DENTISTRY and HONEY BIBLIOGRAPHY

- **Basson, N. J.; du Toit, I. J.; Grobler, S. R. [i](1994) (South Africa)** - **Antibacterial action** of honey on **oral streptococci**,
  in *J Dent Assoc S Afr*, Jul;49(7), pp.339-341. [ii]

- **Canet, M. (1989)** - **Honey** and **cider vinegar diets** (letter),
  in *Br. Dent. Journal 167(5)*, p.158.

- **Constantinescu, M.; Pãtrascu Panseluta (1981) (Romania)** - Miel **dentin**,
  in the XXVIII-Th. Apimondia Congress, p.447 (***-abstract).

- **Dustmann, H. Jost (1987) (Germany)** - **Effet** du miel sur la **bacterie cariogene *Streptococcus mutans***,
  in the XXXI-St. Apimondia Congress, Warsaw, Poland, pp.518-20 (***).

- **Dustmann, H. Jost; Behrens, I. (1987)** - **Effect** of honey on the **cariogenic bacterium *Streptococcus mutans***,
  in *Apidologie 18* (4), pp.348-350;
  in the XXXI-Th International Apicultural Congress of Apimondia, Warsaw, Poland. Apimondia Publishing House, pp.459-461.

- **Jones, Richard (1997) (UK)** - Science Round-up. Honey and healing,
  in *Bee World*, vol. 78, No. 3 (***). [iii]

- **Kudar, A. I. (1994)** - **Ultrafonoforeza** cu miere în **gingivitele catarale**,
  in *Revue Française d'Apiculture*, Avril;
  in *Romania apicolã*, 7, pp.29-30 (***).

- **Nardi Umberto (1996) (Italy)** - *Apiterapia. Curarsi con il Miele, Polline, Propoli, Pappa Reale e Veleno d'api.*

Aporie Edizione. Roma.
ISBN 88-85192-11-4

- **Steinberg, D.; Kaine, G.; Gedalia, I. (1996)** - **Antibacterial effect** of **propolis** and **honey** on **oral bacteria**,
  in *Am J Dent, 9*(6), pp.236-39 (***-abstract). [iv]

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[ii] The antibacterial properties of honey against medically important bacteria have been well documented but this information is not available for the oral bacteria and specifically for the oral streptococci. We determined the minimal inhibitory concentration (MIC) of honey for oral streptococci. Honey had a MIC of 25 per cent (vol/vol) for the bacteria tested with the exception of *Streptococcus anginosus* and *Streptococcus oralis* which were inhibited by 17 per cent (vol/vol) and 12 per cent (vol/vol) honey respectively. The hypertonic sugar control had a MIC of 25 per cent (vol/vol) for all the bacteria tested. Although the results of this study indicate that there could be other antibacterial agents present in the honey, it may be assumed that the hypertonic sugar concentration played an important role in this activity.

[iii] Science Round-up. Honey and healing

As anyone who has seen the film - *Jurassic Park* knows, fossils bear witness to the existence of insects on earth in the Carboniferous period of the Palaeozoic era before the existence of humans. Bees, in relatively unchanged form, have been around for over 50 million years. It is not surprising therefore that their involvement with humans must pre-date history. Cave paintings in Europe dating from 10 000 years BC depict man hunting honey which seems to have been recognized from the beginning as a precious product and cure for ills[1]. The oldest written record is a Sumarian tablet, possibly dated 3000 BC having a prescription using honey to treat a skin infection or ulcer. One of the earliest references in literature that contains solid statements about the curative properties of honey is found in the Koran where it says that God inspired bees to eat from all fruits to produce liquids of different colours in which there are cures for man[2].

In Ancient Egypt, the honey bee formed part of the Pharaoh's cartouche, used to denote the king of Lower Egypt. Honey bees were kept in hives very similar to the mud hives still used in Egypt today. Papyrus writings from that time were acquired in the mid- 19th century by Dr. Edwin Smith, an American scholar. Over 70 years later James Breasted succeeded in translating the document. Known as the *Smith papyrus* it gives a remarkable picture of medicine and surgery over 4000 years ago - including 48 case studies. One of these describes a gaping wound of the eyebrow, penetrating to the bone. The treatment was as follows:

'Now after thou has stitched it, thou shouldst bind fresh meat upon it the first day. If thou findst that the stitching of the wound is loose, draw it together with two strips [sutures] and thou should treat it with grease and honey every day until he recovers.'[3]

The same papyrus gives many other prescriptions, for example wounds and ulcers were treated with linen soaked in frankincense and honey, while honey mixed with aniseed, sycamore and frankincense could be used as a gargle for treating mouth ulcers and sores. A most improbable mixture is that of malachite (copper carbonate) and honey for warding off eye conditions. Yet similar prescriptions occur a thousand years later in ancient Greece and 1 500 years after that in medieval England.

The first book on honey in the English language was written by John Hill and printed in 1759[4]. It has the very unmarketable title: *The virtues of honey in preventing many of the worse disorders; and in the certain cure of several others, particularly the gravel, asthma, coughs, hoarseness, and a tough morning phlegm.* We have this book in the IBRA library and I think it is very apt to quote the first paragraph:

'The slight regard at this time paid to the medicinal virtues of Honey, is an instance of neglect men shew to common objects, whatever their value: acting in contempt, as it were, of the immediate hand of providence, which has in general made those things most frequent, which have the greatest uses; and for that reason, we seek from the remotest part of the world, medicines of harsh and violent operation for our relief in several disorders, under which we should never suffer, if we would use what the Bee collects for us at our doors.'

In the library we also have a paper which concludes that honey is grossly under-utilized in conventional medicine. That paper was published in 1989 - 230 years later in the *Journal of the Royal Society of Medicine* and originated from the medical school of Hammersmith Hospital in the UK[5].

There is not one of us who has not heard of granny's recipe of honey and lemon for a cough; although as we grew up we probably preferred the honey and whisky variant. It has become part of folk medicine and also a huge commercial undertaking.

Many hundreds of tonnes of honey are used each year in commercially manufactured pharmaceutical products. It is also used as a base for ointments. This is quite prevalent in Russia where honey itself is used to treat burns. It has been used in Britain as a surgical dressing for open wounds, burns and septic infections being non-adhesive it has proved to be more comfortable than other dressings.

The folklore and history are fine but where is the hard evidence?

The therapeutic qualities of honey have been rediscovered and its antibacterial properties recognized if not fully understood. A large amount of research work has been done but because the work is so widespread both in time and geography and then published in many different journals and in many languages it is difficult to assess all the findings.

It was established in 1919 that honey has antibacterial properties and these have been attributed in part to the osmotic effect that it can create. The high concentration of sugars in honey give it a hydroscopic quality. Through the process of osmosis it dehydrates and so kills bacteria. There are additional factors and it is difficult to ascertain the extent to which these factors work either independently or in conjunction within the healing process. For example, older literature refers to the presence of a substance - inhibine - this has been found to be hydrogen peroxide[3]. Hydrogen peroxide is produced in a reaction between glucose and oxygen. Furthermore, the low pH (3.7) of commercially produced honey creates an instantly unfavourable environment for bacterial growth which cannot be achieved by granulated sugar[6].

The viscosity of honey makes it a good barrier compound; its water solubility allows easy removal, while its mild noncorrosive properties prevent any additional harm to either damaged or healthy tissue[1].

There are many records of the use of honey and descriptions of its biological effects. But use sometimes implies effectiveness and can be given extra weight by frequent repetition. However, actual effectiveness is far harder to define.

In 1991 Subrahmanyam[8] carried out a conventional method of burn treatment with topical application of honey. Patients (104) were divided into two groups. In both cases the burns were cleaned with saline solution. The one group then had pure, undiluted unprocessed honey applied and rebandaged daily. The second group had gauze soaked in 5% silver sulfadiazine applied daily. Within 7 days 91% of the infected wounds treated with honey were rendered sterile compared to less than 7% in the other group. Of the wounds treated with honey, 87% had healed within 15 days compared with 10% in the control group.

It is suggested that the effectiveness of the treatment of burns is because:

- Honey prevents infection because of antibacterial properties
- Honey provides a viscous barrier to fluid loss and wound invasion by bacteria thus preventing infection
- Honey contains enzymes which may aid healing and promote tissue formation
- Honey absorbs pus thereby cleaning the wound

· Honey reduces pain, irritation and eliminates offensive smells

Efem[9] showed that various types of wounds and skin ulcers that had not responded to conventional treatment responded favorably to honey. The wounds treated included burns, gangrene, varicose ulcers, diabetic ulcers and bed sores. Cleaned wounds had honey and clean bandages applied daily. The dressing proving to be extremely comfortable as, surprisingly it did not stick to the wound. Within 7 days wounds were free from infection, dead tissue was quickly replaced with healthy granulation tissue. Thus it would appear that the antibacterial properties of honey work on skin ulcers in the same way as they work on burns. Similar results have been recorded by Kaegi[10] and Rieder[11] in Switzerland, both of whom treated a variety of ulcers, pressure sores, abscesses and fistulas with honey. It is interesting that honeydew honey was used in treatments because its low pollen content reduces the risk of pollen-allergic reactions.

Also in Switzerland honey has been used to treat sickness arising from radiation treatment. While German researchers found that the high fructose levels stimulate the metabolism of alcohol and so use it to help sober up drunken patients.

Dilute honey administered orally or intravenously has been shown to be effective in treating gastro-enteritis[12]. While New Zealand manuka honey is said to successfully inhibit *Helicobacter pylori*, the causative agent of stomach ulcers[13].

Skin grafts have been successfully stored for up to twelve weeks in sterile, undiluted, unprocessed honey[14].

It can be seen that honey has a long track record of medical use. Both when administered orally or used as a dressing.

A word of caution

In the past the only source of food for bees was nectar from flowers; nowadays, bees are kept in modern movable-frame hives, and may produce totally or partially non-floral honey, if they have been fed on sugar syrup. The honey extracted from such colonies does not differ much in colour or major components from floral honey, but may have inferior curative properties[7], which places all honeys under suspicion.

Furthermore, honeys vary according to their plant origins and the conditions under which they are produced. Physical and chemical characteristics may be changed by processing and storing, while the biological properties of honey are subject to all types of variation associated with living organisms.

Honey from other bees

So far I have not mentioned the differences in honey produced by bees other than *Apis mellifera*, the European honey bee. For example, the honey from the Asian hive bee, *Apis cerana*, in China was used for centuries to prevent smallpox scarring. Honey from stingless bees of central America the Meliponinae - is a different substance but it too has even greater claims to medicinal properties, e.g. records show it has been used in the treatment of eye diseases since the Mayan civilization.

Conclusions

One of the problems with honey and healing is disentangling the folklore from serious research and then to seek out the reports arising from that research. For this very short and very simple overview I have had to dip into medical journals from the UK and elsewhere, text books on apiculture published in the UK, the USA, New Zealand, Australia and Thailand, as well as bee journals from more than half-a-dozen countries and in several languages.

It is, therefore, unique in this subject area to have access to so many sources of information under one roof. IBRA has abstracts of almost every article published on the topic and in most cases the full paper is also available. We can produce bibliographies and conduct subject searches.

If I have in ignorance wandered too far into a medical field which is not my own or failed to cover in depth an issue of particular interest - forgive me. I am but the curator of a national, no international, treasury of Scientific research that you are welcome to use and visit. In that way you will support us in our task of maintaining and developing our resources for future reference.

Further reading

A 76-page reprint of the 2-part article by Peter Molan 'The antibacterial activity of honey', published in *Bee World* (1992), is available from the IBRA BookShop priced £2.70 (includes p & p to a UK address; add 10% (surface) or 15% (airmail) for delivery elsewhere.

A selected annotated bibliography on 'Honey in medicine' is available from the Librarian, IBRA, 18 North Road, Cardiff, UK. Price £2.50 (including p & p to a UK address, or £3 elsewhere).

References

1. CRANE, E (1979) *Honey: a comprehensive survey.* Heinemann; London,, UK.
2. CRANE, E (1983) *The archaeology of beekeeping*. Duckworth; London, UK.
3. MANJO, G (1 975) *The healing hand*. Harvard University Press; USA.
4. HILL, J (1759) *The virtues of honey*. Davis; London, UK.
5. ZUMLA, A; LULAT. A (1989) Honey - a remedy rediscovered. *Journal of the Royal Society of Medicine* 82: 384-385.
6. BOSE, B (1983) Honey or sugar in the treatment of infected wounds. *The Lancet* April: 963.
7. BANBY, M A *et al*. (1988) Healing effect of floral honey from sugar-fed bee, on surgical wounds (animal model). *Proceedings of the 4th International conference on apiculture in tropical climates, Cairo, 1988.* IBRA; Cardiff, UK; pp 46-49.
8. SUBRAHMANYAM, S (1991) Topical application of honey in the treatment of burns. *British Journal of Surgery* 78: 497-498.
9. EFEM. S E E (1988) Clinical observations of the wound healing properties of honey, *British Journal of Surgery* 75: 679-681
10. KAEGI, C (1995) Honey for healing. *Schweitzerische, Bienen-zeitung* 118: 590, 592.
11. REIDER, K (1995) Wound and treatment with honey. *Schweitzerische Bienen-zeitung* 118: 579.
12. HAFFEJEE, L E**;** MOOSA, A (1985) Honey in the treatment of infectious gastroenteritis. *British Medical Journal* 290: 1866-1867.
13. SOMAL, N A *et al* (1994) Susceptibility of *Helicobacter pylori* to antiobiotic activity of manuka honey, *Journal of the Royal Society of Medicine* 87: 497-498.
14. SUBRAHMANYAM, S (1993) Storage of skin grafts in honey. *Lancet* 341: 63-64

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[iv] **Steinberg, D.; Kaine, G.; Gedalia, I. (1996) - Antibacterial effect** of **propolis** and **honey** on **oral bacteria**,
in *Am J Dent, 9*(6), pp.236-39 (abstract).

Purpose: To investigate the antibacterial properties of propolis and honey against oral bacteria *in vitro* and *in vivo*.
Materials and Methods: *In vitro* study: The antibacterial effects of propolis and honey on oral

streptococci were determined using the broth method. Clinical study: The short-term antibacterial effect of propolis solution and honey on salivary total bacteria and *Streptococcus mutans* was tested in 10 volunteers. Results: Propolis demonstrated an antibacterial effect both *in vitro* on isolated oral *streptococci* and in the clinical study on salivary bacterial counts. Honey induced bacteria growth at low concentrations, while at high concentrations honey had an inhibitory effect on bacterial growth *in vitro*. Salivary counts of total bacteria and *Streptococcus mutans* were lower for 1 hour after application of honey. The antibacterial effect of the honey tested may be attributed to its osmolarity effect.