

Vitamins

Vitamins are organic molecules:

- other than proteins, carbohydrates, lipids and nucleic acids
- used in very small amounts
- most cannot be made by body
- don't form polymers
- cannot be broken down for energy

Water Soluble Vitamins (B's & C)

- dissolve easily in water, not fat
- sensitive to heat and light
 - generally don't store well
 - lost in cooking
- absorbed directly into blood and travel freely throughout the body
- generally not stored well in body
 - eliminated daily by kidneys
 - fewer toxicities
 - needed in frequent, small doses

B Vitamins (B1, B2, Niacin, Biotin, Pantothenic Acid, B6, Folic Acid, B12)

- not used directly as fuel but help body *use* fuel
- act as coenzymes in many energy reactions; others help in new cell formation

- deficiencies cause major shutdown in body systems
- toxicities are uncommon but do occur in "pill takers"; toxicities when obtained from food alone are unknown

Vitamin C

- coenzyme
- collagen formation
- antioxidant

Fat Soluble Vitamins (A, D, E, K)

- dissolve easily in fat, not water; tend to appear in different foods than water soluble vitamins
- generally more heat and light stable →not destroyed by cooking or storage
- first enter lymphatic system, then into blood
- stored in liver and fat cells and accumulate; not readily excreted
 - don't need every day →can more easily reach toxic levels
 - needed in less frequent doses

Vitamin A

- promotes vision, growth, bone remodeling, immune system
- in animal foods, liver, fish, butter, eggs; fast foods often lack vitamin A

- A lack of vit A accounts for 600,000 childhood deaths/yr worldwide.

- some use Vit A for acne → no effect (altered form = accutane is)
- retin A for wrinkles, long term effects unknown
- smokers who take Vitamin A to fend off lung cancer actually increase their risk of the disease

Vitamin D

- not "essential"; body can synthesize it with UV
 - light skin → just need 15 minutes of sun on hands, face and arms
 - dark skin → need up to 3 hours of exposure
 - sunscreen >spf 8 prevents vitamin D synthesis
- abundant in egg yolks, liver, fish, butter, fortified milk
- acts like hormone; increases Calcium absorption and raises blood calcium

- taking extra Vitamin D with Calcium pills can increase risk of kidney stones
- liver and kidney disease can cause symptoms of deficiency

Vitamin E

- especially in vegetable oils, fruits
- antioxidant: protects lipids and cell membrane

- does **NOT**:
 - improve physical performance
 - enhance sexual performance
 - slow aging
 - prevent gray hair
 - prevent wrinkles
 - slow parkinsons

Vitamin K

- especially found in liver, leafy green veggies, cabbage
- also synthesized by bacteria in GI tract
- essential for blood clotting

Minerals

- inorganic elements; 4% of body weight
- cannot be changed or broken down
 - no special care to preserve during storage or prep
 - but may leach into water and be lost during cooking

the body requires relatively large amounts of about 7 minerals:

Calcium

bones and teeth
membrane transport
nerve transmissions
muscle contractions
heart rhythm
blood clotting
enzyme cofactor

deficiencies: osteoporosis

excess: nausea, vomiting, loss of appetite, kidney toxicity, irregular heart beat, constipation, gas, reduced absorption of iron and zinc

Phosphorus

bones and teeth
ATP
creatin phosphate
DNA & RNA
phospholipids
active transport

deficiencies: hypophosphatemia

excesses: reduce body stores of calcium

Sulphur

most proteins

Potassium, Chlorine, Sodium

osmotic balance
nerve impulses
muscle contractions

Magnesium

coenzymes

deficiencies: can result in poor calcium absorption

excesses: heart problems, difficulty breathing

the body requires only trace amounts of others, eg.:

Fluoride

strengthens bones

excesses: browning of teeth, brittle bones, fatigue, muscle weakness

Iodine

synthesis of thyroid hormones

deficiencies: goiter; mental & physical retardation (cretinism)

Iron

hemoglobin

excesses: has been linked to arthritis, heart disease, diabetes, infectious diseases and cancer, extreme dosing=death

Cobalt, Chromium, , Manganese,
cofactors for enzymes

Copper

cofactors for enzymes

deficiencies: anemia, impaired immunity, altered iron metabolism

Selenium,

cofactors for enzymes

deficiencies: muscle pain or weakness; impaired immunity

excesses: fragile nails, hair loss, fatigue, abdominal pain, nausea, diarrhea, nerve damage

Zinc

cofactors for enzymes

synthesis of testosterone

sperm development

deficiencies: can make you lose your appetite, weaken immune system

zinc deficiencies account for 400,000 deaths/yr worldwide

excesses: reduced immune function, vomiting, gastric upset, irritation of stomach lining, slow absorption of copper

Molybdenum

cofactors for enzymes

excesses: increased secretion of copper