

Honey: Folklore Treatment in Modern Medicine

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Although many people recognize the nutritional properties of honey, not many realize that there is much more to honey than meets the eye. Honey use goes back to prehistoric times, bees and honey played an important role in ancient civilizations. One of nature's oldest medicines, a sweet food produced by honeybees. They suck up nectar from flowers or other sweet saps found in living plants, store the nectar in their honey sac, and enrich it with some of their own substances to induce changes. When the bees return to the hive, they deposit the nectar in honeycombs for storage and ripening. The composition of honey is excellent, almost 180 elements of high biological value essential for the human body have been already discovered. Modern scientist discovered that honey has unique healing powers. Scientists of today also accept honey as a very effective medicine for all kinds of diseases, if taken in the right dosage as a medicine. It can be used as an antioxidant, has antimicrobial, antibacterial and antifungal properties. Honey offers so many benefits to be enjoyed by mankind.

Introduction

Honey is produced in most of the countries of the world. It is a sweet food made by insects using nectar from flowers¹. The majority is produced by honey bees. Honey bees form nectar into honey by a process called regurgitation, and store it as a food source in honeycombs, inside the beehive¹. Bees practices encourage overproduction of honey, so that the excess can be taken without endangering the colony.

The honey bee life cycle

There are three classes of honey bees: queen, which produce eggs and honey; drones or males, which mate with new queens and have no stinger; and workers, which are all non-reproducing females². The queen lays eggs singly in cells of the honeycomb. Larvae hatch from eggs in three to four days. They are then fed (with pollen and nectar) by worker bees and develop through several stages in the cells. Cells are capped by worker bees, when the larvae pupates. They also build up the honeycomb, clean the hive, store pollen, make honey, guard the hive, and collect pollen or nectar². Queens and drones are longer than workers and so require larger cells to develop². A colony may typically consist of tens of thousands of individuals.

Development from egg to emerging bee varies among queens, workers and drones. Queens emerge from their cells in 16 days, workers in 21 days and drones in 24 days³.

Only one queen is usually present in a hive, and all she does is lay eggs. Queens can live for several years.

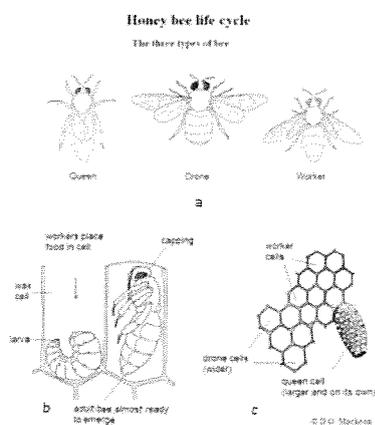


Fig. 1. Honey bee life cycle.

a) The honey bee community consists of three structurally different forms, queen (reproductive female), drone (male) and the worker (no reproductive female).

b) Eggs are laid singly in a cell in a wax honeycomb, produced and shaped by the worker bees.

c) Queen cells are larger and on its own, compared to drone (medium size) and worker cells (small size).

Nectar, a sugar-rich liquid produced by plants, is what a worker bee uses to make honey³. When she gets to a flower, she drinks as much nectar as she can hold. Then she passes the nectar to another worker bee (who holds the nectar on her tongue), so water in it can evaporate. When most of the

water has evaporated, the sweet nectar becomes honey, which is stored in the hive. Besides collecting nectar, the worker bee helps the flowers at the same time, by collecting pollen. They need to transport pollen from one plant to another plant. Once the pollen are transferred to another plant, the flower can produce new seeds. When a working bee visits a flower to get nectar and pollen, it has to get really deep in the flowers to reach its foods. While she is doing this, she gets the dusty pollen all over her body. When she flies to the next flower, some of the pollen falls off. Bees and flowers help each other³.

Honey is created by bees as a food source, pollen are providing fertilization and sexual reproduction of flowers.

Nectar is derived from Latin *nectar* "drink of the Gods", which in turn has its origin in the Greek language⁴. Nectar is an important item, the sugar source for honey. It is also used in agriculture and horticulture, because the adults stages of many predatory insects, as well as hummingbirds and butterflies, feed on nectar⁴.

Honey producing countries

The largest honey producers of the world, for the period 2002-2007 were, in descending order: China, Argentina, Turkey, the USA and Ukraine⁵. In international terms, China is currently by far the world's largest producer of honey, with approximately 245,141 in tons, accounting for over 18,6 % of world output. The largest amount of honey in Europe is produced in Turkey and Ukraine. In the Arab Countries, Egypt leads in production of honey⁶. Mexico, in North America is also considered a important producer of honey⁷. United States and Germany are the biggest importing countries of

Top Five Honey Producers	
Country	Production (%)
 China	18,60
 Argentina	6,44
 Turkey	5,96
 United States	5,78
 Ukraine	4,93
Total production of 5 leading countries	41,71
World honey production	100

Table 1. Total Production of honey. Today, the honey production is estimated at about 1,4 million tons, which is less than 1% of the total sugar production. China is the leader in honey production and honey export, followed closely by Argentina. Mexico, India and Russia are considered as important producers of honey. Also starting to emerge onto the world honey production arena are Brazil and especially in

Honey composition

Today, honey is considered as a high value nutritional food and as a natural tonic for the human body⁸. Almost 180 elements of high biological value essential for the human body have been detected. It contains small amounts of proteins, enzymes, amino acids, minerals, organic acids, vitamins, aroma substances and other substances⁸. However, it has long been known that honey differs not only in color,

aroma, and in flavor, but also in chemical biological, and curative properties. The chemical composition of honey depends in a certain measure on the plants from which they are collected and even on the soil on which the plants grow.

Honey is nature's original sweetener. It has been used as a for at least six thousand years and for much of that time was the sole source of sweet for much of the world's population. At first approximation, honey is a supersaturated sugar solution. However, honey is much more than that. It's unique, through variable combination of components makes honey a prized addition to the diet. Virtually all honey derives from nectar, a derivative of aqueous solution that is expressed from specialized cell groups called, nectaries. Nectar is an aqueous solution of sugars, amino and other acids, protein, lipids, minerals and other components. The exact composition of nectar varies tremendously, depending on the plant species and the environmental conditions. The sugar content can range from 5 till 80 percent of nectar⁹.

The types of sugar can also vary; typical sugars are sucrose, fructose and glucose⁹. In many nectars, sucrose is the main or exclusive sugar, while in some nectars sucrose, glucose, and fructose are present in roughly equal quantities. Some other sugars are rarely found. The liquid contains mainly sucrose, so a chemical change must occur to produce glucose and fructose in the nectar. These chemical changes are mediated by transglucosidases and transfructosidases that are found in the nectaries.

Honey contains also a great amount of water, approximately 17 percent. Amino acids are also found in nectar, but at low quantities, typically 0,002 till 4,8 % of the total solids in the nectar¹⁰. This is usually too low to be considered a viable source of amino acids for honeybee dietary needs; bees typically meet their protein needs from pollen. The variety of amino acids are alanine, argin, serine, proline, glycine, isoleucine, threonine, valine, leucine, glutamic acid, cysteine, phenylalanine, tyrosine, tryptophan, lysine, glutamine, aspartic acid, asparagine, methionine, and histidine¹⁰.

The composition of Honey Energy 1,272 kJ (304 kcal)			
Compound	Amount	Compound	Amount
Carbohydrates	82.4 g	Water	17.10 g
Sugars	82.12 g	Riboflavin (Vit. B ₂)	0.038 mg
Dietary fiber	0.2 g	Niacin (Vit. B ₃)	0.121 mg
Fat	0 g	Iron	0.42 mg
Protein	0.3 g	Magnesium	2 mg
Vitamin B ₆	0.024 mg	Vitamin C	0.5 mg
Ascorbic acid	1 mg	Calcium	6 mg
Phosphorus	4 mg	Potassium	52 mg
Sodium	4 mg	Zinc	0.22 mg

Table 2. A standard composition of Honey. Nutritional value per 100 gram. Source: USDA Nutrient database.

Other components of nectar include lipids, organic acids (incl. Ascorbic acid, vitamin C), and minerals. The exact composition of the nectar has a definite impact on the flavor and quality of the finished honey. Although it is impossible to force bees to visit a particular nectar source, it is not uncommon to locate beehives near a large quantity of one type of flowering plant.

Most of the carbohydrates in honey are monosaccharides, with more fructose than glucose¹¹. At a distant third place is sucrose; other disaccharides present in honey, although in very small quantities, are maltose, isomaltose, nigerose, turanose, and maltulose¹¹. At about 1% or less of the total sugars, a small quantity of higher sugars, oligosaccharides, and dextrans are also present in honey. Honey is deceptively acidic, as the high sugar content tends to mask the acidity in

the taste. The average pH of honey is 3.9, which is equivalent to an 0,0001 M aqueous solution of a strong monoprotic acid. It was originally thought that formic and citric acids were the dominant acids in honey. However, it is now understood that gluconic acid is the predominating acid in honey, produced by glucose oxidase. Other acids that have been identified are acetic, butyric, citric, formic, lactic, maleic, malic, oxalic and succinic acid¹¹. The mineral content of honey has a 50-fold range of values, the largest of any components. The minerals found in honey are Potassium, sulfur, chlorine, calcium, phosphorus, magnesium, sodium, iron, copper, and manganese¹². Trace elements found in honey include chromium, lithium, nickel, lead, tin, and zinc. Honey contains small but detectable quantities of vitamins, riboflavin, pantoic acid, niacin, thiamin, pyridoxin and ascorbic acid¹². However, honey should not be considered good sources of vitamins, as the concentration of many are described as a low concentration.

The most prominent enzymes in honey are α -glucosidase (invertase or saccharase), α - and β -amylases (diastase), glucose oxidase, catalase and acid phosphatase¹². Honey is a fascinating food. Although it can be characterized as an impure, supersaturated sugar solution, the chemistry of honey is more than that. Their variability in color, aroma and flavor make sampling different honeys an educational and tasty, and potentially sticky experience.

History of Honey

From the ancient times up to this day, honey has been always considered a natural kind of food with great nutritional value for the human body. In Egypt, recently, a 3500 B.C old papyrus was found in excavations, and mentions honey as medicine for dozens of diseases¹³. In Ancient Egypt, honey was also often used to sweeten cakes and biscuits, and was used in many other food. According to Zohary and Hopf, the earliest archeological evidence about honey has been found in several sites from ancient Egypt, including Tutankhamen's tomb¹³. Although its exact role in Egyptian culture is unknown, it is known that items entombed with a pharaoh were carefully selected to assist him in the afterlife. There were only a few medicines in Ancient Egypt which did not contain honey¹⁴. The bee (its producer) occupies a prominent place in all hieroglyphic writings¹⁴.

The Egyptian papyrus especially praised its medicinal value. According to the most ancient source of knowledge, honey was not only a staple commodity but a popular medicine, extensively used internally and also externally in surgical dressings for burns, ulcers and preeminently for weakness and inflammation of the eyes¹⁵. Laxative and worms remedies of ancient Egypt without exception contained honey. Milk and Honey was their choice for infant feeding¹⁵. Most prescriptions of the papyrus were taken to Greece. Our Greek ancestors believed that Gods were nourished with honey. From a legendary ancient Greek, Homer to Hippocrates, as well as Pythagoras and Aristotle, honey is mentioned as a high value food with qualities contributing to organisms good health. The Father of Medicine 'Hippocrates' from Greece (462-352 B.C) was suggesting honey to patients, with a great part of beneficial ingredients¹⁶. Hippocrates van Kos was a great believer in honey. He considered it a very good expectorant. According to Hippocrates, honey combined with other things was good for nourishing and to induce a good complexion, but eaten alone it attenuates rather than refreshes, because it provokes urine and purges too much¹⁶. Hippocrates recommended honey for difficulty in breathing, it causes spitting. He alleged that if seeds of cucumbers and other plants are first soaked in honey and then planted, the fruit that growth of them will taste sweeter¹⁶. Pedanius Dioscorides, an ancient Greek who practiced medicine in ancient Rome, also describe honey as a powerful medicine. He had the opportunity to travel extensively seeking medicinal substances from all over the Roman and Greek world¹⁷.

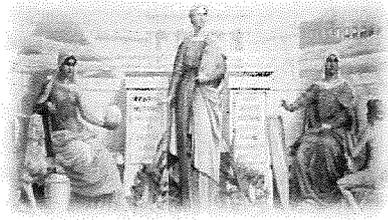


Fig. 2. From Egypt to Greece and Rome. Science and Medicine went from Egypt to Greece and, was then spread to Rome (Italy). In the background a Pyramid (left), the Parthenon (center) and the Colosseum (right), representing the three civilizations of Egypt, Greece and Rome. After the fall of the West Roman Empire, the Arabic World protected the knowledge of medicine from the Greek empire. Greek, Indian and Persian knowledge was

collected and translated into Arabic. The early scholars accumulated the greatest body of scientific knowledge in the world, and they built on it through their own discoveries.

In the Roman Empire, honey was possibly used instead of gold to pay taxes ¹⁷. Pliny the Elder devotes considerable space in his famous *Naturalis Historia* to the bee and honey, and its many uses. Pliny also credited honey in which bees have died with the faculty of relieving of sight and hearing ¹⁷. In antiquity, honey had a great reputation in producing clearer vision, which may be the reason for its reputation of endowing the power of divination, improving thus not only the physical, but also the spiritual sight. Like his famous predecessors Hippocrates, Dioscorides and Pliny, Avicenna also discovered the importance of honey. Avicenna recommended honey in the treatment of tuberculosis ¹⁸.

Honey is not only the sweetener of choice, but it is also considered by Avicenna "the food of foods, the drink of drinks and the drugs of drugs." The most well-known herbal formulas of Avicenna, called *jawarish*, are ground and sifted, and preserved in a honey base ¹⁸. The flower of medieval Arabic culture and learning was Ibn Sina, known to the West as Avicenna, called "The Prince of Physicians and Philosophers" by his contemporaries, he was the towering genius of Islamic civilization. Master of many fields, but his contribution to medicine was excellent.

The Arabs were the last stepping stone before honey invaded Europe (through crusades) from the East, where they are still used today ¹⁹. In the Middle Ages honey was used as an excellent energy food and, up to the introduction of cane sugar, served as the only food sweetener. Likewise being enjoyed as honey, it is used in baking (honey cookies, etc.) or in the manufacturing of alcoholic beverages by mixing with alcohol ¹⁹. On the entire European Continent it was popular in use, especially among Slavic and Nordic races. In the *Eddas*, we find that life of Liabsburg, the mother of Saint Lindgar, was saved with a spoonful of honey (honey liqueur wine) ¹⁹. Preparations containing honey, in combination with milk and cereals were processed for children.

In most ancient scripts we already find references of honey as a glorified food, an ingredient of favored drinks and a popular medicine. The oldest mythologies praised the invigorating and health-giving qualities of honey.

In ancient China honey was used only as a component of diets and as a medicine ²⁰. The Chinese never utilized honey as a sweetening substance. China is the native land of sugar cane, and for this reason bees were rarely cultivated ²⁰.

However, the Chinese used it to neutralize toxins and relieve pain, throat stomach ulcers, high blood pressure, and constipation ²⁰. The Maya civilization used honey from the stingless bee for culinary purposes and also regard the bee as sacred ²¹. Archeologists showed that honey collection is an

ancient activity. Honey is not only just a natural sugar substitute, but also certain strains of honey can actually help to heal wounds and kill bacteria²¹. Honey has been used to prevent and cure illness for centuries. It is well-documented that humans began hunting for honey early in history.



Fig. 3. Chinese and Maya civilization. The Maya civilization is a very old culture in Mesoamerica. China is one of the world's oldest continuous civilization and for most of the last two millennia was one of the largest and most advanced civilizations in the world, until 1850s, when it missed the industrial revolution.

Honey and Religion

The Bible, the Tenach and Qur'an, the sacred books of India, China, Persia and Egypt, all speak of honey in laudatory terms, as a food, beverage and medicine. In Jewish tradition, honey is a symbol for Rosh Hashana²². Rosh Hashana is commonly known as the Jewish New Year. They use apple slices to dab in honey, and they are then eaten to have a sweet New Year to come.

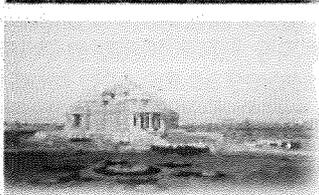
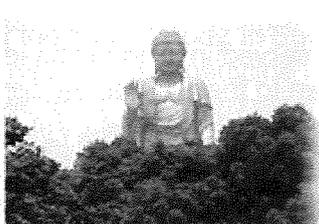
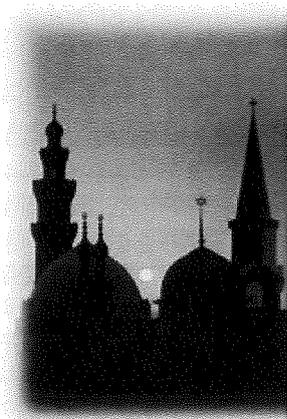


Fig. 4. The Holy City, Jerusalem. Jerusalem (left) plays an important role in Judaism, Christianity and Islam. In The Holy City sometimes synagogues, churches and mosques are found together in one place. In Asian countries a statue of Buddha (right, up) is often used, to represent their religion (Buddhism) clearly. In India amazing temples are mostly found, refer to Hinduism.

In Hebrew Bible many references are found related to honey. The Tenach, is a name used in Judaism for the Canon of the Hebrew Bible.

The Hebrew Bible describes the promised land as " a land flowing with milk and honey " [33:3]²². On the first day of a boy's enrollment in chadar, or religious school, letters from the Talmud (second source for Jewish knowledge) would be written in honey on a slate and licked off by the new boys so as to make their learning sweet²².

In the book of Judges, Samson found a swarm of bees and honey in the carcass of a lion [14:8]²³. However, the claim has been advanced that the original Hebrew (devash) actually refers to the sweet syrup produced from the juice of the date. In addition, The Jews advocated honey as a producer of intellect²³. It was supposed to make one mentally stronger. Moses , when exposed in the fields, sucked honey from a pebble (Exodus 23:8)²³. Subsequently, Solomon's Proverbs mentioned: My son, eat your honey, for it is good [24:13]²³

The resuscitating and invigorating effects of honey are also disclosed in the Bible. Further, Jonathan, the son of Saul, had his eyes enlightened with the aid of honey²³. While Jonathan was

passing through the woods during the war against Philistines, he found also honey dropping on the ground. He plunged his spear into it, and ate enough to restore his lost strength. However, he died on the battle field²³. Christians believe he was sentenced to death, because he ate honey on the day of Abstinence. In the Christians New Testament, John the Baptist is said to have lived for a long period of time in the wilderness on a diet consisting of locusts and wild honey [Matthew 3:4]²⁴.

In Islam, it is regarded as one of the greatest forms of healing medicine available. Islam is the religion articulated by the Qur'an, a religious book considered by its adherents to be the verbatim word of the single incomparable God (Allah), and by the Islamic Prophet Muhammad's demonstrations and real-life examples (called the Sunnah, collected through narration of his companions in collections of Hadith).

The Holy Book of Islam, The Qur'an describes honey as followed: And your Lord taught the bee to build its cells in hills, on trees and in men's habitations. Then eat of all fruits, and follow the ways of your Lord. There comes forth from their bellies, a drink of varying color, wherein is healing for mankind. Verily, in this is indeed a sign for people who think. [16: 68-69]²⁵. The various colors refers to the diversified colors of honey. This entire chapter (16) in the Qur'an is called al-Nahl (The Honey Bee). Not only does the Qur'an promote honey as a nutritious and healthy food, it also describes that it is the female bee who creates honey within her stomach.

In addition, the Prophet Muhammad said: Honey is a remedy for every illness of the body and the Qur'an is a remedy for all illness of the mind, therefore I recommend to you both remedies, the Qur'an and honey [Al-Buchari]²⁵.

The Prophet has also told us the healing found within honey for a variety of medicinal problems, including stomach ailment. It is reported that a man came to the Prophet, because his brother had a stomach disorder. The prophet said: „ let him drink honey ". The man returned a second time, complaining that no improvement happened in his brother's case, and again the Prophet responded: „ let him drink honey ". The man returned again, and said: I have done that, but to no avail. Thereupon the Prophet responded: God (Allah) has said the truth, but your brother's stomach has told a lie. Let him drink more honey. He drank it and was cured. [Al-Buchari]²⁵. According to both narrations, the Prophet Muhammad strongly recommended honey for healing purposes. In another narration originating from the words and deeds of the Islamic Prophet, he said: make use of the two remedies, honey and the Qur'an [At-Tirmidhi]²⁶. De last prophet of the Islam used to like sweet and honey. And mentioned healing is found in three things: A gulp of honey, cupping and branding with fire (cauterizing), but he forbids his followers to use cauterization²⁶.

The largest group, Hindus are using honey widely as an offering to God. In Hinduism, honey (Madhu) is one of the five elixirs of Immortality (Panchamrita)²⁷. In temples, honey is poured over the deities in a ritual called, Madhu Abhisheka²⁷. The scholars and other ancient literature mention the use of honey as a great medicinal and health food. The followers of Buddha are celebrating (festival) with honey, in India and Bangladesh²⁷. Moreover, the day commemorates Buddha's making peace among his disciples by retreating into the wilderness²⁷. The legend, while he was in the wilderness, a monkey brought him honey to eat. On Madhu Purnima, Buddhists remember this act by giving honey to monks. The monkey's gift is frequently depicted in Buddhist art.

Honey, a traditional medicine

Honey has long been touted as an all-purpose panacea. Some cultures believed honey had many practical health uses. It was used as an ointment for rashes and burns, and used to help soothe throats when no other medical practices were available. Honey is used as a sweet spread for bread and for making cookies, gingerbread and other baked products. In the Middle East, Arabs use honey mixed with water or lemon²⁶. Honey has also been used for stomach pains and problems. They use honey also in combination with dates²⁸. The Arabs recommended honey not only as a wholesome food, but as a useful diuretic, a laxative, an excellent remedy for various distempers, particularly those occasioned by phlegm, and also as a substance greatly assisting labor pains. In surgical dressings and skin diseases it was a remedy of first choice²⁴. The Syriac Book of Medicine recommends a handful of bees roasted in a oil as a remedy to turn gray hair into black²⁵. This ancient book of medical knowledge contains three hundred recipes in which honey is an important ingredient.

The ancient Hindus had great faith in the medicinal virtues and magic properties of honey, especially of aged honey. Anyone who eats honey for his daily breakfast, will be free from all diseases throughout his lifetime²⁶. It must heal in a safe, quick and pleasing manner, and all this could be best accomplished with honey. They used it mainly for cough, pulmonary troubles, gastric and bilious disorders²⁹. The Hindu priesthood had to obtain from meat, women, perfumes and honey²⁹. Also they believed that people who are fared became more congenial and affectionate. They considered honey a cure for a sour disposition and bitter feelings. The smallpox patients were anointed with honey³⁰.

In some parts of Greece and Italy, it was formerly the custom for a bride to dip her fingers in honey and make the sign of the cross before entering her new home³⁰. The French consider not only honey, but also the sting of the bee as a powerful aphrodisiac³⁰. Honey and dead bees are used for growing hair. The bees dead in combs, and when they are through dry, they mingle the powder with honey, in which they died. In Africa they recommended raw honey as a laxative cure and boiled honey as a cure for diarrhea³⁰.

Honey, Health and Modern Science

Honey has been used for medicinal purposes for centuries, both as a herb and pressed into oil, in Asia, South and North America, Middle East, Africa and Europe. It has been traditionally used for a variety of conditions and treatments related to respiratory health, stomach and intestinal health, kidney and liver function, circulatory and immune system support, as analgesic, anti-inflammatory, anti-allergic, antioxidants, anticancer, antiviral and for general well-being. Modern medicine research has only recently discovered the fact that honey is a remedy to many diseases. The rapid assimilation of invert sugars which honey contains makes it, for instance, a desirable source of quick energy, a practical food and, at the same time, an effective heart stimulant³¹. Thus it allows the blood to circulate better and provide more oxygen to areas of the body, such as the brain. Honey is also considered an antioxidant³¹.

Antioxidants are nutritive and nonnutritive agents that can retard biologically destructive chemical reactions in foods and living organisms. These compounds are thought to protect humans from disease, in part, through their ability to scavenge oxidants and free radicals, absorbing molecular damage that might otherwise compromise the function of essential lipids, proteins, and nucleic acids. Honey contains flavanoids such as rhamnetin, kaempferol, naringenin, quercetin and apigenin. Throughout evolution, plants and animals have been constantly exposed to oxidative

stress, and proteins. For Example, humans synthesize the antioxidant enzymes Cu-Zn superoxide dismutase (SOD), Mn-SOD, glutathione peroxidase, and catalase, and they can incorporate dietary antioxidants such as plant phenolic antioxidants and increase plasma antioxidant capacity

³²

Honey enhances memory, heals wounds and burns ³². Learning and memory are closely related to one another, but the terms are not interchangeable learning refers to the process by which behavior can be changed as a result of experience or practice. Memory refers to the ability to recall things that have been learned. Ancient civilizations have noted that eating honey regularly improves memory. Honey has choline, which is the precursor of acetylcholine, the memory molecule, and sphingomyelin. Honeybee brain contains nicotinic and muscarinic cholinergic receptors (such as atropine) cause amnesia and drugs inhibiting cholinesterase (such as physostigmine) building acetylcholine improves memory. Patients with Alzheimer's disease, suffer from impaired cholinergic transmission and benefit from cholinesterase inhibitors such as tacrine.

Honey has a well-established usage as a wound dressing in ancient and traditional medicine. In recent times this has been rediscovered, and honey is in fairly widespread use a topical antibacterial agent for the treatment of wounds, burns, and skin ulcers, with many reports of its effectiveness. The observation recorded are that inflammation, swelling and pain are quickly reduced, unpleasant odors cease, sloughing of necrotic tissue occurs without the need for debridement, dressings can be removed painlessly and without causing damage to re-growing tissue, and healing occurs rapidly with minimal scarring, grafting being unnecessary. In many of the cases honey was used on infected lesions not responding to standard antibiotic and antiseptic therapy. It was found to be very effective in rapidly clearing up infection and promoting healing in almost all cases.

The antimicrobial property of honey has been recognized for over 80 years and has been studied by numerous microbiologists since then. The high sugar content of honey is itself sufficient to inhibit the growth of bacteria and fungi, but this action is lost when honey becomes diluted as when lymph seeps out from a wound or ulcer into a honey dressing. But honey contains other antimicrobial components as well. In most honeys the major antimicrobial activity is due to hydrogen peroxide. This is produced by the action of an enzyme in honey. The enzyme is inactive until honey becomes diluted as honey contains an inhibitor of this enzyme. Thus, levels of hydrogen peroxide never get high enough to cause any harm to the wound tissues. It is not possible to get too high a level of hydrogen peroxide produced from honey – the rate of production is near flat over a very wide range of concentration of honey solutions owing to the strong inhibition in high concentrations of honey. Honey also effectively gives a slow release delivery of hydrogen peroxide, as the enzyme keeps on producing hydrogen peroxide over at least 24 hours.

Honey is also effective in treating inflammatory bowel diseases and herpes simplex lesions ³². All honeys, in varying degrees, are effective for healing major wounds, cuts, burns, abscesses, skin ulcers, bed sores, eye infections and varicose ulcers. When honey comes into contact with body moisture, the glucose oxidase introduced to the honey by the bee slowly releases hydrogen peroxide at a sufficient level to be effective against bacteria, without any damage to the tissue. Honey is not only antibacterial, but it also draws body fluids and nutrients to the area, and so assists cell growth and prevents scar formation. When used to treat diarrhea, honey promotes the rehydration of the body and causes the earlier clearing of diarrhea, vomiting, and stomach upsets. Corticosteroids are some of the most important drugs used in the treatment of patients with inflammatory bowel disease. Intrarectal administration of corticosteroids is used in order to obtain topical action of these drugs, and thus to reduce adverse systemic side effects. Moreover, honey is effective in preventing carcinogenesis and in the treatment of bullous keratopathy ³². Many natural

food substances have been shown to protect against carcinogen-induced tumors. Linoleic acid isomers were previously shown to protect against dimethylbenz(a)anthracene (DMBA) induced mammary cancer. Chronic administration of vitamin D analogues (deltanoid) prevented methylnitrosourea (MNU) induced mammary carcinogenesis. Other nutrients used as a whole (natural) or their active ingredients were shown to protect from cancer, e.g. grapes and resveratrol, green tea extract, garlic and selenium. Other nutrients, such as vitamins, which are considered normal constituents of balanced diet, were also demonstrated to inhibit and protect against cancers, e.g. vitamin A and retinoids, vitamin E and selenium, and vitamin C. It is shown that orally administered honey and Nigella grains inhibited methylnitrosourea-induced oxidative stress and carcinogenesis. The role of vitamins as anticancer agents lie in their ability to suppress the carcinogenic process through its contents of antioxidants as flavones in tea or work synergistically with vitamin E as lycopene in tomatoes.

It (honey) has even been shown to be low in calories and useful as a sweetener for diabetics, people with heart disease or those with overweight³³. It is effective in peptic stomach ulcers and in treatment of gastroenteritis³³. Honey was used by ancient Egyptians 5000 years ago to treat inflammations and burns of the cornea and conjunctiva. This practice continued through the Greco-Roman period and the Middle Ages, right up to the modern era. Honey is mentioned as a remedy in the old Testament, the Talmud, and de Koran.

It is described in the Talmud as having a propitious effect on the eyes: Honey enlightens the eyes of man."

This prompted a prospective study of topical honey as a hyperosmotic and healing agent in the medical therapy of bullous keratopathy. Honey can also be used externally to promote healing, when applied to wounds, even postoperative wounds. Research also revealed that honey is effective in the treatment of various wounds and infections, because of its antimicrobial (antibacterial, antiviral and antifungal) properties³³. Further, research showed that honey coats the throat and reduces throat irritation³⁴. It blocks the growth of oral bacteria³⁴. In medicine, honey is used in pure form or prescribed in preparations such as honey milk, fennel honey and ointments for wounds.

It is incorporated into cosmetics in glycerol-honey gels and tanning cream products³⁴. The importance of honey as a food and as a nutrient is based primarily on its aroma constituents and the high content and fast absorption of its carbohydrates. Researchers are not absolutely sure, where healing properties of honey came from, but they are learning new things about honey every day. As mentioned in the beginning, honey contains a variety of sugars and minerals³⁴. Honey is thought with four excellent qualities, first it is a nourishing food, secondly, a good cleanser, third, it has healing power and finally, it is pleasant on account of its sweetness.

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