NATURAL MEDICINES
COMPREHENSIVE DATABASE

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HONEY

Also Known As:

Chestnut Honey, Clarified Honey, Honig, Jellybush Honey, Madhu, Manuka Honey, Mel, Miel Blanc, Purified Honey, Strained Honey.

Scientific Name:

Apis mellifera (honey bee).
Family: Apidae.

People Use This For:

Orally, honey is used for cough, asthma, and allergic rhinitis. It is also used orally for diarrhea and gastric ulcer associated with Helicobacter pylori (H. pylori). Honey is also used orally as a source of carbohydrate during vigorous exercise.
Topically, honey is used for wound healing, burns, diabetic foot ulcers, and for treating cataracts and postherpetic corneal opacities. It is also used topically for sunburn and to prevent surgical tumor implantation.
In foods, honey is used as a sweetening agent.
In manufacturing, honey is used as a fragrance and a moisturizer in soaps and cosmetics.

Safety:

LIKELY SAFE ...when used orally and appropriately. Honey consumption is safe in adults and children over one year (13160, 14319). The concern about botulism pertains to infants and young children and not to adults (13160). ...when used topically and appropriately. A specific commercially available wound dressing containg manuka honey (Medihoney) is an FDA-approved medical device (16353, 16355, 16357, 16362, 16369, 16371). Some evidence suggests other honey preparations can also be used safely when applied to the skin (395, 396, 397, 398, 399, 7847, 7849, 13133, 14317, 16358, 16372).

CHILDREN: POSSIBLY SAFE ...when used orally and appropriately, short-term. Single doses of honey have been safely used in children aged 2 years and older (15910). POSSIBLY UNSAFE ...when used orally in infants or young children. Ingestion of raw honey contaminated with Clostridium botulinum spores can cause botulism poisoning in infants or young children under 12 months of age (13160). This is not a danger for older children or adults.

PREGNANCY AND LACTATION: LIKELY SAFE ...when consumed in food amounts. The concern about botulism pertains to infants and young children and not to adults or pregnant women (13160). There is insufficient reliable information available about the safety of honey when used for medicinal purposes in women who are pregnant or breast-feeding.

Effectiveness:

POSSIBLY EFFECTIVE

Burns. Honey applied directly in gauze applications seems to improve formation of granulation tissue and speed healing time in partial thickness burns. It appears to compare favorably with silver sulfadiazine and moisture permeable polyurethane dressing (OpSite) (395, 396, 397, 398, 399, 14317). Surgical intervention with tangential excision and skin grafting appears to be more effective than honey for moderate burns (7848). However, poor study design limits the reliability

of these findings.

Cough. Some evidence shows that taking 2.5-10 mL (0.5-2 teaspoons) at bedtime can significantly reduce nighttime cough frequency and severity, and improve sleep compared to placebo in children ages 2 years and older. Honey also appears to be at least as effective as the cough suppressant dextromethorphan in typical over-the-counter doses (15910).

Wound healing. Several small clinical trials and case reports describe the use of honey or honey-impregnated dressings for various types of wounds, including post-surgical wounds, chronic leg ulcers, abscesses, burns, abrasions, lacerations, and skin graft donor sites. Honey seems to improve granulation and epithelialization, reduce odors and purulent exudate, help clean the wound, increase eradication of infection, reduce pain, and decrease time to healing (7847, 7849, 14317, 16354, 16355, 16357, 16358, 16360, 16362, 16369, 16372, 16374).

In some reports, wounds healed with honey after failing previous treatments (16369, 16371). Honey applied directly to wounds appears to be comparable to hydrogels such as carboxymethylcellulose, povidone iodine, and hypochlorite solutions (16355, 16358, 16360, 16376). Honey dressings also appear to be comparable to hydrocolloid dressings, paraffin gauze, and saline-soaked gauze (16358, 16360, 16372). However, poor study design limits the reliability of these findings. Trials cannot be directly compared due to variation in wound type and severity, patient characteristics, honey type and processing, dressing techniques, treatment duration, and concomitant use of antibiotics. Adequate blinding is also difficult to achieve due to the distinctive properties and smell of honey (16360). Many of the clinical trials used manuka honey, which is derived from the nectar of Leptospermum scoparium and is gamma irradiated to inactivate bacterial spores (16355, 16357, 16362, 16369, 16371). Some other trials used unprocessed honey (16358, 16372).

INSUFFICIENT RELIABLE EVIDENCE to RATE

Allergic rhinitis. Preliminary clinical research suggests that consuming honey one tablespoon daily, in addition to standard treatment, does not significantly improve symptoms (14319).

Athletic performance. Some preliminary clinical evidence suggests that honey might normalize blood sugar following exercise and improve performance when given during exercise (7851).

Catheter-related infections. Preliminary clinical research suggests that manuka honey (Medihoney) applied three times weekly to the exit sites of tunneled, cuffed central venous hemodialysis catheters is as effective as mupirocin ointment in reducing the incidence of catheter-associated infections and bacteremias. It may also be associated with less development of bacterial resistance than mupirocin (16361). A small study also reported that manuka honey had similar efficacy to povidone iodine for dialysis catheter site care (16375).

Diabetic foot ulcers. Anecdotal reports suggest that applying topical raw honey can speed healing of otherwise non-healing diabetic foot ulcers, even in the presence methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Enterococcus (VRE), and Pseudomonas infection. In one report, previously non-healing ulceration completely healed after applying supermarket honey under dressings for 6-12 months and lower-limb amputation was prevented (13133).

Radiation mucositis. Preliminary clinical research suggests that honey derived from tea tree (Camellia sinensis) nectar taken orally can reduce the severity of mucositis, ulceration, painful dysphagia, and weight loss associated with radiation therapy for head and neck cancers (16352). More evidence is needed to rate honey for these uses.

Mechanism of Action:

Honey is produced by bees (Apis mellifera) from the nectar of several varieties of plants.

It is a supersaturated solution of sugars, of which 38% is fructose and 31% glucose (16363, 16365). Some disaccharides are also present (16363). Honey also contains fatty acids, proteins, and amino acids (16359). Protein content varies from about 160 mg to 550 mg per 100 grams of honey (16365).

Enzymes present include saccharase, amylase, and glucose oxidase (16363). A peptide in honey can inhibit polyphenol oxidase and prevent enzymatic browning of fruits and vegetables (16365). Organic acids, such as glucuronic acid, account for about 0.57% of honey, and minerals account for 0.17%. Potassium is the most abundant mineral present, with smaller amounts of calcium,

copper, iron, manganese, and phosphorus (16363). Vitamins present include ascorbic acid, thiamine, riboflavin, nicotinic acid, and pyridoxine (16359, 16363).

Pharmacological activity can vary depending on the type of plant from which the nectar is obtained. For example, honey produced from poisonous plants can be poisonous.

Honey is thought to help in wound healing by several mechanisms. It provides a protective barrier due to its viscosity, and prevents adhesion of dressings to wounds (16354, 16355). It maintains a moist healing environment, encouraging epithelialization and reducing scarring, and may provide nutrients for the wound healing process (16354, 16355). Increased rates of angiogenesis, granulation, and epithelialization have been reported (16356, 16360). Enzymes and hydrogen peroxide in honey can aid in debridement (395, 396, 399, 7849, 16355, 16356). It also draws lymph into the wound by osmosis, which helps to flush bacteria and debris out of the wound (16355, 16356). Honey can prevent and remove odors associated with wounds, probably because bacteria use its sugars for energy, producing lactic acid instead of the ammonia, amines, and sulfur compounds produced when proteins from dead cells and serum are metabolized for energy (16354, 16355).

In vitro studies indicate that honey has anti-inflammatory activity, increases the activity of phagocytes, causes B- and T-lymphocyte proliferation, and can stimulate monocytes and macrophages to produce cytokines, including tumor necrosis factor alpha and interleukins 1 and 6, which play a role in wound healing (16359, 16360, 16362, 16363). A non-protein component has been isolated from manuka honey (produced with nectar from Leptospermum scoparium), which binds to TLR4 receptors on monocytes, but it has not been fully identified (16359).

Honey has antibacterial and antifungal activity, which might help prevent and treat wound infections. Applying 0.5 mL of standardized medical-grade honey (Revamil, Bfactory; available in the Netherlands) to healthy skin under an occlusive dressing for 48 hours reduces skin colonization to very low levels, whereas colonization increases under an occlusive dressing without honey (16373). The antimicrobial potency of different honeys can vary by as much as 100-fold (16360, 16361, 16373). Potency depends upon the geographical and botanical source; the season; and the conditions of harvesting, processing, and storage (16369). Properties of honey which are thought to contribute to these antibacterial effects include osmotic effects of the high sugar content, the low pH, and the presence of glucose oxidase and antibacterial phytochemicals (396, 1261, 1428, 7850, 16356, 16358, 16362, 16363, 16370). The high osmolarity dehydrates bacteria, and the mean pH of 4.4 (range: 3.2 to 5.5) inhibits growth and discourages colonization (16356, 16370). The low pH also reduces the activity of proteases, which destroy growth factors and protein fibers produced during the healing process (16356). Glucose oxidase produces gluconic acid and hydrogen peroxide in the wound (16364, 16356). This hydrogen peroxide is released continuously in very low concentrations which are sufficient to produce antibacterial effects, but do not seem to cause the tissue damage associated with topical application of hydrogen peroxide solutions (16355). Since glucose oxidase is destroyed by heat and light, the ability of honey to generate hydrogen peroxide can be lost during processing or aging (16368). Honeys from different botanical sources also vary in hydrogen peroxide production; for example, manuka honey generates very little hydrogen peroxide (16364, 16369). The antibacterial phytochemicals present in some honeys, including manuka honey, have not been fully identified (16362, 16370).

Honey can be contaminated with microorganisms from plants, bees, and dust during production, and also during collection and processing (16359, 16363). The antibacterial characteristics of honey ensure that most contaminating organisms cannot survive or reproduce (16359, 16363). However, spore-forming organisms such as Clostridium and Bacillus species may remain, and botulism has been reported in infants given honey orally (16359, 16363). Gamma irradiation can be used to inactivate bacterial spores without affecting the antibacterial properties of honey (16355, 16356, 16362, 16370).

In vitro studies of various honeys have reported inhibition and killing of many organisms including aerobic, anaerobic, gram positive, and gram negative bacteria, and also some fungi and yeasts (16363, 16370, 16373). The honeys were active against Staphylococcus aureus (including methicillin-resistant strains, MRSA), Escherichia coli (including extended spectrum beta-lactamase producing strains), Pseudomonas aeruginosa, Pseudomonas pyocyanea, Proteus mirabilis, coliform species, Klebsiella species, Enterococci (including vancomycin resistant

strains, VRE), Enterobacter cloacae, Acinetobacter baumannii, Streptococcus faecalis, and Streptococcus pyogenes (1261, 7847, 7849, 16352, 16362, 16363, 16369, 16370, 16373).

The antibacterial effects of honey may also be beneficial for management of Helicobacter pylori (H. pylori) infection in peptic ulcer disease. Honey and solutions with similar sugar content demonstrate similar effectiveness at inhibiting H. pylori (1428).

In surgery for some types of malignant cancer, cells from the tumor can become seeded in the wound margins during excision, resulting in growth of the cancer in the wound. Preliminary evidence from animal models suggests that honey can reduce the growth of these tumors, by impeding the seeding or inhibiting the growth of these cancer cells (7852).

Honey varieties have antioxidant effects, although potency can vary 20-fold between different floral sources (16364, 16365, 16366, 16367). Antioxidant content seems to be higher in darker honeys (16366, 16367). Antioxidants in honey have been demonstrated to be bioavailable, increasing plasma total phenolics, and plasma antioxidant and reducing capacities (16366, 16367). Constituents of honey responsible for the antioxidant effects include phenolic compounds, flavonoids, ascorbic acid, carotenoid-like substances, peptides, enzymes, and organic acids (16365, 16366, 16367). The phenolic compounds vary between different types of honey, but include 4-hydroxybenzoic and 4-hydroxycinnamic acids, coumaric acid, and abscisic acid (16365, 16366, 16367). Flavonoids identified in honey include pinobanksin, pinocembrin, chrysin, and galangin (16365, 16367). The ascorbic acid content is generally low (around 5 mg per 100 grams of honey) and may be lost during processing (16365).

It is suggested that the beneficial effect of honey on coughs is due to its pleasant taste, which causes reflex salivation and promotes secretion of airway mucus to increase lubrication. The sweet taste may also promote production of endogenous opioids (16351).

Adverse Reactions:

Orally, honey can cause allergic reactions. Some honey is contaminated with Clostridium botulinum spores, which poses a risk to infants, but not older children or adults (6, 11). Botulinum spores can proliferate in the intestines of infants and cause botulism poisoning.

Honey from the Black Sea coast of Turkey has been linked with a unique form of poisoning. Honey from this region sometimes contains excessive concentrations of acetylandromedol which can cause nausea, vomiting, dizziness, sweating, weakness, bradycardia, atrioventricular (AV) block, and hypotension within a few minutes to several hours after consumption. Fatalities have not been reported. Patients typically respond with fluids and reversal of cardiac conduction abnormalities with atropine. Honey containing this poison is sometimes called "mad honey" (12220).

Topically, honey may cause excessive drying of wounds, which could delay healing. This can be managed by application of saline packs as needed (7850).

Topically, the use of honey applied to wounds can cause local pain, stinging, and burning in about 5% of patients, some of whom stop treatment as a result (16356, 16357, 16358, 16361). Local allergic reactions have also been reported from topical application of honey in people with pre-existing atopy (16356).

Interactions with Herbs & Supplements:

None known.

Interactions with Drugs:

None known.

Interactions with Foods:

None known.

Interactions with Lab Tests:

None known.

Interactions with Diseases or Conditions:

POLLEN ALLERGIES: Honey may cause allergic reactions (6).

Dosage / Administration:

ORAL: For cough, 2.5-10 mL (0.5-2 teaspoons) of honey at bedtime has been used (15910). For radiation mucositis, 20 mL of honey has been used orally 15 minutes before radiation therapy, then 15 minutes and 6 hours after radiation (16352).

TOPICAL: For the treatment of burns and wounds, honey has been applied directly or as a dressing impregnated with honey. The dressings are typically changed every 24-48 hours (16355, 16362, 16372, 16374), but have been left in place for up to 25 days, with wound inspection every 2 days (397, 398). When used directly, 15 mL to 30 mL of honey has been applied every 12-48 hours, and covered with sterile gauze and bandages or a polyurethane dressing (396, 399, 16354, 16356, 16358, 16369, 16372, 16376).

For diabetic foot ulcers, ordinary honey purchased from a supermarket has been used. It is applied in thick applications to a 4x4 gauze and placed on the ulceration and then wrapped (13133).

Editor's Comments:

Avoid confusion with bee pollen, bee venom, and royal jelly.

Honey is considered one of the oldest known wound dressings. It was used by Dioscorides in 50 AD for sunburn and infected ulcerations (14317). Its healing properties are mentioned in the Bible, Koran, and Torah (16361).

Medical grade honey (e.g., Medihoney) is gamma irradiated to inactivate bacterial spores such as Clostridium botulinum (16356, 16357, 16362, 16370). It is also standardized to have consistent antibacterial activity (16356, 16370, 16371, 16373). Some authors also state that medical-grade honey should be collected from hives that are free from pathogens and not treated with antibiotics, and that the nectar should be from plants that have not been treated with pesticides (7847).

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