Fat soluble vitamins
Vitamin D

Two nutritionally important forms: vitamin

- $D_2$ (ergocalciferol) which is found in plants and vitamin
- $D_3$ (cholecalciferol) which is synthesized in the body from cholesterol
• Conversion in skin: provitamin D (a form of cholesterol) is converted to previtamin D$_3$ is converted to vitamin D$_3$

• D$_3$ must be metabolized in the liver before becoming the active form of vitamin D

• Carried by proteins in blood stream
Functions of vitamin D:

- Maintains serum calcium and phosphorus concentrations within the range that supports neuromuscular function and bone calcification

- Calcitriol causes calcium to be absorbed by kidneys and intestines and also causes calcium to be released from bone
Activation of vitamin D
Functions of calcitriol

- Brain development and function
- Reduced inflammatory condition
- Reduced parathyroid hormone
- Heart function
- Blood pressure
- Blood vessel integrity
- Pancreatic B cell function
- Induced insulin secretion
- Calcium reabsorption
- Calcium uptake
- Reduced colon cancer
- Decreased cell proliferation and metastasis during cancer
- Muscle strength
- Immune function
- Anti-microbial
- Anti-inflammatory
- Reduced skin cancer
- Increased melanin
- Reduced vitamin D
- Bone growth
- Mineral density
Dietary sources

- Fortified milk, margarine, butter, cereals, egg yolks, liver, fatty fish
Problems of excess

- Hypervitaminosis

- 5 times the AI is dangerous for infants, 10 times for adults.

- Calcification of soft tissue, growth retardation, excess calcium excretion via the kidneys (kidney stones), headache, muscle weakness, fatigue, excessive thirst
Deficiency causes and consequences

**CAUSES**
- Sun
- Sunscreen
- Melanin
- Latitude
- Winter

**MEDICATIONS & SUPPLIES**
- Antiseizure medications
- Glucocorticoids
- Rifampin
- HAART
- St John's Wart

**MALABSORPTION**
- Crohn's
- Whipple's
- Cystic Fibrosis
- Celiac
- Liver disease

**CONSEQUENCES**
- Schizophrenia
- Depression
- Infections
  - URI
  - TB
- Asthma & Wheezing Diseases
- HBP
- CHD
- AODM
- Syndrome X
- Autoimmune Diseases
  - Type 1 Diabetes
  - MS
  - Crohn's
  - RA
- Muscle weakness
- Muscle aches
- Osteoarthritis
- Osteoporosis
- Osteomalacia (Bone Pain)
- Rickets
- Cancer
  - Breast
  - Colon
  - Prostate
  - Pancreas
  - etc.
Vitamin D deficiency diseases

SIGNS OF RICKETS

- Soft spot on baby's head is slow to close.
- Bony necklace
- Curved bones
- Big, lumpy joints
- Bowed legs (knees bent out)