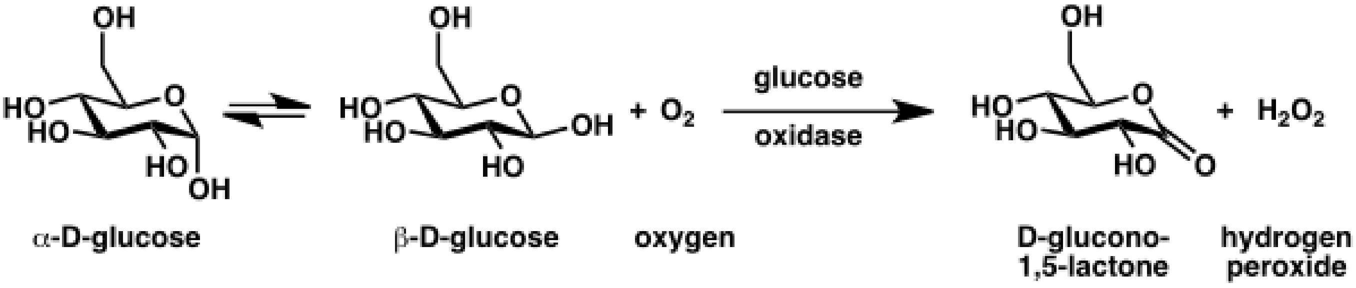
Scientific Effectiveness F4S Tongue Gel containing Manuka Honey against Oral Malador

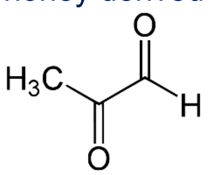
Peroxide activity: **The major contributor to the antimicrobial activity of honey is hydrogen peroxide** which is formed from the oxidation of glucose by glucose oxidase to gluconic acid and hydrogen peroxide when honey is diluted. The varying antimicrobial activity in different types of honey is because of the different concentrations of hydrogen peroxide.



Contribution pH and Osmolarity: **The antimicrobial activity of honey is also attributed by some physical factors such as acidity (pH) and osmolarity**. The high osmolarity of honey is due to the high content of sugar which have high affinity for water molecules leaving little or no water to support the growth of different microorganisms such as bacteria and yeast. Consequently, the microorganisms become dehydrated and eventually die. Honey is slightly acidic which inhibit the presence and growth of many pathogens.

Antimicrobial activity: **Honey has a broad-spectrum antimicrobial activity on *gram-negative* and *gram-positive* bacteria.** Several studies have revealed that honey is effective against *Methicillin Resistant Staphylococcus Aureus* (MRSA), *Streptococci* and *Vancomycin Resistant Enterococci* (VRE) Due to its antibacterial activity, **honey has Caro-protective effect by inhibiting the growth of bacteria causing caries**. It was reported that Manuka honey has a positive effect against dental plaque development and gingivitis making it a useful substitute of refined sugar in the manufacture of candy. **Honey can also inhibit the growth of a wide range of fungi, protozoa and viruses.** It was shown to have inhibitory effect on the *Rubella* virus and *Leishmania* parasite as well as fungi such as *Candida*

Non-peroxide activity: All honey has a level of peroxide activity, but **only Manuka Honey has the additional non-peroxide activity** that makes it unique in health-giving properties. Manuka Honey can be tested for the level of Methylglyoxal (MGO), a component of honey that is unique to honey derived from a *Leptospermum scoparium or* Manuka.



Extensive research from the University of Dresden (Prof Henle) showed the exceptional anti- bacterial activity of MethylGlyoxal in Manuka honey.
Methylglyoxal found in Manuka Honey ranges between 38 and 761 mg/kg, while standard honey contains only very small concentration (3,1 mg/kg) The minimum concentrations needed for inhibition of bacterial growth (minimum inhibitory concentration, MIC) is 1.1 mM.MGO comparable to 80 ppm MGO.

For Fresh4Sure we use 10% Manuka 400+ (400 ppm MGO) together with the anti-bacterial components Erythritol and Zinccitrate.

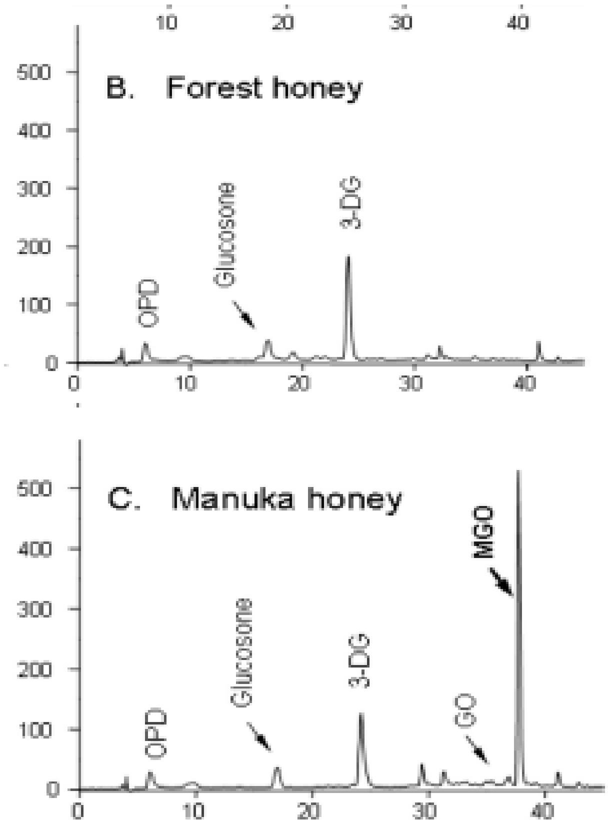
CAVEX

Fresh4Sure

1. Identification and quantification of methylglyoxal as the dominant antibacterial constituent of Manuka (Leptospermum scoparium) honeys from New Zealand. Mol Nutr Food Res. 2008 *Mavric E[1], Wittmann S, Barth G, Henle T.*

Abstract

The 1,2-dicarbonyl compounds 3-deoxyglucosulose (3-DG), glyoxal (GO), and methylglyoxal (MGO) were measured as the corresponding quinoxalines after derivatization with orthophenylendiamine using RP-HPLC and UV-detection in commercially available honey samples. Whereas for most of the samples values for 3-DG, MGO, and GO were comparable to previously published data, for six samples of New Zealand Manuka (Leptospermum Scoparium) honey very high amounts of MGO were found, ranging from 38 to 761 mg/kg, which is up to 100-fold higher compared to conventional honeys. MGO was unambiguously identified as the corresponding quinoxaline via photodiodearry detection as well as by means of mass spectroscopy. Antibacterial activity of honey and solutions of 1,2-dicarbonyl towards Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus) were analyzed using an agar well diffusion assay. Minimum concentrations needed for inhibition of bacterial growth (minimum inhibitory concentration, MIC) of MGO were 1.1 mM for both types of bacteria. MIC for GO was 6.9 mM (E. coli) or 4.3 mM (S. aureus), respectively. 3-DG showed no inhibition in concentrations up to 60 mM. Whereas most of the honey samples investigated showed no inhibition in dilutions of 80% (v/v with water) or below, the samples of Manuka honey exhibited antibacterial activity when diluted to 15-30%, which corresponded to MGO concentrations of 1.1-1.8 mM **This clearly demonstrates that the pronounced antibacterial activity of New Zealand Manuka honey directly originates from MGO.**



Decrease of halitosis by intake of Manuka honey. Conference paper Tsurumi University 2010
Hirokazu Shiga, Ayako Jo, Keiji Terao, Masato Nakano, Thmoko Ohshima

Objectives: Increasing number of people is worrying about their oral halitosis. The major source of halitosis is volatile sulfur compounds (VSCs), which are generated through the decomposition of protein contained in food residue in mouth by oral bacteria such as *Prophymonas gingivalis (➔ Methylmercaptan)* or *Fusobacterium Nucleatum*

Manuka honey, derived from the Manuka tree in New Zealand, is well-known for a pronounced antibacterial activity which cannot be found by any other honey. **Manuka honey contains a typical antibacterial substance "methylglyoxal (MGO)", and shows the strong antibacterial activity against oral bacteria, by which it can be a promising functional food for the oral care. Here, we report on the decrease of halitosis by intake of Manuka honey.**

Methods: Ten healthy subjects (average age : 36 years old, 5 men and 5 women) were selected, and their halitosis was measured before and after intake of Manuka honey or acacia honey. The concentration of VSCs was measured by an oral Chroma (Hali meter RH-17K, Taiyo), and the concentration of anaerobic bacteria in mouth was evaluated by urease activity (Atein mBA-400, Taiyo>' The amount of MGO in honey was measured using RP-HPLC with UV detection as the corresponding quinoxaline after' pre-column derivatization with o-phenylendiamine.

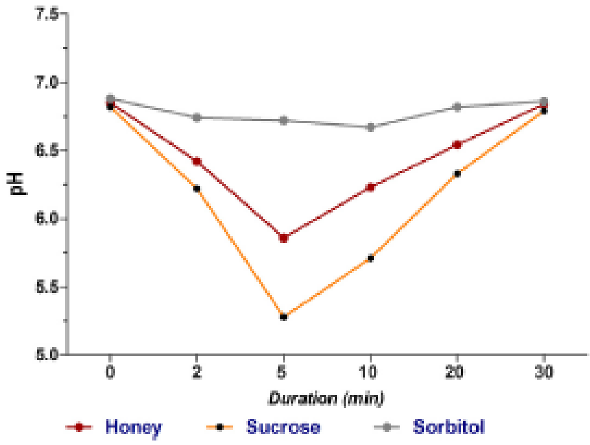
Results: The concentrations of VSCs and anaerobic bacteria in mouth decreased after intake of both honey, but the decreasing effect of Manuka honey was markedly stronger than that of acacia honey. **Manuka honey showed 127 times higher amount of MGO than acacia honey by RP-HPLC analysis**.

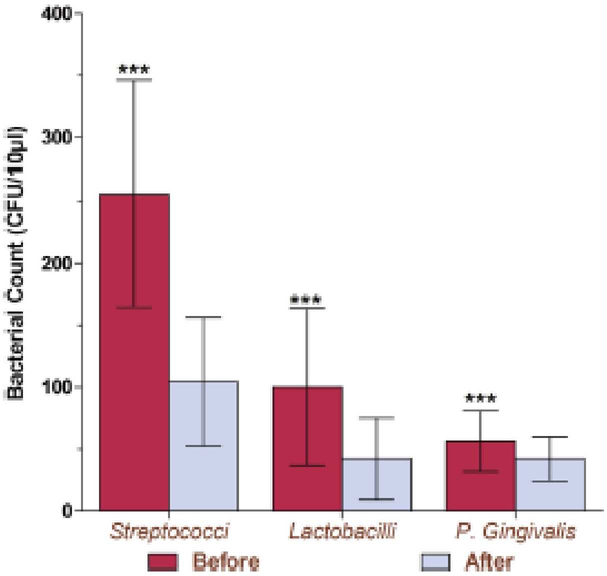
Conclusions: ***Since there is the strong relationship between MGO level in honey and the antibacterial activity, the results indicate that the decreasing effect of halitosis by Manuka honey would originate from the strong antibacterial activity of MGO.***

2. Effect of honey in preventing gingivitis and dental caries in patients undergoing orthodontic Treatment. Saudi Dental Journal 2014 *AL-Dany A. Atwa, Ramadan Y. AbuShahba, Marwa Mostafa, Mohamed I. Hashem*

Abstract Objectives: This study was conducted to investigate the following: (1) the effects of chewing honey on plaque formation in orthodontic patients, (2) the effect of chewing honey on dental plaque bacterial counts, (3) determine if honey possesses antibacterial effects on bacteria recovered from plaques.

Methods: Female orthodontic patients (n= 20, 12–18 years of age) participated in this randomized controlled study. The effects of honey were compared to treatment with either 10% sucrose or 10% sorbitol that served as positive and negative controls, respectively. The pH of plaque was measured using a digital pH meter prior to baseline and at 2, 5, 10, 20, and 30 min after chewing honey or rinsing with control solutions and the numbers of Streptococcus mutans, Lactobacilli, and Prophymonas gingivalis in respective plaques were determined. The antibacterial activity of honey was tested against commonly used antibiotics using the disk diffusion method.





Results: Significant differences in pH were observed in the honey and sucrose groups compared to the pH observed in the sorbitol group (p 6 0.001). The maximum pH drop occurred at 5 min in both the honey and sucrose groups; however the pH in the honey group rapidly recovered 10–20 min after exposure and did not drop below the critical decalcification pH of 5.5. On the otherhand, the pH following sucrose exposure fell <5.5 and was associated with a 30 min recovery time. The pH observed for the sorbitol group did not change over time. Bacterial counts were significantly reduced in the honey group compared to the other treatment groups (p 6 0.001) and honey significantly inhibited the growth of all studied strains compared to inhibition observed with antibiotics (p 6 0.001).

Conclusions: ***Honey can be used as an alternative to traditional remedies for the prevention of dental caries and gingivitis following orthodontic treatment.***

The Composition and Biological Activity of Honey: A Focus on Manuka Honey. Foods 2014
José M. Alvarez-Suarez, Massimiliano Gasparrini, Tamara Y. Forbes-Hernández, Luca Mazzoni and Francesca Giampieri

Abstract: Honey has been used as a food and medical product since the earliest times. It has been used in many cultures for its medicinal properties, as a remedy for burns, cataracts, ulcers and wound healing, because it exerts a soothing effect when initially applied to open wounds. Depending on its origin, honey can be classified in different categories among which, mono-floral honey seems to be the most promising and interesting as a natural remedy. Manuka honey, a mono-floral honey derived from the Manuka tree (*Leptospermum scoparium*), has greatly attracted the attention of researchers for its biological properties, especially its antimicrobial and antioxidant capacities. Our manuscript reviews the chemical composition and the variety of beneficial nutritional and health effects of Manuka honey. *Firstly, the chemical composition of Manuka honey is described, with special attention given to its polyphenolic composition and other bioactive compounds, such as glyoxal and methylglyoxal. Then, the effect of Manuka honey in wound treatment is described, as well as its antioxidant activity and other important biological effects.*

Effect of Manuka honey, chlorhexidine gluconate and xylitol on the clinical levels of dental plaque Contemp Clin Dent. 2010 *Prathibha A. Nayak, Ullal A. Nayak, and R. Mythili*
Department of Periodontics, Modern Dental College & Research Centre, India. Department of Pedodontics & Preventive Dentistry, Modern Dental College & Research Centre, India. Department of Periodontics, Rajah Muthiah Dental College & Hospital, Annamalai Nagar, India

Aims:
To compare the effect of Manuka honey, chlorhexidine gluconate (0.2%) mouthwash and xylitol chewing gum on the dental plaque levels.

Materials and Methods:
Sixty healthy male dental students aged between 21 and 25 years (mean age 23.4 years) participated in the study. All the subjects received a professional prophylaxis at the start of the study, with the purpose of making the dentition 100% free of plaque and calculus. The subjects were then randomly divided into three groups, i.e. the Manuka honey group, the chlorhexidine gluconate mouthwash group and the xylitol chewing gum group. Rinsing with water or any other fluid after the procedure was not allowed as also any form of mechanical oral hygiene for all the subjects during the experimental period of 72 h. After the experimental period, the plaque was disclosed using disclosing solution and their scores were recorded at six sites per tooth using the Quigley and Hein plaque index modified by Turesky-Gilmore-Glickman.

Mean and range of plaque scores in different groups

Groups	Mean	Minimum	Maximum	SD
Manuka honey	1.37	1.09	2.01	0.24
Chlorhexidine mouthwash	1.35	1.03	1.81	0.19
Xylitol chewing gum	1.57	1.12	2.02	0.22

Results:
The mean plaque scores for Groups I, II and III were 1.37, 1.35 and 1.57, respectively. The ANOVA revealed that between-group comparison was significant, with an F-value of 5.99 and a probability value of 0.004. The T-test was carried out to evaluate the inter-group significance, which revealed that the plaque inhibition by Manuka honey was similar to that of chlorhexidine mouthwash. **Both Manuka honey and chlorhexidine mouthwash reduced plaque formation significantly, better than the xylitol chewing gum.**

OPEN ACCESS

How honey kills bacteria University of Amsterdam 2010

Paulus H. S. Kwakman, Anje A. te Velde, Leonie de Boer, Dave Speijer, Christina M. J. E. Vandenbroucke-Grauls and Sebastian A. J. Zaat

Abstract

With the rise in prevalence of antibiotic-resistant bacteria, honey is increasingly valued for its antibacterial activity. To characterize all bactericidal factors in a medical-grade honey, we used a novel approach of successive neutralization of individual honey bactericidal factors.

All bacteria tested, including Bacillus subtilis, methicillin-resistant Staphylococcus aureus, extended-spectrum β-lactamase producing Escherichia coli, ciprofloxacin-resistant Pseudomonas aeruginosa, and vancomycin-resistant Enterococcus faecium, were killed by 10–20% (v/v) honey, whereas ≥40% (v/v) of a honey-equivalent sugar solution was required for similar activity.

Honey accumulated up to 5.62 ± 0.54 mM H_2O_2 and contained 0.25 ± 0.01 mM methylglyoxal (MGO). After enzymatic neutralization of these two compounds, honey retained substantial activity. Using *B. subtilis* for activity-guided isolation of the additional antimicrobial factors, we discovered bee defensin-1 in honey. After combined neutralization of H_2O_2, MGO, and bee defensin-1, 20% honey had only minimal activity left, and subsequent adjustment of the pH of this honey from 3.3 to 7.0 reduced the activity to that of sugar alone. Activity against all other bacteria tested depended on sugar, H_2O_2, MGO, and bee defensin-1. **Thus, we fully characterized the antibacterial activity of medical-grade honey.**

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