# Current honey research at the University of Waikato

I have been asked to write for *The New Zealand BeeKeeper* an outline of the presentation that I gave at this year's national conference of the NBA. This presentation was on research on honey currently being done at the University of Waikato.

To put what has become a very large part of our research into context, I briefly outlined the history of the chance finding by a PhD student at the University of Dresden in 2005 that few samples of manuka honey examined in a survey of foodstuffs contained an exceptionally high level of MGO, which led to the proposal in 2006 that MGO, is the antibacterial component of manuka honey. It was the bringing of this to the attention of the world by Manuka Health in July 2007 that led to six of our research group having to work very hard for the past year on gaining an understanding of how MGO forms in manuka honey, seeking scientific evidence to demonstrate that this worryingly toxic substance can be safely consumed when it is in manuka honey, and that when in contact with wound tissues at the high levels at which it occurs in undiluted honey, it does not interfere with the healing process.

We have recently managed to devise a way to grow cells in the presence of undiluted honey without the high content of sugar in the honey killing them. We are now starting experiments to find if manuka honey will protect the cells from being harmed by MGO, which occurs in manuka honey at levels several times higher than the level of MGO alone that is known to kill cells. We have also been carrying out research to seek evidence that manuka honey will protect the body from the sort of damage that occurs in diabetes (e.g., arterial disease, blindness, kidney failure) that is mainly due to MGO formed in the body when blood sugar levels are high. There is sufficient MGO in a teaspoon of UMF 25 honey to provide enough MGO to raise the blood level to three times that in the blood of a diabetic. (But it is not known if it does - research is needed to find the answer.) We have been carrying out the research on harmful effects of MGO with great urgency to find supportive evidence in case there should be a health scare about the high level of MGO in manuka honey.

We are also very engaged in gaining a good understanding of how much MGO contributes to the antibacterial activity of manuka honey. The researchers at the University of Dresden concluded that "the pronounced antibacterial activity of New Zealand Manuka honey directly originates from MGO". I showed in my presentation published data which demonstrated that manuka honey inhibits bacteria at much lower concentration than the researchers at the University of Dresden found the level of MGO in it was capable of doing, and that the graph showing correlation between UMF and MGO indicated that there was another substance involved in the antibacterial activity besides MGO. I also showed some results we have recently obtained from an experiment carried out which demonstrate that the curve in the correlation graph is not due to a curved relationship between MGO and UMF. The results show that the curve is in fact due to there being less of this second substance in low-UMF honeys, which will be blends of manuka with other nectars. I reported that when MGO is added to other types of honey the UMF activity is the same as when it is added to water, unlike when it is added to manuka honey where the resultant activity is much higher. It is the variation in the amount of this second substance that would explain why the correlation between MGO and UMF is poor. Data was presented that showed that for a single level of MGO the UMF activity of honeys could vary by 6 UMF units.

A research project under way by one of the postgraduate students in the Chemistry Department, working in conjunction with Hills Laboratories, is expected to provide a quick means of determining the proportion of different types of nectar in honeys and identify the floral sources of honeys. This is an updated version of the "fingerprinting" work done in the past, but using state-of-the-art technology to get the volatile components from the honey for gas chromatography, instead of the cumbersome and slow technique of ether extraction previously used.

We have also been investigating how MGO forms in honey and why it forms only in manuka honey. Good progress is being made in this work. From our work we now have devised a way of detecting if MGO has been fraudulently added to honey.

It was briefly mentioned that much work has been going on investigating the antioxidant activity of honey, but because of commercial confidentiality details could not be given of a development in this area, which will be announced soon.

The progress of the research on the anti-inflammatory activity of honey was reported. Watson & Son funded a three-year PhD scholarship for this work, and already after two years of work the way in which the anti-inflammatory activity of honey works has been identified and an assay devised that uses cells in culture rather than animals. Many samples of honey have been assayed and very large differences in the strength of the anti-inflammatory activity have been found. It is anticipated that honeys will be rated for their strength of anti-inflammatory activity. Something I have predicted is that the anti-inflammatory activity of honey will become more important for selling honey than the antibacterial activity.

I also reported that I am involved in a clinical trial under way at Waikato Hospital to find if the anti-inflammatory activity of honey will help decrease the inflammation that results from radiotherapy of breast cancer. Another clinical trial I am involved in, that is awaiting the outcome of a research grant application, is with the University of South Australia on using honey to prevent sore and cracked nipples in nursing mothers, and thus prolong the period for which breast-feeding of babies is possible.

Research work being carried out supported by an MSc scholarship funded by the NBA, investigating the effectiveness of honey against various types of viruses, is producing good results. Activity against influenza virus, herpes virus and adenovirus has been demonstrated.

Work with an ear, nose and throat surgeon in Australia on the use of honey in nasal sinuses cleared by surgery was mentioned. Work is now being done developing suitable ways of getting honey to stay in place for a while in the sinuses. Work on developing forms of honey for other specialised therapeutic applications is ongoing.

A three-year postdoctoral researcher position has been funded by Watson & Son, to start immediately, for a project to find the mechanism by which honey debrides wound (cleans off pus and dead tissue), inhibits protein-digesting enzymes which otherwise prevent wounds from healing by destroying tissues, and stimulates the growth of cells which repair injured tissues.

A research scientist from a government agricultural research institute is visiting for one year and is working on identifying an antibacterial component of bee venom and on isolating and identifying the component of honey that stimulates immunity to infection.

A PhD project almost completed has demonstrated the sensitivity to honey of species of bacteria that cause gastroenteritis. Campylobacter, which are the most common cause of bacterial diarrhoea in New Zealand, have been found to be sensitive to honey even when honey is diluted down to 2% or less.

A research project, funded by a grant from Fonterra, has recently been completed in which rats were fed long-term on a diet with a sugar content like a typical New Zealand diet. One third of the rats had the sugar in the form of sucrose, one third had it in the form of honey, and one third had no sugar in their diet, as a control. (The honey was selected to have a high fructose content and a high antioxidant activity.) The rats fed sucrose gained significantly more body weight, as fat, than the rats fed honey. The weight of the rats fed honey was like that of rats fed no sugar at all. As the rats became old they were found to have significantly less anxiety and a significantly better memory if fed honey instead of being fed sucrose.

The fifteen members of the research group (besides myself) were each introduced (by means of photographs) as their part of the research activity was covered.

**- Professor Peter Molan**
**Honey Research Unit**



# *Responding to a disease report*

A question raised on several occasions during a recent visit to a number of regions is how we respond to a disease report, in particular how we deal with it.

In the case where one or two AFB infected hives are reported, an assessment is made as to the seriousness of the report received and we respond accordingly. A possible response could be as little as a quick chat with the beekeeper through to a full DECA review and audit inspection.

In general terms the most serious AFB situation is, as we know, a "rob out" report. This severely weakened hive can no longer defend itself and has had its stores robbed by neighbouring bees. This situation more than likely results in AFB being spread to neighbouring hives via the robbing process. In this case, letters would be sent to all beekeepers who own hives, generally within a three to five kilometre radius (depending on terrain) of the infection, advising them of the situation and suggesting they inspect their hives or have them inspected by an approved person. Further, if the beekeeper is DECA accredited, a review would be undertaken and depending on AsureQuality's knowledge of the beekeeper concerned, a follow-up inspection might take place.

If the report is considered serious—in other words, if the number of infected hives is high and the area and/or the beekeeper was previously clean or some other risk factor came into play—then the process as already outlined would be implemented. In this case and the "rob out" situation, attempts would be made to ascertain the source of the infection via a database search, beekeeper interview or indeed local intelligence.

A further situation, which is probably the most frequent, is the case where very low infection levels are reported in an area (say, one to two hives) and the beekeeper or the area has a history of disease. Often the beekeeper will say where he thinks the disease is coming from, or that it is self infected and it is established, in which case nothing more can be done. Some beekeepers have a style of operation that makes it very hard for them to eliminate AFB; for example, operators who have high pollination hive commitment or who have high staff turnover.

**- Rex Baynes**
**AFB NPMS Manager**