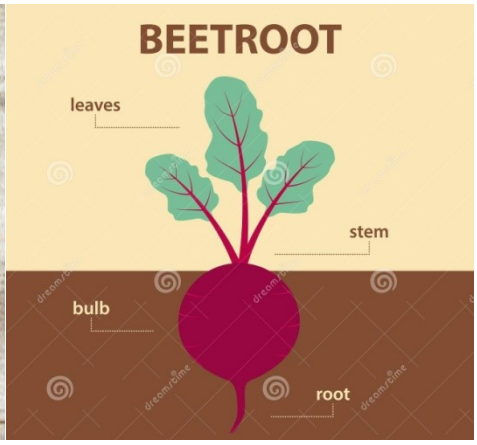
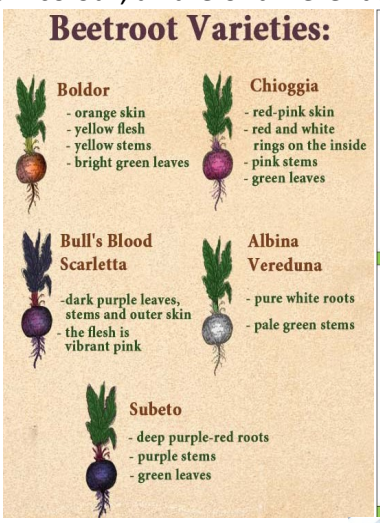
Lesson no. 4 Beetroot.



Beetroot is very common vegetable eaten throughout the world; it has lot of health benefits, its root called as tap root &are eaten, leaves are also edible & full of health benefits, it is of various types & varieties, available throughout the world, but the most common are red beetroot which bleeds (means release reddish fluid); chard which is of white colour& green leaves; golden beet root which is of orange or yellow colour; all are of different shapes & sizes.



Beetroots are mentioned in Hadith of Bukhari & Tirmizi; it was liked by companion of Prophet Muhammad (s.a.w) because it does not have fats in it. Please read lesson no. 42 page no. 99 in part 2 my book Tibb e Nabawi in English. Please visit my website www.tib-e.nabi-for-you.com for detail Islamic study on Beetroot.

- ***NAMES: -***

1. In Hadees they are called as Salq (السلق)
2. In Hindi they are called as Chukander, Shaljam.
3. In English they are called as Beet Root.
4. Many scholars consider Salq as white beet root (Chard)
5. We can consider all types of beet root, but white beet root should to more consider.

It is mentioned in following books of Hadith (reference are also given as Hadith number) Bukhari : 5403, 6248; Tirmizi : 2170;

- ***Beetroot plant: -***


Beetroot plant is an herbaceous (an herb) biennial (takes two years to complete) plant; it is wind pollinated plant; the size of the plant is 120 to 200 cm; it is called as Beta vulgaris in Latin & its botanical family is Chenopodiaceae/Amaranthaceae; it requires cool moist weather, but can be grown in moderate warm climate also, it is cultivated from August to January, it attains best colour, texture & quality in cool weather; a temperature of 18-21 degrees Celsius is considered best quality; it is a least infected plant; the plant takes 60 to 75 days to get ready for harvesting; it needs loose deep soil to grow.

- ***Beetroot leaves: -***



The leaves are mostly rosette (rose) shaped, it is also called as beet green or beetroot green; leaves of all types of beetroot are edible & can be eaten raw or cooked, it is rich in nutrition like vitamin A, C, protein, fiber, calcium, manganese, magnesium, potassium, copper, vitamin k, iron, zinc, phosphorus, little fats etc.

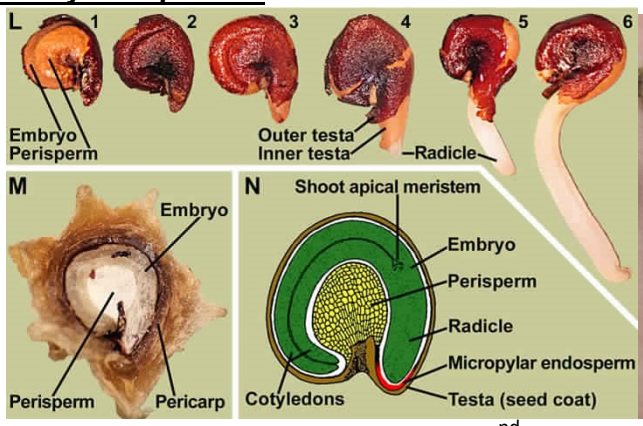
The leaves are of green, red, purple or mixed coloured according to its variety, cultivation, weather, soil etc; the leaves are of rough texture, easy to chew, swallow, cook & easy for digestion. The leaves are simple, lobed or unlobed or ovate shaped not separated into leaflets; leaves are arranged alternatively, there is one leaflet per node along the stem. The leaf edge is entire (has no teeth or lobes). Leaves & roots are produced in 1st year & seeds & flower are produced in 2nd year.

Leave are good for alzheimer's disease, night blindness, cancer, heart disease, helps immune system, stimulates WBC production, reduces free radical & is antioxidant, helps body to make antibodies etc.

- ***Beetroot flower: -***

The flowers are radially symmetric, its petal or sepals are fused into a cup or tube shaped; stamens are 5 in number; the leaves & roots are produced in 1st year & seeds & flower in 2nd year; the flowers are small, inconspicuous (not clearly visible) without corolla, but with green calyx which becomes thick & covers the seeds completely.

- ***Seeds of beet plant: -***



Flowers & seeds on beet plant are produced in 2nd year; the seeds are rough & crinkled, there is bunches of seeds jammed into one seed, they are multi-germ seeds (the germ is the reproductive part of a seed-the embryo-that grows into a new plant).

- ***Beetroot: -***

It is part of root which is edible; it is called as taproot in botany; it is of various types & shape based on weather, geographical region, soil, climate, seed used, method of growth etc; it has several health benefits; it has all the vital vitamin, mineral, protein etc.

- ***Shapes of beetroot: -***

Its shape is spherical, elongated or intermediate.

- ***Varieties of beetroot: -***

Red beetroot, white beetroot, chioggia, sugar beetroot, mangelwarzel, golden beetroot etc all have similar nutritional values with little difference in sweetness, colour, taste some vitamins.

Red beetroot: -

There are many types of red beetroot &is the common variety; it is dark reddish in colour inside &has dark brown dusty colour skin or purple shiny skin, it bleeds-means release red colour fluid; it is also called as table beet, garden beet, detroit dark red, etc. Its colour is used commercially.

Golden beetroot: -


It is of yellowish or orange colour; it does not bleed; it is more sweeter; it contains fiber, iron, potassium, folate, vitamin C, vitamin A, lycopene, flavonoids, zeaxanthin, fiber etc.

Mangel-wurzel: -


It is also called as mangold beet, mangel beet, field beet, fodder beet etc; it is large & elongated, colour is white, orange, yellow or mix; it is mainly given to animals to eat but edible to human; it is high in sucrose content, its leaves are also edible to human.

White beet (Chard): -


It is also called as Swiss chard; silver beet, spinach beet, leaf beet etc; its beet is of white colour or whitish purple colour; there are many types of white beetroot; its leaf stalks are large & often separated from leaf blade, leaf blade is green or reddish coloured, leaf stalk is usually white, yellow or red coloured; its leaves have high nutrition values. It is rich in vitamin A, K, C,E, magnesium, manganese, iron and potassium, carbohydrates, protein, fat and dietary fiber.

Chioggia beet: -


It has red & white stripes; also called as candy cane, candy stripe beet, it is sweet, it bleeds little, it take less time to cook, it is very beautiful & delicious, it has more folate, manganese, potassium, copper, vitamin c, phosphorus, iron, vitamin B6, fiber etc.

Sugar beet: -


It is commercially used as a major source of sugar manufacturing. In it 22% sucrose is present & one-third world sugar production source, it is white in colour & elongated. The sugar beet has a conical, white, fleshy root (a taproot) with a flat crown. The plant consists of the root and a rosette of leaves. Sugar is formed by photosynthesis in the leaves and is then stored in the root.

The root of it contains 75% water, about 20% sugar and 5% pulp. The exact sugar content can vary between 12% and 21% depending on the cultivar and growing conditions. Sugar is the primary value of sugar beet as a cash crop. The pulp is insoluble in water and mainly composed of cellulose, hemicellulose, lignin, and pectin; it is used in animal feed. The byproducts of the sugar beet crop, such as pulp and molasses, add another 10% to the value of the harvest.

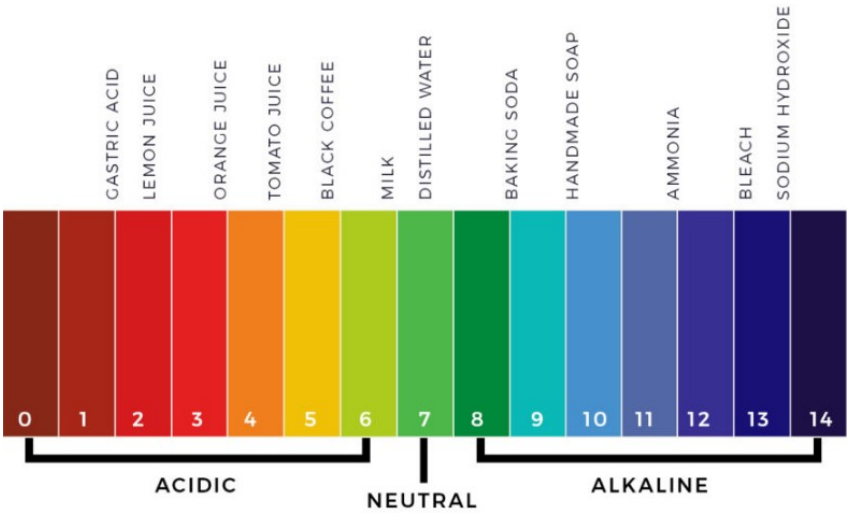
- ***pH of Beetroot is: -***

Cooked beetroot pH is 5.30 to 6.50 & fresh raw beetroot (Beta vulgaris) is an alkaline vegetable with pH from 7.5 to 8.0; so it is alkaline because its pH is more than 7.

pH is a measure of hydrogen ion concentration, a measure of the acidity or alkalinity of a solution. The pH scale usually ranges from 0 to 14. Aqueous solutions at 25°C with a pH less than 7 are acidic, while those with a pH greater than 7 are basic or alkaline& 7 is neutral; only aqueous solutions have pH levels, vegetable oil has no pH value. Likewise, other oils such as animal and petrochemical oils also have no pH value. Fatty acids are organic molecules often found in foods, including vegetable oils.

The pH of pure water is 7. In general, water with a pH lower than 7 is considered acidic, and with a pH greater than 7 is considered alkaline. The normal range for pH in surface water systems is 6.5 to 8.5, and the pH range for groundwater systems is between 6 and 8.5. We can add normal water to reduce the acidity.

It is Sunnat of Prophet Muhammad (s.a.w) to mix acidic with Alkaline to make it neutral or less acidic that why He use eat dates with watermelon or cucumber or dry dates with little butter; so you can mix one acidic with alkaline; also it is Sunnat to drink honey mixed in water; also dates or raisins soaked in water over night & drink the syrup (sharbat). Remember do not soak dates & raisin together at one time; soak at separate time & drink.



- ***Calories of beetroot: -***

100 grams of beetroot give only 43 calories.

- ***Glycemic index & Glycemic load of beetroot: -***

Beetroots have a glycemic index (GI) score of 61, which is considered medium. The GI is a measure of how fast blood sugar levels rise after a meal (2). On the other hand, the glycemic load of beetroots is only 5, which is very low.

A food is considered to have a low Glycemic index (GI) if it is 55 or less; mid-range GI if 56 to 69 & high GI if 70 or more. Glycemic index is a number. It gives you an idea about how fast your body converts the carbs in a food into glucose.

A low Glycemic load (GL) is between 1 and 10; a moderate GL is 11 to 19; and a high GL is 20 or higher. For those with diabetes, you want your diet to have GL values as low as possible.

The glycemic load (GL) of food is a number that estimates how much the food will raise a person's blood glucose level after eating it. Glycemic load accounts for how much carbohydrate is in the food and how much each gram of carbohydrate in the food raises blood glucose levels.

- ***Gross health benefits & indication of beetroot: -***

It helps in reducing high blood pressure, cardio vascular disease, increases heamoglobin thus helpful in anaemia, good for athletic performance, increases blood flow (due to nitric acid), reduces obesity thus helpful in weight control, reduces blood sugar thus helpful in diabetes (expect sugar beet) improves skin, hair, eyes, bones, muscles health; it is powerful antioxidant thus reduces free radicals & cancers, it prevent neural tube defect in the fetus; it increase stamina, reduces inflammation, weakness, infertility, symptoms of dementia, good for liver, increases libido, boron a mineral which helps stimulate the production of sex hormones, increases sperm mobility, prevents lung disease, lungs cancer, colon cancer, skin cancer etc.

- ***Clinical pharmacology of beetroot: -***

Beetroot has dietary nitrate is important for managing cardiovascular health, prevent hypertension, atherosclerosis, type 2 diabetes and dementia.

Beetroot supplementation might serve as a useful strategy to strengthen endogenous antioxidant defense, helping to protect cellular components from oxidative damage & acts as anticancer.

Beetroot is as an exceptionally rich source of antioxidant compounds. The betalain pigments in particular, have been shown by several *in vitro* studies to protect cellular components from oxidative injury. Both two betalain metabolites (betanin and betanidin) were shown to reduce linoleate damage induced by cytochrome C oxidase and lipid membrane oxidation induced by H_2O_2-activated

metmyoglobin and free iron, both also inhibit lipid peroxidation. Beetroot contains several highly bioactive phenolics, such as rutin, epicatechin and caffeic acid which are also known to be excellent antioxidants. A number of studies report that beetroot, in the form of a juice supplement, protects against oxidative damage to DNA, lipid and protein structures. Beetroot juice actually increases digestion.

Beetroot reduce blood pressure, and also a few studies conducted among healthy volunteers showed reduction in blood pressure. Possible mechanisms include diuresis and vasodilation. Nitric oxide formed after the ingestion of raw beetroot juice (obtained through a reduction process) is known to exert vascular smooth muscle relaxation and vasodilatation. In addition, beetroot is known to exert endothelium independent vasodilatation. Further-more benefits you can read in separately explained beetroot's content below.

- ***Medical uses of beetroot: -***

For detox of body & liver: -

Take 1 carrot, 1 small size apple, 1 cucumber, 1 stalk of celery, small piece of ginger, 1 lemon, 1 beetroot put all in mixer & prepare juice & drink once or twice a week empty stomach early morning.

For anemia: -

Take 1 beetroot, 1 dried fig, 3 dates, 1 stalk of mint leaves, 1 stalk of coriander, 7 black caraway (kalonji), 1 slice water melon, 1 small cucumber, half pomegranate put all in mixer & prepare juice & drink empty stomach daily once for 40 days and check for heamoglobin level.

For general health, constipation, piles: -

Take half beetroot, half cucumber, 1 carrot, 1 chard leaves, few mint leaves, few pieces of broccoli, half tomato, put 1 spoon honey & 1 spoon extra virgin olive oil cut all above mix and eat at between lunch & dinner daily for 5 times a week.

For blood pressure: -

Take 1 small beetroot, 1 slice watermelon, 1 spoon extra virgin olive oil cut and mix all & eat two times morning 8.00 am & evening 5.30 pm daily for 40 days; do not leave for blood pressure medicine but check regularly & take your doctor's advice.

To improve digestion, liver function: -

Take 1 beetroot, 1 tomato, 1 carrot, half broccoli, few spinach, celery, kale, 3 dates, 3 raisins, 7 black caraway seeds (kalonji), 7 fenugreek (methi) seeds, few mint leaves, small piece of ginger, 1 tamarind (emli) boil all in water & prepare soup of it & put 1 spoon pure honey & drink at morning empty stomach daily for 7 days than alternative 7 days than twice a week for 7 weeks followed by once a week for ever.

For loose motions: -

Take 1 beetroot, 1 slice watermelon, 1 pomegranate boil all in little water & add 1 teaspoon pure honey init & drink the soup. (Put the pomegranate with its skin & fruit all, just cut open it & put in water & boil it with above) pomegranate contains tannic acid & beetroot, watermelon contain zinc etc which is very good in initial loose motions.

For body building: -

Take 1 banana, 1 beetroot, 1 slice of watermelon, 3 dates prepare juice of it & drink pre workout & post workout to increase the blood flow & stamina.

For red food colour: -

Boil one or more (as per need) beetroot boil it on low flame for 15 to 20 minutes & use this red colour soup as food colour, this is natural colour without side effects.

To improve brain power: -

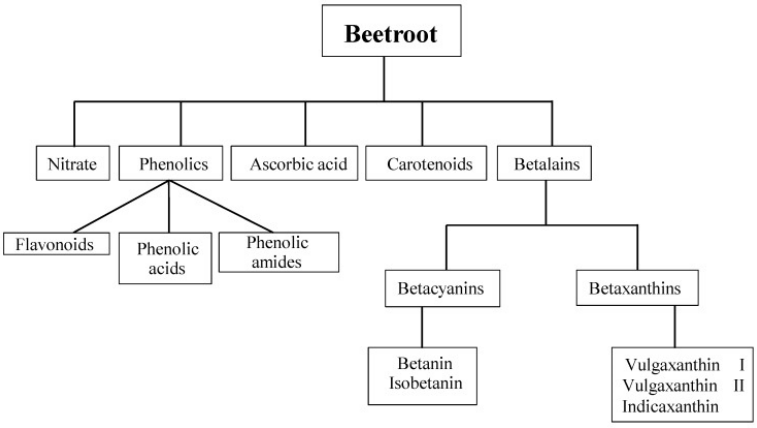
Take half beetroot, 1 walnut, 3 almonds, 7 raisins, 3 dates, 1 dried fig & 1 spoon extra virgin olive oil; drink olive oil & eat all above in breakfast for 11 days than twice a week regularly.

To maintain cardiac & general health: -

Cook beetroot is various food items at least twice a week, eat beetroot, cucumber, tomato, honey, chard leaves as salad daily little at 12.00 pm & 6.00 pm (little is enough).

For complexion & beauty: -

Eat little beetroot, watermelon, cucumber, almonds, fig, and date all each 3 times a day for a week than alternative days for 11 days followed by twice week regularly.



- ***Contents/constituents of beetroot (all types & varieties content the following): -***

All contents may not present in all types of it, because there are many varieties of it according to geographical regions & content may differ a lot as per cultivation, soil, seed, climate etc.

88% water, 10% carbohydrates, 2% protein, 1% fats, sugar, dietary fibers, vitamin A, B1, B2, B3, B5, B6, B9, C, K, calcium, iron, magnesium, manganese, phosphorus, potassium, sodium, zinc, betaine, betanin, alpha-lipoic acid, choline, boron, oxalate (more present in beet leaves (chard leaves), copper in leaves & sugarbeet.

It contains little amount of amino acids in it, mentioned in the table below.

The above ingredients are based on scientific study, means these has been identified, known & learnt by modern science, it does not mean that it contains only these ingredients; there may be many more ingredients which are yet to be discovered, learnt & known by modern science.

Active ingredients of beetroot are betalain & inorganic nitrate.

A good quality beetroot contains following amino acids in little amount: -

Amino acids	Cooked	Raw
Weight (g)	85	136
Tryptophan(mg) (% RDI)	17 (6%)	26 (9%)
Threonine(mg) (% RDI)	42 (4%)	64 (6%)
Isoleucine(mg) (% RDI)	43 (3%)	65 (5%)
Leucine(mg) (% RDI)	60 (2%)	92 (3%)
Lysine(mg) (% RDI)	51 (2%)	79 (4%)
Methionine(mg) (% RDI)	16 (2%)	24 (3%)
Cystine(mg) (% RDI)	17 (6%)	26 (9%)
Phenylalanine(mg) (% RDI)	41 (5%)	63 (7%)
Tyrosine(mg) (% RDI)	34 (4%)	52 (6%)
Valine(mg) (% RDI)	50 (3%)	76 (4%)
Histidine(mg) (% RDI)	19 (3%)	29 (4%)
Arginine(mg)	37	57

Alanine(mg)	54	82
Aspartic acid(mg)	103	158
Betaine(mg)	~	175
Glutamic acid(mg)	379	582
Glycine(mg)	28	42
Proline(mg)	37	57
Serine(mg)	53	80

- ***Natural basic pharmacology of beetroots based on human intake in natural form: -***
- ***Natural oxalate: -***

It is present in many types of plant, it is an organic compound found in leafy vegetables, fruits, nuts, seeds etc. In plants it usually bounds to minerals forming oxalate. The term oxalic acid & oxalate are used interchangeable in nutritional science.

Main sources of natural oxalate: -

It is present in beetroot leaves (chard leaves), beetroot, carrot, spinach, sweet potato, turnip leaves, potato, apple, strawberry, green beans, broccoli, apricots, fig etc.

Basic pharmacokinetics of oxalate (bases on human intake in natural food products): -

In the human body some of the eaten oxalate is broken down by bacteria before it combines (mainly) with calcium & iron in colon & in kidneys (also in urinary tract) to form crystals & is excreted in urine as minute crystals (little is excreted in stool also) if taken in large quantity can cause kidney stones.

Also when fat is not absorbed properly, the fats binds with calcium and leaves oxalate behind, this oxalate is taken up by kidneys to excrete it; it also prevents absorption of calcium &other minerals; Presence of prebiotic can effect oxalic acid excretion. Our body makes oxalates as an end product of protein, vitamin c etc metabolism. It is excreted in urine & stool. Oxalate present in food is soluble & insoluble, insoluble bind with calcium or other molecules that makes it much harder to absorb; soluble do not bind with other molecules & is easily absorbed. Absorption of it differs among people, for some, oxalate is largely broken down in the intestines & eliminate without causing issues; in some, large amount of oxalate is absorbed; & in some, leaky gut can increase the absorption of it & the needle shaped oxalate crystals can perforate the mucus membrane damaging the cells of intestine & cause more leakiness.

Leaky gut is also called as increased intestinal permeability, it is a condition in which many things can pass through the intestinal wall, and this occurs due to breach in intestinal wall or damaged cells, things can pass through their gasps (breach).

Excessive oxalate accumulates in crystal form in many parts of the body like joints, muscles, kidneys etc.

Basic clinical pharmacology of oxalate: -

It reduces absorption of some minerals because it binds with some mineral in the intestine, if taken in larger amount causes kidney stones, autism, vaginal pain etc; we should drink lot of water to avoid excessive oxalate collection in the body & to flush out; its benefits in human body is under research.

- ***Betanin: -***

It is reddish and yellowish pigment found in beetroot (speacially which bleeds means releases red colour fluid), it is excreted through urine & stool thus may give reddish colour urine & stool; it contains nitrogen; it is used as a food colour; it is also called as beetroot red & betalain. It is water soluble.

Main sources of betanin: -

It is present in beetroot, opuntia cactus, swiss chard & leaves of some strains of amaranth (a plant).

Basic pharmacokinetics of betanin (based on human intake in natural food products): -

It need stronger acids in our digestive system & some people digest it well & some not this depends on your digestive acids how stronger they are, the stronger the acids more the absorption; it is believed that it is absorbed in colon-large intestine, it is also believed that some bacteria present in digestive system breaks down it during digestion (it is yet in research).

Basic clinical pharmacology of betanin: -

It is an anti oxidant, prevents oxidation of LDL, prevents DNA damages, controls blood pressure, prevents cardio vascular system from diseases, prevents blood clots in vessels, reduces inflammation, beneficial for brain etc.

- ***Choline: -***

It is water soluble vitamin & essential nutrient; it is a constituent of lecithin; it helps in many functions of the body.

Main sources of choline: -

It is present in watermelon, egg, peanut, fish, dairy products, wheat, beetroot, spinach, beans, whole grains etc.

Basic pharmacokinetics of choline (based on human intake in natural food products): -

Choline is mostly present in food in free form; it is absorbed in small intestine via transporter proteins & metabolized in liver; excessive choline is not stored but converted into phospholipids; it is changed into Trimethylamine in liver & is excreted in urine.

Basic clinical pharmacology of choline: -

It helps the nerves to develop signals. Our body makes some amount of choline, but should be consumed to avoid deficiency; it helps liver function, brain development, muscles movement, cell messenger system, DNA synthesis, nervous system, gall bladder function; it can be taken in pregnancy because it prevents neural tube defect. It aids in fats & cholesterol metabolism & prevent excessive fat building in liver.

- ***Betaine: -***

It is water soluble amino acid glycine; it is derivative of choline (choline is precursor of it) means body needs choline to synthesized betaine. It is also called as trimethylglycine (TMG) it has 3 methyl group attached to it; it was first discovered from beetroot & is called as betaine.

Main sources of betaine: -

It is present in watermelon, beetroot, wheat bran, spinach, grain, brown rice, sweet potato, beef, quinoa etc.

Basic pharmacokinetics of betaine (based on human intake in natural food products): -

It is absorbed in duodenum more than jejunum via sodium & chloride dependent transport & passive sodium independent transport system; it is rapidly absorbed in around 17 minutes & released into blood stream quite fast & its absorption is near complete; it is excreted very little in urine in form of dimethlyglycine (DMG) & little in stools, eliminated mainly via metabolism not excretion. It is stored in all organs (including brain) (it crosses blood brain barrier), skeletal muscles.

Basic clinical pharmacology of betaine: -

Betaine is a methyl donor, this means helps in liver function, cellular function & detoxification, process fats; it converts blood homocysteine into methionine. Homocysteine is an amino acid, body naturally produces, high level of it can be harmful to arteries of heart & may cause cardio vascular disease, arthrosclerosis by producing plague in the arteries of heart & brain (may cause stroke), may also cause osteoporosis, visual abnormalities, blood clots, narrowing & hardening of vessels.

Methyl donors: -

It refers to nutrients involved in bio-chemical process called as Methylation; And this process reduces due to age & we depend on methyl donor foods like vitamin B12, B6, folate, choline, betaine etc so that acts properly.

- ***Potassium: -***

It is a mineral with symbol K & atomic number 19, it is an essential mineral which body cannot prepare; it is necessary for heart, kidney & other organs to function, its low level in body is called as hypokalemia

& high level is called as hyperkalemia; it is mostly present inside the cells (intracellular); normal blood range is 3.5 to 5.0 milli equivalents per/liter (mEq/L).

Main sources of potassium: -

Potassium is naturally present in Banana, orange, dates, raisin, broccoli, milk, chicken, sweet potato, pumpkin, spinach, watermelon, coconut water, white & black beans, potato, dried apricot, beetroot, pomegranate, almond etc.

Basic pharmacokinetics of potassium (bases on human intake in natural food products): -

It is absorbed in small intestines by passive diffusion; it is stored mostly inside the cell, little in liver, bones & red blood cells. 80 to 90% potassium is excreted in urine & 5 to 20% is excreted in stools, sweat.

Basic clinical pharmacology of potassium: -

It is a mineral which belongs to electrolytes of the body; it conducts electrical impulses throughout the body & assists blood pressure, normal water balance, muscle contraction, nerves impulse, digestion, heart rhythm, maintain pH balance. It is not produced in our body so we need to consume it through eating; Kidneys maintain normal level of it in the body by excreting excessive amount of it in urine or reabsorb it if the amount is less in the body so that the body may reuse it. Its deficiency may cause weakness, low blood pressure, constipation, nausea, vomiting etc.

Its normal amount in body keeps blood pressure normal; water balance in body normal; prevents heart disease, stroke, osteoporosis, kidney stone etc.

- ***Carbohydrate: -***

It is a macronutrient needed by the body, the body receives 4 calories per 1 gram of it; carbohydrates include sugar, glycogen, starch, dextrin, fiber & cellulose that contain only oxygen, carbon & hydrogen. It is classified in simple & complex; simple carbs are sugar & complex carbs are fiber & starch which take longer to digest. It is basic source of energy for our body.

Main sources of carbohydrates: -

It is present in watermelon (little), potato, sweet potato, bread, oats, butter, white rice, whole grain rice, pasta, lentils, banana, pineapple, beetroot etc.

Basic pharmacokinetic of carbohydrate (based on human intake in natural food products): -

Its digestion begins in mouth; salivary glands releases saliva & salivary amylase (enzyme) which begins the process of breaking down the polysaccharides (carbohydrates) while chewing the food; now the chewed food bolus is passed in stomach through food pipe (esophagus); gastric juice like HCL, rennin etc & eaten material are churned to form chyme in the stomach; the chyme now is passed little by little down into duodenum, pancreatic amylase are released which break the polysaccharides down into disaccharide (chain of only sugars linked together); now the chyme passes to small intestine, in it enzymes called lactase, sucrase, maltase etc breakdown disaccharides into monosaccharide (single sugar) & absorbed in upper & lower intestines, through villi present in small intestine & send into liver through venous blood present into portal veins, as per bodies need it is released in the blood stream & pancreas release insulin to use it as source of energy for the body, & extra is stored is converted into glycogen by liver & stored in liver & little is stored in muscles& tissues. Liver can reconvert glycogen in to sources of energy if body lacks for other source of energy, the undigested carbohydrates reaches the large intestine (colon) where it is partly broken down &digested by intestinal bacteria, the remains is excreted in stools.

Clinical pharmacology of carbohydrates: -

Carbohydrates are main sources of body energy, it helps brain, kidney, heart, muscles, central nervous system to function, it also regulates blood glucose, it acts on uses of protein as energy, breakdown of fatty acids & prevent ketosis. So it is an instant energy provider for the body & best for pre & post

workout. If we eat less carbohydrate it may lead to hypoglycemia, ketosis, frequent urination, fatigue, dizziness, headache, constipation, bad breath, dehydration etc.

Excessive intake of carbohydrates may lead to vascular disease, atherosclerosis (leads to narrowing of arteries, stroke, diabetes, obesity, fatty liver, blood pressure etc.

- ***Vitamin C: -***

It is also called as Ascorbic acid; it is an essential water soluble vitamin, very much needed by the body for many functions & absorption etc.

Main sources of vitamin C: -

It is present in watermelon, citrus fruit, beetroot, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chilies, cabbage, leafy vegetables, tomato, cereals etc.

Basic pharmacokinetic of vitamin C (based on human intake in natural food products): -

It does not need to undergo digestion, 80 to 90% of it eaten is absorbed by intestine cell border by active transport & passive diffusion & through ion channels it enters the plasma via capillaries. It is very little stored in adrenal glands, pituitary gland, brain, eyes, ovaries, testes, liver, spleen, heart, kidneys, lungs, pancreas & muscles. All together body can store 5 grams of it & we need 200mg/day in order to maintain its normal level & uses, but old, disease person, smokers & alcoholic need more daily value. It is excreted in urine in the form of dehydroascorbic acid changed by liver & kidneys both, but unused vitamin C is excreted intact.

Basic clinical pharmacology of vitamin C: -

It prevent cough & cold, repairs tissue, acts as an enzyme for curtain neurotransmitter, important for immune function, it is a powerful antioxidant (donates electron to various enzymatic & non-enzymatic reactions); body prepares collagen with the help of vitamin c; it is also helpful in Alzheimer's, dementia, acts on iron absorption, it protects the body from oxidative damages, reduces stiffness of arteries, reduces tendency of platelets to clump each other, improves nitric oxide activity (dilatation of blood vessels) thus prevents high blood pressure & heart disease, also prevent eye disease, reduces risk of cataract, prevents the lining of lungs & prevents lung disease, it is a natural antihistamine (anti allergy), eliminates toxins from the body etc. Deficiency of it causes Scurvy disease (brown spots on skin occurs, swelling of gums, bleeding from all mucous membrane, spots are more on thighs & legs, the person looks pale, feel depressed, cannot move, loss of teeth, suppurative wounds occur.

- ***Vitamin K: -***

It is a fat soluble vitamin; it is essential for normal blood clotting; it occurs naturally in two forms, vitamin K1 (phylloquinone) which is widely distributed in plants; it is present in it; Leafy vegetables are good sources of K1; vitamin K2 (menaquinones) is synthesized in alimentary tract by bacteria (Escherichia coli & other bacteria).

Main sources of vitamin K1: -

It is present in olive oil & also present in green leafy vegetables (spinach, kale etc) cauliflower, cabbage, broccoli, sprout, fish, liver, meat, egg, cereals, pumpkin etc.

Basic pharmacokinetics of vitamin k (based on human intake in natural food products): -

It is absorbed in small intestine; bile is required for it absorption & stored in fatty tissues & liver; it is excreted 40% to 50% in stools & 30% to 40% in urine.

Basic clinical pharmacology of vitamin K: -

It acts on synthesis of certain proteins that are prerequisites (necessary) of blood coagulation (means act on stop bleeding) & body also needs it to control the binding of calcium in bones & other tissues. Deficiency of it makes bones weaker, calcification of arteries & other tissues thus takes care of bones, joints & heart; it reduces tumour growth & is helpful in cancers.

- ***Vitamin A: -***

It is a fat soluble vitamin; it is group of unsaturated organic compound that includes retinol, retinal, retinoic acid & several provitamin A carotenoid. There are 2 types of vitamin A, 1) Vitamin A: - found in meat, poultry, fish & dairy products; 2) Provitamin A: - found in fruits, vegetables, plants; beta carotene is common type of provitamin A; it is an antioxidant, reduces wrinkles & repairs the skin damages; it is available in the market as tretinoin in tablets & creams to heal acne.

Main sources of vitamin A: -

It is present in watermelon, beetroot, fish oil, carrot, green leafy vegetables, citrus fruit, sweet potato, spinach, kale etc.

Basic pharmacokinetic of vitamin A (based on human intake in natural food products): -

It is absorbed in jejunum mainly, little through skin; metabolism is in liver & excreted in urine & stools, it is conjugated with glucuronic acid & then changed into retinal & retinoic acid; retinoic acid is excreted in stool, mainly. It is stored primarily as palmitate in Kupffer's cells of liver, normal adult liver stores sufficient amount of it which is enough for 2 years for the body, little is stored in kidneys, lungs, adrenal glands, fats, retina; it is excreted in urine & stools.

Clinical pharmacology of vitamin A: -

It is needed by the body for vision and maintains eye health speacially retina; it prevents night blindness; it helps in normal reproduction of cells thus prevents cancer; it is required for proper growth & development of embryo throughout the pregnancy period, it is good for skin, supports immune function; helps the heart, kidneys & lungs to work properly.

- ***Vitamin B1 (Thiamin): -***

It is called as Thiamin also; it is a water soluble vitamin, it belongs to B-complex family, it is an essential micro nutrient which cannot be made by our body.

Main sources of vitamin B1: -

It is present in watermelon, spinach, legumes, beetroot, banana, wheat germ, liver, egg, meat, dairy products, nuts, peas, fruits, vegetables, cereals, rice, breads, oats etc.

Basic pharmacokinetic of vitamin B1 (based on human intake in natural food products): -

Intestinal phosphatases hydrolyze thiamin to make it free & absorbed in duodenum, jejunum mainly through active transport in nutritional doses & passive diffusion in pharmacological doses, very little is known about its absorption; it is metabolized in liver; it is excreted in urine & stored little in liver, heart, kidney, brain, muscles.

Clinical pharmacology of vitamin B1: -

It is needed for metabolism of glucose, amino acids (proteins), lipids (fats) etc; every cell of the body require it to form ATP (adenosine triphosphate) as a fuel for energy, also it enables the body to use carbohydrates as sources of energy; also nerve cells, heart cells, muscles cell require it to function normally; its deficiency causes beri-beri heart disease, weight loss, confusion, malaise, optic neuropathy, irritability, memory loss, delirium, muscles weakness, loss of appetite, tingling sensation in arms & legs, blurry vision, nausea, vomiting, reduce refluxes, shortness of breath etc; it is helpful to immune system; excessive intake of carbohydrates, protein, glucose (speacially in body builders, athletes etc) increases the need of vitamin B1.

- ***Vitamin B2: -***

It is also called as Riboflavin, it is a water soluble vitamin, it is an essential micro nutrient, it helps many systems of the body; it is not synthesized in human body.

Main sources of vitamin B2: -

It is present in watermelon, liver, milk, dairy products, nuts, egg, fish, leafy vegetables, almonds, mushroom, lean meat and beetroot.

Basic pharmacokinetic of vitamin B2 (based on human intake in natural food products): -

It is phosphorylated in the intestinal mucosa during absorption; mainly absorbed in upper gastrointestinal tract; the body absorbs little from a single dose beyond of 27mg; when excessive amount is eaten it is not absorbed; very little is known about its absorption. The conversion of it into its coenzymes takes place mainly in cells of small intestines, heart, liver, kidneys & throughout the body in many cells; it is excreted in urine & stored little in liver, heart, kidneys & in tissues of the body.

Basic clinical pharmacology of vitamin B2: -

It is needed by the body to keep skin, eyes, nerves, red blood cells healthy, it also helps adrenal gland, nerve cells, heart, brain to function; it also acts in metabolism of food, amino acids (protein), fats, helps to convert carbohydrate into energy (Adenosine triphosphate formation- the energy body runs on). It plays an important role in functioning of mitochondria.

Its deficiency is called as Ariboflavinosis & causes weakness, throat swelling, soreness of mouth & tongue, cracks on skin, dermatitis, anemia, weak vision, itching & irritation in eyes, migraine.

- ***Vitamin B3: -***

It is called as Niacin or Nicotinic acid; it is in 2 forms niacin & nicotinamide acid; it is water soluble vitamin; it is an essential micro nutrient; it plays a role in over 200 enzymatic reactions in the body; It is produced in the body in small amount from tryptophan which is found in protein containing food & sufficient amount of magnesium, vitamin B6 & B2 (are needed to produce it).

Main sources of vitamin B3: -

It is present in watermelon, green peas, peanuts, mushroom, avocados, meat, egg, fish, milk, cereal, green vegetables, liver, chicken, coffee, potato, corn, pumpkin, tomato, almonds, spinach, enriched bread, carrots, beetroot etc.

Basic pharmacokinetic of vitamin B3 (based on human intake in natural food products): -

If eaten in natural form it is absorbed in stomach & small intestines by the process of sodium-dependent carrier-mediated diffusion in 5 to 20 minutes; if taken in therapeutic doses get absorbed by passive diffusion in small intestines. Its uptake in brain requires energy, in kidneys & red blood cells requires a carrier. It is metabolized in liver in 2 ways either is conjugated with glycine or niacin is form into nicotinamide; it is stored little in liver unbounded to enzymes. It is excreted in urine.

Basic clinical pharmacology of vitamin B3: -

It regulates lipid level in the body; it acts on carbohydrate to form energy sources for the body, it eases arthritis, boost brain function, every part of body needs it to function properly, it helps convert food into energy by aiding enzymes & cellular metabolism, it acts as an antioxidant. It prevents heart disease. Deficiency of it causes pellagra, high blood cholesterol, memory loss, fatigue, depression, diarrhea, headache, skin problems, lesion in mouth, tiredness etc.

- ***Vitamin B5 (pantothenic acid): -***

It is also called as pantothenic acid, it is water soluble vitamin, it is a micro nutrient, it is necessary for making blood cells; acts to convert eaten proteins, carbohydrate, fats into energy; it is a component of coenzyme A; it is used in synthesis of coenzyme A. (coenzyme A acts on transport of carbon atoms within the cell).

Main sources of vitamin B5: -

It is present in watermelon, beetroot, meat, chicken, liver, kidney, fish, grains, milk, dairy products, legumes etc.

Basic pharmacokinetic of vitamin B5 (based on human intake in natural food products): -

It is converted into free form by intestinal enzymes & in nutritional doses it is absorbed in intestinal cells via sodium dependent active transport system in jejunum & pharmacological doses are absorbed by passive diffusion; after absorption the free form of it is now transported to erythrocytes via plasma, in cells pantothenic acid is converted into CoA, all the body tissues can convert it into CoA & ACP (acyl

carrier protein), after these two complete their jobs they are degraded to form free pantothenic acid & other metabolites. It is excreted in urine & stools & little in exhaled in carbon dioxide.

Basic clinical pharmacology of vitamin B5: -

It promotes skin, hair & eyes health, proper functioning of nervous system & liver, formation of red blood cells, making of adrenal hormones, sex hormones; it is very helpful in constipation, rheumatoid arthritis, acne, allergies, asthma, baldness, colitis etc.

Its deficiency causes fatigue, nausea, vomiting, irritability, neurological weakness, numbness, abdominal cramps, sleep disturbances, hypoglycemia etc.

- ***Vitamin B6: -***

It is also called as pyridoxine; it is involved in many aspects of macronutrients metabolism; it is present in many food products naturally.

Main sources of vitamin B6: -

It is present in watermelon, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato, beetroot etc.

Basic pharmacokinetic of vitamin B6 (based on human intake in natural food products): -

It is absorbed in small intestines, but before absorption a phosphate group has to be removed making vitamin B 6 in free form & absorbed by passive transport, now reaches liver via portal vein, in liver to get metabolized & flown into the blood stream it is bound with albumin & some are taken up by red blood cells, once getting in blood it can function & promote health & it is excreted mainly in urine & little is excreted in stools, it is very little stored in tissues, muscle tissues, liver, brain, kidneys, spleen.

Basic clinical pharmacology of vitamin B6: -

It is needed for proper development & function of brain in children; it is needed for neurotransmitter, histamine, haemoglobin synthesis & function. It serves as coenzyme (cofactor) for many reactions in the body, it is the master vitamin for processing amino acids & some hormones, it is needed by the body to prepare serotonin, melatonin & dopamine, it is better to intake it during treatment of tuberculosis. It supports adrenal glands to function; it acts as a coenzyme in the breakdown & utilization of fats, carbohydrates, protein, it is important for immune system, it helps in treatment of nerve compression like carpal tunnel syndrome, premenstrual syndrome, depression, arthritis, high homocysteine level, diabetes, asthma, kidney stones etc.

Its deficiency causes seborrheic dermatitis (eruption on skin), atrophic glossitis with ulceration, conjunctivitis, neuropathy, anaemia etc.

- ***Folate (vitamin B9): -***

Folate is an essential micro nutrient, it is a natural form of vitamin B9, it serves many important functions of the body, it plays an important role in cell growth & formation of DNA, RNA & other genetic material & helps in treating many diseases; its name is derived from Latin word Folium, which means leaf, leafy vegetables have it in good amount; Folic acid is a synthetic form of vitamin B9.

Main sources of folate: -

It is present in watermelon, dark green leafy vegetables, fruits, nuts, beans, dates, seafood, egg, dairy products, meat, chicken, legumes, beetroot, citrus fruits, broccoli, spinach, cereals etc.

Basic pharmacokinetic of folate (based on human intake in natural food products): -

Its absorption is complicated because folate present in food are of many different forms, some of which cannot be absorbed until broken down by intestinal enzymes; it is not absorbed more than 50%; dietary folate contains glutamate that need to separate it from glutamate before absorption starts; It is absorbed in duodenum & jejunum, after absorption it is converted into tetrahydrofolate (the active form of folate), than a methyl group is added to it to form methyltetrahydrofolate; now the body uses it for

various functions & metabolism; the body can store folate 20-70mg in liver which is enough for 3 -6 months for the body; it gets excreted in urine & little in stools & bile.

Basic clinical pharmacology of folate: -

It is needed by the body to make DNA, RNA & other genetic material; it prevents many disease & conditions like anaemia, stroke, cardiac diseases, cancers, neurological diseases, macular degeneration (eye disease), palpitation, sores in mouth & tongue, hair fall, graying of hair. It is important in fertilization in male & female, essential during pregnancy to prevent neural tube defect in embryo (it is needed more), it protect us from free radicals & oxidation thus prevent cancers, it is essential in red blood cells formation, reduces high levels of homocysteine.

Its deficiency may cause anaemia, tiredness, palpitation, breathlessness, hairfall, neural tube defect in baby during pregnancy etc.

- ***Sodium: -***

Here we are learning natural sodium, its symbol is Na & atomic no. 11; it is not produced in the body we need to take it in food sources; it is an important & essential mineral on which our body functions; it regulates blood pressure, blood volume etc.

Main sources of sodium: -

Excessive intake of sodium should be avoided; beetroot has very less amount of sodium in it; also vegetables & fruits have less sodium in them which is good for the body. It is present in beans, meat, fish, chicken, chili, bread, rolls, milk, celery, beetroot etc.

Basic pharmacokinetic of sodium (based on human intake in natural food products): -

It is absorbed in ileum by active sodium transport because it is impermeable & in jejunum absorption takes place via mediated active transport & depends on levels of water, bicarbonate, glucose, amino acids etc; its absorption plays an important role in the absorption of chloride, amino acids, glucose & water; similar mechanism are involved in the reabsorption of it in kidneys when its level in the body falls. It is excreted mainly in urine, little in sweat & stools. It is stores in bones & dissolved in various body fluids.

Basic clinical pharmacology of sodium: -

It is amongst the essential electrolyte within the body, it remains in extracellular fluid (outside the cell) mainly, it carries electrical charges within the body, kidney maintain its normal level in the body, normal level is 135-145 milli-equivalent per liter (mEq/L), it is not produce in the body, it acts on muscles contraction, nerve cells, regulates blood pressure, blood volume; it takes part in every function of the body mostly, its low level in body is called as hyponatremia, it is found more in older aged, kidney disease, heart disease, hospitalized patient, this condition may cause brain edema, low blood pressure, fatigue, tiredness etc; its high level in the body is called as hypernatremia may cause increase in blood pressure, thirst, confusion, muscle twitching or spasm, seizures, weakness, nausea, loss of appetite, swelling in body etc.

- ***Calcium: -***

It is natural essential mineral for the body, it is among the electrolytes of the body; its symbol is Ca & atomic no. 20.

Main sources of calcium: -

It is present in watermelon, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, beetroot etc.

Basic pharmacokinetics of calcium (based on human intake in natural food products): -

Calcium is absorbed in duodenum & upper jejunum (when calcium intake is low) by transcellular active transport process, this depends on action of calcitriol & intestinal vitamin D receptors & when calcium intake is high, absorbed by paracellular passive process throughout the length of small intestine by 3

major steps, entry across the brush border, intracellular diffusion via calcium-binding protein & extrusion; Vitamin D is necessary for absorption of calcium, also vitamin C, E, k, magnesium & exercise increases the absorption of calcium. Also the level of calcium is regulated by calcitonin released by thyroid gland it reduces calcium level in blood when it is excessive & increases the excretion of calcium via kidneys; Parathyroid hormones (PTH) released by parathyroid gland increases the blood level of calcium when body need it or calcium is less in blood & promotes reabsorption of it in kidneys (calcitonin & PTH both have opposite function). Intestines can absorb 500 to 600 mg of calcium at a time; it is mostly stored in bone tissues & teeth & excreted in stool & sweat & little in urine depended upon the level of it in blood. Also estrogen act on transport of blood calcium in bones thus women mostly suffer from osteoporosis after menopause.

Basic clinical pharmacology of calcium: -

Calcium acts on bone health, communication between brain & other parts of the body, muscles contraction, blood clotting; it is a co-factor for many enzymes, it relaxes the smooth muscles & blood vessels; it maintains heart rhythm, muscles function; it is more needed in childhood & deficiency of it in childhood may cause convulsions (seizure); Excessive level of it in blood is called as hypercalcemia & may lead to kidney stone formation, heart attack, stroke, loss of appetite, excessive urination, memory loss etc; its low level in blood is called as hypocalcemia & may lead to cramps in the body, weak bones, weak teeth, numbness, tingling etc.

- ***Contraindication: -***

Sarcoidosis, excessive level of calcium in blood, very severe constipation, kidney stones, increased activity of parathyroid gland etc. Hypersensitivity of calcium, severe cardiac diseases, hypercalcemia, hypercalciuria, severe kidney stones etc.

- ***Iron: -***

It is an essential mineral for our body; its symbol is Fe & atomic no. 26; it is an important component of heamoglobin (heamoglobin binds oxygen in lungs & supply it to whole body, it is oxygen carrier).

Main sources of iron: -

It is present in watermelon, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, beetroot etc.

Meat is the best source of iron; it provides Fe+2 directly which can be transported from intestine to blood steam through Fe+2 transporter ferroportin (this binds with transferring & delivered into tissues).

Basic pharmacokinetics of iron (based on human intake in natural food products): -

The absorption of iron is not known fully; about only 10% of iron taken in food is absorbed; it is absorbed in duodenum & upper jejunum mainly & at the end part of ileum; low pH is needed for its absorption, after absorption it get bind to transferring (each transferring can carry 2 atoms of iron); ceruloplasmin (protein) also helps in binding of iron; Hepcidin a hormone produced by liver is released when iron stores are full & inhibits iron transport & binding, thus reduces the absorption of iron; vitamin C & copper enhances iron absorption.

Storage of iron: -

Iron is stored in liver (in hepatocytes & kupffer's cells) kupffer's cells play an important role in recycling body iron, they ingest aged RBC liberate iron for it & reuse by breaking down heamoglobin. Little iron is stored in liver, heart, & kidneys in form of ferritin also little in bone marrow, spleen.

Excretion of iron: -

The body does not possess a physiological mechanism for regularly eliminating iron from the body because most of it is recycled by liver cells; iron is lost within cells, from skin & interior surface of the body (intestines, urine, breathe).

Basic clinical pharmacology of iron: -

It is an important component of Haemoglobin (heamoglobin bind oxygen in lungs & supply it to whole body); iron is beneficial for nails, hair, skin etc; it acts on blood production, its deficiency causes Anaemia (low haemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in haemoglobin, it consists of one heme (iron), one protein chain (globin) this allows it to bind & load oxygen from the lungs & supply it to whole body.
Unbounded or free iron is highly destructive & dangerous it can trigger free radical activity which can cause cell death & destroy DNA.

- ***Magnesium: -***

It is an important essential mineral; its symbol is Mg & atomic no. 12; it is a co-factor for more than 300 enzymes that regulates functions in the body. Its normal range in blood is 0.75 to 0.95 millimoles (mmol)/L.

Main sources of magnesium: -

It is present in watermelon, spinach, beetroot, meat, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, dates, chicken, fish, legumes etc.

Basic pharmacokinetics of magnesium (based on human intake in natural food products): -

It is absorbed about 20 to 50% only; it is absorbed about 40% in distal intestine when the level of it is low via passive paracellular transport & about 5% in descending colon when the level of it is high via active transcellular transport. Vitamin D increases its absorption & also acts on its excretion in urine. It is excreted in urine & stool; it is stored in bones.

Basic clinical pharmacology of magnesium: -

It is a co-factor for more than 300 enzymes that regulates functions in the body. It act on protein synthesis, muscles & nerve function, blood glucose, control blood pressure, it is required for energy production, bone development, synthesis of DNA & RNA. It also plays a role in active transport of calcium & potassium ions, muscles contraction, normal heart rhythm etc.

- ***Phosphorus: -***

It is an essential mineral; its symbol is P & atomic no. 15, it is needed for many parts & functions of the body.

Main sources of phosphorus: -

It is present in watermelon, beetroot, meat, nuts, beans, fish, chicken, dairy products, soy, grains, lentils etc.

Basic pharmacokinetics of phosphorus (based on human intake in natural food products): -

It is absorbed 70-85%, it is absorbed 30% in duodenum, 20% in jejunum, 35% in ileum; it is absorbed in inorganic phosphate form by 2 separate process first when the phosphorus intake is high mainly after meals by paracellular sodium independent passive diffusion pathway & second is transcellular sodium dependant carrier-mediated pathway this falls under the control of vitamin D & etc. When calcium level is too high in the body phosphorus is less absorbed, optimum calcium : phosphorus ratio is helpful in its absorption (excess of anyone decreases the absorption of both). It is stored in bones 85% & rest in tissues; it is excreted 80% in urine & rest in stools (excretion of it is a regulatory action of parathyroid hormone (PTH), vitamin D, and fibroblast).

Basic clinical pharmacology of phosphorus: -

It is present in nature combined with oxygen as phosphate. It acts on growth of teeth, bones, repairs of cells & tissues. It plays an important role in metabolism of carbohydrate, fats, protein & ATP. It works with B-complex vitamins & helps kidney function, muscles contraction, normal heart beats, nerve impulse etc.

- ***Zinc: -***

It is a trace mineral; symbol is Zn & atomic no. 30; it is necessary for human body as it plays vital role in health.

Main sources of zinc: -

It is present in watermelon, meat, fish, legumes, beans, egg, dairy products, seeds, nuts, whole grains, beetroot etc.

Basic pharmacokinetics of zinc (based on human intake in natural food products): -

It is absorbed 20 to 40%, its absorption depends on its concentration & is absorbed in whole intestines (jejunum has high rate of its absorption) via carrier-mediated mechanism, it is released from food as free ions during digestion. Zinc from animal sources is easily absorbed comparing to plants sources. It is present in bile & pancreatic juices which is released in duodenum & is reused by the body this is called as endogenous zinc & zinc present is food sources is called as exogenous zinc. Its absorption depends on 2 proteins- Albumin & metallophinonein. Albumin enables zinc to be transported from plasma into enterocytes. It is stored in muscles, bones mainly & little in prostate, liver, kidneys, skin, brain, lungs, heart & pancreas. It is excreted in stools 80% & rest in urine & sweat. Metallophinonein binds to zinc to make it unavailable & excrete it in stools when zinc is excess in the body, & production of metallophinonein is reduced when zinc is less in the body to make zinc available for the body.

Basic clinical pharmacology of zinc: -

It is necessary for immune system, prevents skin diseases, heal skin diseases, helps stimulate activity of at least 100 different enzymes in the body; it is required in little amount in the body, but children, pregnant & old aged need it more. It promotes growth in children, synthesize DNA & acts on wound healing, it is best in treating initial diarrhea & cold cough. This makes watermelon& beetroot ideal during motions. It improves learning, memory, fertility etc. It heals acne, attention deficit hyper activity disorder (ADHD), osteoporosis, pneumonia etc.

- ***Manganese: -***

It is an essential mineral & micro nutrient, needed by the body for proper health. Its symbol is Mn & atomic no. 25.

Main sources of manganese: -

It is present in watermelon, nuts, beans, legumes, brown rice, leafy green vegetables, pineapple, beetroot etc.

Basic pharmacokinetics of manganese (based on human intake in natural food products): -

It is absorbed 40%, it is absorbed more in women than men; if intake of it is more, than absorption is less & if intake is less, absorption is more; its absorption takes place in small intestines, after absorption it is bounded to blood protein transferring & transmanganin & transport via blood stream to tissues; it is absorbed by inhalation & dermal (skin) also; it crosses brain blood barrier. It is stored in bones, liver, kidney, pancreas; it is excreted mainly in bile & stools, little in urine & sweating; unused manganese is transported to liver for excretion & excreted via bile mainly.

Basic clinical pharmacology of manganese: -

It is needed for proper health of skin, bones, cartilage etc; it helps in glucose tolerance, regulates blood sugar, reduces inflammation, reduces premenstrual cramps, it also aids in formation of connective tissues, bones, sex hormones, blood clotting, metabolism of carbohydrates & fats; it facilitates calcium absorption.

- ***Sugar (fructose): -***

Sugar present in beetroot is fructose; (but diabetic patients should not eat much of it).

Main sources of fructose: -

It is present in watermelon, honey, banana, apple, mango, cherry, strawberry, orange, kiwi, pears, pomegranate, apricots, carrots, yogurt, bread, lemon, lime, green beans, beetroot etc.

Basic pharmacokinetics of fructose (based on human intake in natural fruit & food products): -

Fructose digestion begins in the small intestine (more in upper jejunum) via active transport or facilitated transport (not known properly). Our body cannot absorb intact polysaccharide molecules. Therefore, if fructose is present in the form of sucrose, sucrase, an enzyme, must first break up sucrose into separate glucose and fructose components. Single fructose molecules then enter the lining of the small intestine through a special channel and exit out the other side into the bloodstream, once in the bloodstream, fructose travels with all other absorbed nutrients to the liver for metabolism and processing.

Metabolism: -

Fructose metabolism occurs entirely in the liver. Through a complicated process called fructolysis, fructose undergoes several chemical and structural changes with the help of aldolase B (an enzyme in the liver).

Extra fructose needs to be changed into glycogen by liver & stored in liver, once the storage is full in liver then liver convert it into triglycerides & triglycerides are further converted by liver into very low-density lipoprotein (VLDL) & stored in fat cells & muscles. Excessive fructose is excreted in urine.

Basic clinical pharmacology of fructose: -

Fructose has low glycemic index & results in moderate release of insulin in the blood stream relative to glucose & sucrose; fructose gives the least dental caries among other types of sugars, fructose is more sweeter than other types of sugar; it does not raises blood sugar much as glucose does, it is used as sources of energy in the body, excessive intake of it may cause fatty liver, metabolic disorder, blood pressure, increase lipids, increase in uric acid level, increase in free radicals etc.

- ***Dietary fiber: -***

It is an eatable part of vegetables & fruit; our body cannot digest it just passes the small intestines & colon & excrete in stools; it is of two types 1) soluble fiber 2) insoluble fiber.

Soluble fiber dissolve in water & form a gel like material & helps in controlling blood cholesterol & blood glucose; it is found in apple, carrot, barley, oats, peas, beans watermelon etc.

Insoluble fiber do not dissolve & promotes excretion & increase bulk of the stool thus relief constipation & helps in elimination of toxins also. It is found in wheat flour, beans, cauliflower, potato, green beans, watermelon, beetroot, beet leaves etc.

This is the reason it is helpful in constipation conditions, it can be eaten in pregnancy to relief constipation and get other benefits of it also.

Basic pharmacokinetics of dietary fiber (based on human intake in natural food products): -

Soluble fibers get dissolve in water & become a gelatinous substance; do not get digested; it helps to slow the digestion & help the body to absorb vital nutrient from eaten food.

Insoluble fibers do not dissolve in water but remain in fibrous form, and do not get digested; it helps the food pass through the digestive system and increase the bulk of stool & eliminate toxins also.

Basic clinical pharmacology of dietary fiber: -

It helps in slow down the digestive process thus gives a good control in blood glucose, improves insulin sensitivity, reduces risk of diabetes, maintains weight, helpful in obesity, reduces blood pressure, reduces cholesterol, reduces inflammation, reduces risk of heart disease, relieves constipation thus helpful in piles, fistula & other rectal disorders & disease, improves bowel movement thus improves bowel health, slowdowns the digestion thus improves quality of digestion, reduces risk of many types of cancer.

- ***Boron: -***

It is natural minerals present in beetroot; it has lot of health benefits. Its symbol is B & atomic no. is 5; it is a trace mineral important for bone health.

Main sources of boron: -

It is present in beetroot, apple seed, raisin, almond, peanut, dried apricot etc.

Basic pharmacokinetics of boron (based on human intake in natural food products): -

It is absorbed in intestine mainly & completely, it is little absorbed through skin & inhalation, it is believed that it is absorbed via passive transport in the form of borate (research is on); it is excreted mainly in urine, 2% in stool, little in sweat & breath.

Basic clinical pharmacology of boron: -

It is best for nerve function & nerve booster, good for brain, it is health enhancer, improves calcium metabolism, helps to handle other minerals, cardio vascular health, reduces allergy, reduces auto immune reaction, make bones, teeth & gums strong, cure arthritis, lupus erythematosis, increases sex hormones, estrogen, testosterone; it is antioxidant, aphrodisiac & detox etc.

Deficiency of it may cause alter in brain activity thus hamper neuronal function, alter brain wave activity enhancing delta power in the left parietal & temporal lobes & decreased frontal lobe activity.

- ***Alpha lipoic acid (ALA): -***

It is naturally found in mitochondria; it is a medium fatty acid biosynthesized by cleavage of linoleic acid. In our body it is synthesize from fatty acids & cysteine in little amount & we depend the rest through food sources to be eaten. It is water soluble.

Main sources of alpha lipoic acid: -

It is present in beetroot, spinach, broccoli, tomato, brussels, sprouts, potato, rice bran, liver, heart etc.

Basic pharmacokinetics of alpha lipoic acid (based on human intake in natural food products):

It is absorbed in small intestine (research is on) & send into liver by portal veins & from liver it is send in blood stream-into intra & extra cellular spaces; it crosses brain blood barrier. Uptake of it is more in heart, brain & muscles; it is very little stored in various parts of brain but for not longer, it excreted in urine mainly, 98% of digested ALA is excreted through urine in 24 hours & some undigested ALA is excreted in stools.

Basic clinical pharmacology of alpha lipoic acid (ALA): -

It is free radical scavenger; it helps in insulin resistance diabetes, modulate glucose metabolism, reduces triglycerides, anti obesity (by anorexic action on hypothalamus), it improves vascular functioning, improves nitric acid formation (thus dilates the vessels &increase the blood flow, reduces blood pressure &preload on heart) it also anti inflammatory, anti thrombotic, improves glucose uptake & metabolism in peripheral nerves & nerve conduction, strengthens the spinal cord.

- ***Copper: -***

It is an essential micronutrient mineral; its symbol is Cu & atomic no. 29; there are lot of health benefits of it; it is needed in little amount in the body. It is present in beetroot leaves & sugarbeet.

Main sources of copper: -

It is present in beetroot leaves, watermelon, spirulina (water-plant), nuts, seeds, lobster, leafy green vegetables, guava, grapes, green olive, kiwi, mango, pineapple, pomegranate, egg etc.

Basic pharmacokinetics of copper (based on human intake in natural food products): -

It is absorbed 30 to 50%; it is absorbed easily than other minerals, its absorption depends on the copper present in the body, when the intake of it is less, absorption is increased & when intake is more absorption is less, it is mainly absorbed in small intestines & little in stomach via carrier-mediated process; its absorption is influenced by amino acids, vitamin C & other dietary factors. After absorption it is bound primarily to albumin, peptide & amino acids & transported to liver. Copper is secreted into plasma as a complex with ceruloplasmin. It is mainly stored in liver little in brain, heart & kidneys; it is excreted mainly in bile & little in urine.

Basic clinical pharmacology of copper: -

Together with iron it enables the body to form RBC; it helps to maintain health of bones, blood vessels, nerves & immune system; it also acts on iron absorption, protein metabolism, growth of body, it acts also on development of brain, heart & other organ; it is needed by the body for making ATP, collagen. Excessive of it may cause Wilson's disease.

Deficiency of copper: -

It is very rare; but may cause cardiovascular disease, genetic defects, inflammation of optic nerve etc.

- ***Total amino acids present in beetroot: -***
- ***Absorption & digestion of amino acid.***

When we eat high-protein foods, body breaks down protein into amino acids and peptides through digestive enzymes, such as pepsin & pancreas produces trypsin, chymotrypsin and other that aid in protein digestion.

Pepsin is the primary enzyme responsible for digesting protein; it acts on the protein molecules & breaks the bonds – called peptide bonds – that hold the protein molecules together. Next, these smaller chains of amino acids move in the stomach & then in small intestine where they're further broken down by enzymes released by the pancreas. Small intestine contains finger-like extensions called micro-villi. These structures enhance its ability to absorb dietary nutrients. Now the semi digested material pass through brush border and baso-lateral membranes of small intestine & di-tripeptides are absorbed by passive transport (facilitated or simple diffusion) or active transport (Na+ or H+ co-transporters) pathways. Di and tripeptides are more efficiently absorbed than free amino acids which in turns are better absorbed than oligopeptides. They're released into the bloodstream and used for various biochemical reactions.

Each amino acid has a different role in the human body. Upon absorption, some amino acids are incorporated into a new protein. Some fuel your muscles and support tissue repair. Others are used as a source of energy.

Tryptophan and tyrosine, for example, promote brain health. These amino acids support the production of neurotransmitters, leading to increased alertness and optimum nerve responses. Tryptophan also assists with serotonin production, lifting your mood and keeping depression at bay.

Phenylalanine serves as a precursor to melatonin, epinephrine, dopamine and other chemicals that regulate your mood and bodily functions. Methionine helps your body absorb selenium and zinc, two minerals that promote overall health. Some amino acids, such as isoleucine, play a vital role in hemoglobin production and glucose metabolism.

- ***Tryptophan: -***

It is an amino acids (protein) that is useful in bio-synthesis of protein; it is essential in human because body cannot make it); it is a precursor of neuro-transmitter serotonin, melatonin, vitamin B3; it is a sedative also.

Main sources of tryptophan: -

Salmon oil, egg, spinach, milk, seeds, fenugreek seed, soy products, nuts, fish, meat, wheat, banana etc.

Basic pharmacokinetics of tryptophan (based on human intake in natural food products): -

It is absorbed in small intestine & reached the blood circulation, it passes the blood brain barrier & in brain cells it is metabolized into indolamine neuro-transmitter, niacin, a common example of indolamine is serotonin derivative from tryptophan. Tryptophan is converted into serotonin in the brain & body; it is believed that tryptophan supplements should be taken with carbidopa, which blocks the blood brain barrier. (Serotonin (5HTP) 5 hydroxytryptamine, is a monoamine neuro-transmitter. It contributes in feelings of well-being, happiness, reward, learning, memory, many physiological functions).

In the pathway of tryptophan/serotonin, melatonin hormone is produced. Melatonin regulates sleep-wake cycle. It is primarily released by pineal gland in brain. It controls circadian (daily clock) rhythms.

Pineal gland releases it at night more & very little in day light. It improves immune system function.
Natural sources of melatonin are tomato, pomegranate, olive, grapes, broccoli, cucumber, barley, seeds, nuts etc.
Fructose malabsorption causes improper absorption of tryptophan in intestine thus leading to low level of it & may cause depression.

Basic clinical pharmacology of tryptophan: -

It is necessary for normal growth of infants; nitrogen balance in adults, it aids in sleep pattern, mood. It is necessary for melatonin & serotonin formation in body, it enhances mental & emotional well-being, manages pain tolerance, weight etc. it also helps in build muscle tissue, essential for vitamin B3 production, relives insomnia, reduces anxiety, depression, migraine, OCD, helps immune system, reduces cardiac spasms, improves sleep patter etc.

- ***Threonine: -***

It is an amino acid used in biosynthesis of proteins; it is an essential amino acid important for tooth enamel, collagen, elastin, nervous system, fats metabolism, it prevents fats buildup in liver, useful in intestinal disorders, anxiety, and depression.

Main sources of threonine: -

Cheese, chicken, fish, meat, lentil, black seed, nuts, soy etc.

Basic clinical pharmacology of threonine: -

It is useful in nervous system disorders, multiple sclerosis, spinal spasticity, makes bones, joints, tendons, ligament stronger, it helps the immune system, promotes heart health.

- ***Isoleucine: -***

It is an amino acid that is used in the biosynthesis of proteins, it is an essential amino acid means the body cannot make it & we depend on food sources, it plays & helps many functions of the body.

Main sources of isoleucine: -

Meat, mutton, fish, cheese, egg, seeds, nuts, soybeans, milk, legumes, fenugreek seed etc.

Basic pharmacokinetics of isoleucine (based on human intake in natural food products): -

It is absorbed in small intestine by sodium-dependent active transport. It is metabolized in liver.

Basic clinical pharmacology of isoleucine: -

It promotes glucose consumption & uptake, it is anti-catabolic, enhances athletic performance & best for pre-workout, it acts on wound healing, detox of nitrogenous waste in the body, stimulates immune system, promotes secretion of many hormones, helps in heamoglobin formation, regulating blood glucose, energy in the body, built muscles, helpful to brain for its function.

- ***Leucine: -***

It is branched chain amino acid (BCAA) it is ketogenic amino acid; it is necessary when we do exercise, it stimulates protein synthesis & assists in muscle building.

Main sources of leucine: -

Cheese, soyabean, meat, nuts, chicken, seeds, fish, seafood, beans.

Basic clinical pharmacology of leucine: -

It helps regulate blood glucose, promotes growth, recovers the muscles & bone tissues, acts on production of growth hormones, repairs the tissues, essential for muscle building, it burns fats, controls obesity, promotes lean muscles growth.

- ***Lysine: -***

It is an essential amino acid, which our body cannot prepare and we need to eat it from food sources. It necessary for many body functions, acts in building blocks of protein (muscles).

Main sources of lysine: -

Red meat, chicken, egg, fish, beans, lentils, wheat germ, nuts, soybeans, spirulina, fenugreek seed, shrimp, pumpkin seed, tuna, cheese, milk etc.

Basic pharmacokinetics of lysine (based on human intake in natural food products): -

It is absorbed from the lumen of the small intestine into the enterocytes by active transport, it undergoes first pass metabolism in liver & is metabolized in liver.

Basic clinical pharmacology of lysine: -

It helps the body in tissue growth, repair muscles injury, promote collagen formation, help the body to produce enzymes, antibodies, hormones, supports immune system, its deficiency causes fatigue, irritability, nausea, hair loss, anorexia, inhibited growth, anemia, problems with reproductive system, it is very helpful in treating cold sores (herpes), control blood pressure, diabetes, osteoporosis, helps athletes performance, helpful in treating cancers, reduces anxiety, increase absorption of calcium, improves digestion & prevent leaky gut, helpful in pancreatitis.

- ***Methionine: -***

It is a sulfur containing amino acid; it is essential; it plays a critical role in the metabolism & health; it act on normal cell functioning, growth & repair. It is also a chelating agent for heavy metals; due to its sulfur contain it is helpful in hair, nail health & growth & good for skin health; it reduces cholesterol by increase the production of lecithin in liver & reduces fats formation in liver, also protects kidneys, liver from hepatotoxins, it is an antioxidant. It is absorbed in lumen of small intestines into enterocytes by active transport & metabolized in liver.

Main sources of methionine: -

Meat, mutton, fish, chicken, cheese, egg, beans, milk, nuts, shellfish etc.

- ***Cystine: -***

It is the oxidized dimer form of amino acid, it is nonessential; the body uses it to produce taurine & other amino acids; it is a sulfur containing amino acid; our body uses vitamin B6 with the help of cystine; it heals burns, wounds, bronchitis, assist in supply of insulin, it increases level of glutathione in liver, lungs, kidneys & bone marrow. It is anti aging, anti inflammatory, anti arthritis, anti rheumatoid arthritis.

Main sources of cystine: -

Meat, egg, milk, garlic, onion, broccoli, oats, wheat germ, lentils etc.

- ***Phenylalanine: -***

It is an aromatic essential amino acid in human; it plays a key role in biosynthesis of other amino acids; it is important in the structure & function of many proteins & enzymes. It is precursor of melanin, dopamine, noradrenalin hormone, thyroxin hormone. It is converted in tyrosine & used in biosynthesis of dopamine & noradrenalin. It improves memory, reduces pain of hunger; it is anti-depressant; it is also a building block protein; it is useful in vitiligo, depression, ADHA, parkinson's, multiple sclerosis, pain, osteoarthritis, rheumatoid arthritis, fat burn & helpful in alcohol withdrawal symptoms.

Main sources of phenylalanine: -

Pumpkin seed, nuts, seeds, soy, meat, fish, chicken, egg, beans, milk etc.

- ***Tyrosine: -***

It is a nonessential amino acid; it is also called as 4-hydroxyphenylalanine; it is useful in cell synthesis of protein; it is a building block protein; body prepares it from phenylalanine. It is a precursor & used to produce noradrenalin, dopamine, & thyroxin & melanin hormones. It reduces stress, improves memory, it promotes growth, mental health, skin health, fat burn. It acts as a mood elevator, anti-depressant, improves memory, mental alertness, its deficiency can cause hypothyroidism leading to low blood pressure, low body temperature (hypothermia), stress, fatigue, narcolepsy; it helps thyroid gland, adrenal gland, pituitary gland to function properly. It is absorbed in small intestine by sodium-dependent active transport; after absorption it reaches the blood & crosses the blood brain barrier (BBB) & enters

the brain cells & gets metabolized into catecholamine (noradrenalin). Human body regulates it amount by eating it by food sources & making inside the body (nonessential). The body does not store it much for later uses.

Main sources of tyrosine: -

Meat, fish, egg, milk, nuts, beans, oats, wheat, black seeds etc.

Dopamine: -

It regulates reward & pleasure centers in brain; it is a chemical important for memory, motor skills & etc.

Nor-adrenaline & adrenaline: -

These hormones are responsible for fight & flight response in stressful situation & also controls many functions of the body; it is secreted by adrenal glands.

Thyroxin: -

It is secreted by thyroid gland; it regulates metabolism, blood pressure, digestion, energy etc.

Melanin: -

It is pigmented hormone, gives our skin, hair, eye their colour; dark skinned people have more melanin in their skin than light skin people (depend on exposure to sunlight).

- ***Valine: -***

It is an essential nutrient for vertebrates, biosynthesis of protein; it is an aliphatic & extremely hydrophobic essential amino acid; it is branched chain of amino acid (BCAA); it is important for growth, repair, blood glucose regulation, for energy; it stimulates CNS, proper mental function.

Main sources of valine: -

Cheese, soy, beans, nuts, fish, meat, chicken, mushroom, seeds, nuts, whole grains etc.

- ***Histidine: -***

It is an amino acid used in biosynthesis of protein; it is semi essential amino acid, needed by human for production of histamine & also for growth & tissue repair, it is helpful in maintaining myelin sheaths that covers the nerves & protects the nerves.

Main sources of histidine: -

Meat, mutton, fish, milk, egg, seeds, nuts, chicken, cheese, soy, beans, whole grains, fenugreek seeds.

Basic pharmacokinetics of histidine (based on human intake in natural food products): -

It is absorbed in small intestine via active transport requiring the presence of sodium.

Basic clinical pharmacology of histidine: -

It plays many roles in immunity, gastric secretion & sexual functions. It is also required for blood cell formation & protects tissues against damage of radiation & heavy metals. It keeps normal pH of 7 in the body, useful in rheumatoid arthritis, allergy, ulcer & anemia caused by kidney failure or dialysis. It is an antioxidant, anti inflammatory, reduces cholesterol.

- ***Arginine: -***

It is among conditional essential amino acid the body needs to function properly; it is made in liver; it plays an important role in building protein thus helpful in body building.

Main sources of arginine: -

Chicken, pumpkin seeds, spirulina, dairy products, red meat, fish, egg etc.

Basic pharmacokinetics of arginine(based on human intake in natural food products): -

It is absorbed in jejunum mainly from oral diet.

Basic clinical pharmacology of arginine: -

It releases nitric oxide in the blood & nitric oxide dilates the blood vessels thus increases the blood supply & controls high blood pressure, it improves erection, builds muscle etc. it also acts on release of growth hormone, insulin & other substances in the body. It also improves heart health, athlete

performance, stimulates immune system; citrulline present in watermelon is converted into arginine in kidneys, please refer lesson on watermelon.

- ***Alanine: -***

It is a non-essential amino acid that is present in blood plasma in its free state in high levels; it is involved in sugar & acid metabolism, protein synthesis, it increases immunity, provides energy for muscles tissues, brain & CNS, it acts on tryptophan, vitamin B6 metabolism; it is an important sources of energy for muscles; it helps the body to convert simple sugar (glucose) into energy; it is produced in the body. It increases exercise capacity; reduces muscle fatigue, boost immunity, it is antioxidant; anti aging; increases muscle growth; ideal pre & post workout, reduce blood sugar, prevent liver disease, helps the liver to eliminate toxins, improves CNS functioning, helpful in benign prostate hypertrophy. It is digested in small intestine; it is converted into pyruvic acid by alanine aminotransferase-1; during fasting condition alanine derived from protein breakdown is converted into pyruvate & used to synthesis glucose by gluconeogenesis in liver, it is excreted in urine via urea cycle. It is stored little in skeletal muscles.

Main sources of alanine: -

Meat, fish, egg, milk, aleovera, honey, black seeds, nuts etc.

- ***Aspartic acid: -***

It is a non-essential amino acid; it is over all negatively charged & plays an important role in synthesis of other amino acid, citric acid & urea cycles; it is found in animals, plants, sugarcane, sugarbeet. It may be a neurotransmitter; it strengthens the muscles, improves heart function, helps in maintaining mental health, reduces tiredness, improves athletic performance, increases muscle size, reduces depression & fatigue. It is absorbed in small intestine by active transport.

Main sources of aspartic acid: -

Meat, oysters, seeds, oats, avocado, sugar beet, milk, egg, nuts, cereals etc.

- ***Glutamic acid: -***

It is a nonessential amino acid. It is an excitatory neuro-transmitter; it is necessary for biosynthesis of proteins; body uses it for several key functions within the body like making other neuro-transmitters such as GABA; it promotes brain health, muscles health, intelligence, mood & mental alertness. It is called as chemical messenger. It plays an important role in body's disposal of excessive waste like nitrogen. It is absorbed in lumen of small intestine into enterocytes by active transport & excreted in urine mainly. It is almost about 2 kgs, storage in natural form in brain, kidneys, liver, muscles etc.

Main sources of glutamic acid: -

Meat, chicken, fish, egg, milk, wheat, mushroom, soy, broccoli, walnut, peas etc.

- ***Glycine: -***

It is a nonessential amino acid that body needs for growth &maintenance of tissue & need to prepare hormones & enzymes. It is inhibitory neurotransmitter. It helps in preparing glutathione (a powerful antioxidant & reduces free radicals, delay aging). It is helpful in preparing of creatine (provides energy to muscles to perform exercise etc & acts on muscle contraction), beneficial for brain health, bone health, alzheimer's, schizophrenia, sleep disorder, stroke, burns, protects kidney & liver from harmful side effects of drugs used after organ transplant, heals wound & ulcers, it is anti inflammatory, improves skin health.

Main sources of glycine: -

Meat, fish, milk, legumes etc.

- ***Proline: -***

It is a protein-genic amino acid used in biosynthesis of proteins. It heals cartilages, cushion joints, tendons, ligament, heart muscles, connective tissues & helps in formation of collagen.

Main sources of proline: -

Soy, pumpkin seed, lentils, black beans, quinoa etc.

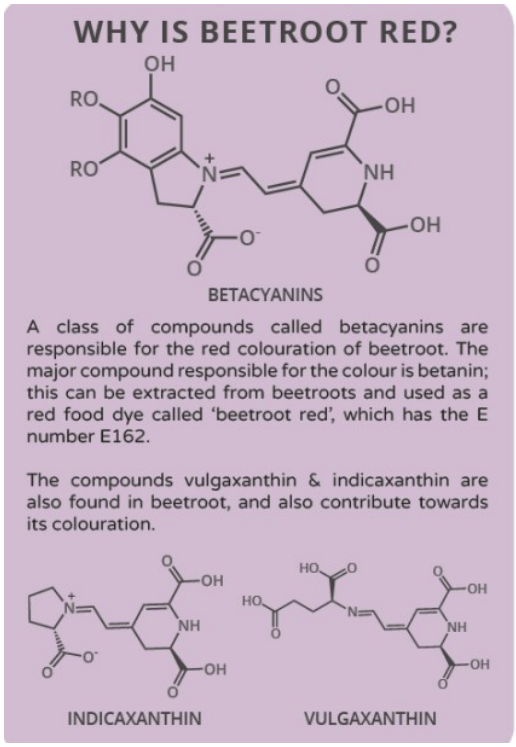
- ***Serine:-***

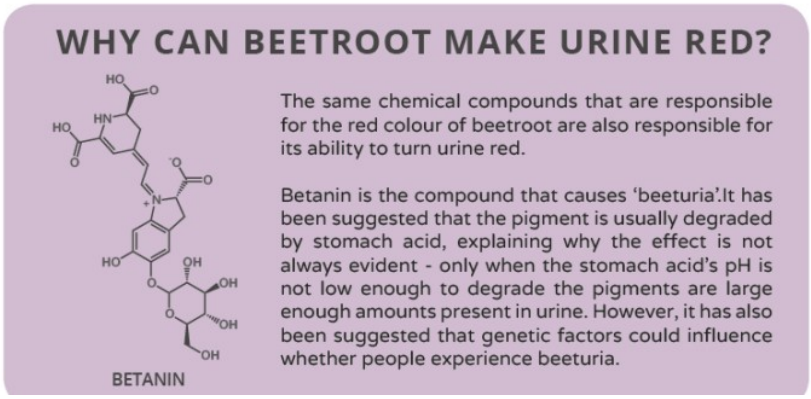
It is a nonessential amino acid, important for synthesis of protein, fats metabolism, muscle growth, immune system; it is a precursor of many amino acids, helpful in enzyme catalyze its reaction, overall health, physical & mental health.

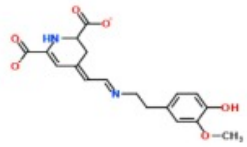
Main sources of serine: -

Soybean, egg, lentils, meat, fish, nuts, almonds, walnut etc.

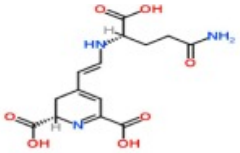
- ***Main chemical structures of beetroot: -***



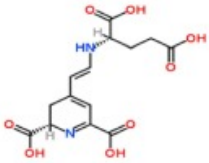




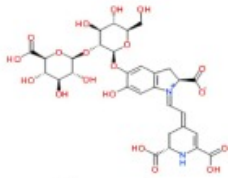
Betaxanthin



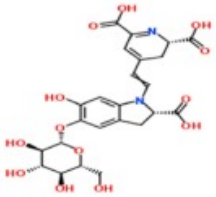
Vulgaxanthin-I



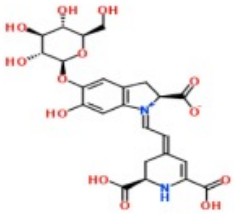
Vulgaxanthin-II



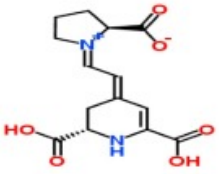
Betacyanin



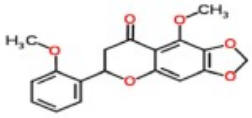
Betanin



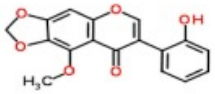
Isobetanin



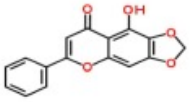
Indicaxanthin



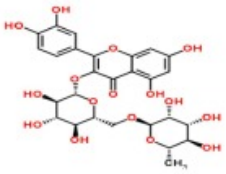
Betagarin



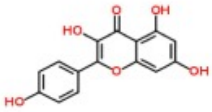
Betavulgarin



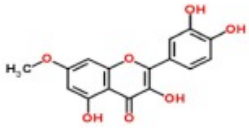
Cochliophilin A



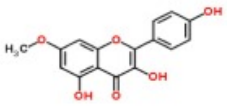
Rutin



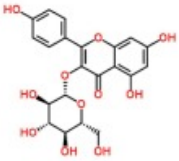
Kaempferol



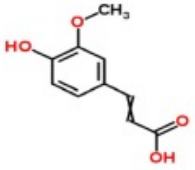
Rhamnetin



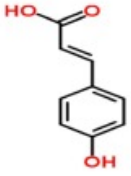
Rhamnocitrin



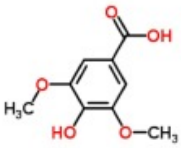
Astragalin



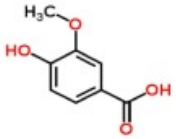
Ferulic acid



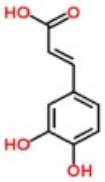
p-coumaric acid



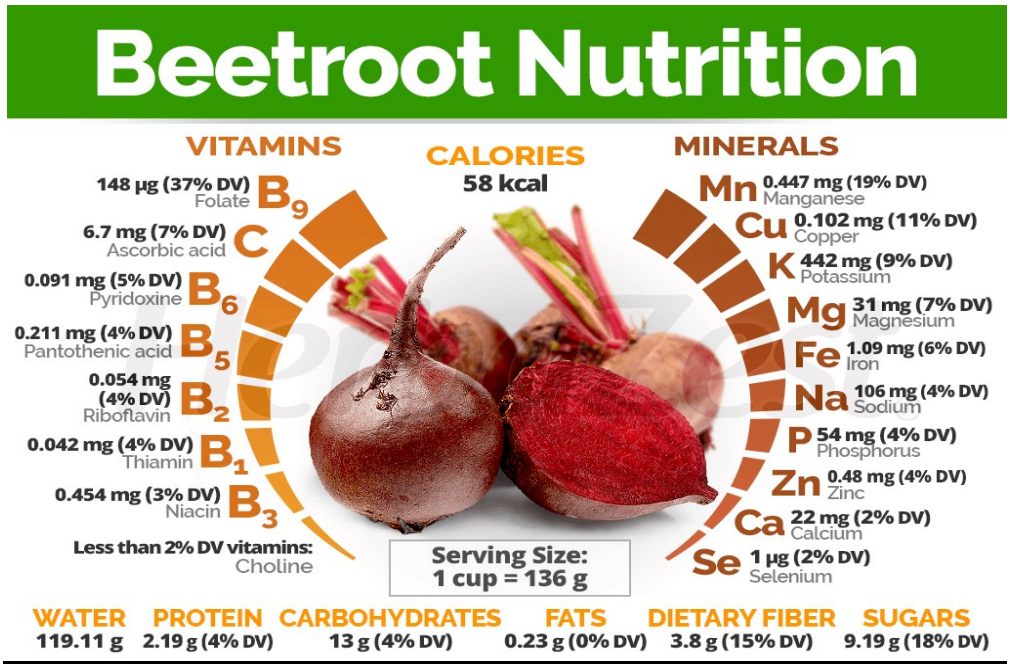
Syringic acid



vanillic acid



Caffeic acid



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^ Making Wild Wines & Meads; Pattie Vargas & Rich Gulling; page 73

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- ***Research: -***

SCIENCE & HADEES REGARDING BEET ROOT: -

In Hadees Nabi ﷺ stop Hazrat Ali رضي الله عنه to take more Dates & advised to eat gravy of beetroot: -

Beetroot is a powerhouse of nutrients and has many important health benefits. As well as purifying the blood, fighting cancer and other diseases, this super food has recently been found to provide an energy boost and improve physical performance whilst using up less energy. It is rich in Vitamin B; it helps for skin health and hair growth. Including 1 glass Beetroot juice in our diet controls the high blood pressure and also improves the memory power.

1. **No Fat: -** Beetroots doesn't contain fat as it helps us to reduce the desire of eating sweet. It will be beneficial for those who are dieting.
2. **Boosts the Energy: -** Beetroots contains carbohydrates and it helps to give instant energy.
3. **Folic Acid: -** Folic Acid is essential for women as it helps to develop the fertility system & prevents prostate health; Including Beetroot in your diet is the natural way of gaining folic acid in our body.
4. **Nutrition: -** Many Parents feel that we lack in providing nutritious food to their children, So Beetroots are the best nutritious foods as it contains Vitamin A, C, Magnesium, Calcium, Minerals, Potassium, Iron etc which helps to provide the required energy and supplements to our body.
5. **For Healthy Heart: -** Are you suffering from High blood pressure? Then take 1 glass of beetroot juice daily. It contains Nitrates, when it mixed with blood it produces nitric oxide which helps to reduce the blood pressure so can we yield good healthy heart.
6. **Beetroot Juice: -** Taking Beetroot juice daily gives lot of benefits to us. It just contains not only Nitrates; these are the rich sources of Vitamins, Minerals, and Amino acids. It also has the characteristic of fighting against cancer causing agents. A glass of beetroot juice a day will improve blood flow to the brain, which will result in better and efficient brain functionality. Beetroot juice naturally and efficiently opens blocked blood vessels and veins and increases the blood flow in the body. A glass of beetroot juice a day improves the immunity system and gives you a kick of energy.

- ***CONCLUSION OF RESEARCH: -***

Happiness of Hazrat Sahl Bin Saad رضي الله عنه indicates that beetroot was liked by them, & saying that if it has no fats indicates that they disliked Fats which is mostly unwanted by the body & gives severe ill effects in health. Hazrat Ali رضي الله عنه was advised to eat beetroot gravy in place of dates, indicates its importance in health after illness (recovery period) means we should eat them in recovery periods. And also note the intelligence of Umme Munzir رضي الله عنها that when she heard that Ali رضي الله عنه was stopped from eating more dates quickly prepared what was suitable for Ali رضي الله عنه This shows how intelligent & wise they were regarding uses of food.

Beetroot has a lot of antioxidant, anticancer, cardio-protective, digestive, hepato-protective, nutritive properties; it is easily available all season; best to be eat raw in salads or juice. Diabetes patients should eat much; blood pressure patients can eat it or drink its juice; ill patient can drink its soup. It contains no fats, and has many constituents of its own & this makes it amongst best vegetable.