

# **HONEY AS WOUND CARE FOR INDIGENOUS COMMUNITIES: A SUSTAINABLE AND ACCESSIBLE APPROACH**

UTS SCIENCE LORAINÉ HOLLEY ESSAY PRIZE

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## Preface:

As the non-Indigenous author of this essay, I make no claim to provide Indigenous knowledge or speak on behalf of Australian Indigenous Peoples. I note that the term “Indigenous” does not convey the great diversity and heterogeneity of specific nations, languages, and traditions found across Australia. This essay uses the term “Indigenous” for the purpose of readability with no intended disrespect.

## Summary:

Australian Indigenous Peoples suffer disproportionately higher rates of skin infections than non-Indigenous people. Manuka honey exhibits exceptional antimicrobial activity against numerous infection-causing, antibiotic-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA or Golden Staph). However, medical honey treatments are clinically underutilised despite approval by the Australian Therapeutic Goods Administration, largely because its mode of action is unclear. The aim of my research is to unravel how manuka honey kills antibiotic-resistant bacteria in a way that makes them unable to develop resistance to honey. This could ultimately help promote manuka honey as a viable treatment option for skin infections in Indigenous communities.

## Research Work:

Honey has been used as a medicine for millennia, particularly as a wound dressing, across many different cultures including Australian Indigenous Peoples. Manuka honey, from *Leptospermum scoparium* nectar, exhibits exceptional antimicrobial activity against numerous infection-causing, antibiotic-resistant bacteria, and there are many case studies and trials demonstrating its efficacy as a wound dressing (e.g. Figure 1) [1]. However, honey is clinically underutilised despite approval by the Therapeutic Goods Administration (TGA), largely because the mode of action is not well understood.



**Figure 1.** 84-year-old woman suffering from persistent non-healing ulcers, infected with MRSA and treated with Medihoney™ over 10 weeks (Source: Comvita). Due to non-healing and persistent infection (over more than 10 years), doctors were considering amputation. However, after honey treatment for just 10 weeks, the infection resolved and healing took place.

To better understand how honey works and why bacteria do not develop resistance to its activity (like they do to antibiotic drugs), I am investigating changes in bacterial gene expression, protein profiles and cell morphology caused by honey. I focus on common and problematic bacteria, MRSA and *Pseudomonas aeruginosa*, which cause serious skin infections.

The rationale behind my approach is that most genes contain the information that is used to produce functional molecules known as proteins. Depending on what is happening to an organism (from bacteria to humans) at any given point in time genes are turned on or off, and the protein profile changes. From this, we can derive clues about how treatments – like honey – work, by looking at how they affect the genes and protein profiles of bacteria.

So far, I have:

- Established that genes responsible for many different types of cellular functions (e.g. protein production, the ability communicate between bacteria, and detoxification systems) are affected by manuka honey.
- *Shown for the first time that honey is drastically different and unlike any other antibiotics (which typically target only one function).*

I will:

- Continue investigating how honey affects bacterial protein profiles.
- Look directly at bacterial cells, using high power microscopy, to visualise whether gene and protein changes result in corresponding structural changes.

### **Target Community:**

The health status of Australian Indigenous Peoples today is undoubtedly worse than that of any other demographic, and significantly poorer than the health of Indigenous peoples in New Zealand, the USA and Canada [2-4].

Australia is failing to meet the guidelines and recommendations put in place by the United Nations Declaration of Human Rights, relating to the burden of infectious disease experienced by Indigenous Peoples. The reasons for Australia's poor record on Indigenous health are extremely complex and multifaceted, and are deeply rooted in its colonial history [4, 5]. Prior to British colonisation, Australian Indigenous Peoples enjoyed better health than Europeans with many of the diseases plaguing Europe in the 18<sup>th</sup> century non-existent amongst Indigenous populations [6], however this alone does not account for Indigenous People's health today.

Detrimental policy established by colonialists was imposed on Indigenous Peoples under the so-called "Protection Act", mandating "total control over Aboriginal peoples" including access to health services and absorbing wages and entitlements [4]. Injustices against Indigenous Peoples continued into the 20<sup>th</sup> century efforts to erase culture and tradition through assimilation and forced removal of children, which endured to the early 1980s [4, 7].

Injustices and harmful policy have undoubtedly shaped the social and economic environments of Indigenous Peoples. Social and economic factors are direct determinants of health in individuals and communities [8], for example, poverty is linked to poor nutrition and shown to have an association with diabetes [3]. Other social and economic factors can compound and worsen this, as diabetic comorbidities like non-healing diabetic foot ulcers are exacerbated by overcrowded housing [3].

Some of the socioeconomic determinants accounting for the health disparity experienced by Australian Indigenous Peoples include:

- A history of racism [7]
- Poor education outcomes [3, 7]
- Dispossession of land [4]
- Overcrowded housing [3]
- Disruption of traditional customs and social structure [3, 7]

### **How the research could benefit the target group:**

Australian Indigenous Peoples suffer from disproportionately high rates of skin infections, for example, impetigo affects up to 70% of children in some Aboriginal communities in the Northern Territory [9]. One of the first community-acquired MRSA strains to emerge in Australia was found in Indigenous communities in the Kimberly [10]. Recent studies suggest increasing rates of MRSA carriage and infection amongst Australian Indigenous Peoples, with one case study reporting a prevalence of 15% [11].

Medical honey is an ideal treatment for skin infections in Indigenous communities for both practical and social reasons. It can be stored at ambient temperature (no refrigeration required) unlike many other treatments - advantageous for storage and transport to remote communities [12]. Many Indigenous communities historically used honey as medicine [13, 14], which may have a positive effect on its uptake and usage by clinicians and patients, as has been the case with other traditional medicines [15].

Alongside establishing the mechanism of action of manuka honey, I am also involved in investigating the more than 80 other Australian native *Leptospermum* honeys [12]. A unique opportunity exists here to link this research with the Working on Country programme [16, 17], which has been highly successful in creating employment and career pathways in environmental management. A collaboration could lead to the creation of jobs specifically for Indigenous Peoples relating to land management, as well as establishing apiaries producing medicinal honey, run and managed by local Indigenous beekeepers.

In conclusion, despite its approval for use as a wound treatment, medical honey remains grossly underutilised, largely due to questions about its mechanism of action. The outcomes from my research will support the greater clinical use of honey, which would be of particular benefit to Australian Indigenous Peoples, who suffer disproportionately from skin infections that we know are susceptible to the healing power of honey.

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