General Characteristics of Vitamins

1. Small, organic compounds.
2. Usually obtained from food.
   a. Synthesized by body
   b. Precursor compounds.
3. Essential to life.
4. Each has a specific function.
5. Regulate body processes.
6. Contain no kcalories.
7. Toxicity at mega doses: 10x RDA
8. No perfect food contains all vitamins.
9. Body can’t defect difference between synthetic and natural vitamin.
10. Classified as fat or water soluble.
# Fat and Water Soluble Vitamins

<table>
<thead>
<tr>
<th>Fat soluble</th>
<th>Water soluble</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carried in fat</td>
<td>Soluble in water</td>
</tr>
<tr>
<td>A, D, E, K</td>
<td>Thiamin, riboflavin, niacin, folate, B12, B6, biotin, pantothenic acid, vitamin C.</td>
</tr>
<tr>
<td>Needed every three days.</td>
<td>Needed daily</td>
</tr>
<tr>
<td>Deficiencies develop slowly</td>
<td>Deficiencies develop quickly</td>
</tr>
<tr>
<td>Transported lymph. Stored in the liver and body adipose</td>
<td>Transported in blood. Not stored in the body</td>
</tr>
<tr>
<td>Excess toxic in small amounts (6-10x RDA)</td>
<td>Excess usually not toxic. (&gt; 10 x RDA)</td>
</tr>
<tr>
<td>Have precursors or provitamins.</td>
<td>Generally do not have precursors.</td>
</tr>
</tbody>
</table>
**B1 Thiamin, B2 Riboflavin, B3 Niacin**

**Functions:**
1. Coenzyme energy metabolism
3. Release energy from nutrients.

**Thiamin:**
- Part of coenzyme TPP, thiamin pyrophosphate
- 1998 RDA
- Beriberi – CNS damage/heart/wt loss
- Pork and enriched grains

**Riboflavin:**
- Part of coenzyme FMN and FAD, flavin mononucleotide & flavin adenine dinucleotide
- 1998 RDA
- Ariboflavinosis
- Milk products; enriched grains; liver.
Niacin:

- Two chemicals: nicotinic acid and nicotinamide
- Part of coenzyme NAD and NADP.
  - Nicotinamide adenine dinucleotide
  - And its phosphate form
- 1998 RDA
- Pellagra – 4 “D”s
- Toxicity: niacin flush

- Milk, eggs, meat, poultry, fish, enriched grains, nuts.
- Niacin made from tryptophan, about 1/2 our need.
- NE = 1 mg niacin or 60 mg tryptophan.
Pyridoxine (B 6)

Function:
1. Coenzyme protein synthesis  
PMP = pyridoxamine phosphate  
PLP = pyridoxal phosphate  
2. Hemoglobin formation  
3. Transmits nerve impulses

1997-2000 DRI & RDA: 1.3 mg adults

Deficiency: Rarely alone.  
Weakness, irritability, insomnia.  
Growth failure, impaired motor function, convulsions.

Toxic: Yes. Irreversible nerve damage.

Sources: Widely distributed.  
Best - chicken, meat, legumes, green leafy vegetables, potatoes, whole grains, banana, watermelon
**Folate**

Functions:
- a. DNA & RNA synthesis for new cells.
- b. Activates B 12
- c. Coenzyme form is THF (tetrahydrofolate) & DHF (dihydrofolate)
- d. Blood formation - part of hemoglobin

RDA: 1997-2000 DRI
- 400 mcg women & men
- 600 mcg pregnant women

Deficiency:
- Macrocytic or megaloblastic anemia
- Mental confusion, depression, gi deterioration.

Toxicity: Masks vitamin B12 deficiency symptoms.

Food Sources: Fortified grains, green leafy vegetables; liver, orange juice and legumes.
Vitamin B 12 - Cobalamine

Functions:
   a. DNA & RNA synthesis for new cells.
   b. Normal growth
   c. Maintain nerve fibers
   d. Releases folate coenzyme

Absorpsion: Intrinsic factor

RDA: 1997-2000 DRI
   2.4 mcg women and men

Deficiency:
   Macrocytic or megaloblastic anemia.
   Pernicious anemia.
   Nerve degeneration; paralysis.
   Causes a folate deficiency.

Toxicity: No.

Food Sources: Animal products.
**Pantothenic Acid = B5**

Function:
1. coenzyme in energy metabolism
2. synthesis of hormones, neurotransmitters, etc.

AI: 5 mg

Deficiency: no
Toxicity: no

**Biotin**

Function: coenzyme in energy metabolism

AI: 30 ug

Deficiency: no
Toxicity: no
Non B Vitamins

1. choline
   1998 AI was established.
   Men  550 mg/day
   Women 425 mg/day

Made from amino acid methionine.
   a. synthesizes neurotransmitter acetylcholine.
   b. part of phospholipid lecithin

Deficiency: rare

Sources: milk, liver, eggs, peanuts, cauliflower, soy products.

2. inositol - non essential
   a. 6-carbon synthesized from glucose
   b. Used in cell membranes.

3. carnitine - non essential.
   Synthesized from a.a. lysine.
OTHERS

a. Co enzyme Q = Ubiquinone

b. taurine

c. lipoic acid

d. B 15 (pangamic acid)
   A hoax; actually calcium gluconate.

e. B 17 - laetrile

f. Vitamin P (hesperidin) bioflavonoids

g. PABA = para aminobenzoic acid

h. vitamin O = ozygenated salt water
**Vitamin C - Ascorbic Acid**

**Function:**
1. collagen synthesis
2. antioxidant
3. resists/fights infection
4. aids in wound healing
5. promotes iron absorption

**RDA:**
- 75 mg women
- 90 mg men
- +35 for smokers

**Deficiency:**
Scurvy - weakness, bleeding gums, petechia, delayed wound healing

**Toxicity:**
- 2000 mg upper limit
- Diarrhea, cramps, nausea.

**Sources:**
Fruits & vegetables only.
Arguments for Supplements

1. Correct overt deficiencies
   a. lactose intolerance
   b. anemic

2. Improve nutrition status
   a. low food energy intakes
   b. vegan diets

3. Reduce disease risks
   a. non milk/dairy eaters

4. Support increased nutrient needs
   a. infants
   b. pregnancy
   c. elderly

5. Improve body’s defenses
   (injury, infection, surgery, diseases)
Arguments Against Supplements

1. Toxicity.

2. Life threatening misinformation.

3. Unknown needs.

4. False sense of security.

5. Bioavailability & antagonistic actions.

6. Misinformation that supplements can enhance athletic performance.

7. Belief supplements provide energy, reduce stress and cure illness.
Selection of a Supplement

1. Form

2. < 10 times RDA

3. < RDA for Vitamin A, D

4. Natural, organic or synthetic

5. Avoid high potency


7. Cost