

Lesson no. 17 Honey



• **NAMES: -**

1. In Quran & Hadees it is called as A'sal (عسل)
2. In English it is called as Honey.
3. In Urdu it is called as Shahad.
4. In Hindi it is called as Madh.
5. In Sanskrit it is called as Madhu.
6. Honey bee in Quran is called as NAHL and a whole chapter (sura) is named on honey bee, the chapter no. 16 Al Nahl (The honey bee).

• **QURANIC REFERENCES OF HONEY: (عسل)**

1. Chapter no. 16 Al Nahl, verse no. 68 & 69.
2. Chapter no. 47. Muhammad verse no. 15.
3. Chapter no.66. Tah'reen verse no.1.

In chapter No. 16 (Surah) Al-Nahl, verse no. 68 & 69, Allah Talah says:

وَأَوْحَىٰ رَبُّكَ إِلَى النَّحْلِ أَنِ اتَّخِذِي مِنَ الْجِبَالِ بُيُوتًا وَمِنَ الشَّجَرِ وَمِمَّا يَعْرِشُونَ ثُمَّ كُلِي مِن كُلِّ الثَّمَرَاتِ فَاسْلُكِي سُبُلَ رَبِّكِ ذُلُلًا يَخْرُجُ مِنْ بُطُونِهَا شَرَابٌ مُّخْتَلِفٌ أَلْوَانُهُ فِيهِ شِفَاءٌ لِلنَّاسِ

Translation: He has taught honey bees to make their combs on top of mountains, trees & heighted places, & these bees suck nectars from all types of flowers, & Allah Talah made the bees to follow the path of their lord (Allah Talah), a fluid of different colour comes out from their bellies, in which there is healing for human.

This is a sign of Almighty so people should admire & pick benefits. This is according to Allah Talah creation & laws of nature.

In chapter No. 47 (Surah) Muhammad verse no.15 Allah Talah says:

مَثَلُ الْجَنَّةِ الَّتِي وَعَدَ الْمُتَّقُونَ فِيهَا..... وَأَنْهَارٌ مِنْ عَسَلٍ مُّصَفًّى وَلَهُمْ فِيهَا مِنْ كُلِّ الثَّمَرَاتِ

Translation: in Jannah, there will be various gifts and boons, pure best honey streams and fruits of various types.

In chapter No. 66 Al-Tahreem verse no 1. Allah Talah said to Prophet ﷺ:

يَا أَيُّهَا النَّبِيُّ لِمَ تُحَرِّمُ مَا أَحَلَّ اللَّهُ لَكَ

Translation: Do not discard the use of honey or else, which Allah Talah has Permitted to eat (Halal) for human.



Honey is mentioned in Hadith & it was liked by Prophet Muhammad ﷺ; lot of teaches about honey is present in many books of Hadith like do not like honey bee; cure for self with honey & QURAN; honey is

best medicine & much more; Please visit my website www.tibb-e.nabi-for-you.com for detail Islamic study on Honey or please read lesson Honey in my English book Tibb e Nabawi part 2 lesson no. 72 page 255 for more Islamic detail on honey.

It is mentioned in following books of Hadith (reference are also given as Hadith number): -

Bukhari; Abu Dawud; Ibn-Majah; Tirmizi, An-Nasai; Mustadrak Al-Hakim; Kanzul-ummal; Moa'jam Ausat; Abu-Nuaim; At-tibb al Nabawi Harfutta.

- **Honey: -**

Honey is a sweet syrupy substance produced by honeybees from the nectar of flowers and used by humans as natural home medicine. Honey is comprised of 17-20% water, 76-80% glucose, and fructose, pollen, wax, and mineral salts. Its composition and color is dependent upon the type of flower that supplies the nectar. For example, alfalfa and clover produce a white honey, heather a reddish-brown, lavender and amber and acacia and sainfoin straw color.

An average bee colony produces 27-45 kg of honey each year. Colonies are divided by a three-tier organization of labour 1) 50,000-70,000 workers 2) one queen, and 3) 2,000 drones. Worker bees only live for three to six weeks, each one collecting about one teaspoon of nectar. One pound (0.454 kg) of honey requires 4 lb (1.8 kg) of nectar, which requires two million flowers to collect.

When the worker bees are about 20 days old, they leave the hive to collect nectar, the sweet secretion produced by the glands of flowers. The bee penetrates the flower's petals and sucks the nectar out with its tongue and deposits the nectar into its honey sac or abdomen. As the nectar journeys through the bee's body, water is drawn out and into the bee's intestines. The bee's glandular system emits enzymes that enrich the nectar.

Pollen attaches to the bee's legs and hairs during the process. Some of it falls off into subsequent flowers; some mixes with the nectar.

When the worker bee cannot hold anymore nectar, she returns to the hive. The processed nectar, now on its way to becoming honey, is deposited into empty honeycomb cells. Other worker bees ingest the honey, adding more enzymes and further ripening the honey. When the honey is fully ripened, it is deposited into a honeycomb cell one last time and capped with a thin layer of beeswax.



- **Full honeycombs removed from hive: -**

To remove the honeycombs, the beekeeper wears a veiled helmet and protective gloves & dress. There are several methods for removing the combs. The beekeeper may simply sweep the bees off the combs and guide them back into the hive. Alternately, the beekeeper injects a puff of smoke into the hive. The bees, sensing the presence of fire, gorge themselves on honey in an attempt to take as much as they can with them before fleeing. Somewhat tranquilized by engorgement, the bees are less likely to sting when the hive is opened. A third method employs a separator board to close the honey chamber off from the brood chamber. When the bees in the honey chamber discover that they have been separated from their queen, they move through a hatch that allows them to enter the brood chamber, but not reenter the honey chamber. The separator board is inserted approximately two to three hours before the honeycomb is to be removed.

The majority of the cells in the comb should be capped. The beekeeper tests the comb by shaking it. If honey spurts out, the comb is reinserted into the honey chamber for several more days. Approximately one-third of the honey is left in the hive to feed the colony.

- **Uncapping the honeycombs: -**



Honeycombs that are at least two-thirds capped are placed into a transport box and taken to a room that is completely free of bees. Using a long-handled uncapping fork, the beekeeper scrapes the caps from both sides of the honeycomb onto a capping tray.

- **Extracting the honey from the combs: -**



The honeycombs are inserted into an extractor, a large drum that employs centrifugal force to draw out the honey. Because the full combs can weigh as much as 5 lb (2.27 kg), the extractor is started at a slow speed to prevent the combs from breaking.

As the extractor spins, the honey is pulled out and up against the walls. It drips down to the cone-shaped bottom and out of the extractor through a spigot. Positioned under the spigot is a honey bucket topped by two sieves, one coarse and one fine, to hold back wax particles and other debris. The honey is poured into drums and taken to the commercial distributor.

- **Processing and bottling: -**



At the commercial distributor, the honey is poured into tanks and heated to 120°F (48.9°C) to melt out the crystals. Then it is held at that temperature for 24 hours. Any extraneous bee parts or pollen rise to the top and are skimmed off.

The majority of the honey is then flash-heated to 165°F (73.8°C), filtered through paper, and then flash cooled back down to 120°F (48.9°C). This procedure is done very quickly, in approximately seven seconds. Although these heating procedures remove some of the honey's healthful properties; a small percentage, perhaps 5%, is left unfiltered; it is merely strained; this honey is darker and cloudier; this is left out because many customers want this type of honey only, & the honey is then pumped into jars or cans for shipment to retail and industrial customers.

- **Royal jelly: -**



Royal jelly is a creamy liquid produced and secreted by the nurse bees to feed the queen. Nutrient rich with proteins, amino acids, fatty acids, sugars, vitamins, and minerals, it is valued as a skin product and as a dietary supplement. Proponents believe it prolongs youthfulness by improving the skin, increases energy, and helps to reduce anxiety, sleeplessness, and memory loss. Royal jelly which is sometimes called bee's milk, is a thick creamy liquid secreted by special glands in young worker bees who serve as "nurses" to the hive.

All bee larvae are fed a small amount of royal jelly mixed with honey for the first three days of their lives. Starting on day four, however, most of the bees are weaned from this diet and develop into worker bees. But one bee, hatched from an egg identical to the rest, is fed exclusively on royal jelly. That bee becomes the queen. She will grow, on average, 40% larger than her fellow bees, perhaps 50% heavier, and live up to 40 or 50 times as long. And all the while, she will be producing enormous numbers of eggs, equal to more than twice her own body weight, every single day.

- **Propolis: -**



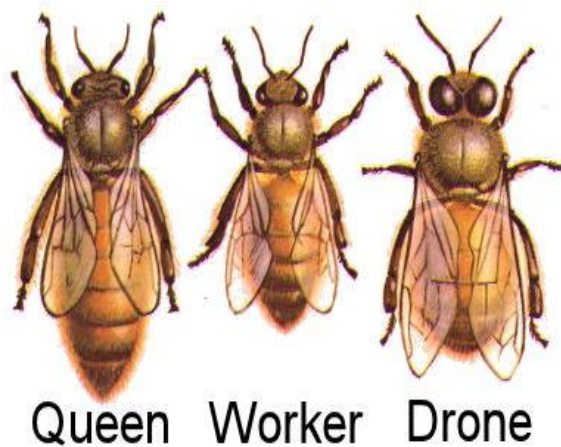
Propolis is plant resin collected by the bees from the buds of plants and then mixed with enzymes, wax and pollen. Bees use it as a disinfectant, to cover cracks in the hive, and to decrease the hive opening during the winter months. Commercially it is used as a disinfectant, to treat corns, receding gums, and upper respiratory disease, and to varnish violins.

- **Honeycomb: -**

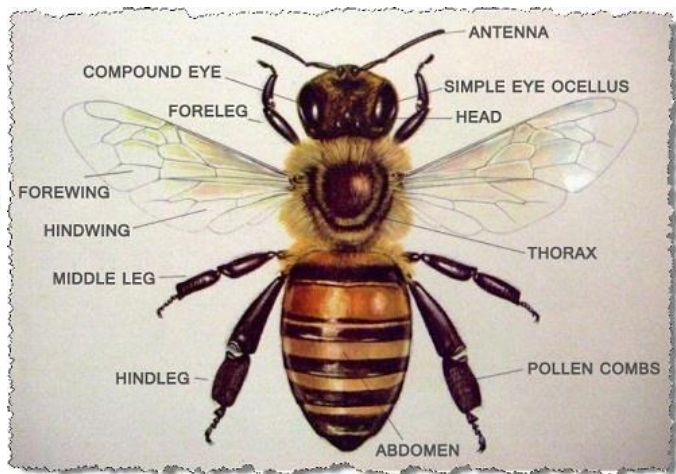


Honeycombs are made from beeswax, a substance created by worker bees. When the temperature is right, worker bees secrete wax scales from special glands in their body. Then they chew the wax with a bit of honey and pollen to produce the beeswax. The hexagonal cells serve as storage vessels for honey, as well as homes to raise young bees. Honeycomb is a mass of hexagonal prismatic wax cells built by honey bees in their nests to contain their larvae and stores of honey and pollen.

- **Honeybee: -**



Queen Worker Drone



Honeybees are flying insects; close relatives of wasps & ants; they are found on every continent on earth except Antarctica. There are many types of honey bee depend on different places; all types of bees live on nectar & pollen, apart from producing honey they also act on pollination & our agriculture field depends much on the honeybee-pollination.

Body of honey bee consist of a long straw like tongue called as probiscus, it allows them to suck the nectar deeply from various flowers; they have 2 wings, 2 antennae, head, thorax, abdomen & legs.

They are social insect that live in colonies (the hive); the hive consists of a single queen, few hundred drones & thousands of worker-bees.

While carrying the nectar back to the hive, sucrose present in the nectar is broken down in their body by their enzymes, saliva etc into simple sugar as fructose & glucose; after tucking the nectar neatly into the honeycomb cell, the bee beats its wings furiously over top of this released nectar to fan out the moisture & thicken the nectar & when this is completed, the bee will cap that cell with bee-wax, sealing the perfected honey for later consumption. Scientific name of honeybee is *Apis mellifera*; size is 0.4 to 0.6 inches of worker bees. Bees live on stored honey and pollen all winter, and cluster into a ball to conserve warmth. Larvae are fed from the stores during this season and, by spring; the hive is swarming with a new generation of bees. All honeybees are social and cooperative insects. A hive's inhabitants are generally divided into three types.

- **Workers: -**

Workers are the only bees that most people ever see. These bees are females that are not sexually developed. Workers forage for food (pollen and nectar from flowers), build and protect the hive, clean, circulate air by beating their wings, and perform many other societal functions.

- **The Queen: -**

The queen's job is simple—laying the eggs that will spawn the hive's next generation of bees. There is usually only a single queen in a hive. If the queen dies, workers will create a new queen by feeding one of the female larvae an exclusive diet of a food called “royal jelly.” This elixir enables the worker to develop into a fertile queen. Queens also regulate the hive's activities by producing chemicals that guide the behavior of the other bees.

- **Drones: -**

Male bees are called drones—the third class of honeybee. Several hundred drones live in each hive during the spring and summer, but they are expelled for the winter months when the hive goes into a lean survival mode.

- **Life cycle of honey bee: -**

Queen bee mates with the drone (male) bees and get fertilized to produce eggs. These eggs stay there in the cells of the comb (hive). It takes about 3–4 days for larvae to hatch from eggs. These larvae give rise to pupae and afterwards transform into new female worker bees which are being fed by the existing worker bees. A typical bee colony consists of tens of thousands of individual bees, mainly comprising of the sterile female worker bees. Drones die after mating with the queen and the normal life span of the queen bee lasts about 3–4 years.

- **Types of honey available in the market: -**

Honeycomb	Untouched by human hands. Contains all the goodness that nature has put into the honey. Bit awkward to chew.
Raw Honey	Extracted and cleaned using a settling tank at room temperature. Contains virtually all the goodness that nature put into the honey. Will granulate quickly and may separate in the jar with liquid fructose on top and granular glucose on the bottom.
Liquid Honey - Filtered with minimal heat	Extracted and cleaned using a 50 micron filter. Honey is heated to the same temperature inside a hive on a hot day. Contains a great deal of the goodness that nature put into the honey. Will granulate in two to six months, depending on the type of flowers the bees visited to gather the honey.
Creamed Honey	Creamed honey is made from pure liquid honey through a controlled crystallization process to produce very fine uniform crystals, thus resulting in a creamy smooth consistency. Creamed honey has nothing added and has the same nutritional value as its liquid counterpart.
Liquid Pasteurized Honey	Extracted and cleaned using flash heating to a high temperature, super filtered through a 1 to 5 micron filter, and quickly cooled. Loses much of the goodness that nature provided, but will last over 9 months on the store shelf without granulating.

- **Varieties of honey: -**

The flavour, colour, texture, and aroma of honey depend on which plants the bees gathered nectar from. Blueberry blossom honey is made with the nectar from blueberry blossoms, is dark amber in colour, and has a brown sugar after taste. Raspberry blossom honey is extra light in colour with a slight fruity taste, and buckwheat honey is almost black in colour with a heady, pungent odour and flavour. Generally, a dark honey will have a higher nutritional content than a light honey. There are hundreds of flowering plants which produce nectar, thus providing hundreds of varieties of honey.

These are few famous varieties of honey: -

1. Acacia Honey,
2. Alfalfa Honey,
3. Aster Honey,
4. Avocado Honey,
5. Basswood Honey,
6. Beechwood Honey,
7. Blueberry Honey,
8. Bluegum Honey,
9. Buckwheat Honey,
10. Clover Honey,
11. Eucalyptus.

Natural or Forest honey is the best where there are lot of flowers, greenery & healthy climate. Honey of neem (Azadirachta indica) tree, babool tree, jambul (jaamun) tree, apple tree etc can be used in various diseases (ex. Jambul tree honey may be best in diabetes, neem tree honey may be best for stomach diseases and infective diseases.)

- **Honey crystallization: -**

Crystallization of honey is due to natural monohydrate glucose present in honey, low water content, high glucose content, presence of solid particles like pollen grains & honey crystals; temperature close to 14 C; stirring. Crystallization of honey is completely normal & does not damage the honey; by mild warming the crystallization will melt.

- **How to de-crystallize honey.**

Honey that has started to crystallize, characterized by glucose crystals forming on the bottom of the container, can be easily melted. Simply put the honey container (with the lid on) into a warm water bath on the stove at approximately 45 C for a couple hours, or as necessary. Stirring the honey, or turning the container upside down occasionally to break up the crystals, will speed the process.

- **Storing Honey**

Honey is a very robust food product, and if stored properly, will last years if not decades. In fact, honey has been found perfectly preserved in tombs of the Pharaohs in Egypt. The quality of honey may be damaged by the following factors:

- | | |
|-------------------------------------|--|
| Excessive moisture | Ideally the moisture content of honey should be less than 17.8%. If the moisture content is too high, say greater than 20%, the honey may ferment due to yeasts in the honey. Since honey is hygroscopic (tending to absorb moisture from the air). If it is not in a sealed container, it will attract moisture from the air. |
| Excessive heat | Honey loses many of its health benefits with the combination of heat and time. The following is a rule of thumb storage time v/s temperature to retain most of its' health benefits:
40 C for 30 days
30 C for 6 months
20 C for 4 years
10 C for 35 years |
| Prolonged exposure to sunlight | Honey loses many of its health benefits with prolonged exposure to sunlight. |
| Noxious elements in its environment | Honey is hygroscopic and takes on odours from its environment. It is also acidic, so it can dissolve metal if stored in metal containers. |

- **Honey Storage Guidelines**

Store honey in a sealed non-metallic container. For normal use, store the container in a cupboard (away from direct sunlight) at room temperature (21 C). For prolonged storage of honey (> 4 years), store at refrigerator temperature (4 C).

- **Adulteration: -**

Honey is susceptible to adulteration with cheaper sweeteners; those that have been detected in adulterated honeys include sugar syrups and molasses inverted by acids or enzymes from corn, sugar cane, sugar beet and syrups of natural origin such as maple.

- **Test for purity of honey: -**

The Thumb Test:

Place a small amount of honey on your thumb and check if spills or spreads around like any other liquid. If it does, it may not be pure. Pure honey is thick while impure honey will be runny. Pure honey sticks to the surface it is applied to and doesn't drip away. Moreover, the taste of impure honey may linger due to the presence of added sugar.

The Water Test:

Take a teaspoon of the honey and put in a glass full of water. Fake or adulterated honey will dissolve in the water while pure honey which has a denser texture will settle right at the bottom of the glass as lumps. The same is the case with blotting paper or a white cloth. If you pour pure honey on the two, it will not get absorbed or leave stains.

Use vinegar:

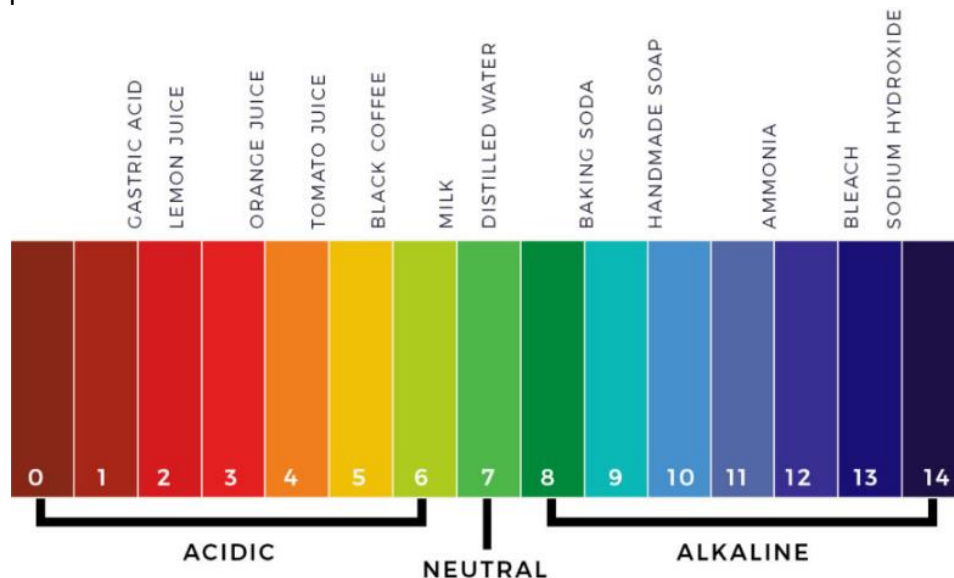
Mix a tablespoon of honey, some water and 2-3 drops of vinegar essence together. If this mixture foams up, there's a very high chance that your honey may be adulterated.

- **pH of honey is:** -pH is 3.4 to 6.1 but mostly is 3.9; 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 honey:** - 1teaspoon 21 grams give 64 calories.
- **Glycemic index & Glycemic load**

Glycemic index (GI) of honey is 58 in 1 table spoon & glycemic load (GL) is 10 but honey from different regions may vary little. So honey comes in mid-range of GI & GL & diabetic patients can use it in little quantity, usually we take honey in medicinal doses & not eat it in bulk quantity.

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

- **pH of honey: -**

The average pH of honey is 3.9, but can range from 3.4 to 6.1.

- **Gross health benefits of honey: -**

Honey offers incredible antiseptic, antioxidant and immune boosting properties for our body and gives health. It not only fights infection and helps tissue healing but also helps in reducing inflammation and is often used for treating digestive problems such as indigestion, stomach ulcers and gastroenteritis. Researchers around the world are discovering new and exciting medical benefits of honey and other healing items produced in the hive such as propolis, royal jelly and bee pollen. Honey is a bluent and an aperient. It contains detergent and tonic properties that cleanse the arteries and bowels of impurities. It opens obstructions of the liver, kidney and bladder. It is also a general preservative, and it helps to preserve the potency of other natural medicinal remedies. It also helps to break up excess moisture in the bowels, such as in diarrhea. Honey is superior to sugar in many aspects, and it is less sweet but stronger, and if taken excessively, it can be harmful to the bile, unless it is mixed with vinegar. Honey is good for the aged; it is a cough suppressant and is used in medicine to treat corrupted phlegm in the stomach and to soften the general constitution of the body. Honey is also a curative for a depraved appetite, and when taken as a drink mixed with hot water and a pomace made from sweet roses, it helps the treatment of rabies, and is considered a safeguard from further infections. Honey is also used as detoxicant for drug users, and as an antitoxin to treat accidental eating of poisonous plants of the nightshade family (*Hyoscymus niger*) or wild fungus, among others. When taken as a drink mixed with hot water only, it helps as a remedy for dog bites. As a preservative, honey can be used to preserve meat for up to three months, and is used in pickling cucumbers, squash, eggplant, and various kinds of fruits for up to six months. Known as "the trustworthy preservative", honey was also used as a principle ingredient in embalming the dead. The study on pollens and spores in raw honey (melissopalynology) can determine floral sources of honey. Because bees carry an electrostatic charge and can attract other particles from nature. Modern medicine has only recently discovered the fact that honey is a remedy to many diseases. Traditional uses of honey have included honey mixed with lemon for sore throats. Honey coats the throat and reduces throat irritation. Research has already shown that honey blocks the growth of oral bacteria. Honey has also been used for stomach pains and problems. Modern research shows that honey is effective when used in the treatment of gastric or peptic (stomach) ulcers. Research has also revealed that honey is effective in the treatment of various wounds and infections because of its antimicrobial (anti-bacterial, antiviral and antifungal) properties. Researchers are not absolutely sure why honey heals but they are learning new things about honey every day. As mentioned in the beginning, honey contains a variety of sugars and minerals. Honey is also considered an antioxidant. This means it allows the blood to circulate better and provide more oxygen to areas of the body such as the brain. Honey can also be used externally to promote healing when applied to wounds, even post-operative wounds. Honey has also been effective in its use to treat burns. It has even been shown to be low in calories and useful as a sweetener for diabetics, people with heart disease or those overweight.

- **Clinical pharmacology of honey: -**

Honey has been reported to have an inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram-positives and gram-negatives. Pathogens that are found to be sensitive to anti-infective properties of honey are manifold. Various results are in favor of its activity against *Bacillus anthracis*, *Corynebacterium diphtheriae*, *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Listeria monocytogenes*, *Mycobacterium tuberculosis*, *Pasteurella multocoda*, *Yersinia enterocolitica*, *Proteus species*, *Pseudomonas aeruginosa*, *Acinetobacter spp*, *Salmonella diarrhoea*, *Sal. typhi*, *Serratia marcescens*, *Shigella dysentery*, *Staphylococcus aureus*, *Streptococcus faecalis*, *Strep. mutans*, *Strep. pneumoniae*, *Strep. pyogenes* and *Vibrio cholerae*. Previously, a small number of case studies examining the antimicrobial activity of honey against *methicillin-resistant Staph. aureus (MRSA)* organisms demonstrated that natural honey had an antimicrobial activity against the *community-associated MRSA* organisms in *in vitro* condition. The MIC (minimum inhibitory concentration) of honey

was found to range from 1.8% to 10.8% (v/v), i.e. the honey had sufficient antibacterial potency to still be able to stop bacterial growth if diluted at least nine times, and up to 56 times for *Staphylococcus aureus*, the most common wound pathogen. It has been indicated that diluted honey treated urinary tract infections because certain bacteria causing urinary tract infections, e.g. *E. coli*, *Proteus* species and *Strep. Faecalis*, were found to be sensitive to the antibacterial activity of honey.

In vitro studies of *H. pylori* isolates which causes gastritis have been shown to be inhibited by a 20% solution of honey. Even isolates that exhibited a resistance to other antimicrobial agents were susceptible (10, 15). Unlike most conventional antibiotics, it has been reported that honey dose not lead to development of antibiotic-resistant bacteria, and it may be used continuously. There many benefits mentioned below in separate content section: -

- **Modern uses of it: -**

USES OF HONEY FOR GENERAL HEALTH: -

1. Mix honey in Luke- warm water in winter season and drink early morning and in summer mix honey in normal water and drink early morning. You can mix 1 or 3 teaspoon honey, in half cup of water & drink it twice or thrice a week.

2. Or lick honey early morning, but mixing in water is best & beneficial, can be used 1time early morning empty stomach or also at evening 6:00 pm. It can be mixed with fruit & eaten. Can be mixed in milk; twice or thrice a week & not daily. During disease you can use daily for 15 day or 1 month followed by twice a week lifelong.

USES FOR DISEASES: -

1. For throat infection, gums & teeth infection lick honey, 1 big teaspoon, 3 times a day. For all diseases mix 20 ml honey in 30 ml water and use it on empty stomach, 3 times a day keeping 8 hours interval till complete relief.

2. Honey can be mixed with fruit & eaten or honey can be mix in fresh rain water & used. For weakness in joint or body, mix honey in milk & drink. Honey has many enzymes, anti bacterial properties & many phytochemicals which are yet not discovered & have several health benefits. It is an amazing natural medicine.

- **Other uses of honey: -**

Stress / fatigue: 15 ml of bee's honey orally to reduce stress and fatigue.

Weakness: 15 ml each of bee's honey and fruit juice of *Punica granatum* twice a day before meals.

Sleep disturbance: Intake of 15 ml of bee's honey leads to sound sleep.

Eyesight: 10 ml of honey mixed with 10 ml of carrot juice and consumed regularly will improve eyesight.

Bad breath: 5 g of powdered cinnamon bark and 5ml of bee's honey mixed with water and use as a mouth wash.

Teething pain: Massage gums gently with bee's honey.

Sore throat: 5 ml of bee's honey and 10 ml of lime juice is mixed and given. Swallow the concoction (without water) every few hours until symptoms clear up. Add a pinch of black pepper to increase blood circulation to the throat.

Cold and cough: Mix 10 ml of honey with equal quantity of ginger juice and consume twice a day.

Bronchial asthma: A mixture of 2.5g of black pepper powder, 5ml each of honey and juice of ginger consumed thrice daily help to relieve the symptoms of asthma.

Hiccough: 5 ml of bee's honey is mixed with 10 ml of breast milk. *Nasya Karma* (nasal douche) is performed with this mixture in treatment of hiccough. This is used by traditional physicians of Sri Lanka.

Stomach ulcers: 5 ml of new bee's honey diluted in 10 ml of water and given twice a day before meals.

Vomiting: 2.5g each of powder of fruit of *Piper longum* and popped rice is ground with 15ml of bee's honey and given orally as an antiemetic.

Dehydration: Fresh bee's honey diluted in water is given to rehydrate.

Diarrhea: Drink 5 ml of old bee's honey thrice a day before meals.

Diarrhea/Dysentery: 15 ml of bee's honey mixed with 120 ml of decoction of tubers of *Cyperus rotundus* is given in treatment of diarrhea and dysentery.

Bed-wetting: Give 5ml of old bee's honey daily just before going to bed.

Polyuria: 5 ml of bee's honey, 20 ml of fresh juice of fruits of *Phyllanthus emblica* and 6g of pulp of *P. emblica* are mixed together and consumed twice a day.

Diabetes mellitus: 5 ml of bee's honey mixed with a pinch of powdered seeds of *Gossypium herbaceum* and is given to reduce blood sugar in diabetic patients.

Hypertension: Daily intake of 10 ml of honey mixed with 5 ml of garlic juice helps to control blood pressure.

Hemiplegia: 240 ml of bee's honey is dissolved in 960 ml of water and is boiled down to total volume of 960 ml. In Unani system of Medicine, this is known as *Mavul Asal*. 30ml of this is given twice a day during early stages of hemiplegia. This prescribed for patient suffering from hemiplegia at Ayurveda Teaching Hospital, Borella, Sri Lanka.

Obesity: Keep garlic immersed in bee's honey for one year. Then, use 1 clove of garlic daily before breakfast. This is used as a home remedy. One glass of warm water taken with 10 ml of honey and 5 ml of lemon juice in early morning reduces fat and purifies blood.

Arthritis: 30 ml each of bee's honey and coconut vinegar is mixed in 100ml of water and given twice a day to reduce arthritis and arthralgia.

Burns: Apply fresh bee's honey directly.

Cut and wounds: Apply bee's honey on cuts and wounds.

Eczema: Apply fresh bee's honey on the lesion.

Dermatitis: Bee's honey is mixed with ash obtained by burning stem of *Pterocarpus santalinus* and applied on the lesion.

Allergies due to seasons: Bee's honey should be collected from the area where the patient lives. 5ml of this honey is to be given daily before breakfast.

Sub fertility due to lack of semen: Add 5 ml of bee's honey to a glass of goat's milk and drink.

Morning sickness: 15 ml of bee's honey before breakfast.

Relief from hangover: Mix 10ml of bee's honey with half a cup of orange juice and half a cup yogurt. Blend them together properly and drink.

Jaundice, bleeding disorders: 15ml of bee's honey mixed with 120 ml of fresh juice of *Adhathoda vasica*, is given twice a day in treatment of jaundice and bleeding disorders. (60g each of fresh leaves and flowers of *A. vasica* are taken, pounded well, and fresh juice is extracted after adding 100 ml of water).

Burning sensation in the body and thirst: Unpolished rice is washed with water and 100ml of this water is taken. 15 ml of bee's honey, 5g of sugar and 10g of powder of stem of *Santalum album* are added to this and mixed well. This mixture is given twice a day after meals.

Cosmetic uses of bee's honey

Honey and beeswax are used in the beauty industry as a skin moisturizer, softener and to heal the skin tissue. Some cosmetic applications of bee's honey are given below-

Face wash: Mix a small quantity of lemon juice into 5ml of bee's honey and apply on face before washing. This is used as a home remedy.

Facial cleansing scrub: Mix 5g of almond seed powder into 5ml of bee's honey, scrub softly and then wash.

Facial to improve smoothness: A tablespoon of honey whisked together with white of an egg, 1 teaspoon of glycerin and 1/4 cup of flour makes an excellent firming mask. Just smooth on the face, leave on 15 min, and rinse off with warm water.

Facial to improve softness: Mix one or two tablespoons of honey with one-third cup finely ground oatmeal. Add a teaspoonful of rose water. Clean face thoroughly. Spread facial mixture evenly over face. Relax for 10 min to 1.5 h. Remove with a soft washcloth and warm water. Rinse with cold water.

Facial moisturizing pack: Mix 2 tablespoons of honey with 2 teaspoons of whole milk. Apply over the face and keep for 15 min. Rinse off with warm water, and then with cold water.

Pimples: Apply bee's honey on pimples.

Cracked lips: Apply bee's honey on cracked lips.

Lotion for dry patches of skin: Mix 5ml of bee's honey, 5ml of olive oil and 2.5 ml of lemon juice. Apply on skin and wash after 15 min.

Hair luster: Mix 5ml of bee's honey into 4 cups of warm water. Use as a hair rinse.

Conditioner: Mix 10 ml of olive oil into 5ml of bee's honey and apply on hair. Wash after 15 min.

USES OF HONEY FOR COMPLEXION: -

1. Wash your face with Luke warm water & take 1 tsp honey, 1 tsp lemon juice, 1 tsp rose water, 1 tsp of olive oil, 1 tsp aloe Vera juice, 1 pinch salt, 1 tsp cucumber juice, 1 tsp watermelon juice mix all & apply face pack for 15 to 20 minutes and wash the face with warm water. (Prepare the above & apply instantly, do not store)
2. Eat one banana daily with breakfast. Eat watermelon at 6:00 pm empty stomach one slice daily. Eat 1 small size cucumber daily.

USES OF HONEY ON SKIN LESIONS: -

1. Honey can be applied on burns, ulcers, diabetic ulcers & can be put in eyes for eye diseases. It can also be used for complexion with other things.

Indications: All age, all season, it can be used in all diseases.

Contents/constituents of honey: -

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.

Carbohydrates: -carbohydrate is 82% in honey. The carbohydrates present are the monosaccharides fructose (38.2%) and glucose (31%); and disaccharides (~9%) sucrose, maltose etc.

Vitamins, Minerals and Antioxidants: -

Honey contains trace amounts of the B vitamins riboflavin, niacin, folic acid, pantothenic acid and vitamin B6. It also contains ascorbic acid (vitamin C), and the minerals calcium, iron, zinc, potassium, phosphorous, magnesium, selenium, chromium and manganese, pinocembrin (is unique to honey and bee propolis), catalase.

Other compounds: -

Honey also contains organic acids such as acetic, butanoic, formic, citric, succinic, lactic, malic, pyroglutamic and gluconic acids, kaempferol, galangin, quercetin chrysin, apigenin, pinocembrin, and hesperidin), superoxide dismutase (SOD), reduced glutathione (GSH), phenolic acids (such as caffeic, p-coumaric, ellagic, and ferulic acids), butyric, capronic, palmitic, succinic, caffeic acid, p-coumaric acid, ferulic acid.

A good quality of honey may contain little amount of amino acids mentioned in table below: -

The above ingredients are based on scientific study, means these has been indentified, 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 natural pure honey and not synthetically prepared.

Active ingredient of honey: -

Is carbohydrates present in the form of monosaccharides, fructose, glucose and disaccharides, maltose, isomaltose, maltulose, sucrose and turanose and the sweetness of honey is due to presence of these ingredients.

Honey	21 gram of honey has: -	Valine(mg) (% RDI)	2 (0%)
Weight (21 grams)	1 teaspoon	Histidine(mg) (% RDI)	0 (0%)
Tryptophan(mg) (% RDI)	1 (0%)	Arginine(mg)	1
Threonine(mg) (% RDI)	1 (0%)	Alanine(mg)	1
Isoleucine(mg) (% RDI)	2 (0%)	Aspartic acid(mg)	6
Leucine(mg) (% RDI)	2 (0%)	Betaine(mg)	0
Lysine(mg) (% RDI)	2 (0%)	Glutamic acid(mg)	4
Methionine(mg) (% RDI)	0 (0%)	Glycine(mg)	1
Cystine(mg) (% RDI)	1 (0%)	Proline(mg)	19
Tyrosine(mg) (% RDI)	2 (0%)		

● **Carbohydrate:** -

It is a macronutrient needed by the body, the body receives 4 calories per 1 gram of it; carbohydrates includes 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 etc.

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

Its digestion begins in mouth; salivary glands release 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. 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.

- **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 raise 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.

- **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 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, 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 is 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; 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, 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), then 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 certain 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, cucumber 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; cucumber 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 hemoglobin (hemoglobin 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 stream through Fe+2 transporter ferroportin (this binds with transferrin & 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 transferrin (each transferrin can carry 2 atoms of iron); ceruloplasmin (protein) also helps in binding of iron; Heparin 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 hemoglobin. 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 Hemoglobin (hemoglobin 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 hemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in hemoglobin, 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.

Unbound or free iron is highly destructive & dangerous it can trigger free radical activity which can cause cell death & destroy DNA.

- **Selenium: -**

It is an essential trace mineral; it is micro nutrient helpful to our body; its symbol is Se & atomic no. 34.

Main sources of selenium: -

It is present in watermelon, fish, nuts, beef, chicken, mushroom, egg, grains, garlic, grapes etc.

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

It is mainly absorbed in duodenum & proximal jejunum by active transport process; Dietary selenium is in 2 forms organic (selenomethionine) it is 90% absorbed & inorganic (selenite) it is 50% absorbed; after absorption it is sent in liver via portal veins, liver turns it into selenite & then is bound with selenoproteins & send into blood stream, gets in RBC, muscles, tissues etc; it is not distributed evenly in the body, liver has more of it; Vitamin E & other vitamins increases its absorption & both work as an anti-oxidant. Natural selenium remains in the body for less than 24 hours; it is stored in amino acid in skeletal muscles, little in liver, kidneys & pancreas; it is primarily excreted in urine, stool & expired in air via lungs very little in sweat & semen.

Basic clinical pharmacology of selenium: -

It is important for many body functions, immune system, fertility (both male & female); it contributes in thyroid hormone metabolism, DNA synthesis; it protects the body from oxidative damages & infection, it is found in tissues, skeletal muscles; it helps testies & seminal vesicles in their function; it reduces the risk of miscarriages, liver disease, cancer, asthma, cardio vascular disease; deficiency of it causes pain in muscles & joints, weaken the hair, nails, white spots on nails are found etc.

• **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 transcellular 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 in food sources is called as exogenous zinc. Its absorption depends on 2 proteins- Albumin & metallophionein. 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. Metallophionein binds to zinc to make it unavailable & excrete it in stools when zinc is excess in the body, & production of metallophionein 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.

- **Chromium: -**

Chromium picolinate is the form of chromium commonly found in dietary supplements, it is an essential trace mineral metallic element.

Main sources of chromium: -

Broccoli, potato, green beans, beef, chicken, apples, banana, grape, cucumber, milk, dairy products.

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

It is poorly absorbed in human & rapidly excreted in urine, not much is known about its metabolism.

Basic clinical pharmacology of chromium: -

It is effective at improving insulin response & lowering blood glucose in diabetic patients. It also reduces hunger, it enhances protein, carbohydrate & lipid metabolism.

- **Kaempferol: -**

It is a natural flavonol (a type of flavonoid) it is tetra-hydroxy-flavone.

Main sources of kaempferol: -

Fenugreek seeds, green tea, grapes, tomato, broccoli, spinach, raspberries, peaches, green beans, onion, potato etc.

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

It is ingested as a glycoside, absorbed in small intestines usually by passive diffusion; it is metabolized in various parts of the body. In small intestine it is metabolized to glucuronide & sulfo-conjugate by intestinal enzymes & it is also metabolized by colon micro-flora (bacteria) which can hydrolyze the glycosides to aglycones or form simple phenolic compounds. It is mainly metabolized in liver to glucurono-conjugated & sulfo-conjugated form. It is mainly excreted in urine.

Basic clinical pharmacology of kaempferol: -

It is anti oxidant, anti inflammatory, anti microbial, anti cancer, cardio protective, neuro microbial, anti diabetes, estrogenic, analgesic, anxiolytic, anti allergic, anti viral etc.

- **Quercetin: -**

It is a plant flavonol from the flavonoid group of polyphenols; it is bitter in taste.

Main sources of quercetin: -

Red onion, green tea, apples, ginko biloba, grapes etc.

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

Its absorption, metabolism & excretion are yet not known & are under research.

Basic clinical pharmacology of quercetin: -

It is good for heart diseases, coronary heart disease, prevents cancer, arthritis, bladder infection, diabetes; it is anti oxidant, anti inflammatory, reduces benign prostatic hyperplasia, cholesterol, blood pressure, asthma, symptoms of rheumatoid arthritis.

- **Apigenin: -**

It is a natural flavonoid compound found in many fruits & vegetables serves multiple physiological functions.

Main sources of apigenin: -

It is present in onion, oranges, wheat, tea, grapes, parsley, thyme.

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

Its absorption, metabolism & excretion are yet not known & are under research.

Basic clinical pharmacology of apigenin: -

It calms the nerves, provides antioxidant effects, prevents & helps the body to fight cancer; it is anti-obesity; neuro-protective, help mood & brain function; reduces cortisol, blood sugar; improves bone, heart & skin health; promotes sleep. It is also anti bacterial, anti viral; reduces blood pressure.

- **Palmitic acid: -**

It makes up 7% to 13% of extra virgin olive oil; it is a common saturated fatty acid; it is the first fatty acid produced during lipogenesis (fatty acid synthesis) & from which longer fatty acids can be produced.

Main sources of palmitic acid: -

It is present in olive oil, flaxseed oil, soyabean oil, sunflower oil, palm oil, cocoa butter, meat, milk & etc.

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

Its absorption, metabolism & excretion are under research.

Basic clinical pharmacology of palmitic acid: -

It softens the skin & keeps it moist thus good for psoriasis & eczema. It coats the skin, it is powerful anti-oxidant; it maintains the health of hair & skin from aging, cleans them from dirt, sweat, excessive sebum (main cause of acne and boil on face & other parts of the body).

- **Pinocembrin: -**

Pinocembrin is a major flavonoid molecule, isolated from a variety of plants such as Euphorbia, Sparattosperma leucanthum, Populus, Eucalyptus, Pinus heartwood, etc. It exhibits antitumor, antimicrobial, anti-inflammatory, anticancer and antioxidant properties.

- **Catalase: -**

Catalase is a common enzyme found in nearly all living organisms exposed to oxygen (such as bacteria, plants, and animals). It catalyzes the decomposition of hydrogen peroxide to water and oxygen. It is a very important enzyme in protecting the cell from oxidative damage by reactive oxygen species.

- **Gluconic acid: -**

Gluconic acid, together with gluconolactone, is present in all honeys at much higher concentrations. Gluconic acid in honey derives from two main sources: (i) the action of bee glucose-oxidase on nectar glucose, (ii) the metabolic activity of certain *Gluconobacter* spp. bacteria (which are present in the bee's gut and during the ripening of honey), producing large quantities of gluconic acid under aerobic conditions in the presence of high glucose concentrations. Thus, part of the gluconic acid of honeys has a bacterial origin. Gluconic acid levels depend on the time needed for the total transformation of nectar into honey; the larger the amount of glucose-oxidase added by the bees, the larger the amount of gluconic acid will be synthesized. Its activity is under research & not known fully.

- **Acetic acid, formic acid, Citric acid, succinic acid present in honey: -**

These acids are present naturally in all types of honey & it prevents honey bee colony (hive) from many mites infection like *Varroa jacobsoni*, one of the most common and dangerous mites in colonies of honey bee and can cause the death of untreated bee hives in a few years. They have anti bacterial, anti viral & antifungal properties. Succinic acid is a dicarboxylic acid with the chemical formula $(CH_2)_2(CO_2H)_2$. The name derives from Latin *succinum*, meaning amber.

- **Lactic acid in honey: -**

The lactic acid bacterial microbiota is of great importance to the honeybee health, protecting them against bee pathogens [73, 74] and contributing to the antimicrobial properties of honey [71]. Lactic acid bacteria are found in two distinct phyla: Firmicutes and Actinobacteria.

- **Malic acid: -**

Malic acid is a substance found naturally in apples and pears. It's considered an alpha-hydroxy acid, a class of natural acids; Malic acid is found in fruits and vegetables and is produced naturally in the body when carbohydrates are converted into energy. It is good for skin care & complexion that's why it is used in cosmetics & skin care products, Malic acid is a precursor to citrate, a substance believed to prevent calcium from binding with other substances in urine that form kidney stones. Malic acid in combination with magnesium helped alleviate pain and tenderness in people with fibromyalgia.

- **Pyroglutamic acid: -**

Pyroglutamic acid is a ubiquitous but little studied natural amino acid derivative in which the free amino group of glutamic acid or glutamine cyclizes to form a lactam. The names of pyroglutamic acid conjugate base, anion, salts, and esters. It is said to help stimulate cognitive function.

- **Chrysin: -**

Chrysin, also called 5,7-dihydroxyflavone, is a flavone found in honey, propolis, the passion flowers, *Passiflora caerulea* and *Passiflora incarnata*, and in *Oroxylum indicum*. It is extracted from various plants, such as the blue passion flower (*Passiflora caerulea*). It is used for bodybuilding; for treating anxiety, inflammation, gout, HIV/AIDS, erectile dysfunction (ED), and baldness; and for preventing cancer. It increases the male hormone called testosterone and improves bodybuilding results, but yet to prove.

- **Pinocembrin: -**

Pinocembrin is a major flavonoid molecule, isolated from a variety of plants such as *Euphorbia*, *Sparattosperma leucanthum*, *Populus*, *Eucalyptus*, *Pinus heartwood*, etc. It exhibits antitumor, antimicrobial, anti-inflammatory, anticancer and antioxidant properties.

- **Hesperidine: -**

Hesperidin, a flavanone glycoside, is a natural phenolic compound with a wide range of biological effects. Mounting evidence has demonstrated that hesperidin possesses inhibitory effect against development of neuro-degenerative diseases.

- **Caffeic acid:** -

It is 3-4 dihydroxycinnamic acid; it is a type of polyphenol; It is an organic compound that is classified as hydroxycinnamic acid; it is present in all plants; it is a strong antioxidant, anticancer, beneficial in dementia & anti inflammatory, antiviral, boosts athlete performance, reduces blood glucose in diabetes, and reduces aging. It is present coffee, turmeric, thyme, cabbage, apple, mushroom, olive oil etc. Every less is known about it yet.

- **p-coumaric acid:-**

p-Coumaric acid is a hydroxycinnamic acid, an organic compound that is a hydroxy derivative of cinnamic acid. There are three isomers of coumaric acid—*o*-coumaric acid, *m*-coumaric acid, and *p*-coumaric acid—that differ by the position of the hydroxy substitution of the phenyl group. *p*-Coumaric acid is the most abundant isomer of the three in nature. *p*-Coumaric acid exists in two forms *trans-p*-coumaric acid and *cis-p*-coumaric acid. It is present in dates, peanut, garlic, tomato, basil, beans, honey, vinegars, barley grains, bread, flex seeds. It is a strong anti inflammatory, best for arthritis, antioxidant, liver & kidney protective.

- **Ferulic acid:** -

It is a hydroxycinnamic acid, an organic phenolic compound; it is antioxidant & used in skin care products, it reduces spots, wrinkles; it is anti-ageing, anti hypertensive, anti diabetic, helpful in cardiovascular diseases, Alzheimer's etc. It is mainly present in bran, oats, rice, eggplant, citrus, apple seeds etc.

- **Butyric acid:** -

Natural butyric acid present in honey prevent mites & viral infections among the bees; it is also artificially used as a mite repellent in honey hive by honey harvester.

- **Capronic acid:** -

Hexanoic acid, also known as caproic acid, is the carboxylic acid derived from hexane. It is a colorless oily liquid with an odor that is fatty, cheesy and waxy in honey.

- **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 acid (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, relieves insomnia, reduces anxiety, depression, migraine, OCD, helps immune system, reduces cardiac spasms, improves sleep pattern 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 hemoglobin 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, soybean, 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.

- **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 act 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 acids 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.

- **Main chemical structures of honey: -**

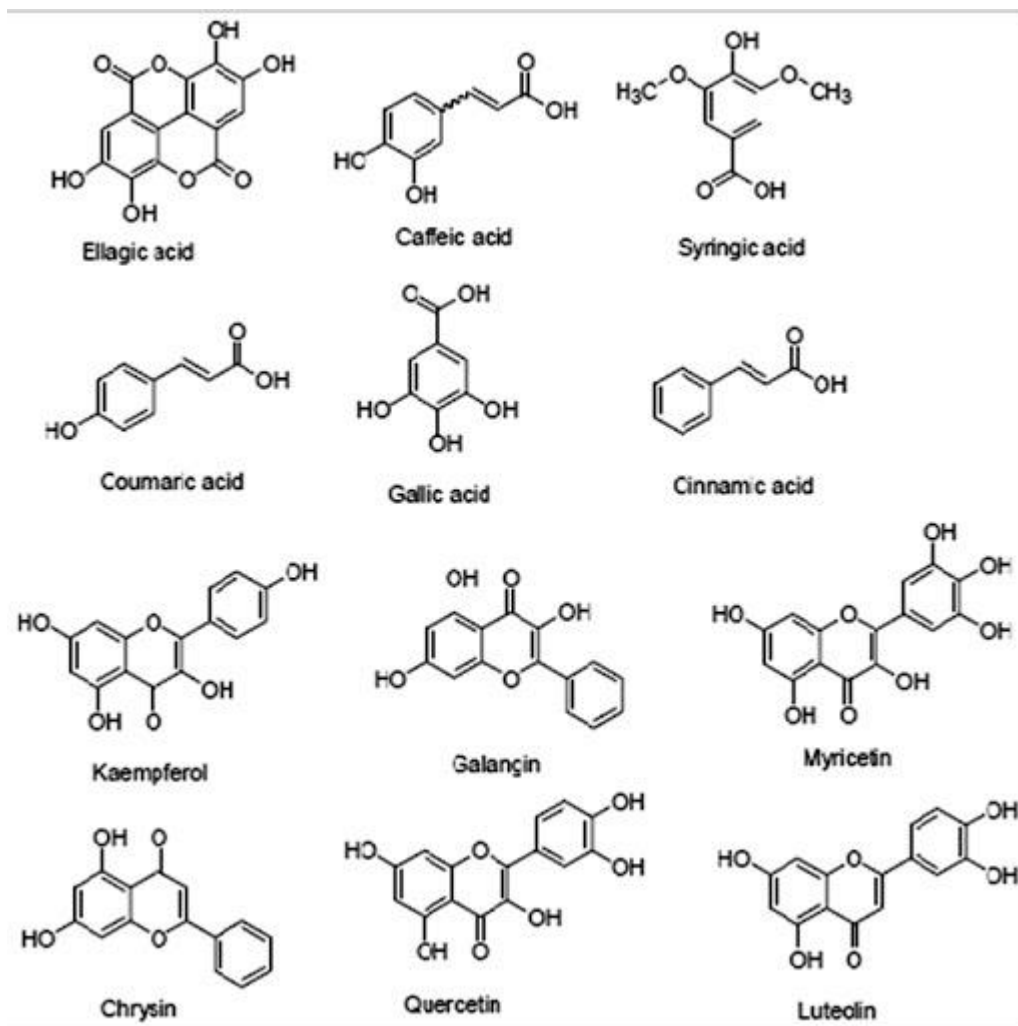
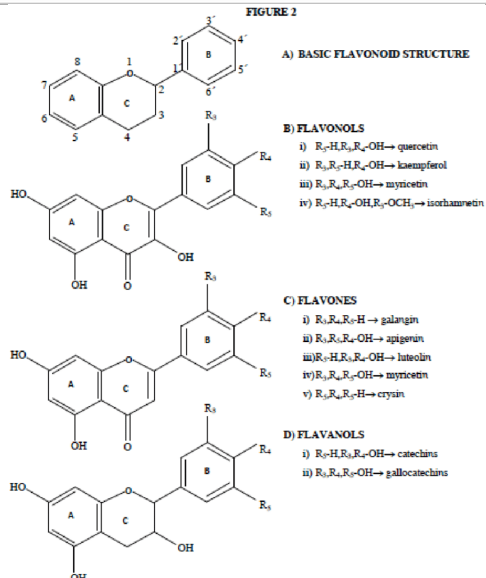
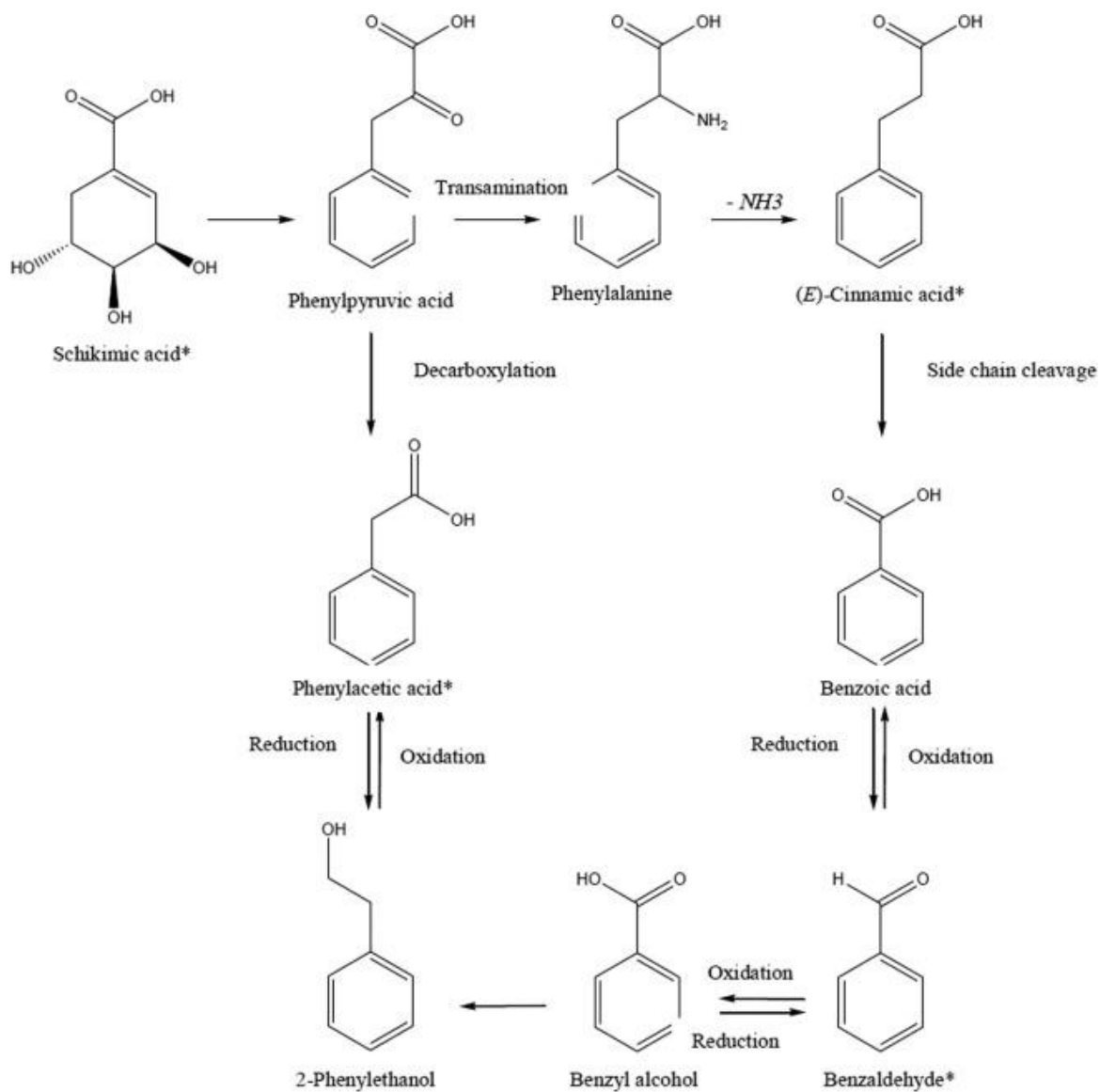


FIGURE 2





Honey	
Nutritional value per 100 g	
Energy	300 kcal 1270 kJ
Carbohydrates	82.4 g
- Sugars	82.12 g
- Dietary fiber	0.2 g
Fat	0 g
Protein	0.3 g
Water	17.10 g
Riboflavin (Vit. B2)	0.038 mg 3%

Niacin (Vit. B3) 0.121 mg	1%
Pantothenic acid (B5) 0.068 mg	1%
Vitamin B6 0.024 mg	2%
Folate (Vit. B9) 2 µg	1%
Vitamin C 0.5 mg	1%
Calcium 6 mg	1%
Iron 0.42 mg	3%
Magnesium 2 mg	1%
Phosphorus 4 mg	1%
Potassium 52 mg	1%
Sodium 4 mg	0%
Zinc 0.22 mg	2%

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- **Research:-**

SCIENCE & HADEES REGARDING HONEY: -

Honey offers incredible antiseptic, antioxidant and immune boosting properties for our body and gives health. It not only fights infection and helps tissue healing but also helps in reducing inflammation and is often used for treating digestive problems such as indigestion, stomach ulcers and gastroenteritis. Researchers around the world are discovering new and exciting medical benefits of honey and other healing items produced in the hive such as propolis, royal jelly and bee pollen. Honey is abluent and an aperient. It contains detergent and tonic properties that cleanse the arteries and bowels of impurities. It opens obstructions of the liver, kidney and bladder. It is also a general preservative, and it helps to preserve the potency of other natural medicinal remedies. It also helps to break up excess moisture in the bowels, such as in diarrhea. Honey is superior to sugar in many aspects, and it is less sweet but stronger, and if taken excessively, it can be harmful to the bile, unless it is mixed with vinegar. Honey is good for the aged; it is a cough suppressant and is used in medicine to treat corrupted phlegm in the stomach and to soften the general constitution of the body.

Honey is also a curative for a depraved appetite, and when taken as a drink mixed with hot water and a pomace made from sweet roses, it helps the treatment of rabies, and is considered a safeguard from further infections. Honey is also used as detoxicant for drug users, and as an antitoxin to treat accidental eating of poisonous plants of the nightshade family (*Hyoscyamus niger*), or wild fungus, among others. When taken as a drink mixed with hot water only, it helps as a remedy for dog bites. As a preservative, honey can be used to preserve meat for up to three months, and is used in pickling cucumbers, squash, eggplant, and various kinds of fruits for up to six months. Known as "the trustworthy preservative", honey was also used as a principle ingredient in embalming the dead.

The study on pollens and spores in raw honey (melissopalynology) can determine floral sources of honey. Because bees carry an electrostatic charge and can attract other particles from nature.

Modern medicine has only recently discovered the fact that honey is a remedy to many diseases. Traditional uses of honey have included honey mixed with lemon for sore throats. Honey coats the throat and reduces throat irritation. Research has already shown that honey blocks the growth of oral bacteria.

Honey has also been used for stomach pains and problems. Modern research shows that honey is effective when used in the treatment of gastric or peptic (stomach) ulcers. Research has also revealed that honey is effective in the treatment of various wounds and infections because of its antimicrobial (anti-bacterial, antiviral and antifungal) properties. Researchers are not absolutely sure why honey heals but they are learning new things about honey every day. As mentioned in the beginning, honey contains a variety of sugars and minerals. Honey is also considered an antioxidant. This means it allows the blood to circulate better and provide more oxygen to areas of the body such as the brain. Honey can also be used externally to promote healing when applied to wounds, even post-operative wounds. Honey has also been effective in its use to treat burns. It has even been shown to be low in calories and useful as a sweetener for diabetics, people with heart disease or those overweight.

- **CONCLUSION OF RESEARCH: -**

1. Honey is all time best remedy for all diseases, can be licked or taken mixed in water, warm water, milk or add in medicines, best if used with Quranic verses, best time to take is empty stomach early morning, can be taken with fruits, excessive boiled water (reduced to 1/3) mixed with honey is best for some kidney disorders, can be taken by alone or with fruits etc.
2. It has many important constituents which gives instant energy; it has many compounds which are yet to be discovered; it has curative, preventive, healing properties; can used in all season, all age in medicinal dose only.