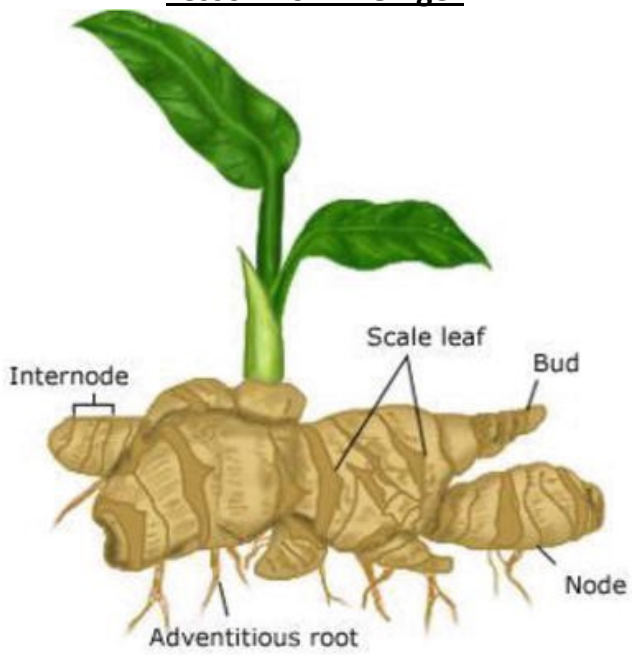
Lesson no. 21 Ginger



Ginger is a very famous herb all around the world; available all season; every place; it has a spicy taste & a good odour; it is very famous for its health benefits; Ginger's Latin name is Zingiber officinale &its family is Zingiberaceae; Ginger originated from Island Southeast Asia. It is true cultigens and does not exist in its wild state; it is among the earliest recorded spices to be cultivated and exported. It is mentioned in Quran & Hadith. Please visit my website www.tib-e.nabi-for-you.com for detail Islamic study on ginger or read my English book Tibb e Nabawi part 2, lesson no. 38, page 75; direct link to lesson ginger on my website http://www.tib-e-nabi-for-you.com/ginger.html

- ***NAMES:-***

1. It is called as Zanjabeel (الزنجبيل) in Quran & Hadith.
2. In Arabic it is called as Zanjfil.
3. In English it is called Ginger.
4. Its Latin name is Zinger officinale.
5. Its family is Zingiberaceae.
6. In Hindi & Urdu it is called as Adrak.
7. In Gujrati it is called as Adu.
8. In Sanskrit it is called as Ada.

- ***In Quran it is mentioned in following Sura/verses: -***

1. ***Chapter No. 76 (Surah) Dahr verse no. 17: -*** (In it, it is mentioned that Allah ﷻ's people will be given a preparation, mixed with Zanjabeel (الزنجبيل) (ginger) in Jannah (paradise).

وَيُسْقَوْنَ فِيهَا كَأْسًا كَانَ مِزَاجُهَا زَنجَبِيلًا ﴿١٧﴾

And they will be given to drink there a cup (of wine) mixed with Zanjafil (ginger, etc.)

It is mentioned in following book of Hadith Abu Nuaim: 161; Hazrat Abu Saeed Al khudri رضي الله عنه says that, the king of Rome, Byzantine sent to Nabi ﷺ a jar of ginger (الزنجبيل) pickle, as a gift (hadiya). Nabi ﷺ accepted the pickle, and gave it little-little to each person, even Abu Saeed رضي الله عنه got some.

- ***Basic encyclopedia of ginger: -***
- ***Ginger plant: -***



Ginger is an herbaceous perennial flowering plant of the family Zingiberaceae; native to southeastern Asia; harvested for its aromatic, pungent rhizome ginger (underground stem) used as a spice, flavouring, food, and medicine. It is propagated by 2 methods by seed or by rootstalk cuttings by planting and has been under this type of cultivation for so long that it no longer goes to seed. Tropical plant, ginger grows best in warm and sunny climates in a deep but well-draining soil loam that is high in organic matter. The optimum soil pH for growth of ginger is between 6.0 and 6.5 and the plant requires a minimum temperature of 15.5°C (59.9°F). Ginger plants require an average annual rainfall of between 250 and 300 cm for optimal growth and development and require additional irrigation where rainfall is not adequate. Ginger plants will not tolerate waterlogged soils. It is of many types.

- ***Leaves: -***

It has an erect stem, up to 75 cm in height. Leaves of ginger plant are simple, alternate, linear-lanceolate, sheathing at the base, sessile, acuminate at apex, glabrous (leaves are reed-like with linear leaves that are arranged alternately on the stem). The shoots originate from a multiple bases and wrap around one another. The leaves can reach 7 cm (2.75 in) in length and 1.9 cm (0.7 in) broad.

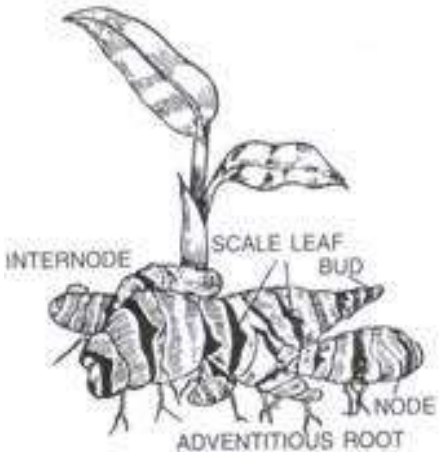
- ***Flower: -***

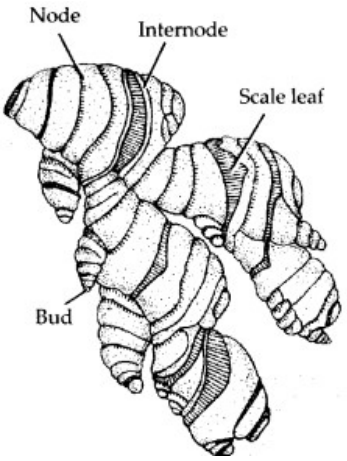


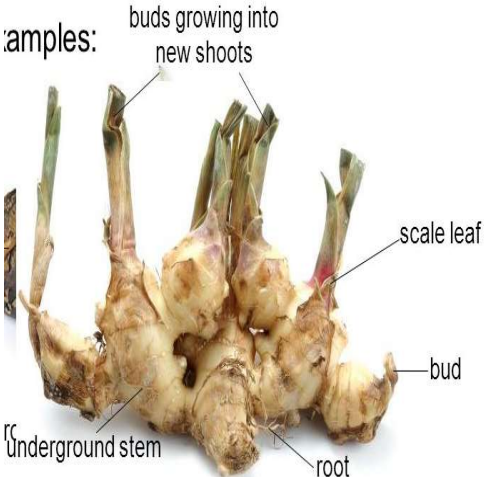


The flowers are small, have calyx that are lofty, have sepals very united, are three toothed, and split open on a side with three sub-equal corolla forming an oblong to lanceolate connate segment with green coloration. Flowers are cone shaped of pale yellow or red colour. Ginger plant produces clusters of white and pink flower buds that bloom into yellow flowers. Flowers are hermaphroditic (have male and female reproductive organs within the same flower**)**, usually strongly zygomorphic; flowers typically have two of their stamenoids (sterile stamens) fused to form a petaloid lip, and have only one fertile stamen. The ovary is inferior and topped by two nectaries, the stigma is funnel-shaped. Flowers are yellowish-green mostly that grow in dense spikes and a tangled.

- ***Ginger: -***







Ginger is the underground rhizome of the ginger plant with a firm, striated texture. The flesh of the ginger rhizome can be yellow, white or red in color, depending upon the variety. It is covered with a brownish skin that may either be thick or thin, depending upon whether the plant was harvested when it was mature or young. Ginger may also be referred to as true ginger, stem ginger, garden ginger or root ginger. It is aromatic & taste is pungent and spicy; it is usually harvested after the leaves senesce, dry out and the stem falls over. Ginger roots are harvested by digging. Commercially produced ginger is harvested with the use of cutter bar which is pulled by a tractor. After harvest, the ginger should be cured for 3 to 5 days to prevent the development of mildew on the rhizomes.

- ***Ginger root: -***

Root of are attached to ginger & do not spread much; ginger is a modified plant stem but under-soil.



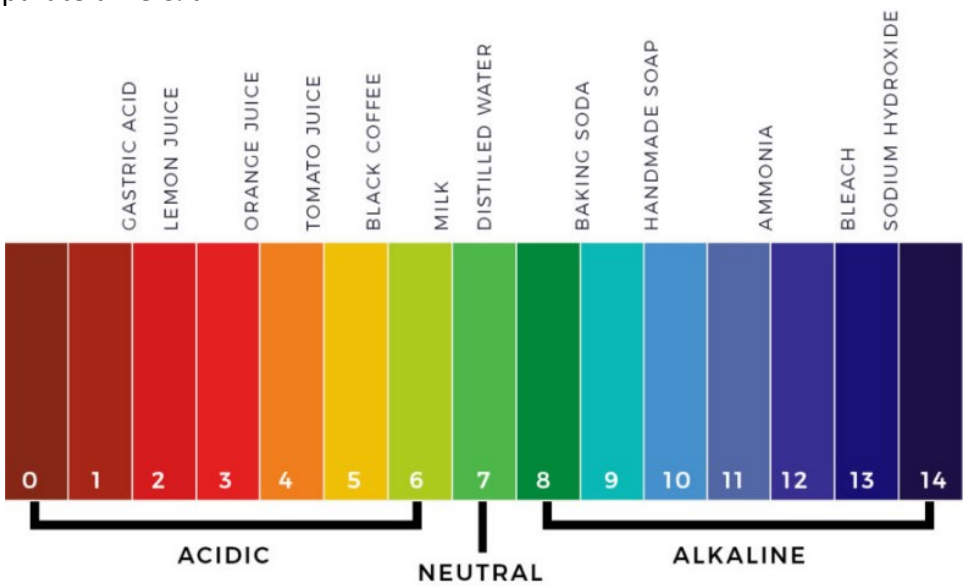
- ***Different types of ginger***

- ***pH of ginger is: -***5.60 - 5.90; it is acidic because its pH is below 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 ginger: -*** 100 grams of ginger give only 80 calories.
- ***Glycemic index & Glycemic load of ginger: -*** Its GI & GL are very low & we do not eat ginger in bulk it is an additive in cooking or used in tea, soup etc for taste or medicinal uses.
- ***Gross health benefits of: -***

It is antibacterial, antiviral, antifungal, anti-inflammatory, antioxidant, anticancer, anti cold & cough; it is digestive, increases taste, appetite, best for digestive disorders, throat infection, sinusitis, extreme cold climate, reduces pain when eaten & applied on the affected part (its paste), it is sedative, soothing, reduces swelling, anti-diabetic, promotes heart, liver, kidney health; controls blood pressure, reduces migraine, reduces spasm, diarrhea, good for irritable bowel syndrome, reduces lipid, anti-platelets etc.

- ***Its uses: -*** It is used in following forms: pickle, paste used in cooking, in tea, its paste applied on pain region; to chew in mouth, tablets, lozenges, steam inhalation, in dried powder form, as essential oil.
- ***Clinical pharmacology of it: -***

Ginger is a source of a large number of antioxidants and also plays an important role in the reduction of the lipid oxidation and inhibits the pathogenesis of diseases due to Gingerol and gingerol related compound.

Gingerol-related compounds showed that anti-inflammatory effects of ginger such as inhibition of COX and inhibition of nuclear factor κB.

Zerumbone, Gingerol and gingerol related compound present in ginger also acts as antitumor via modulation of genetic pathways such as activation tumour suppressor gene, modulation of apoptosis and inhibition of VEGF.

Ginger also shows antimicrobial and other biological activities due gingerol and paradol, shogaols and zingerone. An important finding showed that 10% ethanolic ginger extract was found to possess antimicrobial potential against pathogens.

Ginger and their constituents showed pivotal role in the control of diabetes and its complications via anti-hyperglycemic effect. The exact mechanism of action of ginger in diabetes control is not fully understood but it might be due to the inhibition of oxidative stress and anti-inflammatory process.

Ginger and their constituents play a vital role as neuro-protector. The exact mechanism of action of ginger in this vista is not known fully. But it is thought ginger shows neuro-protector effect due to the phenolic and flavonoids compounds.

Ginger shows a significant role in the treatment of osteoarthritis and also has important therapeutic importance in Ayurvedic and Unani medicine since ancient time. An important study on osteoarthritis (OA) patients of knee has revealed that, highly purified and standardized ginger extract had significant effect on reducing symptoms of OA of the knee. Another report in the support of ginger showed that, ginger is effective as indomethacin in relieving symptoms of osteoarthritis with negligible side effects.

Ginger and its constituents show a vital role in ulcer prevention via increasing mucin secretion. Earlier findings have shown anti-ulcerative effects of ginger in experimental gastric ulcer models. More benefits are mentioned in separately explained contents below.

- ***Modern uses of it: -***

For detox, cleaning the body: -

Take 1 spoon of extra virgin oil, 5 pieces of watermelon, 1 fig, 1 small piece of ginger, half cucumber, half beet root, little pomegranate, 1 spoon honey put all in mix & add 1 glass water & grind it in the mixer add little black pepper & salt as the taste & drink this juice once a week lifelong.

For prevention of arthritis, liver diseases, heart health: -

Take one small piece of ginger, 1 spoon of honey, 1 spoon of apple cedar vinegar, 2 cup warm water, 1 clove cut garlic, 7 seed of kalonji mix all in water & boil it on low flame for 10 minutes & drink it at night before sleep one a week please note take a dinner light & early.

For pain in joints: -

Take 1 cup milk, 1 small piece of ginger & turmeric boiled the milk with both on low flame & drink twice a day for 11 days followed by once a day for 11 days followed by alternative once a day for 11 days followed by once a week for lifelong.

For digestive problem: -

Cut small piece of ginger & sprinkle on the dish & serve the dish to this once a day only or take little dried ginger boil it in little water & drink it after meals twice a day for 11 days or you can eat homemade ginger pickle.

- ***Contents/constituents of it:-***

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.

Chemical analysis of ginger shows that it contains over 400 different compounds.

The major constituents in ginger rhizomes are water 79%, carbohydrates (50–70%), sugar, lipids (3–8%), terpenes, and phenolic compounds. Terpene components are zingiberene, *β*-bisabolene, *α*-farnesene, *β*-sesquiphellandrene, and *α*-curcumene, while phenolic compounds include gingerol(23–25%), paradols(18–25%), and shogaols &camphene, cineole, limonene, phellandrene, zingerone, eucalyptol, citral, borneol, linalool, sesquiterpene, terpenes, protein, vitamin C, E, B1, B2, B3, B5, B6, B9, calcium, iron, magnesium, manganese, phosphorus, zinc, potassium, sodium etc.

A good quality of ginger contains little amount of amino acids mentioned in 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.
The details given below are based on natural ingredients found in ginger.

- ***Active ingredient of***

The major identified components from terpene are sesquiterpene hydrocarbons and phenolic compounds which are gingerol and shogaols, oleoresin, terpenes, zingerone, and paradol.

Raw ginger	In mg
Weight (2 grams)	2
Threonine(mg) (% RDI)	1 (0%)
Isoleucine(mg) (% RDI)	1 (0%)
Leucine(mg) (% RDI)	1 (0%)
Lysine(mg) (% RDI)	1 (0%)
Phenylalanine(mg) (% RDI)	1 (0%)
Valine(mg) (% RDI)	1 (0%)
Histidine(mg) (% RDI)	1 (0%)
Arginine(mg)	1
Alanine(mg)	1
Aspartic acid(mg)	4
Glutamic acid(mg)	3
Glycine(mg)	1
Proline(mg)	1
Serine(mg)	1

- ***Contents of ginger separately explained: -***
- ***Terpenes: -***

It is a group of volatile unsaturated hydrocarbons organic compound found in essential oils of plants; they have a strong odour & it protects the plant.

Main sources of terpenes: -

It is commonly present in mangoes, hops, lemon grass, thyme etc.

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

Its absorption, metabolism & excretion are yet not known & are under research. It is well absorbed in gastrointestinal tract & through skin.

Basic clinical pharmacology of terpenes: -

It is anti-inflammatory, analgesic, reduces migraine pain, headache, stimulates many brain chemicals which benefits in reducing pain, inflammation etc.

Phenolic compounds: -

Phenolic compounds include simple phenols, phenolic acid, hydroxycinnamic acid derivatives & flavonoids, tannins, etc all are bioactive substances present in plants.

Main sources of it: -

Apples, tea, coffee, berries, mango, citrus fruits, plumps, cherries, kiwi, onion, flour of whole wheat, rice, corn, oats etc.

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

They are absorbed extensively & modified in the body & excreted in urine (but it is in research & the complete metabolism will be known after the research). Its storage in the human body is not known.

Basic clinical pharmacology of phenolic constituents: -

They are powerful anti-oxidant (prevent cancer and deadly disease) by acting as a free radicals scavengers & radical chain breaker. It prevents heart disease (reduces cholesterol & LDL & prevent hardening of heart arteries-atherosclerosis), metabolic disease, diabetes, cancers of many types (it acts on anti-oncogenic pathway thus the growth of tumour cells & cancer cells is inhibited), they protect the brain damage; they are anti-microbial speacially bacteria of lungs & intestines. They are also metal chelator (metal stabilizer & make metal soluble).

- ***Borneol: -***

It is a bicyclic organic compound and a terpene derivative; it is naturally found in two forms enantiomers (opposite or mirror image) as d & I. It aids the digestive system by stimulating the production of gastric juices, tone of heart, improves circulation; treats bronchitis, cough & cold; can relieve pain cause by rheumatic diseases & sprains; reduces swelling, relives stress. It is under research.

- ***Farnesene: -***

The term farnesene refers to a set of six closely related chemical compounds which all are sesquiterpenes; it is found in alpha & beta form, both are similar with little difference but alpha is most common & found in apple coats, perilla oil; it is anti anxiety, anti spasmodic, calming, sedative, muscles relaxant, anti inflammatory, anti fungal, anti bacterial; it is used in cosmetics, perfumes etc.

- ***Camphene: -***

It is a bicyclic mono-terpene, soluble in water; volatile in nature in room temperature; has a pungent smell. Please do not get confused with camphin & camphene, both are different; it has a role as a plant metabolite & a fragrance; it has structure as exactly 2 rings which fused to each other so called as bicyclic. It is present in dill, caraway, hyssop, fennel, camphor oil, citronella oil, thyme oil, ginger oil, cypress oil, thyme oil etc; it is used in medicine, fragrance, flavouring in food. It is absorbed through skin, inhalation & ingestion; it is anti fungal, anti microbial, antioxidant, analgesic, reduces lipids, anti viral, expectorant, anti septic, anti biotic, heals wounds, reduces swelling, headache, migraine etc. Its absorption, metabolism in under research & not known yet.

- ***Phellandrene: -***

In Marjoram alpha & beta phellandrene are present; it is a pair of organic compound that have a similar molecular structure & similar chemical properties; both alpha & beta are cyclic monoterpenes & are double-bond isomer. In alpha both double bond is endocyclic & in beta one double bond is exocyclic; both are soluble in water; they have a pleasant aroma & peppery taste.

Alpha is potential immune stimulator, anti-fungal, anti inflammatory, anti-cancer, anti-pain, develop natural killer (NK) in the body, boost immune system; beta is anti microbial, anti-fungal, antioxidant; both are believed to be excreted in stools,

Beta is present in oil of following bitter fennel, elemi, ginger-grass, ridolfia segetum & alpha is present in oil of cinnamon, dill, turmeric, ceylon etc.

- ***Cineole/eucalyptol: -***

It is mono-terpene ether present in essential oils & used in fragrance, flavoring, medicines, cough drops, personal care products, used as expectorant, anti septic. It is main constituent of eucalyptus oil; it is colourless, oil, slightly soluble in water. It has camphor like odour & pungent spicy cooling taste; it is also called as eucalyptol; it is anti inflammatory, anti viral, antioxidant, anti spasmodic, increase cerebral blood flow, anti fugal, immune-regulator, helpful in sinusitis, asthma, acute & chronic bronchitis, sore throat, laryngitis, herpes simplex, acne, measles, chicken pox, ulcers, wounds, boils cuts, burns; it is mucolytic, analgesic, clears the airway. It is present in sweet basil oil, common sage, bay leaves, camphor laurel, tea tree, worm-hood, mugwort, rosemary, thyme oil, cannabis sativa. Its absorption & metabolism is not known.

- ***Limonene: -***

It is a cyclic monoterpene & is the major component in the oil of citrus fruit peels; it is soluble in water; it has a pleasant aroma.

Main sources of limonene: -

It is present in orange, orange peel, grapes, lemon, lime, mandarins & marjoram.

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

Limonene is completely absorbed when taken orally; it can be absorbed by inhalation up to 70%; it can be also absorbed by skin; it is distributed throughout the body & fats tissues; it is metabolized in liver & excreted in urine.

Basic clinical pharmacology of limonene: -

it is anti-inflammatory, antioxidant, anti-stress, prevents diseases, it is a natural insect repellant, it is used as an additive & flavouring agent, it is used in shampoo, soaps, perfumes detergent making, also used in laundry, cosmetics, air fresher etc. It is also available in concentrated supplement in capsules & liquid form; it is anti-inflammatory, antioxidant, anti-cancer, heals heart disease, strengthens the heart, reduces stress, anxiety and improves digestion.

- ***Linalool: -***

It refers to 2 enantiomers (opposite or mirror image) of naturally occurring mono-terpene found in flowers & plants of many spices; it has a role plant metabolite, a volatile oil component, an anti microbial agent, a fragrance agent, it is present in sweet basil, lavender, laurel, citrus fruits, cinnamon, rosewood, birch tree, tea tree oil etc. It is anti-anxiety, anti-depressant, sedative, anti inflammatory, anti epileptic, increase immunity. It is under research & its absorption &metabolism is not known.

- ***Zingiberene: -***

Zingiberene is a monocyclic sesquiterpene that is the predominant constituent of the oil of ginger (*Zingiber officinale*) from which it gets its name. It can contribute up to 30% of the essential oils in ginger rhizomes. This is the compound that gives ginger its distinct flavoring. It is antiviral, useful in gastric ulcers, Alzheimer's disease.

- ***Zingerone: -***

It is a pungent component of dry ginger; zingerone is absent in fresh ginger but cooking or heating transforms gingerol to zingerone. Zingerone is closely related to vanillin from vanilla and eugenol from clove. It has potent anti-inflammatory, anti-diabetic, anti-lipolytic, anti-diarrhoeic, antispasmodic, immune stimulator, appetite stimulant, anxiolytic, antithrombotic, radiation protective, and antimicrobial & helpful in Alzheimer's disease and many other disorders.

- ***Citral: -***

It is present in ginger & reported to be bronchodilator & reduces hyper-activity in lungs. Citral is a main component of citrus fruit's peel oil. It is especially found in orange peel.

- ***Sesquiterpene: -***

Sesquiterpene is a terpene; simple derivative compound; Sesquiterpene molecules deliver oxygen molecules to cells, like hemoglobin does in the blood. Sesquiterpenes can also erase or deprogram miswritten codes in the DNA.

- ***Beta-Sesquiphellandrene: -***

Beta-Sesquiphellandrene is found in common oregano; it is a constituent of ginger oil; it belongs to the class of organic compounds known as sesquiterpenoids

- ***Bisabolene: -***

Bisabolenes are a group of closely related natural chemical compounds which are classified as sesquiterpenes; it is present in many plants; it is anticancer, anti-tumour.

- ***Curcumene: -***

Alpha-Curcumene, also known as (R)-curcumene or L-α-curcumene, belongs to the class of organic compounds known as sesquiterpenoids. It is mainly present turmeric; it has lot of health benefits, such as the potential to prevent heart disease, Alzheimer's and cancer. It's a potent anti-inflammatory and antioxidant and may also help improve symptoms of depression, arthritis; it is antibacterial, antiviral best cough & cold & infections.

- ***Gingerol: -***

Gingerol, properly as [6]-gingerol, is a chemical compound found in fresh ginger. Chemically, gingerol is a relative of capsaicin and piperine, the compounds which give chili peppers and black pepper their respective spiciness. It is normally found pungent yellow oil; it is a powerful antioxidant, anti-inflammatory; prevent heart disease, arthritis, cancer and other ailments.

- ***Paradol: -***

Paradol is the active flavor constituent of the seeds of Guinea pepper (Aframomum melegueta or grains of paradise). It is also found in ginger. Paradol has been found to have antioxidant and antitumor promoting effects in a mouse model. It is used in flavors as an essential oil to give spiciness.

- ***Shogaol: -***

Shogaols are pungent constituents of ginger similar in chemical structure to gingerol. The most common of the group is [6]-shogaol; like zingerone, it is produced when ginger is dried or cooked. It prevents heart disease, arthritis, cancer and other ailments.

- ***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.

- ***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, quince, cucumber 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 releases 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. 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 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, banana, quince, 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 quince.

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, quince 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 ease 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, quince, 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, quince, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato 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; it 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, quince, 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.

- ***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, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chilies, cabbage, leafy vegetables, tomato, cereals, quince, cucumber 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. 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.

- ***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, quince 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 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.

- ***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; It has very less amount of sodium; 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, quince, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, cucumber 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, quince, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, cucumber 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, quince, spinach, meat, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, dates, chicken, fish, legumes, cucumber 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 acts 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, quince, meat, nuts, beans, fish, chicken, dairy products, soy, grains, lentils, cucumber 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 trans-cellular sodium dependent 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, quince, meat, fish, legumes, beans, egg, dairy products, seeds, nuts, whole grains, cucumber 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. 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.

- ***Limonene: -***

It is a cyclic monoterpene & is the major component in the oil of citrus fruit peels; it is soluble in water; it has a pleasant aroma.

Main sources of limonene: -

It is present in orange, orange peel, grapes, lemon, lime, mandarins & marjoram.

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

Limonene is completely absorbed when taken orally; it can be absorbed by inhalation up to 70%; it can be also absorbed by skin; it is distributed throughout the body & fats tissues; it is metabolized in liver & excreted in urine.

Basic clinical pharmacology of limonene: -

it is anti-inflammatory, antioxidant, anti-stress, prevents diseases, it is a natural insect repellant, it is used as an additive & flavouring agent, it is used in shampoo, soaps, perfumes detergent making, also used in laundry, cosmetics, air fresher etc. It is also available in concentrated supplement in capsules & liquid form; it is anti-inflammatory, antioxidant, anti-cancer, heals heart disease, strengthens the heart, reduces stress, anxiety and improves digestion.

- ***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.

- ***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 7 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.

- ***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.

- ***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.

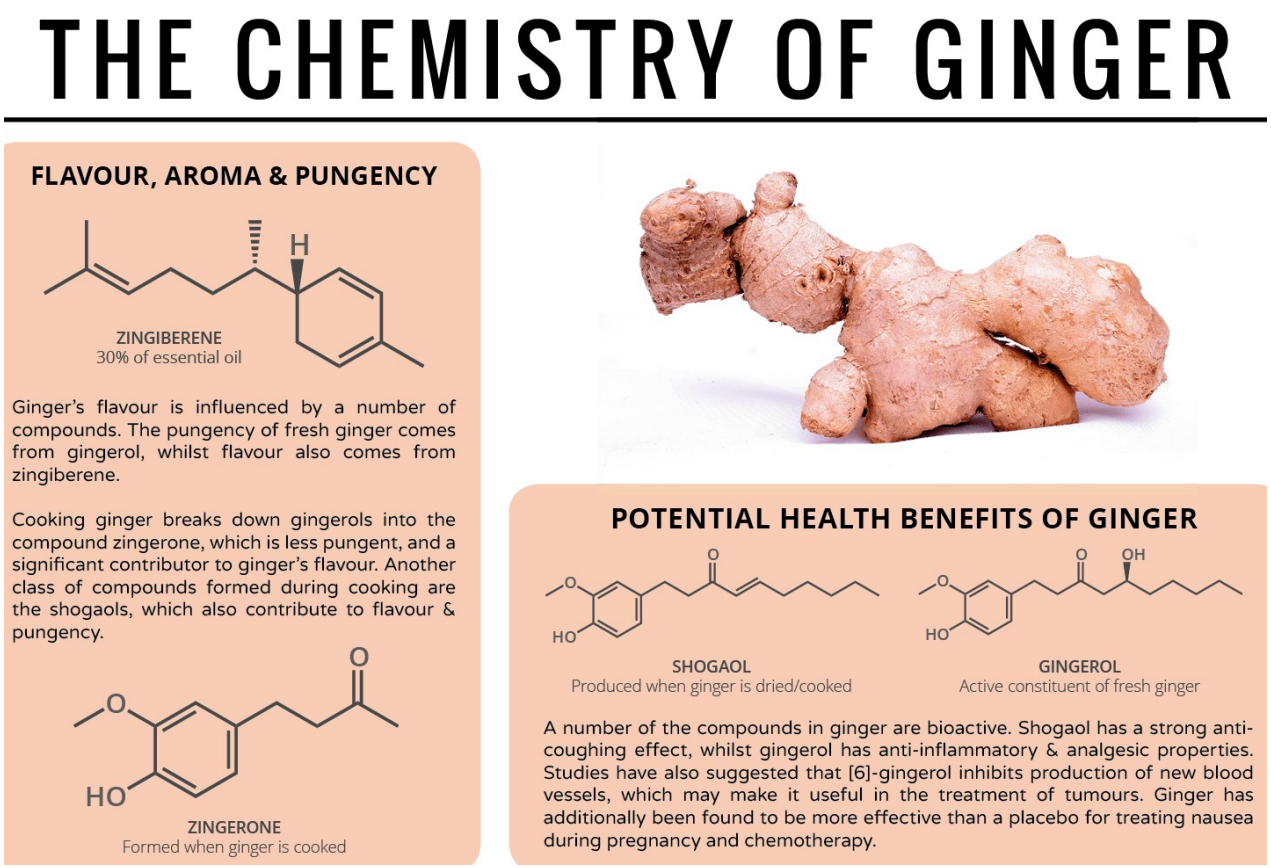
- ***Serine: -***

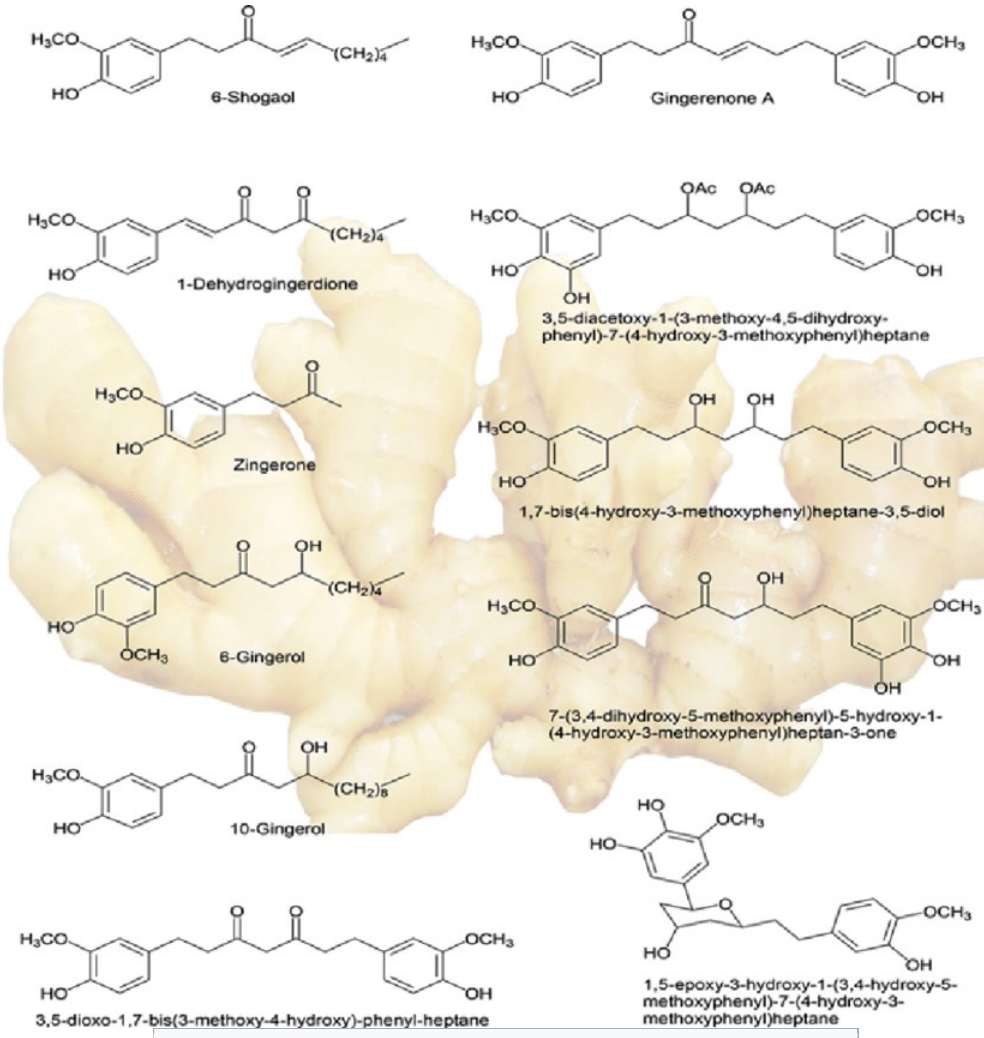
It is a nonessential amino acid, important for synthesis of protein, fats metabolism, muscle growth, immune system; it is a precursor of many amino acids, helpful in enzyme catalyze its reaction, overall health, physical & mental health.

Main sources of serine: -

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

- ***Main chemical structures of ginger: -***





Ginger root (raw)

Ginger section

Nutritional value per 100 g (3.5 oz)

Energy	333 kJ (80 kcal)
Carbohydrates	17.77 g
Sugars	1.7 g
Dietary fiber	2 g
Fat	0.75 g
Protein	1.82 g
Vitamins	Quantity % DV[†]
Thiamine (B1)	2% 0.025 mg
Riboflavin (B2)	3% 0.034 mg
Niacin (B3)	5%

	0.75 mg
Pantothenic acid (B5)	4% 0.203 mg
Vitamin B6	12% 0.16 mg
Folate (B9)	3% 11 µg
Vitamin C	6% 5 mg
Vitamin E	2% 0.26 mg
Minerals	Quantity% DV†
Calcium	2% 16 mg
Iron	5% 0.6 mg
Magnesium	12% 43 mg
Manganese	11% 0.229 mg
Phosphorus	5% 34 mg
Potassium	9% 415 mg
Sodium	1% 13 mg
Zinc	4% 0.34 mg
Other constituents	Quantity
Water	79 g

Full link to USDA Database entry

Units
µg = micrograms • mg = milligrams
IU = International units

†Percentages are roughly approximated using US recommendations for adults.
Source: USDA Nutrient Database

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- ***Research: -***

The results of many experiments showed that different bacterial species exhibited different sensitivities towards the extract of ginger. Today, most pathogenic organisms are becoming resistant to antibiotics. To overcome this alarming problem, the discovery of novel active compounds against new targets is a matter of urgency. Most of the spices extracted either in water or in organic solvents have biologically active compounds, which can be used in the synthesis of potent drugs. Thus spices, which are normal ingredients of our routine food preparations, can provide protection to a certain extent against our natural enemies like bacterial pathogens.

- **SCIENCE & HADEES REGARDING GINGER: -**

1. Quran mentions ginger as one of the drinks of Paradise. The modern name, “ginger,” comes from the Arabic root, “zindshebil,” and as centuries have passed, we have discovered the amazing and miraculous healing properties of ginger. Ginger is one of the best known treatments and is the classic medicine for dealing with many digestive disorders. Ginger promotes digestive and metabolism, which promotes digestive heat burning toxins, removes and lowers cholesterol deposits, as well as boosts the metabolism.

2. Ginger contains special enzymes responsible for catalyzing the proteins in your food, thus aids the digestion process and prevents cramps; this explains why ancient Greeks used to eat ginger after a large meal. Ginger is also particularly helpful when suffering from constipation.

3. Nausea and vomiting can be a problem when travelling (motion or seasickness), morning sickness during pregnancy, or while undergoing chemotherapy treatments. Ginger is known to relax and soothe the intestinal tract and alleviates symptoms of gastrointestinal stress.

4. By a study, it is effective as an anti-emetic (to stop vomiting) Ginger was put up against Dramamine, the most commonly used over the counter medication for motion-induced nausea. Ginger was not only more effective than the drug, but also

showed no side effects compared to the drug. According to the American Cancer Society, ginger has been promoted as a cancer treatment "to keep tumors from developing.

5. The characteristic odour and flavor of ginger is caused by a mixture of zingerone, shogaols, and gingerols, volatile oils that compose one to three percent of the weight of fresh ginger. In laboratory animals, the gingerols increase the motility of the gastrointestinal tract and have analgesic, sedative, antipyretic & anti-bacterial properties. Gingerols can inhibit growth of ovarian cancer cells in vitro -gingerol (1-[4'-hydroxy-3'-methoxyphenyl]-5-hydroxy-3-decanone) is the major pungent principle of ginger.

- **Food for the brain: -**

As a mood enhancer (ginger's cineole) content may help to relief stress and dried ginger may improve poor memory (using 1 gram and powder in warm milk). Research shows that ginger can reverse the damaging side effects (headaches, migraines, eye damage, fatigue, drowsiness, depression, numbness, muscle spasms, nausea, rashes, rapid heartbeat, chest pain, etc) that Monosodium Glutamate (MSG), a common food additive, has on vital dopamine, serotonin, and other neurotransmitters responsible for proper brain function and ginger helps to maintain this neurotransmitters (chemical of brain).

- ***Conclusion of research: -***

Current mode of treatment based on synthetic drugs such as anti-inflammatory, anti-diabetic, chemotherapy and radiotherapy drugs for the treatment are effective but also shows adverse side effect. A safe, effective and inexpensive product is needed to control the diseases development via modulation of genetic, metabolic, anti-oxidant and other associated activity. Ginger shows an important effect in the suppression of NFkB, COX2, and LOX, induction of apoptosis, activation of tumour suppressor gene and also modulates various biological activities. Ginger and their constituents create optimism towards the novel therapeutic strategy. Future research should focus on clinical trials to investigate its effectiveness and their exact role in modulation of molecular pathways.