



vitamins



B.Sc. Third Year V Semester
Chemistry, Paper XII [Organic + Inorganic]
Organic Chemistry

VITAMINS

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VITAMIN COMPLEX



Vitamin E



VITAMINS

What are vitamins?

Vitamin, word was coined in 1911 by Casimir Funk, Biochemist.



- Vitamins are organic compounds that are essential for maintenance of normal metabolism and must included in diet
- The vitamins are trace nutrients required in the diet of animals for proper growth development, good health.

They are essential for providing good health and are necessary for many life functions.

Vitamin absence result in deficiency caused diseases.

Proteins, carbohydrates, fats, minerals, water also required in diet.

Body needs vitamins but body does not produce vitamins





Classification

- There are '13' vitamins isolated.
- Fat soluble vitamins
- A, D, E, & K
- Water soluble Vitamins
- B₁, B₂, B₆, B₁₂ & C



Supplements, what are they?

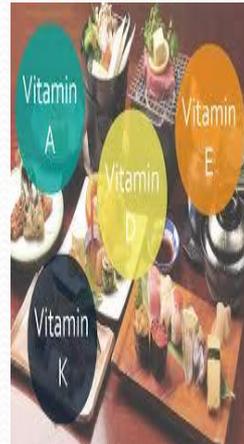
- Synthetic or natural substances which can be purchased as pills, tablets, capsules, wafers, powders or liquids.



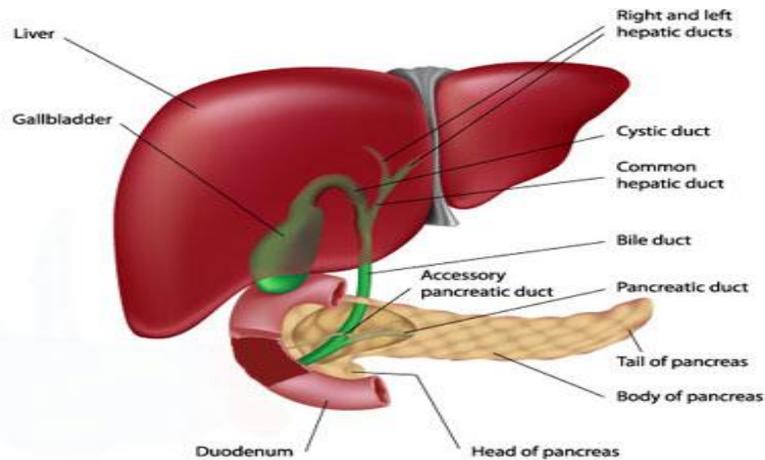


What is the difference between fat-soluble and water-soluble vitamins?

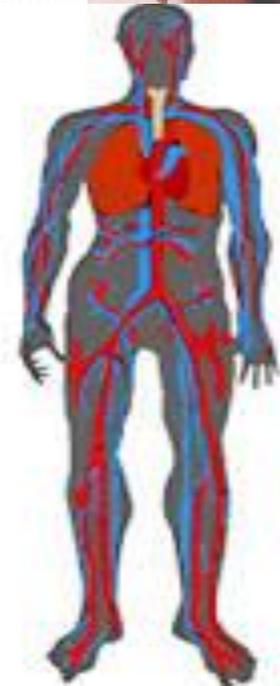
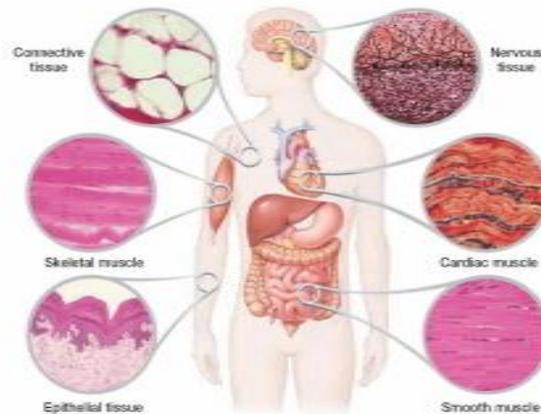
- Fat-soluble are stored in the liver and fatty tissues. These are not readily excreted from the body.



Liver, Gallbladder, Pancreas and Bile Passage



Human Body Tissues



- Water-soluble vitamins travel in the blood and are stored in limited amounts.



These are readily excreted from the body through urine.

What is Vitamin A?



- Fat-soluble
- **Retinol**
- One of the most active, usable forms.
- Found in animal and plant sources.

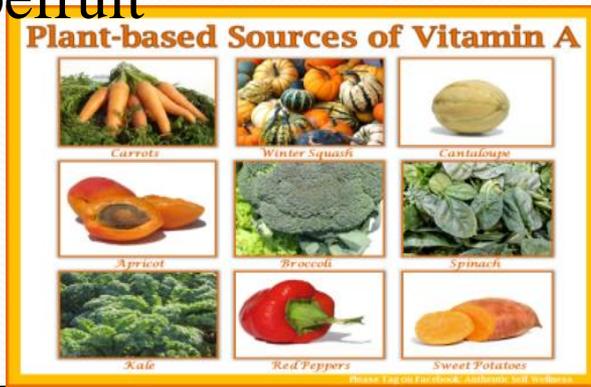


Plant Sources & Other Sources

- Carrots
- **Sweet Potatoes**
- Cantaloupe
- Pink Grapefruit
- Apricots
- Broccoli
- Spinach
- Pumpkin

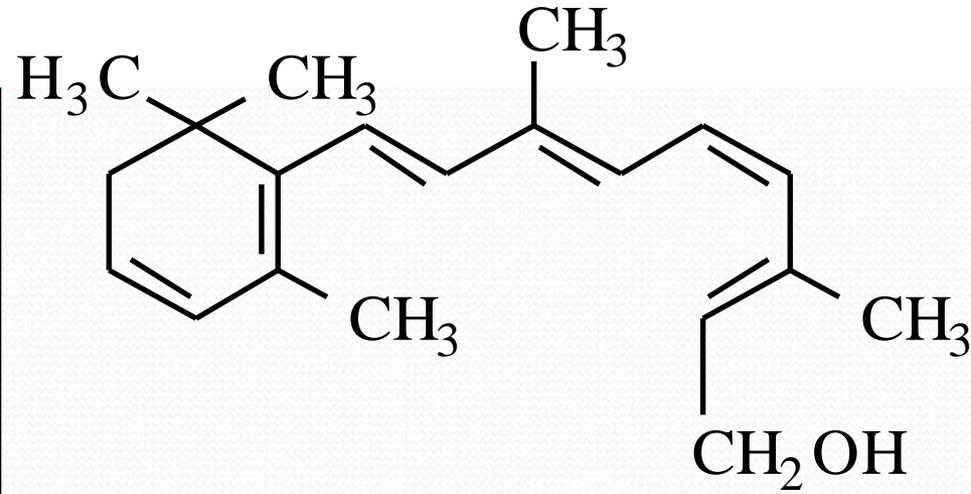
Fish, liver oil, eggs, butter, meat

Cheese, livers of other animals



Beta-carotene
Leafy Vegetables

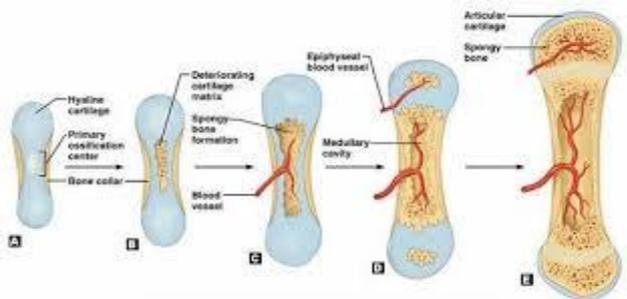
Structure of Vitamin 'A'



Signs of Deficiency

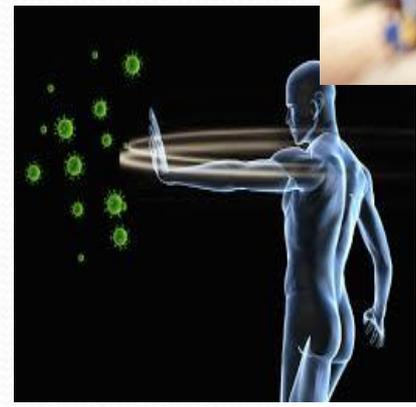
- Night blindness
- Decreased resistance to infections.
- Extremely dry skin, hair or nails.
- Xerophthalmia eye disease.
- Salivary glands loses secrete saliva.
- Nausea
- Weakness & dermatitis.





What does it do?

- Vision
- Generates pigments for the retina.
- Maintains surface lining of eyes.
- Bone growth
- Reproduction
- Cell division and differentiation.
- Healthy Skin
- Regulate Immune System.



High incidences of vitamin A deficiency or **measles**.



What is Vitamin D ?

Fat-soluble

Vitamin D (Anthracitic)

D₂ (Calciferol)

D₃ (Cholecalciferol)

Sources

- ☐ Sunlight is the most important source.
- ☐ Fish liver oil, Cheese, butter, fortified milk
- ☐ Fish & sea food (**herring** & **salmon**).
- ☐ Eggs & milk of mammals.
- ☐ Plants do not contain vitamin D3.



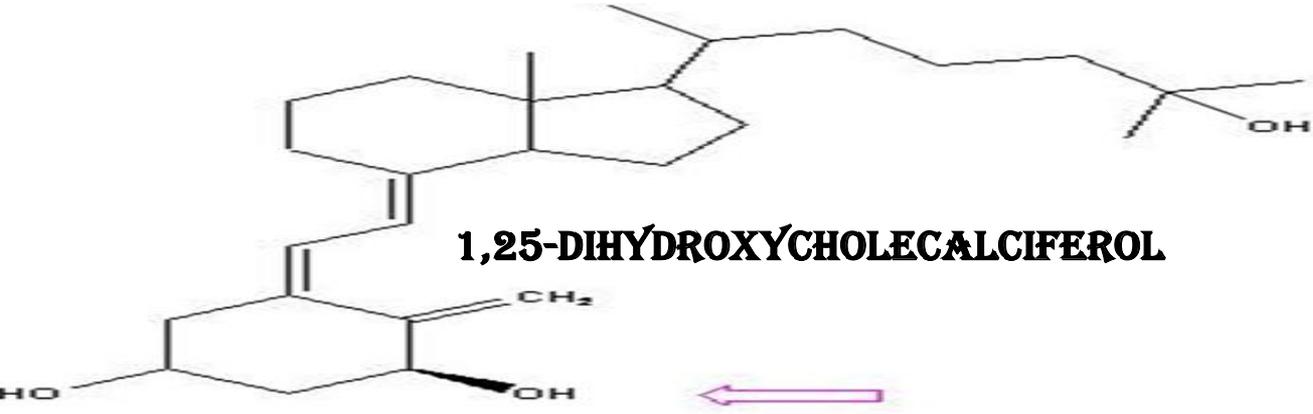
The body itself makes vitamin D when it is exposed to sun



Available North Atlantic fish



Structure of Vitamin 'D'



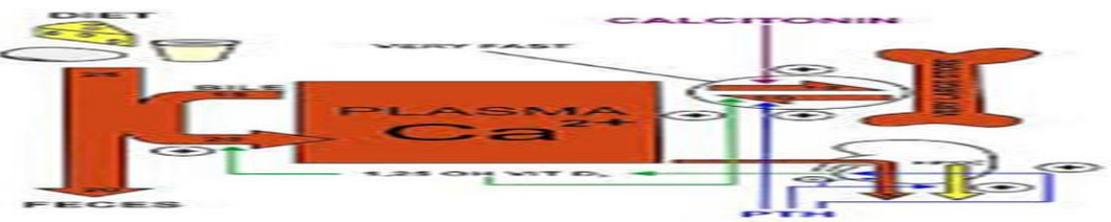
Signs of Deficiency

- Rickets in small children.
- Osteomalacia
- Osteoporosis
- Control Ca & P metabolism

OSTEOMALACIA

- Osteomalacia is softening of the bones due to a lack of vitamin D or a problem with the body's ability to break down and use this vitamin.
- Not enough vitamin D in the diet
- Malabsorption of vitamin D by the intestines
- Not enough exposure to sunlight, which produces vitamin D in the body

Unmasking Osteomalacia



What does it do ?

- Vitamin D: has multiple role in the body.
- D helps regulate the amount of calcium & phosphate of body.
- Prompting healthy bones and teeth.
- Supporting immune, brain and nervous system health.
- Regulating insulin level & supporting diabetes management.
- Supporting lungs function cardiovascular health.
- Influencing the expressions of genes involved in cancer development.



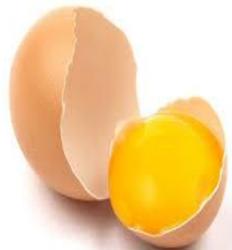
What is Vitamin E ?

- Fat soluble
- Antioxidant
- Reduce the energy of the free radical.
- Interrupt an oxidizing chain reaction to minimize the damage of free radicals.
- Vitamin E some time called fertility factor.



Sources

- Wheat germ oil
- Vegetable oils
- Nuts and seeds
- Whole grains
- Egg yolk
- Leafy green vegetables
- Peanut oil.



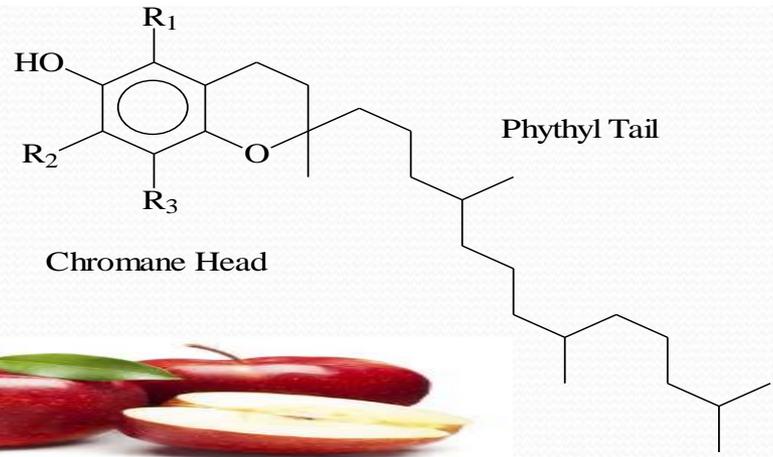
Specific Food Sources

Vitamin E



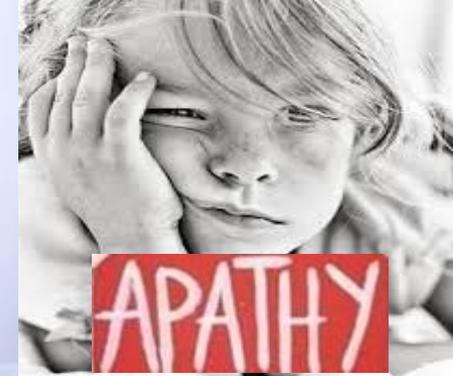
- Vegetable oils.
- Corn, cottonseed, and peanut oil.
- Nuts and seeds.
- Almonds, hazelnuts, sunflower seeds, walnuts, and margarine..
- Whole grains.
- Whole-wheat flour, wheat germ.
- Vegetables and fruits.
- Spinach, lettuce, onions, blackberries, apples, and pears.

Structure of Vitamin 'E'



Who is likely to be deficient ?

- Lack of vitality
- Lethargy
- Apathy
- Inability to concentrate
- Muscle weakness
- Infertility



What does it do ?



- Protects cell membranes and other fat-soluble parts of the body (LDL cholesterol) from oxidation.
- **May reduce the risk of heart disease.**
- **May also discourage development of some types of cancer.**
- Promotes normal growth and development.
- Promotes normal red blood cell formation.
- **Acts as anti-blood clotting agent.**
- Plays some role in the body's ability to process glucose.
- Also been known to aid the process of wound healing.



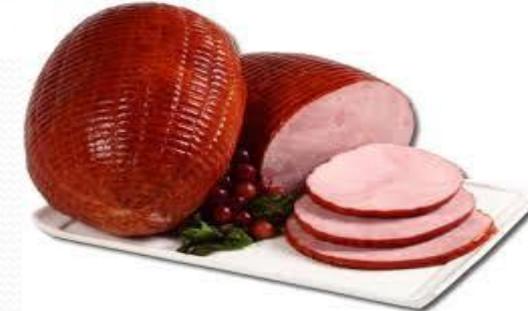


DIETARY SOURCES OF VITAMIN K

- Collard Greens
- Spinach
- Salad Greens
- Kale
- Broccoli
- Brussels Sprouts
- Cabbage
- Olive Oil
- Asparagus
- Okra
- Green Beans



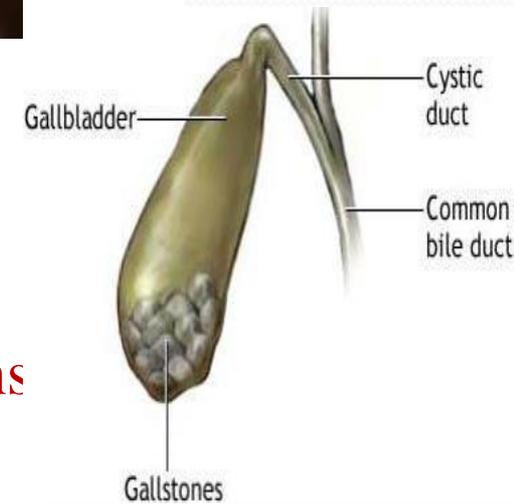
- Lentils
- Egg Yolks
- Whole wheat
- Fruits
- Cheese
- Ham
- Beef
- Liver
- Green tea
- Tomatoes
- yogurt



➤ Freezing foods may destroy vitamin K, but heating has no affect

Signs of Deficiency

- Antibiotics will interfere with the normal production of Vitamin K in the intestine
 - Gallbladder or biliary disease
 - Liver disease
 - Ongoing diarrhea
 - Heavy menstrual bleeding
 - Especially from a surgical stand point.
 - Vitamin K stores are typically low in newborns and are at risk of hemorrhage
- This is why infants are given vitamin K injections within 6 hours of delivery



What does it do ?

- K is body needs to stay healthy.
- It is important for blood clotting and healthy bones.
- It decreases fractures risk and important role in healing wounds.
- Protection against hart disease and protest cancer.



WATER SOLUBLE VITAMINS

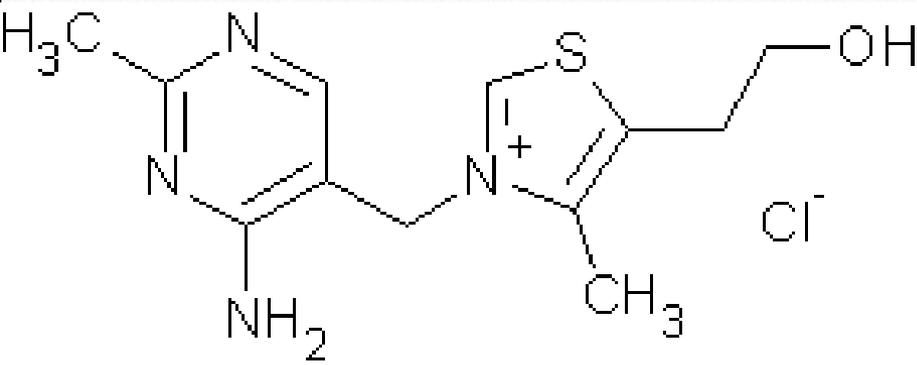
B₁ Thiamin (Vitamin F)

Sources

- Pork
- Fish
- Liver
- Legumes
- Nuts
- Whole grain or enriched breads and cereals.
- Lean meat and yeast



Structure of Vitamin 'B₁'



LEGUMES
What are legumes and should you avoid them?
• A FULL LIST OF LEGUMES



Signs of 'B₁' Deficiency

- Loss of appetite
- Weakness & Feeling tired
- Insomnia
- Loss of weight
- Depression
- Heart & Gastrointestinal problem
- Causes beriberi in human.



What does it do ?

- Producing energy from carbohydrates.
- Proper nerve function.
- Stabilizing the appetite.
- Promoting growth and good muscle tone.
- ATP production.
- Prevent complication in nervous system brain & heart

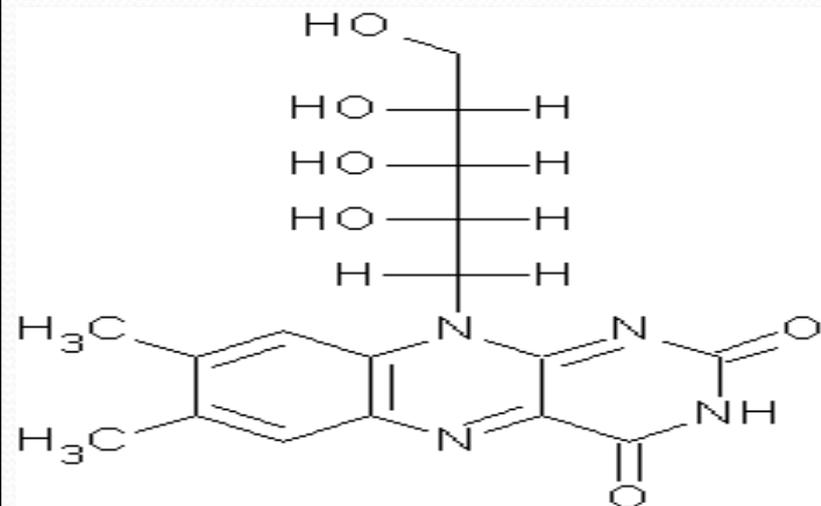
B₂ Riboflavin (Lactoflavin)

Water soluble

Sources

- Large amounts in
 - Dairy milk, Eggs and Meats
 - Liver and Fish
- Small amounts in
 - Leafy green vegetables
 - Enriched grains and Germinated

Structure of Vitamin 'B₂'



Signs of 'B₂' Deficiency

- Itching and burning eyes.
- Cracks and sores in mouth and lips.
- Bloodshot eyes.
- Dermatitis.
- Oily skin.
- Digestive disturbances.



What does it do ?

- Energy production.
- Carbohydrate, fat, and protein metabolism.
- Formation of antibodies and red blood cells.
- Cell respiration.
- Maintenance of good vision, skin, nails, and hair.
- Alleviating eye fatigue.

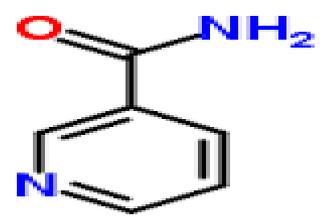


B₃ Niacinamide & Niacin:

Water soluble

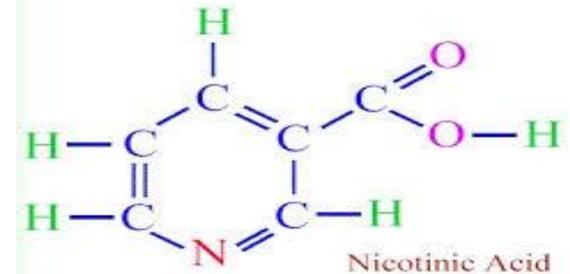
- Two Types

- Niacinamide (Nicotinamide).
- Does not regulate cholesterol.
- Niacin (Nicotinic Acid).
- Highly toxic in large doses.
- Inositol Hexaniacinate is a supplement that gives the cholesterol regulation without high toxicity.



Nicotinamide

Structures of B₃



Nicotinic Acid

Sources

- Milk
- Honey
- Vegetables
- Sweet potatoes
- Vitamin B complex
- Also found in liver & kidney
- Brain, spleen, tongue, pancreas



Signs of 'B₃' Deficiency

- **Pellagra** (Dermatitis, Pigmentation, Thickening skin).
 - Rare in Western societies.
- Gastrointestinal disturbance, loss of appetite.
- Headache, insomnia, **mental depression**.
- Fatigue, aches, and pains.
- Nervousness, irritability.
- **Inflammation of tongue and mouth.**



What does it do ?

- Energy production.
- Maintenance of skin and tongue.
- Improves blood circulation
- Maintenance of nervous system.
- Health of the digestive track.
- Helps lower cholesterol, arthritis
- Reduction of tiredness and fatigue
- Normal functioning of brain & boosting memory

B₆ Pyridoxine

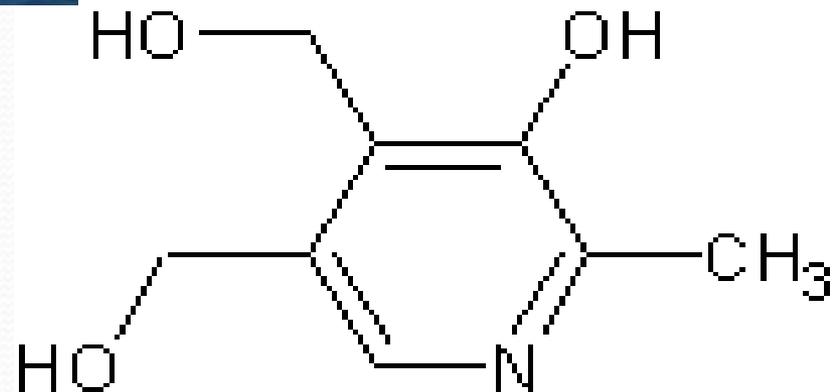
Water soluble

Sources

- Meat
- Fish
- Egg yolk
- Whole cereal grains
- Leafy vegetables
- Milk
- Yeast

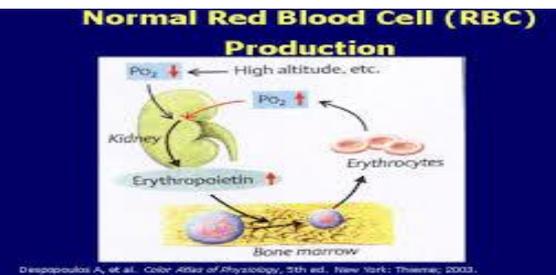


Structures of B₆



Signs of 'B₆' Deficiency

- Nervousness, insomnia
- Loss of muscle control, muscle weakness
- Arm and leg cramps
- Water retention
- Skin lesions



GET RID
OF WATER
RETENTION



What does it do ?

- Production of red blood cells
- Immunity, maintaining healthy hair, skin & Vision
- Nervous system functions & helps make hormones
- Reducing muscle spasms, cramps, and numbness
- Maintaining proper balance of sodium and phosphorous in the body & disease prevention.



B₁₂ Cobalamin

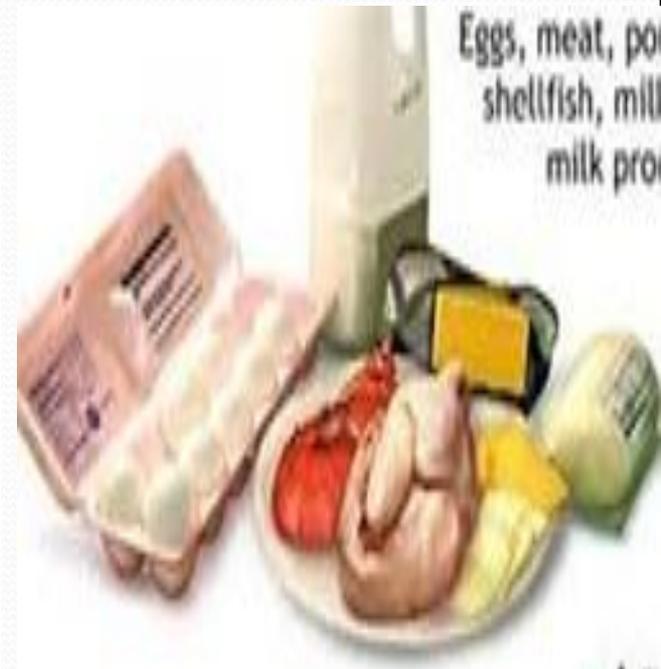
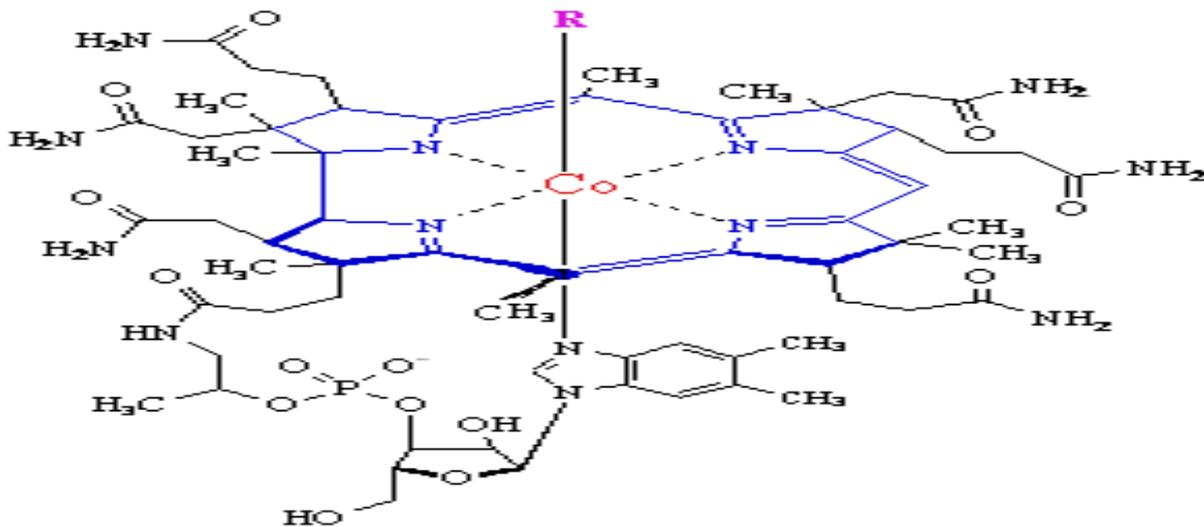
Water soluble

Sources

- Abundantly in liver
- **Meat**
- Eggs
- **Sea food**
- **Milk and milk product**



Structures of B₁₂



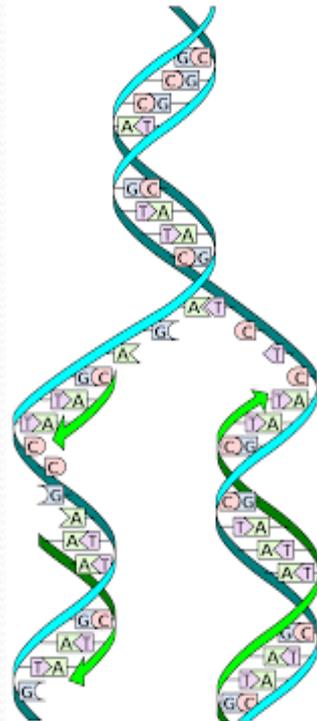
Signs of 'B₁₂' Deficiency

- Anemia
- Nerve damage
- Hypersensitive skin



HYPERSENSITIVE SKIN

Hypersensitive skin is composed of ALLERGIC or IRRITATED skin. Both types of hypersensitivity require contact with an allergen and response to either involves immune tolerance and allergy. Allergic skin is aggravated by irritants and allergens, while irritated skin is caused by various chemical (stimuli, aggressive cleaning).



What does it do ?

- Proper nerve function
- Production of red blood cells
- Metabolizing fats and proteins
- **Prevention of anemia**
- **DNA reproduction**
- Energy production



Vitamin C (Ascorbic acid)

Water soluble

- Ascorbic acid (Toxic to viruses, bacteria, and some malignant tumor cells)
- Antioxidant

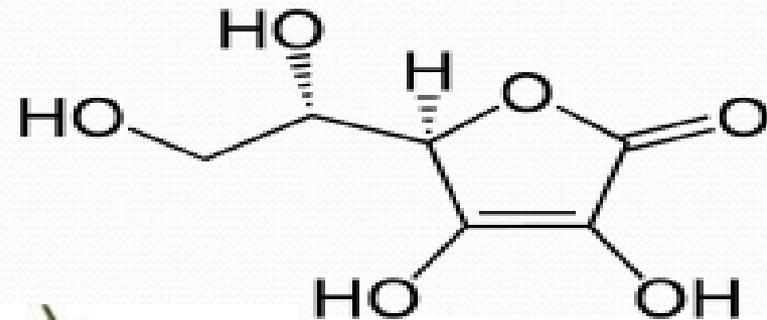
Antioxidants



Sources

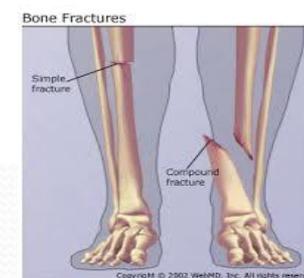
- Guava, **Broccoli**, Cantaloupe, Green peppers
- Red Bell Pepper, Orange Juice
- Strawberries, Tomato Juice
- Raw Tomato, Sweet & white Potatoes
- Tangerine, **Spinach**, Leafy Greens
- Berries, Citrus Fruits.

Structures of vitamin C



Signs of Vitamin 'C' Deficiency

- **Weight loss.**
- **Fatigue and joint pain.**
- **Scurvy (bruising easily, bleeding gums, and tendency for bones to fracture).**
- **Reduced resistance to colds and infections.**
- **Slow healing of wounds and fractured bones.**
- **Loosing teeth.**



What does it do ?

- **Protects you body from free radicals.**
- **Helps form connective tissue that hold your bones, muscles**
- **Aids in the healing of wounds.**
- **Aids the body in absorbing iron from plant sources.**
- **Helps to keep your gums healthy.**
- **Helps your body to fight infections.**
- **Aids in the prevention of heart disease.**
- **Helps prevent some forms of cancer.**

.....**SUGGESTIONS**



Created by, Dr. Subhash Lonkar

THANKS

