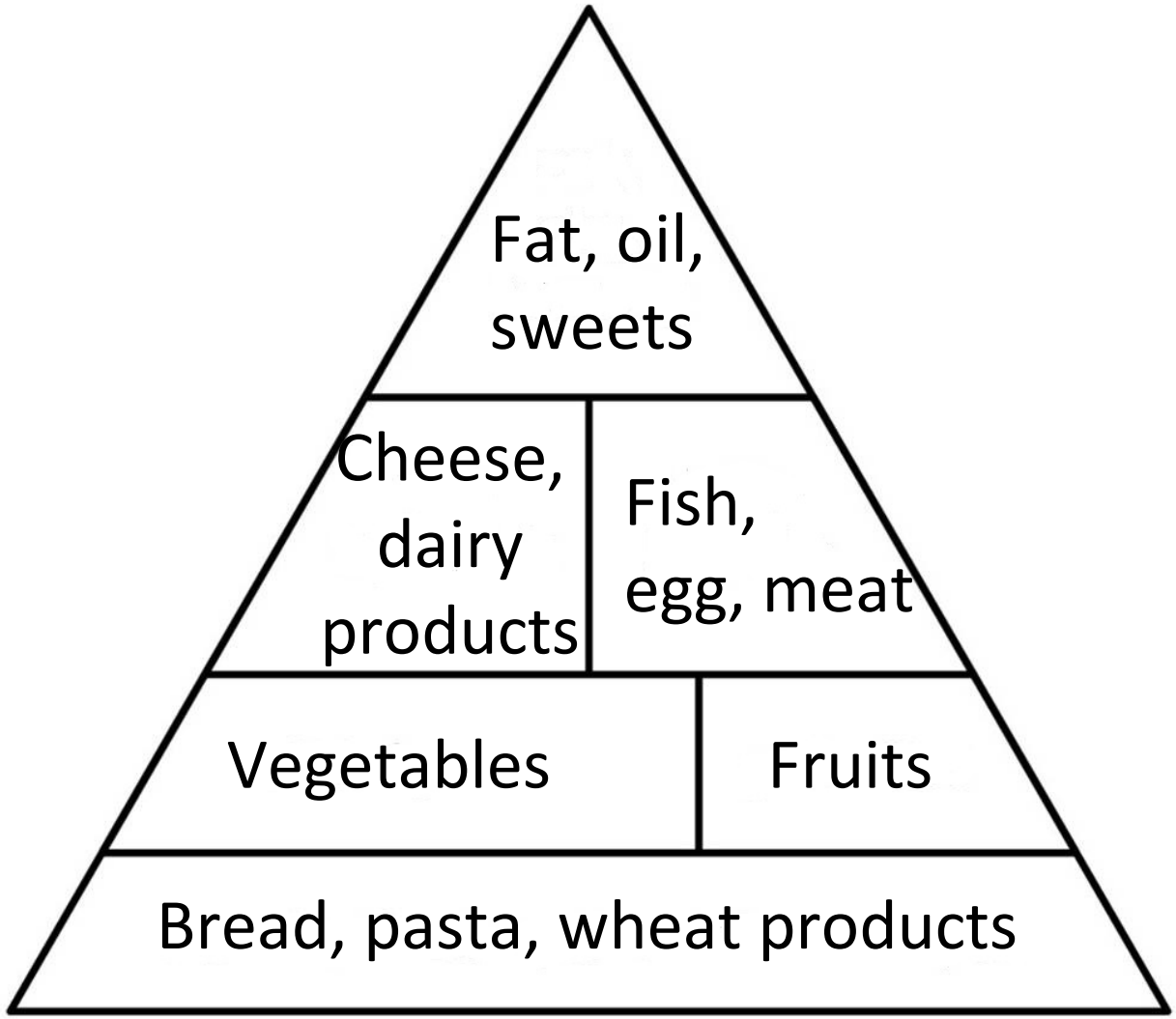
- Optimal, enbalanced nutrition
  - intake of every required nutritient
  - prevent the intake of harmful materials

- Purpose: maintain or restore health and good life quality

Demands and supply

- What do we need?
  - nutritients: → macro: proteins, carbonhydrates, fats
    → micro: vitamins, minerals
- What do we eat?
  - nutritients
  - fibres
  - additives (e.g. spices)
  - bioactive compounds (e.g. alkaloids, hormons)

- Storeage, processing: loss of nutritions


Fat, oil,
sweets
Cheese,
dairy
products
Fish,
egg, meat
Vegetables
Fruits
Bread, pasta, wheat products

Makronutrients

- Each can be devoted to energy production!
- Transfer to each other
  (except: essential amino acids)
- Ideal rate of energy intake:
  carbohydrates 55-60%, fats 25-30%,
  proteins 10-15%

Proteins - quantity

- 0,8 g/kg/day, 10-15% of energy intake
- Elevated requirements: e.g. childhood, recovery, strengh sports
- Protein-spare: sufficient carbohydrate
  →energy source is carbohydrate

Proteins - quality

- Limiting amino acids: restrict utilization
  (generally Lys, Met, Trp)
- Biological value: similarity to the amino acid - rate of human proteins
  →complete: animal
  →incomplete: plant – lack of esszential amino acids
- Complettation

Proteins - abnormalities

- Absence
  - marasmus (low energy and protein intake)
  elderly population

  - kwashiorkor (decreased protein intake + infection)
  children

- Excessive intake
  - obesity
  - decomposition products→tendency to metabolic acidosis, hyperammonaemia
  - increase of Vitamine B6 requirement
- Proposed: intake low fat-containing, completted proteins

Carbohydrates

- Dose:
  - min. 50-100 g/person/day
  - 55-60% of energy intake

- Deficite→glukagone-effect
  - protein-decomposition→glukoneogenesis
  - fatty acid decomposition→ketogen tendency

- Excessive intake→insuline-effect
  - elevated glycogen, triglyceride and protein synthesis
  - B1-vitamine requirement increases
  - effect of monosaccharides (caries, fluctuation of blood sugar level)

Lipids

- Dose: 25-30% of energy intake

- Quality
  - **saturated** (pl. valeric acid, palmitoic acid, sztearic acid, arachidic acid, etc.
  - **unsaturated** (pl. palmitoleic acid, oilic acid; doxosahexaenoic acid, eicosapentaenic acid, alpha-linolenic acid)
  - **essential**

Abnormalities

- Deficite: absorption disturbances
  - amount of lipase/biliaric acid decreases
  - symptomes:
    deficiency symptomes of lipophilic vitamines
    poly-unsaturated→skin-inflammation
    EPA→ thrombotic tendency
    newborn lack of DHA → CNS development-disturbances

- Excessive intake
  - change of lipidprofile
  - atherosclerosis
  - ischemic heart disease
  - etc.

Fibres

- Dose: 30 g/day

- Not water-soluble: cellulose
  - structure: glcuose polymer
  - effect: cleaning of the colon, etc.

Water-soluble fibres

- Hemicellulose
  - structure: cellulose+xilane+other units
  - effect: gel formation, etc.
- Pectine
  - structure: polygalacturone acid-derived
  - effect: absoprtion of fat, biliary acids, etc.
- Lignine
  - structure: polifenol-derived
  - effect: antioxydant, etc.
- Others

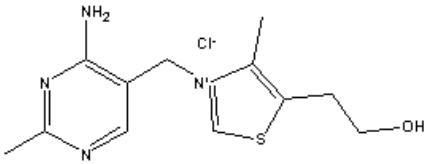
Abnormalities

- Deficite
  - developed countries
  - elevated risk: obstipation, colon cancer, etc.

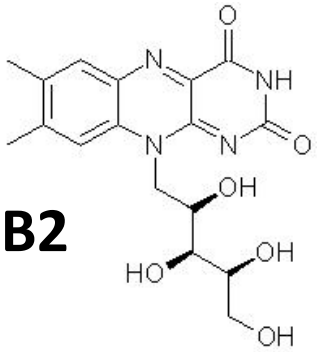
- Abuse
  - underdeveloped countries
  - consequences: Fe, Ca depletion, reduced absorption of lipid-soluble vitamines, etc.

Micronutrients: vitamins

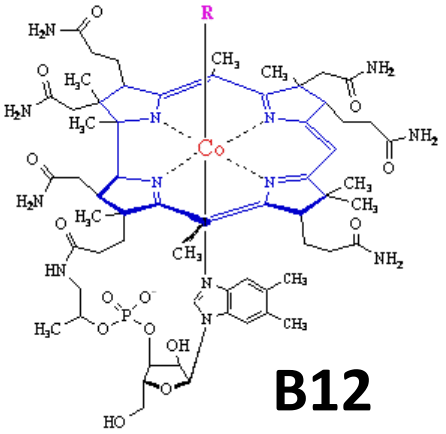
- Coenzyme function
  - vitamins:



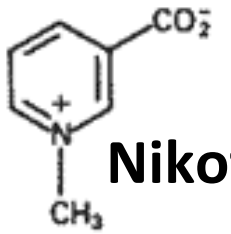
B1



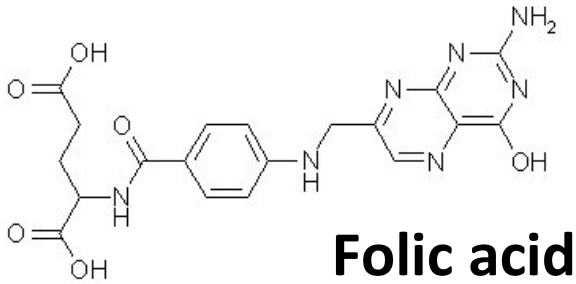
B2



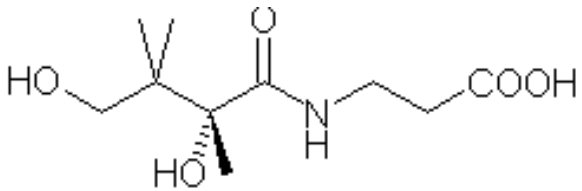
B12



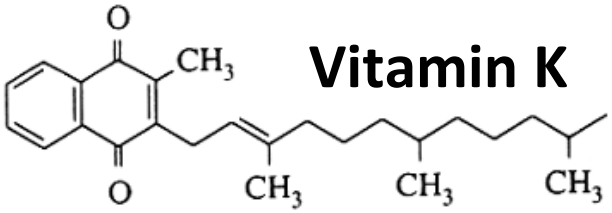
Nikotinic-acid



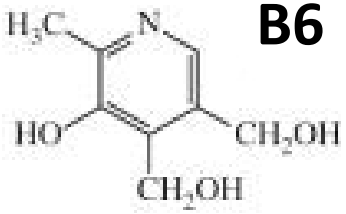
Folic acid



Pantothenic acid

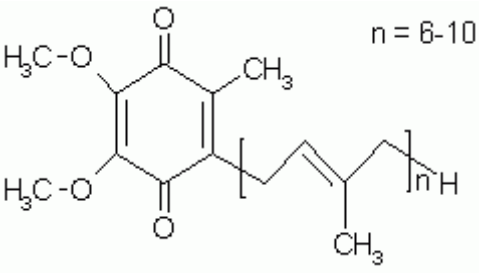


Vitamin K

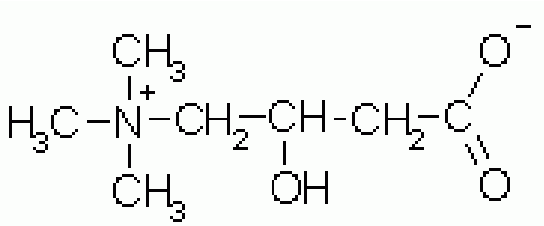


B6

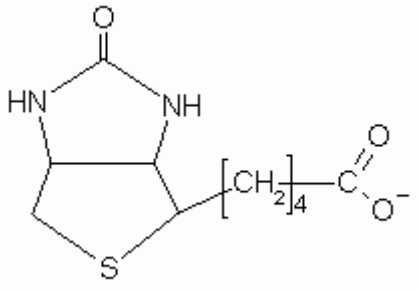
- vitamin-like: biotin, carnitin, ubiquinone (Q10)



Ubiquinone

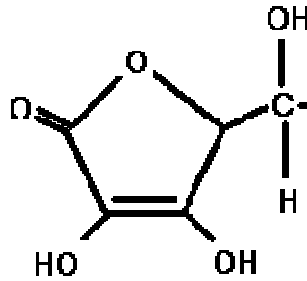


carnitin



biotin

- Antioxidants
  - hidrophil:



Vitamin C

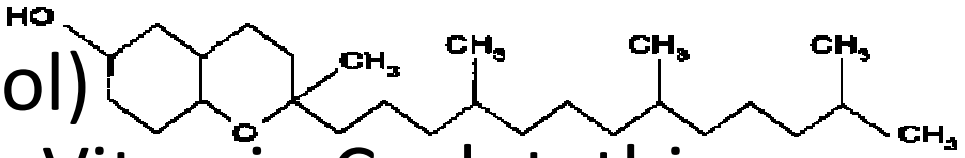
Vitamin C:

Hidroxylation reactions, oxidation of Fe^{3+} , neutralization of free radicals

Sources, recommended dosage, deficiency symptoms

flavonoids (e.g. resveratrol)

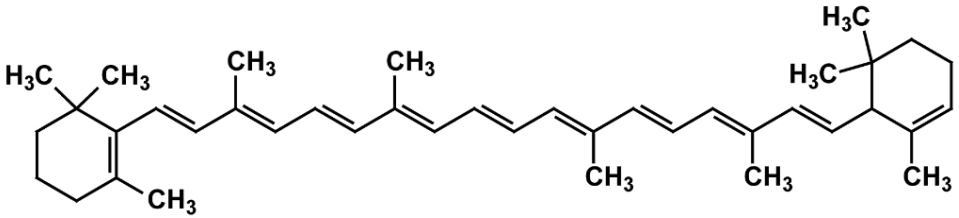
- lipophil:

Vitamin E (tocopherol) 

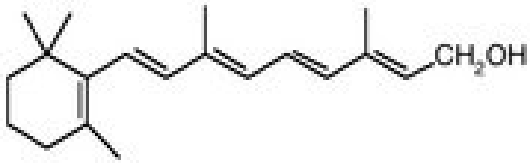
Redox chain with Vitamin C, glutathione, NADPH+H→protection against tumors and ageing

Sources, recommended dosage, deficiency symptoms

Vitamin A

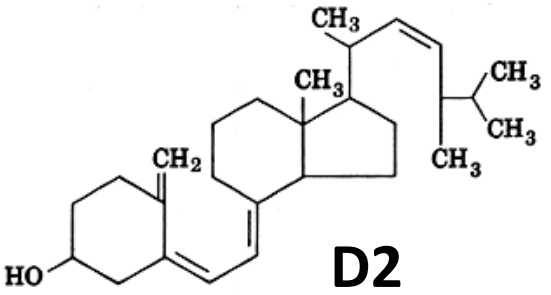


- Others
  - Vitamin A



Sight, growth, cell differentiation, antioxidant

Source, recommended dosage, deficiency abuse symptoms

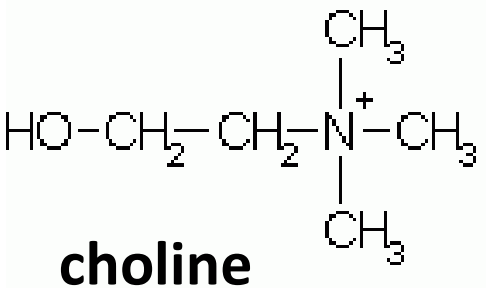


D2

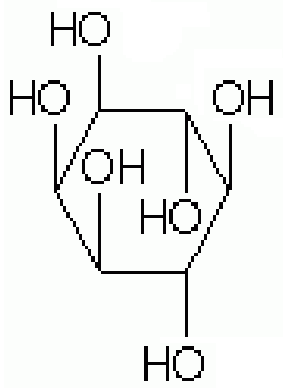
- Vitamin D (lipophil)

Role in Ca2+ homeostasis

source, production, recommended dosage, deficiency and abuse symptoms



choline



inositol

Micronutrients: minerals

- Macrominerals (daily claim>100 mg)
  - Na, K, Ca, Mg, Cl, P, S

- Microminerals (daily claim<100 mg)
  - Fe, Cu, Zn, Mn, F, I, Cr, Co, Se, Mo, stb.