

Rating the antibacterial activity of manuka honey

Professor Peter Molan

Honey Research Unit, University of Waikato

The unique type of antibacterial activity that is present in manuka honey, distinct from the antibacterial activity due to hydrogen peroxide that is common to all honeys, was discovered in research at the University of Waikato in 1982. This discovery was first published in an MSc thesis which is held in the university library (K.M. Russell, 1983, *The antibacterial properties of honey*), and subsequently in a journal (Molan, P.C. and Russell, K.M. 1988, 'Non-peroxide antibacterial activity in some New Zealand honeys', *Journal of Apicultural Research* 27, 62–67).

The variation that occurs in the level of this unique activity in manuka honey was reported in a subsequent publication (Allen, K.L., Molan, P.C. and Reid, G.M., 1991, 'A survey of the antibacterial activity of some New Zealand honeys', *Journal of Pharmacy and Pharmacology* 43, 817–822) where it was noted that:

The present survey has shown not all samples said to be manuka honey can be relied upon to provide this antibacterial activity.

It was from this came the term “**Active Manuka Honey**”. The term was used in a fact sheet put out by the *New Zealand Honey Food & Ingredient Advisory Service* in 1998, which said:

All of the patients in the trials who were taking the special active manuka honey, as opposed to those patients taking ordinary inactive manuka honey, had a **marked** improvement in their symptoms.

It also said:

Research at the University of Waikato showed that **some** New Zealand manuka honey (and it is important to emphasise “**some**”, **not all**) New Zealand manuka honey has a unique antibacterial activity. Laboratory trials showed that this active manuka honey is effective in killing *Helicobacter pylori*.

Because of increasing publicity about active manuka honey though news media reports on the research being done at the Honey Research Unit at the University of Waikato, the public demand for this special honey increased. But it also brought out people seeking to gain financially by ‘passing off’ to the public so-called manuka honey which did not have the unique antibacterial activity. In 1997 I was asked by TRADENZ (the predecessor to New Zealand Trade and Enterprise) to help with the setting up of an Industry Group for the producers of the genuine active manuka honey, and to advise on how best the producers of the genuine active manuka honey, and consumers, could be protected from those selling manuka honey without the unique type of activity yet implying that it was the same thing.

Unfortunately the recommendations I made have not provided the answer to the problem. For instance, in the UK it is said that much of the manuka honey on sale does not have measureable levels of the non-peroxide antibacterial activity that is unique to manuka honey. Similarly there is honey on sale in New Zealand where the rating of activity on it is not a rating of the unique type of activity as measured by the assay described in Allen *et al.* (1991). There are also people selling manuka honey with the activity claimed to be the unique non-peroxide activity “assayed by the method developed by Dr. Molan” but there are beekeepers saying that different results from different laboratories are obtained for the same honey. There have also been many complaints that poor repeatability in results is seen when the same honey is sent repeatedly to the same laboratory. Consequently there is a need for a method for assaying and certifying the unique non-peroxide antibacterial activity of manuka honey that is accurate, highly reliable, independent of competing companies, open to anyone meeting set standards, and in which consumers can have confidence.

The measurement of the antibacterial activity of manuka honey by the method published in Allen *et al.* (1991) is by reference to a standard antibacterial agent (phenol) which is not what gives the manuka honey its activity. The assay uses bacteria which can vary in their relative sensitivity to the factors in the manuka honey and to phenol. Because of this, small differences in the way the assay is performed can give

different results for the rating of the honey. (This is why cross-checking between laboratories is essential.) Similarly, lack of adequate control to ensure that the catalase added to destroy hydrogen peroxide is fully effective can lead to results being reported for non-peroxide activity for honeys such as honeydew, which have high activity due to hydrogen peroxide but no non-peroxide activity. Thus people selling honey saying that the claimed non-peroxide activity has been tested by the method published by Allen *et al.* (1991) may be misleading the consumer.

The unit of measurement of the antibacterial activity of honey relative to that of phenol has *de facto* always been defined by the Honey Research Unit at the University of Waikato, with most other laboratories which carry out such measurement cross-checking their results with the Honey Research Unit to ensure that they are the same. I shall shortly be submitting for publication a paper which tightly defines the conditions and controls for the testing (and thus for the unit of activity) so that any laboratory following exactly the published method will get the correct result. This can then be used as the basis of a standard for Active Manuka Honey and can be used by regulatory authorities overseas to ensure that products on sale have the activity level claimed. If it is claimed that a laboratory has used the method then it can easily be verified if that is true, because with the tight specification of procedure exactly the same result should be obtained if the honey is re-tested.

The specifications in the method will ensure that there is no bias towards an incorrect result. For example, the new specification that checks should be made spectrophotometrically on the purity of the phenol standard will prevent a laboratory giving results that are consistently too high because their standard contains less phenol than is assumed, as can happen if the phenol has deteriorated with age. Another new specification will be that repeated assays are done. This is necessary so that allowance is made for the inherent margin of error and the variation in the many factors which cause deviation from the correct results. These are random (*i.e.* give no bias), so by repeated measurement it is possible to apply statistical analysis to estimate the correct result and the degree of confidence there can be that the true result will be within a particular degree of variance from the stated result. This has not been normal procedure in commercial assaying of honeys even though it is a basic scientific procedure. (It was not included in the method published by Allen *et al.* because that paper described an investigation of a very large number of samples of honey, seeking trends associated with floral type, so knowing the exact level of activity of single samples was not necessary.)

Research in the Honey Research Unit seeking improvement in the accuracy of the assay method for measuring the antibacterial activity of honey has been going on for many years. Some of the findings and new ideas have been implemented in the commercial testing over the years. Others have been recommended but not implemented, as published in the August 2008 issue of *The New Zealand Beekeeper* (pp. 24–25). Since then we have done further work to identify the various reasons for the errors and variation that occur in the results, and to devise ways of eliminating them. Because funding for this work has not been forthcoming from the honey industry the research has been funded by the university. Consequently the intellectual property (IP) from this further work belongs to the university. A proprietary assay giving more accurate and less variable results will be offered in the near future. With this, if the sample of honey supplied is truly representative of the bulk quantity the sample is taken from, then beekeepers can have a more reliable measure of the activity of the honey when trading drums of honey, and to be able to confidently adjust or confirm the blending of drums in a stirred vat to get a batch with the desired activity level.

A condition of use of this new proprietary assay will be that the results are not to be used for rating the activity of honey sold in retail packs unless the producer is licensed to have the University of Waikato certification of activity on the packs. This new assay will be a service available only for beekeepers to know the activity of bulk quantities of honey. This is because there will also be offered by the University of Waikato a certification of the correctness of the rating of antibacterial activity of retail packs of honey. This certification will be done only after assay of samples of finished labelled retail packs with labels bearing the batch number, with proof of consistency of activity throughout the batch being required, so as remove any scope for error which could lead to consumers purchasing jars of honey with activity not true to label.

The certification will include a statement of the statistical confidence in the correctness of the rating, for example, “There is 99.9% certainty that the activity is no more than 0.1 units below what is stated.”

I have been approached by several companies over a number of years asking for the University of Waikato to provide such a certification of rating the activity of manuka honey that would be open to anyone producing the genuine article. I have resisted doing so because I have invested so much effort into educating the world's consumers about the system I initially recommended to TRADENZ. However, because there is now so much confusion in the market place (see the recent article in the *Daily Mail*, a major UK daily newspaper, as an example: <http://www.dailymail.co.uk/health/article-1134423/Is-manuka-honey-really-worth-money.html>) the time has come for the provision of a rating system that consumers can trust, that will easily allow them to distinguish genuine Active Manuka Honey.

This certification by the University of Waikato is expected to be readily recognised as trustworthy by consumers because there has been so much exposure of the Honey Research Unit at the University of Waikato in the news media. I have been filmed in 19 TV documentaries on manuka honey, contributed information for seven others, filmed about manuka honey for 20 TV news programmes, interviewed for 14 radio news programmes, and have been interviewed in 38 other radio programmes. I have also been interviewed about manuka honey for 111 newspapers and 137 magazines, books and news websites. Most of these TV, radio and print media have been overseas. Discussion with buyers for companies in the health food trade overseas has indicated ready acceptance of the certification system because of the reputation of the Honey Research Unit and the recognition of the expertise of this group in the measurement of the antibacterial activity of honey.

Because the new proprietary assay of activity will give the same results when run in any laboratory, it will be possible to license overseas laboratories to operate the service and thus allow the university to certify honey exported in bulk and packed overseas, as long as the requirement is met of assays being done on labelled retail packs. This will give beekeepers more options for marketing the honey they produce, and at the same time hopefully will encourage reputable packing companies overseas to sell genuine Active Manuka Honey. The university will also make the proprietary assay available to regulatory authorities overseas so that they can easily check if manuka honey on sale in their countries genuinely does have the activity claimed.