An Investigation into the antibacterial and anti-inflammatory potential of an Irish Ivy Honey

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A resurgence of interest into the medicinal uses of honey has occurred over recent years, with many investigations focusing on the healing properties of different monofloral honeys. Amongst the most well known and well studied medicinal honey is Manuka and numerous publications have documented antimicrobial activity and healing effects on superficial/partial thickness burns and lacerations, with greatly reduced recovery times being observed. Methylglyoxal is an active compound which has been identified in Manuka and much of the antimicrobial activity has been attributed to this compound. Many other monofloral honeys are currently being produced in Ireland, for example Ivy and Heather honeys. Anecdotal medicinal effects have long been ascribed to these honeys but they are largely understudied for antimicrobial and anti-inflammatory activity. Linking of scientifically observed antimicrobial and healing benefits of such honeys with chemical compounds would undoubtedly add value for honey producers, in terms of ~~the~~ pricing and product recognition. Additionally it would ~~be one step on the road to a~~ advance the development of label claims ~~the **labeling system???**.~~ With this in mind a small scale, preliminary study into the medicinal properties pertaining to ~~potential of~~ Ivy honey ~~as a wound healing agent~~ was undertaken **in May 2017, as part of a taught Masters research project??**. Both the antimicrobial and anti-inflammatory activity of non-heat treated Irish Ivy honey was evaluated and compared with Manuka honey (conc of Methylglyoxal??) and an off the shelf supermarket brand honey. A range of bacteria associated with wound infections, some containing antimicrobial resistance genes, were included in the study to determine Minimum Inhibition Concentrations (MIC). Changes in expression of genetic inflammatory markers (NF-kB & COX-2) in challenged monocyte cells exposed to the honeys was also investigated. Preliminary results were encouraging ~~indicate some~~ with evidence of antimicrobial activity of Ivy honey against a range of bacteria, including those with resistance to third generation cephalosporin antibiotics. Gene expression analysis indicated reduced expression of the NF-kB inflammatory marker in challenged monocytes exposed to Irish Ivy honey. Thin Layer Chromatography was also carried out to separate and compare compounds within the honeys. ~~Although results are preliminary,~~ Overall initial indications ~~show~~ are that Irish Ivy honey has ~~the~~ potential value as a wound healing agent. Future studies that aim to broaden and advance this research into the therapeutic efficacy of Irish Ivy honey and other indigenous monoflora honeys are warranted and would be of considerable benefit to the industry both from a knowledge and economic perspective. ~~We are hoping to build on and broaden the scope of this research to further evaluate the therapeutic efficacy of Irish Ivy honey and other indigenous monoflora honeys in future studies.~~

Methods

Anti-bacterial Effects of Ivy Honey:

Minimum **I**nhibitory **C**oncentration **(MIC) Studies** of bacterial strains** from skin/wound infections treated with Ivy honey

Immune modulatory Effects of Ivy Honey

Gene expression analysis of NF-κB & COX-2 Inflammatory Markers

Extraction & Analysis of Honey Components

Thin Layer Chromatography (TLC)

Table 1 Bacterial strains used in MIC testing**

Organism name
Escherichia coli ATCC 25922
E. coli ATCC 8739
Staphylococcus epidermidis ATCC 12228
S. aureus ATCC 25923
S. aureus ATCC 6538P
S. aureus ATCC 12600
E. coli UK strain A CTXM1
Klebsiella pneumoniae ATCC 700603

Picture of honeys

Results

Table 2. MIC values for Ivy honey. % solution v/v

	MIC % solution (v/v)
E. coli ATCC 25922	6.25
E. coli ATCC 8739	12.5
S. epidermidis ATCC 12228	12.5
S. aureus ATCC 25923	1.5
S. aureus ATCC 6538P	0.02
S. aureus ATCC 12600	12.5
E. coli strain A CTXM1	12.5
K. pneumoniae ATCC 700603	<0.02

Fig 1. Bacterial streak plate

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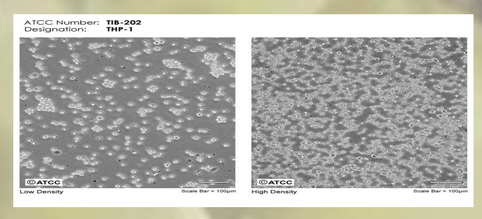

Fig 2. THP-1 Monocyte suspension cultures (image courtesy of ATCC)

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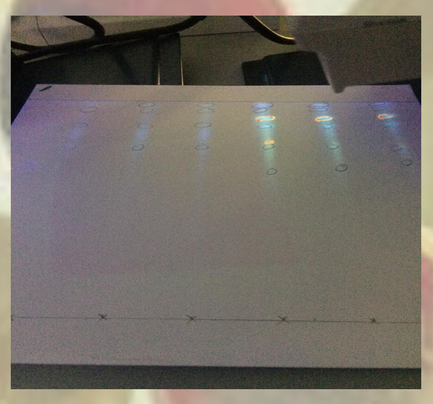
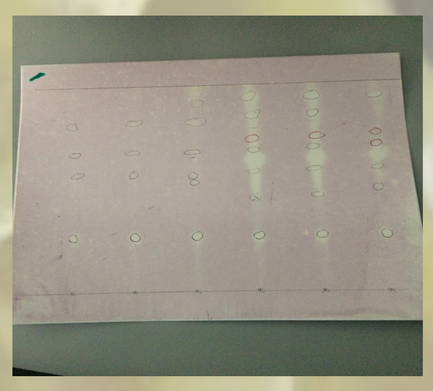
Fig 3. RT-PCR analysis of inflammatory marker genes



A



B

Fig 4. Thin Layer Chromatography analysis of Ivy honey and Manuka honey (A) showing flavonoids / phenolic components (antibacterial, antioxidant potential) as green and blue fluorescent spots following staining with 2-aminoethyldiphenyl borinate (UV light 365nm); (B) detection of components with antioxidant activity as yellow spots on a purple background (natural light) following staining with DPPH reagent.

Conclusions and Future Work

There is evidence to suggest that Ivy honey ~~could~~ may have ~~some~~ beneficial uses in wound dressings ~~bandages for wound healing~~ from the PCR analysis which showed that the Ivy honey has the potential to **induce??** the Cox-2 and NF-kB housekeeping genes which cause an increase in the inflammatory responses from cells which will help to reduce the chances of infection and cellular damage experienced at the wound site. If given the opportunity to further the research then I would recommend conducting further antimicrobial and anti-bacterial tests which may show that the honey has the ability to inhibit some strains of bacteria.

References

Acknowledgements

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