Water Soluble Vitamins
Vitamin B$_{12}$ (cyanocobalamin)

- Compounds containing the mineral cobalt
- Synthesized by bacteria, fungi, and other lower organisms
- Role in folate metabolism
- Maintenance of the myelin sheaths
- RBC formation
Deficiency of Vitamin $B_{12}$

- **Pernicious anemia**
  - Nerve degeneration, weakness
  - Tingling/numbness in the extremities (parasthesia)
  - Paralysis and death
  - Looks like folate deficiency

- Usually (95%) due to decreased absorption ability

- **Achlorhydria** especially in elderly
- **Injection** of $B_{12}$ needed
- Takes $\sim20$ years on a deficient diet to see nerve destruction
Food Sources of Vitamin $B_{12}$

- Synthesized by bacteria, fungi and algae
  Animal products (Stored primarily in the liver)

RDA

1 ug/ day for adults and elderly

1.2ug/day for pregnant women
Vitamin C (Ascorbic acid)

- Synthesized by most animals (not by humans)
- Decreased absorption with high intake
- Excess excreted
Functions of Ascorbic acid

• To make collagen, the most plentiful protein in your body.

• Collagen helps keep your bones, skin, teeth and blood vessels healthy.

• Acts as an antioxidant, helping to reduce the risk of developing chronic diseases like heart disease and cancer.

• It keeps the immune system healthy and does not help cure the common cold

• Essential for iron absorption
Deficiency of Vitamin C

• Scurvy
  • Deficient diet for 20-40 days
  • Fatigue, pinpoint hemorrhages
  • Bleeding gums and joints. Hemorrhages
  • Associated with poverty

• Rebound Scurvy
  • Sudden halt to high levels of vitamin C supplements
Scurvy

Scorbutic rosary

Follicular hemorrhages
Food Sources of Vitamin C

- Guava, amla, Citrus fruit
- Potato
- Green pepper
- Cauliflower
- Broccoli
- Strawberry
- Romaine lettuce
- Spinach

Easily lost through cooking
Sensitive to heat
Sensitive to iron, copper, oxygen
Vitamin C Foods
RDA for Vitamin C

• 40 mg/day for adults

• 60mg/day for pregnant women
Choline

- Newest essential nutrient
- All tissues contain choline
- Precursor for acetylcholine (neurotransmitter)
- Precursor for phospholipids
- Some role in homocysteine metabolism
Food Sources of Choline

Widely distributed

Milk
Liver
Eggs
Peanuts

Lecithin added to food
Choline deficiency

• Inadequate choline intake can also lead to fatty liver or non-alcoholic fatty liver disease (NAFLD).

• The most common symptoms of choline deficiency are fatty liver and/or hemorrhagic kidney necrosis.