

# HONEY- GOLDEN LIQUID FOR HEALTH

\*Vibha Singh

Department of Oral and Maxillofacial Surgery, K.G. Medical University, Lucknow, U.P. India.

\*Address for correspondence : Dr Vibha Singh, Professor, Department of Oral and Maxillofacial Surgery, K.G. Medical University, Lucknow, U.P. India.

**Email ID :** vibhasinghraghuvanshi@gmail.com

## ABSTRACT

*Honey is one of the oldest traditional medicines considers to be important in the treatment of several human ailments. Treatment of infection has been practiced since the origin of mankind. In most of the ancient cultures honey has been used for both nutritional and medical purpose. Honey was used to treat infected wounds as long ago as 2000 years before Bactria was discovered to be the cause of infection. In 50 AD Dioscorides described honey as being good for all rotten and hollow ulcers. Honey was often used for wound dressing in the early decade of 20th century but after second world war it as replaced by more modern and sophisticated products despite plethora of literature discribing the healing properties of honey.*

**Keywords :** Antioxidant; Apitherapy; Wound Healing

## INTRODUCTION

Honey therapy is known as Apitherapy. As per Rigveda this herb born of honey dripped in honey, sweetened by honey is the remedy for all injuries. Let's every wing that blow drops honey, let the rivers and streams recreate honey let all our medicine turn in to honey, let dawn and the evening be full of honey our nourishes this sky above be full of honey let our trees be honey let the sun be honey let our cows secrete honey.<sup>[1]</sup>

Honey is one of the oldest traditional medicines considers to be important in the treatment of several human ailments. Treatment of infection has been practiced since the origin of mankind. In most of the ancient cultures honey has been used for both nutritional and medical purpose. Honey was used to treat infected wounds as long ago as 2000 years before Bactria was discovered to be the cause of infection. In 50 AD Dioscorides described honey as being good for all rotten and hollow ulcers.<sup>[2]</sup>

In Hinduism the Madhu (Honey) is one of the five ingredients of Panchamrit the five nectars the other four are ghee, sugar and butter milk. In the temples honey is poured over the deities in ritual called Madhuabhiseka. Jatakarma is performed to welcome the child in the Hindu family by putting some drops of honey in the child's mouth and whispering name of god in the ear of child.<sup>[1]</sup>

Honey is sweet sticky material produced by bees following the collection of nectar and honey dew.

Its healing properties have been known for hundreds of years. It was often used in early decades of the 20th century but after the Second World War it was gradually supplanted by more modern and sophisticated products. Although it was widely used in treating wounds by ancient civilizations and it is still utilized in remote communities for the same purpose. The alternative medicine branch known as Apitherapy offers treatment based on honey and other bees product against disease including bacterial infections.

In the past 25 years or so more and more studies have been carried out all over the world to gain a better insight into the efficacious ingredients of honey, in the light of current state of knowledge honey deserves more than our passing curiosity as clinician we should honey full attention especially in the hospital environment where the bacteria's become resistant to antibiotics.

The honey have both anti-inflammatory and antibiotic properties, antioxidant and have greater influences on healing wound. Honey has been proven to create favourable condition in the wound bed autolytic debridement and presence of substance that promote and accelerate the healing process.<sup>[3]</sup>

Honey has been a well-known medicament since ancient times but recently there has been a resurgence of interest in using honey in the

management of wounds. The excellent antimicrobial properties of honey have been reported in various studies.<sup>[4]</sup>

### ANTIOXIDANT ACTIVITY

The antioxidant activity of natural honey is due to the presence of a variety of compounds such as flavonoids namely, apigenin, kaempferol, pinocembrin, quercetin, chrysin, galangin, hesperetin etc., phenolic acids such as ellagic, p-coumaric, caffeic, and ferulic acids), ascorbic acid, catalase, tocopherols, superoxide dismutase, reduced glutathione, amino acids and selenium<sup>[5]</sup> The anti-oxidant activity has been shown to strongly correlate with the phenolic content of the particular honey. Gheldof et. Al. reported a linear correlation between phenolic content and oxygen radical absorbance capacity (ORAC).<sup>[6]</sup>

In addition to neutralization of free radicals, honey also exerts its anti-oxidant action by inhibiting the formation of free radicals, catalysed by metal ions such as iron and copper. Flavonoids and other polyphenols, common constituents of honey have the potential to trap these metal ions in complexes, preventing the generation of free radicals. Honey contains both hydrophilic and lipophilic antioxidants which may act at different cellular/physiologic levels making it the ideal source of anti-oxidants.<sup>[7]</sup>

Given its complex composition and diverse medicinal properties coupled with its impressive safety profile, it is not surprising that honey has found a very significant role in modern wound care. Several randomized controlled trials, investigating the effect of honey on minor burns demonstrated accelerated healing time compared with conventional dressings, such as silver sulfadiazine. It was even found to be superior to non-conventional dressings such as amniotic membrane and potato peel.<sup>[8]</sup> Furthermore, Analysis of current evidence also indicates the superiority of honey in superficial and partial thickness burns therapy. Further a recent Cochrane review reported high quality evidence that honey dressings heal partial thickness burns more quickly than conventional dressings. Honey compared with 1% silver sulfadiazine cream in the treatment of superficial and partial thickness burns. Till date, majority of the studies conducted speak in favour of using honey for management of radiation-induced oral mucositis in head and neck cancer patients receiving radiotherapy, especially in light of the

fact that the conventional therapies have failed to offer a comprehensive and effective management for oral complications.<sup>[9,10,11,12]</sup>

In a meta-analysis, Cho et. Al. reported oral administration of honey after radiotherapy could prevent moderate to severe mucositis and associated weight loss.

In their meta-analysis, Song et. Al. reported an overall, pooled relative risk of developing severe Mucositis to be almost 80% lower in patients treated with honey compared to patients in the control groups based on the studies included in the review.<sup>[13]</sup>

### ANTIMICROBIAL AND WOUND HEALING PROPERTIES

Honey selected for medicinal use should be produced under hygienic condition from traceable source with minimal contamination by pesticide antibiotics or pollutants.

The antimicrobial nature of all honey is clearly demonstrated by the ability to remain unspoiled by micro organism. The inhibitory effect of pure honey on various Gram-positive and Gram-negative bacteria and found that most pathogenic bacteria failed to grow in honey at a concentration of 40% and above, In particular, Salmonella, Shigella, Enteropathogenic Escherichia coli and Vibrio cholera.<sup>[4]</sup>

Honey can be divided into those whose activity was confined to their high sugar content low moisture content and acidity or those that exclusively generated low levels of hydrogen peroxide on dilution or those that retained activity that was independent of synthesis of hydrogen peroxide on dilution.

The types of honey reported in the literature peroxidase and non-peroxidase honey the ability to generate hydrogen peroxide has been shown due to the oxidation of glucose by glucose oxidase which is an enzyme secreted by the bees at its deposits nectar and honey dew in to the hive. Peroxidase honey is not uncommon. Antibacterial activity of 42 Canadian honey against two bacterial species shows that all the activity was associated with the production of hydrogen peroxide. Non peroxide honey however are less common. Manuka honey from New Zealand and Jelly bush honey from Australia are two common examples of non-peroxide honey which are postulated to possess unidentified active components in addition to the production of hydrogen peroxide.<sup>[14]</sup>

The wound healing properties of honey are because of three physical properties a very high concentration of glucose and fructose (osmotic action) a low Ph value (3.2 -5.4) and low water content and four important ingredients honey has three pharmacological characteristics antimicrobial, wound healing and anti-inflammatory. Honey promotes healing by maintaining an environment which is moist (18%) water and acidic. Its osmotic properties resulting from high level of simple sugar (80%) honey helps clear away the necrotic tissue in the wound bed . This prevents the dressing sticking to the wound and protects the granulation edges and this turn stimulates cell division mitosis, because of this high glucose fructose concentration honey deprives the inflammatory bacteria of their nourishment . Instead of metabolizing the amino acids the amine and sulphur containing decomposition products of amino acid causes putrid smell the bacteria concentrate on the producing lactic acid and acidifying environment through this mechanism honey is able to inhibit development of pathogenic bacteria that causes infection.

The presence of glucose oxidase enzymes leads to the formation of hydrogen peroxide in the honey in accordance with following chemical reaction

Glucose + water = gluconic acid + hydrogen peroxide.

This release very gradually after 12 hours the concentration is 4 to 5 microgram after 24 hour and this is sufficient to disinfect wound to set autolytic debridement in motion and promote granulation without any risk of toxic effect that would be caused by too high concentration of hydro radicals.

A second ingredient with antibacterial properties this is one non peroxide was demonstrated by Professor Thomas Henle at Germany in 2008. This is substance which have been known for many years because it is present in all food stuffs with higher sugar content Methylglyoxal. This is one of the dicarbonyl components that are formatted through Maillard reaction which occurs in all products that have very high sugar content. It varies according to the geographic origin and the type of honey .Depending on the MGO content which can range from 3-4 microgram to 750-800 microgram per gram honey the honey will have weaker or strong effect on a narrower or wider spectrum of

bacteria particularly on the methicillin resistant Staphylococcus aureus strain, the vancomycin resistant enterococci and pseudomonas aeruginnisa which are unaffected by present day antibiotics.

The third effective ingredient was demonstrated by Dr Zaat in 2009 A minute quantity of the substance ranging from 2-3 nanogram per gram honey is present in all types of honey . This substance is similar to human beta defensin 1 (HBD-1) protein a peptide molecule with cationic properties which play an antimicrobial role by aggregation and destruction of the host cell behaving like a true peptide antibiotic.

A fourth group of substance which al so play an important role in wound healing are the flavonoid a group of molecules belonging to the polyphenols which are known to be effective against type 1 radicals .

At high concentration these substances reduces any inflammation present and moderate the pain the important of these effects during the wound healing process should not be under rated as they make the episode more bearable for the patient.<sup>[15]</sup>

## COMPOSTION

Honey comprise of 40% glucose, 40% fructose, 20% water with organic acid , vitamins enzymes and minerals. It has specific weight 1.4 and ph 3.4. Treatment with honey is simple and inexpensive and it's not needs to be sterilize as it already possesses a bactericidal property. Because of its high viscosity it forms a physical barrier creating moist environment which appears to be helpful and accelerate wound healing.<sup>[16]</sup>

The exact molecular mechanism of wound healing using honey is yet to be elucidated .various studies shows that it acts by reducing ROS levels beside this it exert antibacterial activity and low pH and high free acid content may assist wound healing with honey .

The types of wound and degree of severity al so affect efficacy selected honey should be used in sufficient quantity so that it remains there if diluted with wound exudates .It should cover and extend beyond the wound margin, the effect of wound healing is result of combined effect of chemical debridement of dead and devitalized tissue from ulcer by catalase, absorption of edema by hygroscopic properties of honey and promotion of granulation and epithelisation from wound edges.

Even raw honey can be used directly for wound care when all of the above facilities are not available for sterilization of the honey. Wound care by honey should be supervised by physician or experienced wound care nurse in patients with significant co morbidities. Any co morbidity problem which contribute to the problem in wound healing should be diagnosed and treated. It should be contact with the wound for at least 12 hours, preferably for 24 hours. If dressing is not appropriate the honey may be wash out of the wound by exudates.

In the case of infected wound systemic antibiotic should be administered after local swab has been taken or if fever or local sign revealed soft tissue infection. The use of honey never has been observed to foster bacterial resistance.

There are some adverse effect related to use of honey. Stinging pain after administration of honey is reported in 5% of cases, this can be managed by applying Local anaesthetic cream but it causes vasoconstriction which can result in reduction in local perfusion.

It can also be used preoperatively to prepare wounds for reconstruction or to make it possible to use smaller or less complex graft. This will help in reducing post-operative morbidity of the donor site. The effect of treatment should be evaluated continually for a period of up to two weeks.<sup>[17]</sup>

Types of wound, care protocols and pharmaceutical requirements for the medicinal use of honey Honey therapy can so play a palliative role in improving quality of life for terminal patients with decubitus ulcers. It helps in changing dressing without any pain and also eliminates unpleasant foul odour. But if debridement is inadequate honey dressing will not help because it does not replace good quality basic wound care.<sup>[18]</sup>

There is increase in use of honey as a dressing on infected wounds burns and ulcers but there is some common concern that risk of botulism from clostridial spores sometimes present in honey. It is established fact that antibacterial activity is heat labile so would be destroyed if honey will be sterilized by autoclaving. So effect of gamma radiation in sterilization of honey and its antibacterial properties was studied by Molan PC et al showed that 25 kGy of gamma radiation was sufficient to achieve sterility without affecting its antibacterial properties.<sup>[19]</sup> Use of honey in

management of damaged intestinal mucosa, It promote the repair of damaged intestinal mucosa stimulate the growth of new tissue and work as an anti-inflammatory agent. It also reduces symptoms of inflammation when applied to the wounds. Raw honey contains copious amount of compound like flavonoids and other poly phenols which may function as antioxidants.<sup>[20]</sup>

The mucositis a side effect of chemo and radiotherapy that affects the entire gastrointestinal tract from the mouth to the anus. The cancer treatment breaks down the epithelial cell lining the tract leaving the patient prone to ulceration and infection. The use of honey in oral mucositis followed by radiotherapy is very effective in terms of ulcer healing and quality of life improvement.<sup>[21]</sup>

The use of honey in the cases of alveolar osteitis dry socket followed by dental extraction and use of honey in oral mucositis. The symptomatic relief was significant, and results were quite promising both of the studies were done in the department of oral and maxillofacial surgery K.G.M.U.<sup>[21]</sup>

Honey has a complex chemical composition and neither the identities of all of its inhibitory components nor its mechanisms of action are yet completely understood. Laboratory tests have demonstrated the effective inhibition of a wide range of microbial species, with both antibiotic-sensitive and antibiotic-resistant bacteria showing susceptibility. The publication of case reports of the eradication of MRSA from patients give validity to in vitro observations, but large scale clinical trials are needed to establish its clinical efficacy. With the increased availability of licensed wound care products containing honey, clinical use is expected to increase and further evidence will become available. Honey seems to have the potential to clear infection as well as being an effective prophylactic agent that may contribute to reducing the risks of cross-infection. Time will demonstrate whether the present optimism about honey is justified.<sup>[22]</sup>

The therapeutic effectiveness can be guaranteed by measuring the peroxidase activity and antibacterial properties against a selection of bacteria. Active ingredient contents of honey depends on the production area and the way in which the honey is collected and processed the bee keeping production and collection of honey needs to be carried out under strictly controlled conditions.

It is essential that honey that is produced in protected natural areas such as Regional Park is selected and tested for pesticides and heavy metals. Absence of bacterial contamination yeast and botulism spore. Honey is quickly contaminated when it is exposed to the air especially in the polluted atmosphere. Sterilization with gamma rays is necessary to produce honey with bacterial burden of no more than 30CFU/gram.

Presence of pollen may cause allergic reaction in some patients. In moderate climate regions honey can be stored at room temperature but temperature 25 degree should be avoided optimum storage temperature is between 12-25 degree temperature. It should also be protected against UV rays as there are chances of change in honey by UV rays. In more than 500 publications the clinical use of honey in open wound in the literature no adverse reaction have been noted. Some times a localised stinging sensation described by some patients. This may be due to acidity of the honey as it has not been reported when acidity is neutralised.<sup>[23]</sup>

## CONCLUSIONS

Honey was often used for wound dressing in the early decade of 20th century but after second world war it was replaced by more modern and sophisticated products despite plethora of literature describing the healing properties of honey. There are many possible reasons why the pharmaceutical companies have ignored this natural product including lack of knowledge lack of research in to medicinal use of honey. Honey seems to have the potential to clear infection as well as being an effective prophylactic agent that may contribute to reducing the risk of cross infection.

There are some practical considerations which should be taken care of before using honey for clinical cases. The amount of honey required for the wound dressing should depend on the amount of exudate released from wound will result in dilution of the dressing. If there is no exudate dressing needs to change twice/week. It should be applied to absorbent dressing because if applied directly on the wound it tends to rub off before secondary dressing is applied. Soaking of honey in to direct dressing facilitated by warming honey to body temperature or adding one part with 20 part of honey. For moderately to heavily exudated wound

a secondary dressing may be needed. Honey can be used to treat cavity wound by using adhesive film dressing. A low adherent dressing helps prevent the honey sticking to the wound but it must be porous to allow antibacterial component of the honey to diffuse freely in to the wound bed.

Honey can be safely filled in to cavities and sinuses. It is water soluble and easily rinsed out any residue are biodegradable. For sinuses catheter or syringe can be used for applying honey. Honey dressing needs to extend beyond the inflamed area surrounding a wound.

## REFERENCES

1. Nayik et al. UJP 2014, 03 (01): Page 5-8 www.ujponline.com. Universal Journal of Pharmacy, 03(01), Jan-Feb 2014.
2. Gunther RT. The Greek Herbal of Dioscorides *The Greek Herbal of Dioscorides*. New York: Hafner, 1934 (reprinted 1959).
3. GMS Krankenhhyg Interdiszip. 2007; 2(2): Doc51. Published online 2007 Dec 28.
4. Mohammad Javed Ansari, Ahmad Al-Ghamdi, Salma Usmani, Noori S. Al-Waili, Deepak Sharma, AdgabaNuru, and Yehya Al-Attal, Effect of Jujube Honey on Candida albicans Growth and Biofilm Formation. Archives of Medical Research 44 (2013) 352e360.
5. Ahmad Oryan, Esmat Alemzadeh, Ali Moshiri, Biological properties and therapeutic activities of honey in wound healing: A narrative review and meta-analysis. Journal of Tissue Viability (2016) 25, 98-118.
6. Gheldof N Wang XH, Engeseth NJ identification and quantification of antioxidant component of honey from various floral sources. J.Agric Food Chem 2002 Oct 9 50 (21) 5870-7.
7. Subrahmanyam M. A prospective randomised clinical and histological study of superficial burn wound healing with honey and silver sulfadiazine. Burns 1998;24:157-61.
8. Subrahmanyam M. Honey dressing versus boiled potato peel in the treatment of burns: a prospective study. Burns 2006;32:121-34.
9. doi: 10.1080/10376178.2016.1171727. Epub 2016 Apr Mashhood AA, Khan TA, Sami AN. Prospective randomized study. Burns 1996;22:491-3. J Pak Assoc Dermatol 2006;16:14-9.

10. Bangroo AK, Katri R, Chauhan S. Honey dressing in pediatric burns. *J Indian AssocPediatrSurg* 2005;10:172-5.
11. Subrahmanyam M, Sahapure AG, Nagane NS, Bhagwat VR, Ganu JV. Effects of topical application of honey on burn wound healing. *Ann Burns Fire Disasters* 2001;14(3).
12. Subrahmanyam M. Honey-impregnated gauze versus amniotic membrane in the treatment of burns. *Burns* 1994;20:331-3.
13. Song JJ, Twumasi-Ankrah P, Salcido R. Systematic review and meta-analysis on the use of honey to protect from the effects of radiation-induced oral mucositis. *Adv Skin Wound Care* 2012;25(1):23-8.
14. *GMS Krankenhhyg Interdiszip.* 2007; 2(2): Doc51. Published online 2007 Dec 28.
15. Dr David LECHAUX, gastrointestinal surgeon - Hôpital Yves Le Foll 22000 ST-BRIEUC (France). Previously specialist in internal medicine at various hospitals in Rennes (Fr). Chairman of the Food and Nutrition Liaison Committee
16. Topical Application of Honey in The Treatment of Wound Healing: A Metaanalysis B Medhi, A Puri\*, S Upadhyay,\*\* L Kaman\*\*\*PMCID: PMC2686636
17. Arne Simon Kirsten Traynor Kai Santos Gisela Blaser UdoBode and Peter Molan Medical Honey for Wound care Still a latest Resort .A Evid Based Complement Alternat Med 2009 Jun 6(2) 165-173.
18. Dr David Lechaux, gastrointestinal surgeon - Hôpital Yves Le Foll 22000 ST-BRIEUC (France). Previously specialist in internal medicine at various hospitals in Rennes (Fr). Chairman of the Food and Nutrition Liaison Committee.
19. Molan PC Allen K The effect of gamma irradiation on antibacterial activity of honey. *J Pharma Pharmacol* 1996 Nov 48 (11)1206-9.
20. Manisha Deb Mandal and Shyam APADA Mandal -Honey its medicinal property and antibacterial activity *Asian Pac J Trop Biomed* 2011 Biomed 2011 Apr 1(2) 154-160
21. Vibha Singh, US PAL, Nikita V Soni. Honey a sweet approach to alveolar osteitis *National journal of maxillofacial surgery* 2014 Jan 5(1) 31-4.
22. Rose Cooper Centre for Biomedical Sciences Cardiff School of Health Sciences University of Wales Institute Cardiff . United Kingdom *GMS Krankenhaushyg Interdiszip* 2007 2(2) Doc 51 . <http://www.egms.de/de/journals/dgkh/2007-2/dgkh000084.shtml>
23. Honey and wound care dr david lechaux D. Lechaux Yves Le Foll Hopital St Briuc. D. Lechaux, Yves Le Foll Hôpital, St-Brieuc