

The Water-Soluble Vitamins

B Vitamins and Vitamin C

The Vitamins - Characteristics

	Water-Soluble Vitamins: B Vitamins and Vitamin C	Fat-Soluble Vitamins: Vitamins A, D, E, and K
Absorption	Directly into the blood.	First into the lymph, then the blood.
Transport	Travel freely.	Many require protein carriers.
Storage	Circulate freely in water-filled parts of the body.	Stored in the cells associated with fat.
Excretion	Kidneys detect and remove excess in urine.	Less readily excreted; tend to remain in fat-storage sites.
Toxicity	Possible to reach toxic levels when consumed from supplements.	Likely to reach toxic levels when consumed from supplements.
Requirements	Needed in frequent doses (perhaps 1 to 3 days).	Needed in periodic doses (perhaps weeks or even months).

NOTE: Exceptions occur, but these differences between the water-soluble and fat-soluble vitamins are valid generalizations.

Vitamins B - Function

- Coenzymes

Without coenzymes, compounds A, B, and CD don't respond to their enzymes.

With the coenzymes in place, compounds are attracted to their sites on the enzymes...

... and the reactions proceed instantaneously. The coenzymes often donate or accept electrons, atoms, or groups of atoms.

The reactions are completed with either the formation of a new product, AB, or the breaking apart of a compound into two new products, C and D, and the release of energy.

Wiley-Blackwell - Thomson Learning

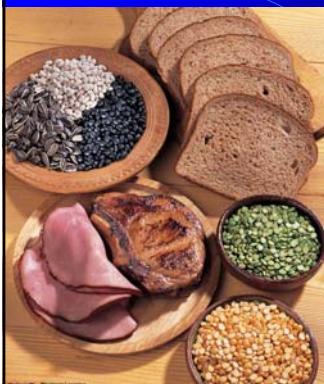
Thiamin - Doses

- Other names: Vitamin B₁
- RDA
 - men: 1.2 mg/day
 - women: 1.1 mg/day

B₁ - Function

- Chief functions in the body
 - Part of coenzyme TPP (thiamin pyrophosphate) used in energy metabolism

Thiamin - Sources



- Significant sources
- Whole grain, fortified, or enriched grain products
- Moderate amounts in all nutritious food
- Pork
- Easily destroyed by heat

Riboflavin – B₂

- RDA
 - Men: 1.3 mg/day
 - Women: 1.1 mg/day

Riboflavin - Function

- Chief functions in the body
 - Part of coenzymes FMN (flavin mononucleotide) and FAD (flavin adenine dinucleotide) used in energy metabolism.




Niacin – Names and Doses

- Other names
 - Nicotinic acid; Nicotinamide; Niacinamide
 - Vitamin B₃
- Precursor: dietary **tryptophan**
- RDA
 - Men: 16 mg NE/day
 - Women: 14 mg NE/day
- Upper level for adults: 35 mg/day

Niacin

- Chief functions in the body
 - Part of coenzymes NAD (nicotinamide adenine dinucleotide) and NADP (its phosphate form) used in energy metabolism



Niacin Sources:

- Milk, eggs, meat, poultry, fish
- Whole-grain and enriched breads and cereals
- Nuts
- All protein-containing foods

Biotin

- Adequate intake (AI)
 - Adults: 30 µg/day
- Chief functions in the body
 - Part of a coenzyme used in energy metabolism, fat synthesis, amino acid metabolism, and glycogen synthesis

Biotin Sources

- Significant sources
 - Widespread in foods
 - Organ meats, egg yolks, soybeans, fish, whole grains
 - Also produced by GI bacteria

Pantothenic Acid

- Adequate intake (AI)
 - Adults: 5 mg/day
- Chief functions in the body
 - Part of coenzyme A, used in energy metabolism

Pantothenic Acid - Sources

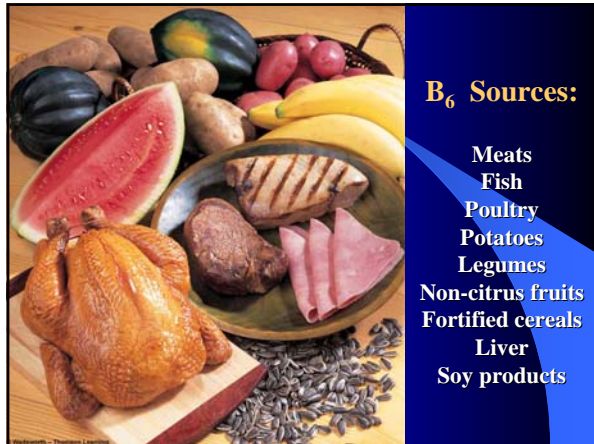
- Significant sources
 - Widespread in foods
 - Organ meats, mushrooms, avocados, broccoli, whole grains
- Easily destroyed by food processing

Vitamin B₆ - Pyridoxine

- Other names
 - Pyridoxine
 - Pyridoxal
 - Pyridoxamine
- RDA
 - Adults (19-50 years): 1.3 mg/day
- Upper level for adults: 100 mg/day

Vitamin B₆ - Functions

- Chief functions in the body
 - Part of coenzymes used in amino acid and fatty acid metabolism
 - Helps to convert tryptophan to niacin and to serotonin
 - Helps to make red blood cells



Folate- Names and Doses

- Other names
 - Folic acid
 - Folacin
 - Pteroylglutamic acid (PGA)
- RDA
 - Adults: 400 µg/day
- Upper level for adults: 1000 µg/day

Folate - Function

- Chief functions in the body
 - Part of coenzymes used in DNA synthesis and therefore important in new cell formation (fetus development)
- ✓ Present in foods as glutamic acid derivative and require s B₁₂ for activation



Folate Sources:

Fortified grains
Leafy green vegetables, legumes, seeds
Liver

Vitamin B₁₂ – Names and Doses

- Other names: cobalamin

- RDA
 - Adults: 2.4 µg/day

B₁₂ - Functions

Chief functions in the body

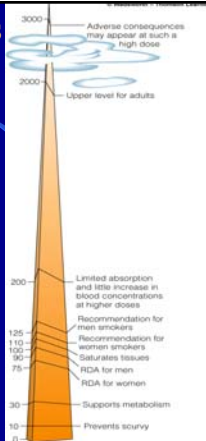
- Part of coenzymes methylcobalamin and deoxyadenosylcobalamin used in new cell synthesis
- Helps to maintain nerve cells
- Reforms folate coenzyme
- Helps to break down some fatty acids and amino acids

Vitamin B₁₂ - Sources

- Significant sources
 - Animal products (meat, fish, poultry, shellfish, milk, cheese, eggs)
 - Fortified cereals
- Easily destroyed by microwave cooking

Vitamin C – Names Doses

- Other name: ascorbic acid
- RDA
 - Men: 90 mg/day
 - Women: 75 mg/day
 - Smokers: + 35 mg/day
- Upper level for adults: 2000 mg/day



Vitamin C - Functions

Chief functions in the body

- Collagen synthesis
 - Strengthens blood vessel walls, forms scar tissue, provides matrix for bone growth
- Antioxidant
- Thyroxin synthesis
- Amino acid metabolism
- Strengthens resistance to infection
- Helps in absorption of iron



Vitamin C - Sources

Significant sources

- Citrus fruits
- Cabbage-type vegetables, dark green vegetables (such as bell peppers and broccoli)
- Cantaloupe, strawberries
- Lettuce, tomatoes, potatoes
- Papayas, mangoes

• Easily destroyed by heat and oxygen

Vitamin C - Overdose

- Toxicity symptoms
 - Nausea, abdominal cramps, diarrhea
 - Headache, fatigue, insomnia
 - Hot flashes, rashes
 - Interference with medical tests, aggravation of gout symptoms, urinary tract problems, kidney stones

Vitamin And Mineral Supplements

Arguments for supplements

- Correct overt deficiencies
- Improve nutrition status
- Reduce disease risks
- Support increased nutrient needs
- Improve the body's defenses

Vitamin And Mineral Supplements

Arguments against supplements

- Toxicity
- Life-threatening misinformation
- Unknown needs
- False sense of security
- Other invalid reasons
- Bioavailability and Antagonistic actions

END
