Water Soluble Vitamins
Riboflavin (Vitamin B$_2$)

Functions:

- Coenzymes
- Participate in many energy-yielding metabolic pathways
  - Fatty acids broken down and burned for energy
  - Like many other B vitamins, riboflavin helps your body metabolize carbohydrates, protein and fats.
  - Riboflavin also protects the health of the body’s cells and enhances the function of some of the other B vitamins, niacin and Vitamin B$_{12}$.
Deficiency of Riboflavin

- stomatitis: including
- Riboflavin deficiency (also called ariboflavinosis)
  - painful red tongue with sore throat,
  - chapped and fissured lips (cheilosis), and
  - inflammation of the corners of the mouth (angular stomatitis).
- There can be oily scaly skin rashes on the scrotum, vulva, philtrum of the lip, or the nasolabial folds.
- The eyes can become itchy, watery, bloodshot and sensitive to light.
Cheilosis and angular stomatitis
Deficiency of Riboflavin

Due to interference with iron absorption, riboflavin deficiency results in an anemia with normal cell size and normal hemoglobin content (i.e. normochromic normocyticanemia).
This is distinct from anemia caused by deficiency of folic acid (B\textsubscript{9}) or cyanocobalamin (B\textsubscript{12}), which causes anemia with large blood cells (megaloblastic anemia).

Deficiency of riboflavin during pregnancy can result in birth defects including congenital heart defects and limb deformities.
Ariboflavinosis

- Sore red eyes and lids
- Angular stomatitis
- Glossitis of tongue
- Cheilosis of lips
- Scrotal dermatitis
Food Sources of Riboflavin

- Milk/products
- Enriched grains
- Ready to eat cereals
- Liver
- Oyster
- Brewer’s yeast
- Vegetables (asparagus, broccoli, greens)
- Sensitive to UV radiation (sunlight)
- Stored in paper, opaque plastic containers
Food Sources of Riboflavin
RDA for Riboflavin

- 1.1 mg/day for women
- 1.4 mg/day for men
- Average intake is above RDA
- Toxicity not documented
- No upper level
Niacin (Vitamin B₃)

- Nicotinic acid and nicotinamide
- Coenzymes
- Needed when cell energy is being utilized
- Synthetic pathways require niacin, especially fatty acid synthesis
- Niacin protects the health of skin cells and keeps the digestive system functioning properly.

- Niacin may also help the body to metabolize fat.

- In large amounts, niacin can help lower LDL and triglyceride levels, while raising HDL, or good cholesterol, levels.
Deficiency of Niacin: Pellagra

• 3 Ds

  • Dementia
  
  • Diarrhea

  • Dermatitis (worse with sun exposure)

• Occurs in 50-60 days

• Poor appetite, weight loss, weakness
Pellagra

• Prevented with an adequate protein diet

• Enrichment Act of 1941

• Became epidemic in southern Europe in early 1700s when corn became a staple food (poor source)

• Reached epidemic proportions in the South Eastern U.S from late 1800s to 1930s

  • Only dietary deficiency disease to reach epidemic proportions in the US
Pellagra
Food Sources of Niacin

- Enriched grains, ready to eat cereals
- Beef, chicken, turkey, fish
- Asparagus, peanuts
- Heat stable; little cooking loss
• 60mg tryptophan can be converted into 1 mg niacin; meets 50% of our needs

• Niacin in corn is bound by a protein

  • Soaking corn in alkaline solution, like lime water releases niacin

  • Hispanic people soak corn in lime water before making tortillas
• Food sources of Niacin

Food sources of Niacin (vitamin B3) include dairy, poultry, fish, lean meat, nuts and eggs.
RDA for Niacin

- 12 (mg) NE/day for women
- 16 (mg) NE/day for men
- Daily Value on labels is 20 mg
- Upper Level is 35 mg
- Toxicity S/S: headache, itching, flushing, liver and GI damage
- Mega dose can lower LDL and TG and increase HDL