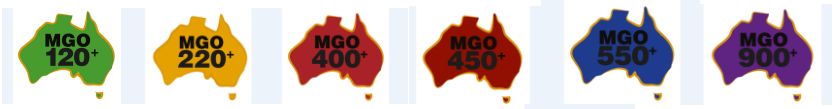
# Bioactive Honey”

Not all traditional medicines are safe or effective.

Honey however is one of the traditional medicines that seems both safe and efficacious for a number of different conditions.




Berringa Honey ©

Document prepared for Mr. Peter D Woodward

***PLEASE NOTE: "Bioactive" honey has to have had its MGO measured by a NATA (National Association of Testing Authorities) certified scientific laboratory. It is also important to note that Manuka is only one type of "bioactive" honey and that it must be remembered that NOT ALL Manuka honey is BIOACTIVE! As there are MANY misleading labeling on the "bioactive" honey market, it is imperative that all "bioactive" honey definitions are understood.***

# Overview

Currently there is an alarming and disturbing rise in antibiotic resistance and chronic wound infections that are posing a very serious threat to the public world-wide. It is even more concerning that this antibiotic resistance also includes the major "last-resort" drugs of which the frequencies of bacterial resistance are increasing. This threat is further compounded by the fact that very few new antibiotics are being developed.

Therefore, alternative antimicrobial strategies are *urgently* overdue.

Even though honey has been used for treatment of ailments since ancient times[1], it has largely been underutilized until recently. "Bioactive" honey is now gaining acceptance in modern medicine as an alternative therapeutic strategy owing to its antimicrobial activity and wound healing properties.

Furthermore, there has never been any recorded antibiotic resistance to "Bioactive" honey and it is believed that "Bioactive" honey avoids this fate owing to its multi-pronged approach. By comparison, resistance to penicillin was first recorded just 4 years after it went into mass production[2].

It is now known that "Bioactive" honey is produced predominantly from the Leptospermum species of plants, which impart the honey with very high levels of a naturally occurring compound known as methylglyoxal (MGO). This MGO has been scientifically shown to be the major compound responsible for "bioactive" honey's antimicrobial activity, including very effective activity against antibiotic resistant and sensitive bacterial pathogens such as Methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE), (E.g. GOLDEN STAPH).

It is not surprising then, that "bioactive" honey-based wound care products have been registered with medical regulatory authorities as wound care agents in Australia, Canada, the European Union, Hong Kong, New Zealand and the USA.

# Knowledge so far:

## What is “Bioactive” honey?

Also known as Active Honey or Super Honey or Super Manuka

Derived from Leptospermum (L.) species of plants predominantly the L. polygalifolium and L. scoparium species[3].

“Bioactive” honey has a high concentration of a natural plant derived factor known as MGO (methylglyoxal). MGO has been scientifically shown to be responsible for the broad spectrum antimicrobial activity seen with “bioactive” honey. This is also referred to as the “non-hydrogen peroxide” activity of honey[4].

“Bioactive” honey has the bonus of having all the antimicrobial activity of normal honey due to its hydroscopy, hydrogen peroxide ($H_2O_2$), and acidic pH but has the enormous advantage of having high levels of MGO! I.e. Superhoney!

“Bioactive” honey has been shown to have a broad spectrum antimicrobial activity against fungi, viruses, and bacteria. (Including aerobes and anaerobes, gram-postive and gram-negatives and antibiotic resistant strains e.g. Golden Staph). (For further information please see entry under antimicrobial action of “bioactive” honey).

No recorded antibiotic resistant recorded for “bioactive” honey due to its multi-pronged antimicrobial approach.

“Bioactive” honey has been effectively used in wound care, in particular wounds that have not responded to conventional treatments such as antibiotics. (For further information please see entry under “wound care”).

“Bioactive” honey has been shown to have antioxidant, immunomodulatory and anti-inflammatory effects.

## Floral source of “Bioactive” honey.

These floral species are almost entirely found in the genus level of Leptospermum plants, these plants have unique properties that allow the bees to produce “bioactive” honey[3].

Leptospermum spp. have the highest concentrations of the natural plant derived compound called methylglyoxal (**MGO**), and consequently the highest levels of non-hydrogen peroxide antimicrobial activity found in honey[3].

Leptospermum which has approximately 80 species, originated on the east coast of Australia around the cretaceous period and then only recently migrated to other parts of the region, but only some of these species have the revered non-hydrogen peroxide antibacterial activity ie MGO[5,6].

To date this non-hydrogen peroxide antimicrobial activity has been found in six different Australian Leptospermum species (L. polygalifolium, L. liversidgei, L. semibaccatum, L. leavigatum, L. trinervia, L. speciosum), and only one Leptopermum sp growing in New Zealand[3].

As such antimicrobial “bioactive” honey is found at the genus level of Leptospermum and NOT restricted to just one species such as Leptospermum Scoparium (referred to in New Zealand as the **Manuka** tree)[3].

A recent study has demonstrated that honey samples from **Australia** EXCEEDS “bioactive” honey levels that have been reported for honey from other countries, in both the prevalence of non-peroxide activity ie (MGO) and the level of this activity[7].

Leptospermum Plant in full bloom

## What is Antimicrobial activity?

Activity that kills or suppresses multiplication or growth of microbial organisms.
A microbe is a microscopic organism, such as a fungus, bacteria etc. So

Antimicrobial can be:
*Antifungal*
*Antiviral*
*Antibacterial*- can either be bactericidal (kills the bacteria) or bacteriostatic (slow their growth or reproduction).

### What are the Antimicrobial components of "Bioactive" Honey?

[1] **MGO** Methylglyoxal (MGO) is a natural constituent of honey and has been found to be in high levels in "bioactive" honey MGO has been found to be the main component of "bioactive" honey that affords it the very potent antimicrobial activity[4]. In one study when "bioactive" honey was tested against different antibiotic resistant bacteria, the "bioactive" honey with the higher MGO levels were more effective in killing both bacteria [8]. ***To put it simply the higher the MGO the more potent the honey is!*** It is sometimes called the non-hydrogen peroxide activity, this means when you have eliminated the antibacterial activity of "bioactive" honey (contributed by the $H_2O_2$) you are left with the activity of MGO. The $H_2O_2$ portion of the "bioactive" honey antimicrobial activity is heat and light sensitive whereas the MGO component is not.

[2] **high osmolarity**, low water activity (inhibits microbial growth but when diluted (with wound exudus), this ceases to be effective).

[3] **low pH** (around 3.2 to 4.5) The low pH is largely due to gluconic acid formation (which has a mild antibacterial effect).

[4] **hydrogen peroxide**, This has antimicrobial activity. $H_2O_2$ is formed by diluting (wound exudus) the enzyme glucose oxidase.

[5] **phenolic acids and flavonoids**, show a weak antibacterial activity, but are believed to exert anti-inflammatory action[9], and other not fully characterised compounds.

## Bacteria Terminology.

**Antibiotic Resistance:** *The ability of bacteria and other microorganisms to overcome the effects of an antibiotic to which they were once sensitive.*

**No Antibiotic Resistance:** "Bioactive" honey differs from antibiotic activity as "Bioactive" honey has a multi-pronged approach to its antimicrobial activity, (MGO, H2O2, pH), so it has **not** had to date ANY reported antibiotic-resistance recorded. (Antibiotics recorded resistance as early as 4 years after penicillin was massed produced).

**Biofilms:** Bacteria can be free-floating or they "stick" to a surface and grow in a group in one "sticky" location, this is called "biofilms". Biofilms are complex and they afford the bacteria protection against the host defenses (ie neutrophils don't work against biofilms) and it also makes the bacteria EVEN more antibiotic resistant. Fortunately "bioactive" honey seems to be able to kill the bacteria even in biofilm form.

**Catalase positive bacteria:** Bacteria can either be catalase positive or negative, this means if it's catalase positive, it contains an enzyme called catalase. Catalase destroys hydrogen peroxide ($H_2O_2$) produced by honey into water and oxygen. That is why "bioactive" honey is still effective even on these types of bacteria, as they can rely on the MGO presence to kill the bacteria and not just the $H_2O_2$ portion.

## What Antimicrobial Activity does "Bioactive" Honey Demonstrate?

### Antibacterial

"Bioactive" honey has antimicrobial activity against a broad spectrum of bacteria. "Bioactive" honey has been reported to have an inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram-positives and gram-negatives of both antibiotic-resistant and antibiotic-sensitive bacteria.

In one study (that tried to account for the level of activity of the "Bioactive" honey), it was shown that antibiotic-susceptible and -resistant isolates of *Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus faecium, Escherichia coli, Pseudomonas aeruginosa,*

*Enterobacter cloacae,* and *Klebsiella oxytoca* were killed within 24 h by 10%-40% (vol/vol) of the "Bioactive" honey[10].

***"Golden Staph" and MRSA***

Antibiotic resistant *Staphylococcus aureus* (*S.aureus*) is sometimes called "Golden Staph" or MRSA (Methicillin-resistant *Staphylococcus aureus*). *S. aureus* can survive from hours to months on dry surfaces[11], it is **catalase positiv**e bacteria and grows **biofilms.** The diseases from *S. aureus* can be quite mild to *life-threatening*.

It is the cause of postsurgical wound infections, and it is the most common causes of nosocomial infections. Other conditions are: Skin infections boils, pimples, cellulitis follicitulis, carbuncles, scalded skin syndrome, abscesses), Sinusitis, Pneumonia, Meningitis, Osteomyelitis, Endocarditis, Toxic shock syndrome, and Bacteremia sepsis.

It is a very "hardy" bacteria, in 1944 when Penicillin was introduced 94% of *S.aureus* isolates were susceptible, by 1950 50% were resistant and by 1960 virulent multi-resistant *S.aureus* were seen, in the very year (1961) methicillin was released and methicillin-resistant *Staphylococcus aureus* (MRSA) was seen[12].

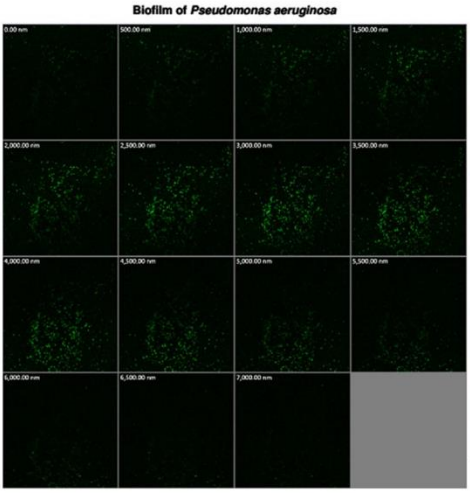
**Findings:** In many studies, wounds that have failed to be treated by antiseptics and antibiotics, "bioactive" honey was found to heal these wounds, even wounds that had been infected or colonized by MRSA[12].

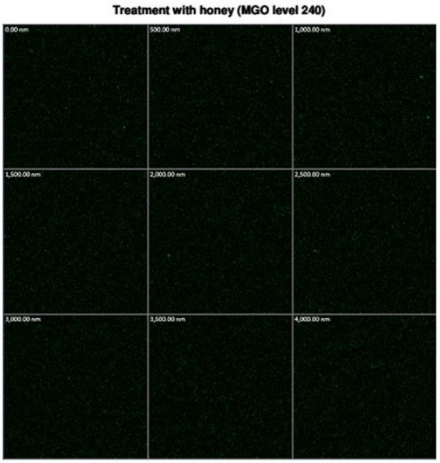
It has been found that "bioactive" honey was effective on 18 strains of MRSA Methicillin resistant *Staphylococcus aureus* collected from infected wounds[13]. In another study antibiotic sensitive and antibiotic resistant isolates of *Staphylococcus aureus* were killed within 24 hrs with 20-40% vol/vol of honey[10].

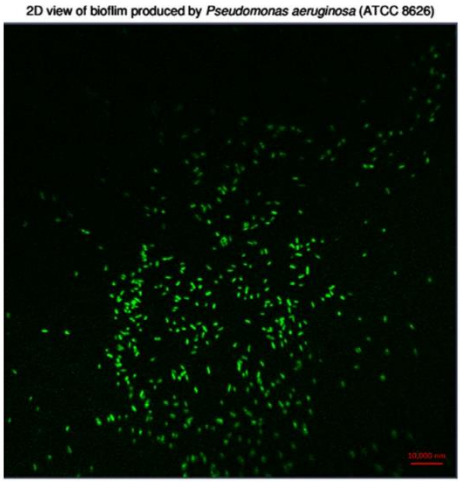
"Bioactive" honey kills antibiotic-sensitive and antibiotic-resistant *S. aureus* "GOLDEN STAPH" (Methicillin-resistant *Staphylococcus aureus*-MRSA) in free floating and in biofilm forms and the rates of bactericidal activity was even higher than seen with antibiotics commonly used against *S. aureus*[14,15,16].

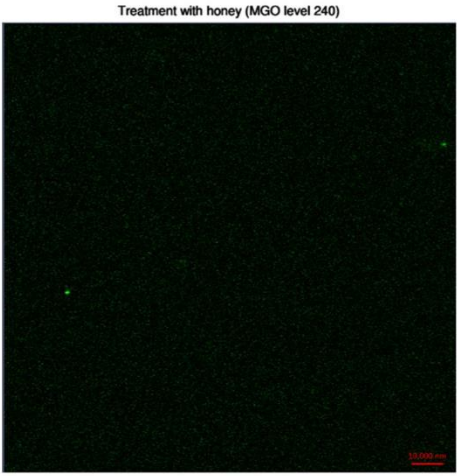
Biofilm before and after treatment with MGO (240) Honey

Pictures supplied by Dr. Yasmina Sultanbawa - Queensland Alliance for Agriculture and Food Innovation - University of Queensland



***Streptococcus pyogenes.***

*S. pyogenes* is a B-hemolytic bacteria, which means it ruptures red blood cells.

It can produce the following diseases; Streptococcal pharyngitis (Strep throat), impetigo, Scarlet fever, to the more severe conditions such as Streptococcal toxic shock syndrome, pneumonia, bacteremia and the flesh-eating disease, necrotizing fasciitis.

The fact that "bioactive" honey is effective against this bacteria, is very relevant as this bacteria can survive for months on dry surfaces[11] and there over 700 million infections worldwide with over 500 000 deaths[17], and the mortality rate of necrotizing fasciitis is approximately 27%[18].

**Findings:** "Bioactive" honey has been effective (significant cell death and dissociation of cells from the biofilm) against *S. pyogenes* in both free-floating and biofilm forms. Although higher concentrations were needed for the biofilm effects[19].

***Enterococci***

This hardy bacteria that can survive for months on dry surfaces[11], can cause the following diseases: urinary tract infections, bacteremia, bacterial endocarditis diverticulitis, meningitis, neonatal meningitis.

A high level of antibiotic resistance is seen with Enterococci and alarmingly particularly virulent strains of *Enterococci* are resistant to the antibiotic vancomycin (vancomycin resistant *Enterococci* VRE).

**Findings:** *Enterococcus faecium* was killed within 24hrs with 30-40% vol/vol "bioactive" honey[10].

7 strains of vancomycin-sensitive *enterococci* isolated from swabs collected from acute and chronic wounds and 20 strains of vancomycin-resistant *enterococci* VRE isolated from the hospital environment[14].

***Pseudomonas aeruginosa*.**

*Pseudomonas aeruginosa* flourishes in hospital environments and is an opportunistic catalase positive pathogen of clinical relevance. As it can survive for months on dry surfaces[11], it is the second most common infection in hospitalized patients. *Pseudomonas aeruginosa* forms biofilms. It is highly resistant to antibiotics.

**Findings**: "Bioactive" honey has been found to be effective against 50 strains of *Pseudomonas aeruginosa* from infected wounds[20]. Again "bioactive" honey was found to effectively kill *Pseudomonas aeruginosa* in free-floating and biofilm form[14]. In another study *Pseudomonas aeruginosa* killed within 24 hrs with 20% of "bioactive" honey[10].

***Other bacteria:*** In the literature there is a long list of different bacteria studied with "bioactive" honey, below are but some of these that "bioactive" honey is effective against: *Staphylococcus epidermidis, Escherichia coli, Enterobacter cloacae, Klebsiella oxytoca, helicobacter pylori*[10, 21].

## ANTIFUNGAL.

Pathogenic fungi resistance to antibiotics is compounding the control of infections caused by these microbes.

"Bioactive" honey has an antifungal action that has been observed for some yeasts and species of the *Candida* species including *Candida* biofilms of the pathogen *Candida albicans* and has been shown to have success with treating vulvovaginal candidiasis on pregnant women using a honey mixture [22,23,24]. "Bioactive" honey has an antifungal activity against the common dermatophytes; *Epidermophyton floccosum; Microsporum canis; Microsporum gypseum; Trichophyton mentagrophytes var. interdigitale; Trichophyton mentagrophytes var. mentagrophytes; Trichophyton rubrum and Trichophyton tonsurans* [25].

# ANTIVIRAL.

**Coughs and colds** It is with great interest that WHO (world health organization) and the American Academy of Pediatrics both recommend using honey for coughs (in children above the age of 1 year old), in preference to some over the counter medications. [26,27]. It has been suggested that the relief is due to the honey's antimicrobial capabilities and the fact the texture is smooth and lessens the irritation of the sore throat, "There's an interaction between the sensory nerves locally and those in the central nervous system that are involved in the regulation of the mechanism of cough" [26].

**Findings**
"Bioactive" honey has been found to be an effective antiviral agent against *Respiratory syncytial virus* (RSV), which is implicated in the common cold. The study found that "bioactive" honey may possibly be an effective antiviral treatment for the therapy of respiratory viral infections. The results found inhibition of viral replication (at the transcription level), very little virus detected in honey-treated cells compared with untreated cells infected with RSV[28].

***Varicella Zoster Virus* (VZV).**

In one study "Bioactive" honey helps with the treatement of *Varicella Zoster Virus* (VZV) lesions or better known as Herpes lesions on both lips and labial. It was found that "bioactive" honey was 35 to 59% better than acyclovir in treating VZV lesions. They suggested that the application of honey is safe and effective in the management of the signs and symptoms of recurrent lesions from labial and genital herpes[29].

In another study, the antiviral activity of "bioactive" honey against VZV with an approximate EC50 of 4.5%wt/vol and suggested that it would make an excellent inexpensive remedy to treat zoster rash[30].

## Use of "Bioactive" honey in Wound Healing.

"Bioactive" honey has successfully been used to treat a wide range of wounds including infected wounds, skin grafts and burns that were not responding to conventional antibiotics and antiseptic treatments [13,31,32,33,34]. A Cochrane review has found that "bioactive" honey reduces the time taken for mild burns to heal[35].

"Bioactive" honey has been used to treat adult and neonatal postoperative infection, burns, necrotizing fasciitis, infected and non-healing wounds and ulcers, boils, pilonidal sinus, venous ulcers, diabetic foot ulcers and leg ulcers of mixed aetiology, pressure ulcers, unhealed graft donor sites, pressure ulcers, unhealed graft donor sites, abscesses, infected wounds from lower limb surgery.

**Findings:** Following is only *some* of the peer reviewed scientific findings of using "bioactive" honey on the above mentioned wounds:

In one of many studies, it shows that wounds that antiseptics and antibiotics had failed to treat, "bioactive" honey had fully healed 7 consecutive patients whose wounds were either infected or colonized with methicillin resistant *S. aureus* (MRSA)[13].

Another study found that wounds dressed with honey (as compared to traditional silver dressings) had decreased inflammation, better control of infection and quicker wound healing[33].

Another study showed that "bioactive" honey successfully treated 9 infants that had large open postoperative infected wounds that were not responding to conventional treatment. By day 5 of the honey treatment, all infants showed clinical improvement and by day 21 the wounds were closed, clean and sterile, with *NO* adverse reactions seen[34].

The scientific studies are numerous but the reason *why* "bioactive" honey is so effective at healing wounds, even on wounds not responding to conventional treatment is not quite understood but seems to be multifaceted.

[1] Antimicrobial activity of "bioactive" honey decreases microbial growth which causes the unpleasant odours associated with infected wounds.

[2] Excess inflammatory cell activity can delay wound healing, and by removing the microbial growth, the healing process can begin. "Bioactive" honey's nutritional and antioxidants may aid this healing process as well.

[3] Low pH, not only has antimicrobial activity but it also helps regulate the protease activity, i.e. this helps the healing process as proteases are enzymes that play an essential role in epithelialisation.

[4] Hydrogen peroxide ($H_2O_2$)

Glucose + water + O2 *(glucose oxidase)* gluconic acid + hydrogen peroxide

$H_2O_2$ lost favour as a wound care treatment as it caused tissue damage, however honey that contains $H_2O_2$ has been known for aiding in healing tissues. It is found that $H_2O_2$ in honey is produced continuously in very low concentrations when honey is diluted, (gradual dilution of the honey from wound exudus.). $H_2O_2$ concentrations that are not damaging to tissue but more effective at killing bacteria than when added in isolation. Ie "bioactive" honey is a very proficient and efficient vehicle to deliver the $H_2O_2$ to the wound. $H_2O_2$ produces oxygen free radicals which can be catalased by free iron of wounds, "bioactive" honey also sequesters and inactivates these free irons.

[5] There also seems to be other factors attributed to honey that contribute to wound healing, such as anti-oxidant and anti-inflammatory effects and the proliferation of peripheral blood B-lymphocytes and T-lymphocytes in cell culture is stimulated by honey and its antioxidant components help to mop up oxygen free radicals, etc[36].

All of the above factors leads to "bioactive" honey being an ideal complementary wound care agent.

Honey case study – Photos supplied by Jan Rice – World of Wounds

7/3/2013

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21/3/2013

## A Note on the Measurements of Antimicrobial Activity.

**UMF®.** Unique Manuka Factor, is a commercial term that is calculated from a biological assay that is supposed to measure the "total" anti-microbial factors of honey compared against a range of phenol equivalents.

UMF has a number of issues that has precluded its usage from being listed as reliable terminology with the TGA (Therapeutic Goods Administration), as such therapeutic goods regulations prohibit ANY representation of phenol equivalents.

**UMF Methodology**.
Honey samples are allowed to diffuse through a defined hole cut into the agar plate, that has been inoculated with a bacteria called *Staphylococcus aureus*. If the honey has antimicrobial activity you will see a "clearance zone" where the honey has inhibited the visual growth of the bacteria (the rest of the plate will grow bacteria). The honey clearance zones are compared to the clearance zones of a set of phenol standards (w/v phenol in water). This "bioactivity" is then expressed as the equivalent phenol concentration (%w/v). Eg 20+ UMF means an "bioactive" honey has a clearance zone that compares to a Phenol standard's clearance zone of 20g/100mL[37].

**UMF Limitations**.

[1] Limited in its accuracy, when "bioactive" honey has a very high or very low MGO concentration. Low MGO levels give a varying number of UMF values, whereas at higher MGO levels the apparent UMF decreases in relation to MGO mg/kg[38].

[2] Prone to operator error, or technician skills (results may vary depending on "who" is performing the experiment).

[3] Unsuitable for quantification of total antimicrobial activity of honeys as it uses only one type of bacteria *S. aureus*, so it is not a measure of total antimicrobial activity (different bacteria, fungus etc).

[4] Can't tell if antibactercidal (kills the bacteria) or antibacterial (inhibits growth).

[5] Phenol standard used in the UMF assay has limited solubility of 9.3% (ie 9.3g/100mL)[39], yet standards of up to 30 or higher are used. For example when a honey has a rating of a UMF of 20+, the clearance zone of the honey on the bacteria is compared to a phenol standard's clearance zone that is 20g of Phenol/100mL!

**UMF vs. MGO is only a SEMI-quantitative correlation and *care* should be taken when trying to compare the two values.**

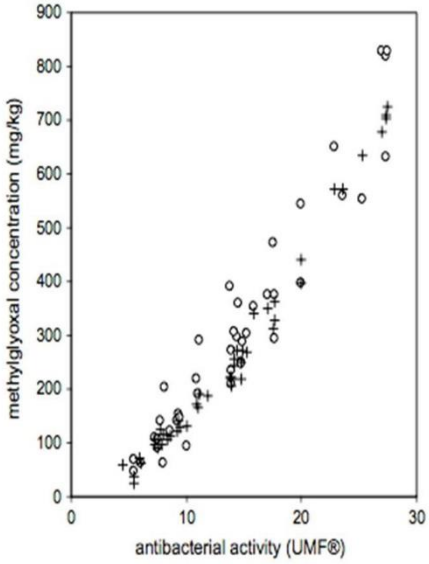
Different correlation values have been reported to provide a linear relationship between UMF and MGO, i.e. originally the factor was reported to be 1.96 and now is being reported as 1.87 (as reported by the UMF organization). But as can be seen (table below) when these conversion factors are used, the values do not correspond to the reported values found in the scientific literature (see graph below)(38). For example a "bioactive" honey sample with 500 mg/kg of MGO, it has a corresponding UMF value of 14.5, 14.6, 20 or 21!

At very high or very low levels of MGO, the corresponding UMF value do not correlate very well. When Adams *et al* analysed 83 samples of honey and compared UMF and MGO concentrations, they found that at the lower limits of detection (of the UMF assay), the comparative MGO values did not correlate, eg some honey samples had NO detectable UMF activity or value but these same samples had MGO values ranging from 2.1 to 24 mg/Kg of MGO. ***Whereas at higher levels the apparent UMF decreases in relation to MGO mg/kg.***

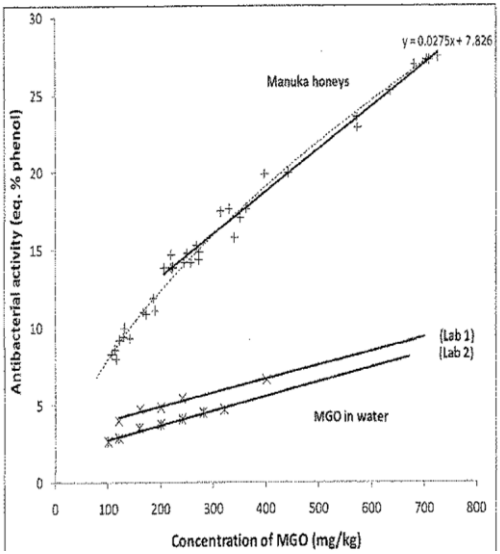
MGO is able to allow direct comparison of different honey i.e. it is a clearly defined property of honey especially "BIOACTIVE" honey. E.g. a honey with a MGO factor of 100 MGO will contain 10 x less MGO than a product with an MGO of factor 1000. This linear relationship does NOT seem to be the case with UMF measurements.

| MGO mg/Kg | UMF using 1.96 (older) | UMF using 1.87 | Apparent Value based on Adams et al 2008 | Apparent Value based on Molan 2008 |
|---|---|---|---|---|
| 100 | 5.5 | 5.7 | ~8 | ~7.7 |
| 200 | 7.9 | 8.1 | ~12 | ~11.9 |
| 300 | 10.2 | 10.3 | ~15 | ~15.4 |
| 400 | 12.4 | 12.5 | ~18 | ~18.3 |
| 500 | 14.5 | 14.6 | ~20 | ~21 |
| 750 | 19.4 | 19.3 | ~28 | ~27 for 700 MGO |
| 900 | 22 | 21.9 | (no value) | (no value) |
| 1200 | 26.5 | 26.3 | (no value) | (no value) |

Below: graphs from actual UMF/MGO values recorded experimentally left graph is Adams etal and right is Molan 2008.

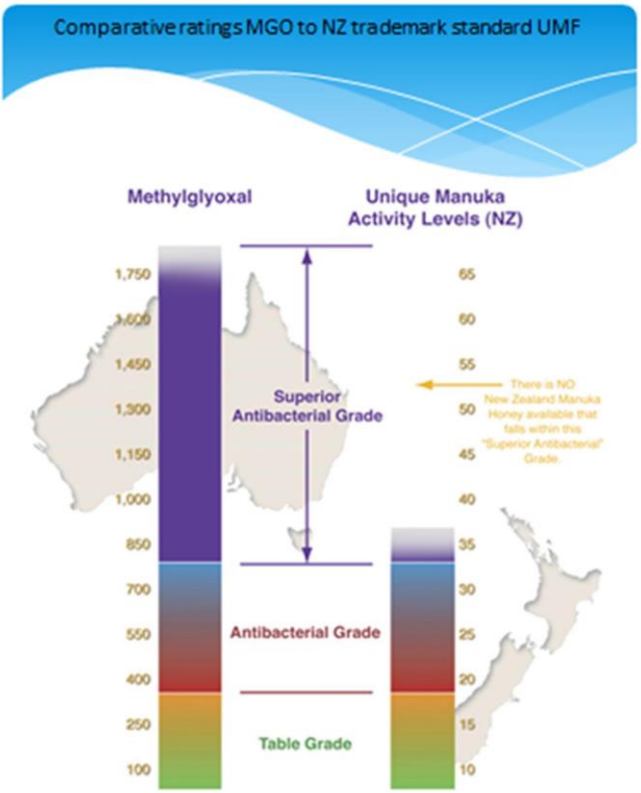



Adams




Molan

If you plot the values obtained through laboratory measured MGO values and their corresponding UMF values you get a graph that looks like this.




**Summary UMF V MGO**

It is now largely accepted in the scientific community that “bioactive” honey should be rated on its MGO level.

Two of the leading researchers, Prof T. Henle (from the University of Dresden in Germany) and Prof P Molan (from the University of Waikato in New Zealand) have both publicly agreed that the rating of “bioactive” honey should be with their MGO concentrations, as it is a superior method. It is a science based published method, which is reliable and repeatable, honest and transparent. It is also easy to understand by consumers[(40)].

## A NOTE ON DISCREPANCIES IN THE SCIENTIFIC LITERATURE.

It must be noted that analysis of the literature has shown that older data collected (ie before they knew that MGO was predominantly the responsible antimicrobial agent of "bioactive" honey) has shown some conflicting conclusions.

It is believed that it is because NON-"bioactive" honey may have been used instead of "bioactive" honey and/or the amount of MGO present in the "bioactive" honey was never standardized to make the studies valid. (It has been found that not all Manuka honey is active).

Ie As MGO is a naturally occurring compound and large variations are found between batches of honey even collected from the same location (differences are seen even during different seasons), this has confused the data and hampered its acceptance in modern medicine. But even with these limitations the amount of studies conducted, and the positive results seen it is simply quite staggering.

## A Note on "Bioactive" Honey Labelling.

As the MGO content of "bioactive" honey is a naturally occurring compound from very select tree species, the concentration of MGO may vary from batch to batch, it is IMPERATIVE that "bioactive" honey has an MGO rating for EACH batch from a NATA (National Association of Testing Authorities) certified scientific laboratory.

NOT all honey is labeled correctly and this can be misleading to consumers. Prof P Molan has warned the public to be wary of misleading labeling as NOT all Manuka honey is "bioactive" honey and it should have its MGO ratings displayed[40].

This seems to be backed up by current news articles:

[a] The New Zealand Herald, 25 August 2013, “The land of bad milk and fake honey” :
“Britain's Food Standards Agency has issued a nationwide warning about misleading and illegal claims made on the labels of Manuka honey jars, in a worrying blow to the fast-growing Kiwi industry”….. [41].
[b] The New Zealand Herald, 25 Aug 2013, “A message from UK: Stop exporting ‘crap’”:
“A major honey company has been ordered to pulp 40,000 labels that made illegal claims about the health benefits of the New Zealand manuka honey which it sells throughout the UK”…… [42].

"Because the price is so screaming high, it's encouraged the cowboys in New Zealand to label anything they can get away with as Manuka." Spacey said the amount of product labelled and sold as Manuka honey around the world vastly exceeded the amount produced in New Zealand. "You'd have to bulldoze Auckland and Wellington and replant them with Manuka, increase your bee population by 400 per cent, and you still couldn't produce enough to fill the jars that are labelled 'New Zealand Manuka honey'"…… [42].

***Disclaimer:***

***The information contained herewith is of a general nature only and is not intended to be a complete statement of the relevant laws, regulations nor requirements on any subject matter.***

***This information is not intended to provide and does not provide any legal, financial, medical, technological or other advice. You should always obtain professional advice for your own specific circumstances in relation to any subject matter discussed in this document.***

## TGA warnings & Disclaimers

Whilst all due care and attention that definition is relevant and is not a true and total definition

Honey has been identified as a source of Clostridium botulinum spores and thus recommendations have been made that honey should not be given to infants under 1 (some say 2) year because of risk to causing infant botulism.1,2

**Reference:**

[1] Majno G. The Healing Hand. Man and Wound in the Ancient World. Cambridge, MA: Harvard University Press; 1975. p. 571.

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