NUTRITION & BALANCED DIET AND VITAMINS

-Mahesha

nutrition

- Nutrition in the process of taking in food and using it for growth, metabolism and repair.

- TYPES OF NUTRIENTS
- Macronutrients

=Carbohydrates

=Proteins

=fat

- Micronutrients

=minerals, vitamins, water

TYPE OF NUTRIENTS	FOOD SOURCES
Carbohydrate	Sugars like glucose, fructose, galactose and sucrose Starch, fiber
Proteins	Eggs, **almonds**, chicken, lean beef, tuna, **whey protein, soy protein,** shrimps
Fat	Fatty meats and fish, cheese, butter, nuts and seeds, chocolate, avocado etc.,

Balanced diet

- The nutrition which required to fulfil the requirement of the body.
- Ratio of macronutrients in balanced diet is

4:1:1 = Carbohydrate: Protein : Fat and **other micronutrients**

- Energy

=calorific value

The amount of energy obtained by complete combustion of 1 gm of fuel in a bomb calorimeter.

= physiological fuel value

1 gm of substance after complete oxidation in the body.

Minerals

- Sodium(Na): = nerve impulse conduction
  = absorption of glucose
  osmotic balance
- Potassium (K): = nerve impulse conduction
  =osmotic balance
- Calcium (Ca): = bone and teeth formation
  =nerve impulse conduction by
  helping in release of neurotransmitters
  =essential for blood clotting
  = for muscle contraction
- Iron (Fe): = part of Hb helps in transport of oxygen
  & other respiratory gases
  = formation of thyroxin & proper functioning of
  thyroid gland

- Phosporus = teeth & bone formation
  = constituent of DNA & RNA
  = constituent of ATP
- Magnecium = cofactor for enzymes
  = essential for ribosomal assembly
- Zinc =essential as activator of enzymes
  like Carbonic anhydrase and
  dehydrogenase in fermentation
- Cobalt = formation of vit-B12
- Manganese = as cofactor for various enzymes

VITAMINS

- A vitamin is an organic molecule(or related set of molecule) which is an essential micronutrient-that is, a substance which an organism needs in small quantities for the proper functioning of its metabolism but cannot synthesize, either at all or in sufficient quantities, and therefore must obtain through its diet
- The vitamin requirements are not the same for all animals. For example, ascorbic acid (vitamin C) can be synthesized by most mammals, but humans and few other mammals (some primates, bats, and the guinea pig) must have it supplied in the diet

Classification of vitamins by solubility

- Vitamins are classified as either **water soluble** or **fat soluble**. In humans there are 13 vitamins and over all there are many number of vitamin factors with respect to their needs. Among the 13 vitamins: 4 fat soluble (A, D, E and K) and 9 water soluble (8 B complex vitamins and vitamin C).
- Water soluble vitamins dissolve easily in water and, in general, are readily exerted from the body, to the degree that urinary output is a strong predictor of vitamin consumption. Because they are not as readily stored, more consistent intake is important.
- Fat soluble vitamins are absorbed through the intestinal tract with the help of lipids (fats). Because they are more likely to accumulate in the body, they are more likely to lead to hypervitaminosis than are water soluble vitamins. Fat soluble vitamin regulation is of particular significance in cystic fibrosis.

Ethymology of vitamins

- The term vitamin was derived from “vitamine” , a compound word coined in 1912 by the Polish biochemist Casimir Funk when working at the leister institute of preventive medicine. The name is from vital and amine, amine of life, because it was suggested in 1912 that the organic micronutrient food factors that prevent beri-beri and perhaps other similar dietary deficiency disease might be chemical amines.
- Max Nierenstein a friend and reader of biochemistry at Bristol University reportedly suggested the “vitamin” name, the name soon become synonymous with Hopkins “accessory factors”, and, by the time it was shown that not all vitamins are amines, the word already ubiquitous. In 1920, Jack Cecil Drummond proposed that the final “e” be dropped to deemphasize the “amine” reference, after researchers began to suspect that not all vitamines (in particular, vitamin A) have an amine component.

EXPLAINATION OF VITAMINS

- **Vitamin A (beta carotene):**
- vitamin A can be found in both animal and plant foods. It is found as retinol in animal foods and as carotenoids in plant foods. These are compounds the body can convert into vitamin A.
- **What it does?**
- Helps to keep eyesight and promote the growth of skin, hair, bones, and teeth. Carotenoids act as antioxidants that prevent some cancers and fight heart disease.
- **Good food sources**
- Beef, liver, lean ham and pork chops, eggs, shrimp, fish, fortified milk, cheddar cheese, Swiss cheese, darkly colored orange or green vegetables (carrots, sweet potatoes, pumpkin, turnip greens and spinach), orange fruits (cantaloupe, apricots, peaches, mangoes)
- **Effect of deficiency**
- Night blindness, dry, rough skin, poor bone and teeth growth and development, a susceptibility to infectious diseases

- **Vitamin B1 (thiamine):**
- **What it does?**
- Thiamin helps the body convert carbohydrates into energy and is necessary for the heart, muscles, and nervous system to function properly
- **Good food sources**
- Lean pork, legumes, bananas, most fish, liver, nuts and seeds, potatoes, peas, watermelon, avocado, poultry, whole-grain and fortified cereals
- **Effect of deficiency**
- Early symptoms of thiamine deficiency include fatigue, weak muscles, anorexia, weight loss and mental changes, such as confusion or irritability, sensitivity of the teeth, cheeks and gums, as well as "cracks" in the lips. More severe deficiencies can result in anemia, paralysis, muscular atrophy,

- **Vitamin B2 (riboflavin)**
- **What it does?**
- Helps convert food into energy. Needed for skin, hair, blood and brain. Helps to prevent sores and swelling of the mouth and lips.
- **Good food sources**
- Milk, yogurt, cheese, eggs, fish and shellfish, fortified cereals, meat, poultry, kiwi, avocado, broccoli, turnip greens, asparagus
- **Effect of deficiency**
- Itching and irritation of lips, eyes, skin and mucous membranes, and can cause eyes to be light sensitive.

- **Vitamin B3 (niacin)**
- **What it does?**
- Helps to release energy from carbohydrates. It is important in the maintenance of healthy skin, nerves, and the digestive system
- **Good food sources**
- Meat, poultry, fish, fortified and whole grains, mushrooms, potatoes, mango, lentils, peanuts
- **Effect of deficiency**
- Depression, diarrhea, dizziness, fatigue, halitosis, headaches, indigestion, insomnia, limb pains, loss of appetite, low blood sugar, muscular weakness, skin eruptions, and inflammation

- **Vitamin B5 (pantothenic acid)**
- **What it does?**
- Synthesize coenzyme A. coenzyme A is involved in the synthesis of fatty acids and is important for converting foods into fatty acids and cholesterol.
- **Good food sources**
- Meat, broccoli, avocados.
- **Effect of deficiency**
- Chances of causing paresthesia

- **Vitamin B6 (pyridoxine, pyridoxamine, pyridoxal)**
- **What it does?**
- May reduce the risk of heart disease. Regulates the metabolism of amino acids and carbohydrates. Aids healthy nervous system function and in the production of red blood cells. Important for normal brain function.
- **Good food sources**
- Bananas, watermelon, Brewer's yeast, wheat bran, walnuts, brown rice, meat, fish, poultry, potatoes, soy,
- **Effect of deficiency**
- Can cause skin disorders, an abnormal nervous system, confusion, poor coordination and insomnia

- **Vitamin B7 (biotin)**
- **What it does?**
- Help to support adrenal function, help calm and maintain a healthy nervous system, and are necessary for key metabolic process.
- **Good food sources**
- Raw egg yolk, liver, peanuts, leafy green vegetables.
- **Effect of deficiency**
- Chances of causing Dermatitis, enteritis.

- **Vitamin B9 (folate/folic acid)**
- **What it does?**
- Vital for new cell creation. Helps prevent brain and spine birth defects when taken early in pregnancy. Essential for mental and emotional health as it helps to maintain normal brain functions.
- **Good food sources**
- Dark green vegetables, dry beans, peas, lentils, enriched grain products, fortified cereals, liver, orange juice, wheat germ, yeast.
- **Effect of deficiency**
- Anaemia and a reduction in growth rates. Other subtle symptoms may include digestive disorders such as diarrhea, loss of appetite, and weight loss can occur, as can weakness, sore tongue, headaches, heart palpitations, irritability, forgetfulness, and behavioural disorders.

- **Vitamin B12 (cyanocobalamin, hydroxocobalamin, methylcobalamin, adenosylcobalamin)**
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- **What it does?**
- may lower the risk of heart disease. Assists in making new cells and breaking down some fatty acids and amino acids. Protects nerve cells and encourages their normal growth Helps make red blood cells
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- **Good food sources**
- Meat, poultry, fish, milk, cheese, eggs, fortified cereals, fortified soymilk
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- **Effect of deficiency**
- Demyelination and irreversible nerve cell death. Symptoms include numbness or tingling of the extremities and an abnormal gait

- **Vitamin C (ascorbic acid)**
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- **What it does?**
- Vitamin C is needed to form collagen, a tissue that helps to hold cells together. It's essential for healthy bones, teeth, gums, and blood vessels. It helps the body absorb iron, aids in wound healing, and contributes to brain function. Vitamin C may lower the risk for some cancers, including those of the mouth, oesophagus, stomach and breast.
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- **Good food sources**
- Fruits and fruit juices (especially citrus), potatoes, broccoli, bell peppers, spinach, strawberries, tomatoes, Brussels sprouts
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- **Effect of deficiency**
- Bleeding and inflamed gums, loose teeth, poor wound healing, and anaemia

- **Vitamin D (cholecalciferol, ergocalciferol)**
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- **What it does?**
- Helps maintain normal blood levels of calcium and phosphorus, which strengthen bones. Helps form teeth and bones. Supplements can reduce the number of non-spinal fractures
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- **Good food sources**
- Fortified milk or margarine, fortified cereals, fatty fish, liver, eggs and sunlight
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- **Effect of deficiency**
- Weak, soft bones and skeletal deformities

- **Vitamin E (tocopherols, tocotrienols)**

- **What it does?**
- Acts as an antioxidant, neutralizing unstable molecules that can damage cells. Helps the healing of skins and prevents scarring. Diets rich in vitamin E may help prevent Alzheimer's disease. Supplements may protect against prostate cancer.

- **Good food sources**
- Vegetable oils, nuts and seeds, peanuts and peanut butter, wheat germ, whole-grain and fortified cereals.

- **Effect of deficiency**
- Deficiency is rare and is mostly found in premature or low weight babies who do not absorb fat properly.

- **Vitamin K (phylloquinine, menaquinones)**

- **What it does?**
- Activates proteins and calcium essential to blood clotting. May help prevent hip fractures

- **Good food sources**
- Cabbage, liver, eggs, milk, spinach, broccoli, sprouts, kale, collards, and other green vegetable

- **Effect of deficiency**
- A shortage of this vitamin may result in nosebleeds, internal haemorrhaging

THE CHEMICAL STRUCTURES OF VITAMINS

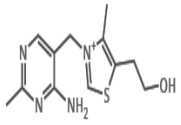
Vitamins are the essential nutrients that our body needs in small amounts. More specifically, an organic compound is defined as a vitamin when it is required by an organism, but not synthesised by that organism in the required amounts (or at all). There are thirteen recognised vitamins.

VITAMIN A

RETINOL
active form in mammalian tissues

Important for eyesight. Also strengthens immune system and keeps skin and linings of parts of the body healthy.

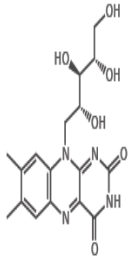
VITAMIN B1



THIAMIN
can also occur in pyrophosphate ester form

Used to keep nerves & muscle tissue healthy. Also important for processing of carbohydrates and some proteins.

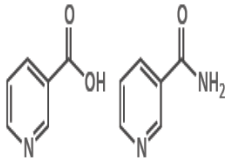
VITAMIN B2



RIBOFLAVIN
excess turns urine bright yellow

Important for body growth, red blood cell production, and keeping the eyes healthy. Also helps processing of carbohydrates.

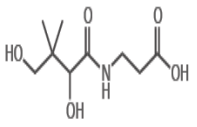
VITAMIN B3



NICOTINIC ACID **NICOTINEAMIDE**
niacin is collective name for these compounds

Helps with digestion and digestive system health. Also helps with the processing of carbohydrates.

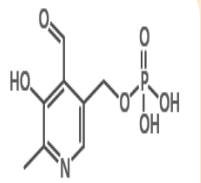
VITAMIN B5



PANTOTHENIC ACID
also occurs in pyrophosphate ester form

Important for manufacturing red blood cells and maintaining a healthy digestive system. Also helps process carbohydrates.

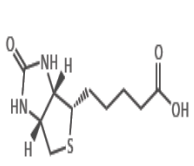
VITAMIN B6



PYRIDOXAL PHOSPHATE
active form in mammalian tissues

Helps make some brain chemicals; needed for normal brain function. Also helps make red blood cells and immune system cells.

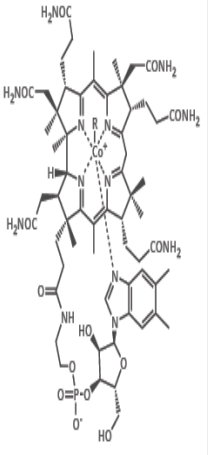
VITAMIN B7



BIOTIN
produced by intestinal bacteria

Needed for metabolism of various compounds. Often recommended for strengthening hair, but evidence is variable.

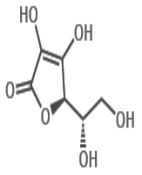
VITAMIN B12



COBALAMIN
usually contains CN as the R group

Important for the nervous system, for making red blood cells, and helps in the production of DNA and RNA.

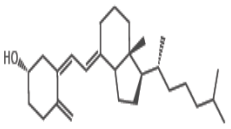
VITAMIN C



ASCORBIC ACID
deficiency can cause scurvy

Important for a healthy immune system; helps produce collagen, used to make skin and other tissues. Also helps wound healing.

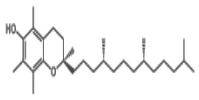
VITAMIN D



CHOLECALCIFEROL
natural form; different form used in supplements

Important for bone health and maintaining the immune system function. May also have a preventative role in cancers.

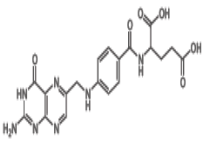
VITAMIN E



ALPHA-TOCOPHEROL
group includes tocopherols & tocotrienols

An antioxidant that helps prevent damage to cells and may have a preventative role in cancer. Also helps make red blood cells.

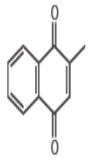
VITAMIN B9



FOLIC ACID
found as tetrahydrofolate in food

Important for brain function & mental health. Aids production of DNA & RNA. Important when tissues are growing quickly.

VITAMIN K



MENADIONE
all K vitamins are menadione or derivatives

Helps blood clot properly, & plays a key role in bone health. Newborns receive vitamin K injections to prevent bleeding.

Key

Vitamins can be divided broadly into two classes.

WATER-SOLUBLE VITAMINS
These vitamins are not stored in the body. As such, generally, they are required more frequently than the fat-soluble vitamins.

FAT-SOLUBLE VITAMINS
These vitamins are stored in the liver and fatty tissues until required. As such, they can be harmful if too much is taken in.