

Health Benefits and Medicinal Value of Honey¹

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Florida statute has defined honey as the natural food product resulting from the harvest of nectar or honeydew by honeybees and the natural activities of the honeybees in processing nectar or honeydew. The bees process the nectar into honey and store it in wax combs for later consumption. The bees' diet consists of pollen, honey and water. Honey is the main source of carbohydrates for bees and contains many of the same compounds found in a healthy human diet.

The United States is one of the five top honey producers in the world (TIPS, 2005). The major industrial uses for honey in the United States are baking, pharmaceuticals, candy making, and cereals (Taylor, 1999). However, there is a growing market niche for honey as a health product with current research supporting the potential of honey as a medicinal product.

Honey has been used for medicinal purposes for thousands of years (Jeffrey 1996). The ancient Egyptians were known to use honey as an embalming agent and a wound dressing. It also has been used for the treatment of burns, wounds, and infections. Honey is rich in sugars such as glucose and fructose, but it also contains small amounts of vitamins, minerals, amino acids, and antioxidants such as phenolic acids and flavonoids. These nutrients help to make honey a unique, natural health product.

Floral Source

The floral source and geographical location from which bees harvest can greatly influence the composition and

various characteristics of the honey (Baltrušaitytė, 2007). Just as some fruits and vegetables contain higher levels of beneficial phenolic compounds, different honeys can have varying levels of these beneficial compounds. Honey is generally divided into two broad classifications, monofloral and multi-floral (wild-type) honeys. Monofloral is a loosely used definition but generally implies that the majority of the honey comes from a single floral source. The best way to confirm which floral source a honey is from is a method called pollen counting. This method determines the type and concentration of pollen in the honey. One can infer the source of the nectar used to produce the honey by determining the source of the pollen it contains. Florida is known for its citrus, palmetto, Brazilian pepper, tupelo, and gallberry monofloral honeys (Marshall, 2014). Many of the shelf-available honeys are a blend from floral sources (multi-floral) to achieve an ideal amber color for consumer preference.

Color of Honey

Honey is often graded on a number of different properties such as water content, carbohydrate content, and color. The types and concentration of beneficial compounds in honey can greatly influence the honey's color (Alvarez-Suarez, 2010). Generally, darker honeys have been shown to have higher concentrations of polyphenols, and thus higher antioxidant and anti-inflammatory properties.

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Beneficial Compounds

On average, honey consists of over 80 percent glucose and fructose and 17 percent water (Table 1). The remaining fraction contains small amounts of other compounds, such as enzymes and phenolic compounds, which have been shown to have beneficial properties (Estevinho, 2008). Table 1 describes the average composition of honey. These values may differ depending on the floral source and also when the honey is extracted from the comb.

Table 1. Summary of the nutritional composition of honey.

Components	Averages (g/100g)
Total Sugars	80
Fructose	28–45
Glucose	19–40
Water	15–20
Ash	0.1–2.0
Protein	0.2–0.7
Methylglyoxal (MGO)	0–0.15
Micronutrient	Trace–0.05
Lipid	Trace
Values obtained from (Bogdanov, Jurendic, Sieber, & Gallmann, 2008).	

Sometimes there are detrimental events in the animal body that cause negative compounds (i.e., free radicals) to form. These compounds have been shown to cause damage to animal cells, damage that can contribute to the acceleration of cancer, cardiovascular disease, and other age-related diseases (Aruoma, 1998). Phenolic compounds found in honey and other plant materials are known to have antioxidant capacities that can help eliminate or reduce free radicals in the body (Gheldof, 2002). These compounds may help reduce the negative effects of free radical formation. These compounds also contribute to the taste and aroma of honeys. Phenolics are generally known to have a bitter taste and may be why some darker varieties of honeys, though thought to be more beneficial, are not preferred as a sweetener (Marshall, Schneider, Cisneros, & Gu, 2014).

Antimicrobial Properties

The antimicrobial capacity of honey has been attributed mainly to the presence of hydrogen peroxide, a compound that when used at low concentrations can induce wound healing. Hydrogen peroxide is produced from glucose oxidase (an enzyme) and phenolic compounds found naturally in honey. The high acidity in honey is also thought to influence the antimicrobial capacity, because many

bacteria cannot survive in acidic environments. The efficacy of honey against surgical and foodborne microorganisms often depends on the floral source and concentration of these beneficial compounds used in treatment.

A more recent compound discovered in honey that may contribute to its antimicrobial capacity is methylglyoxal (MGO). This compound has been extensively researched in Manuka honey from New Zealand because it is found in high concentrations in this variety of honey. MGO is an intermediate compound in food browning reactions. Browning reactions are commonly used in processed foods for color enhancement, and it may be the reason Manuka honey has such a unique color. Manuka honey has made a name for itself in the natural health market. Research claims that the higher concentrations of MGO are unique to this variety and can inhibit microorganisms such as *E. coli* and *Staphylococcus aureus*.

Honey has been used frequently as a topical treatment on skin wounds, burns and abrasions (Molan, 2001). Honey's low water activity, due to its high sugar content, peroxide components, and other non-peroxide components such as MGO and phenolic compounds, all contribute to its antimicrobial activity. Certain varieties of honey have been shown to be effective against common bacteria associated with hospital infections, such as *Staphylococcus* and *Streptococcus* species. Darker honeys generally have been shown to exhibit stronger antimicrobial capacities (Alvarez-Suarez, 2010).

Manuka honeys from New Zealand can now be certified based on their MGO concentration (Kato, 2014). The higher concentrations of MGO and similar compounds have been shown to increase a honey's antimicrobial activity against common microorganisms. MGO and other carbonyl compounds can lead to advanced glycation endproducts (AGEs). AGEs lead to other aging and diabetic inflammatory diseases, such as asthma, arthritis, atherosclerosis, myocardial issues, and neuropathy.

Anti-Inflammatory Properties

Though honey has been used as a health product for thousands of years, only recently have studies been conducted to confirm its potential to help reduce inflammation (Tonks, 2003). Different varietal honeys have been tested to determine their capacity to reduce reactive oxygen species that contribute to inflammation. After application of honey to wounds and infections, the number of inflammatory cells was shown to be reduced, suggesting honey's benefits in wound treatment applications (Molan, 2002). Honey's

ability to reduce inflammation has not been attributed to one compound but to its overall composition and properties, similar to its antimicrobial capacity.

Honey has been thought to help with common environmental allergies such as pollen, dust and grass allergies. There is no consensus in the scientific community as to whether honey does help reduce allergies. The theory is that the increased exposure of pollen in natural, unprocessed honey may help to reduce allergies to these specific pollens (Saarinen, 2011).

The composition and overall properties of honey, including its low pH and low moisture content, make it a potential functional food that could provide antioxidant, anti-inflammatory, and antimicrobial properties. It has been shown that color and varietal source play an influential role in the medicinal properties of honey; however, with no regulations on labeling, there is no way for consumers to know exactly what they are buying. Though there is research supporting honey as a natural anti-microbial, anti-inflammatory, and antioxidant, please consult a physician before using honey as a medical treatment (Vallianou, 2014).

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