

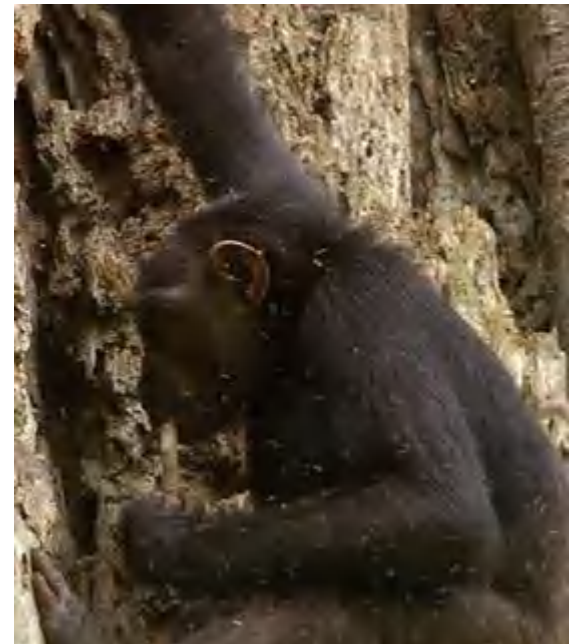
Honey – a sweet solution for problem pathogens, and promoting digestive health

Shona Blair, PhD
Sydney, Australia



Humans, honey and bees

- * Bees ~120,000,000 years ago
 - * 20,000 species of bees
 - * 7 species honey bees
 - * 44 subspecies
- * Humans ~8,000,000 years ago

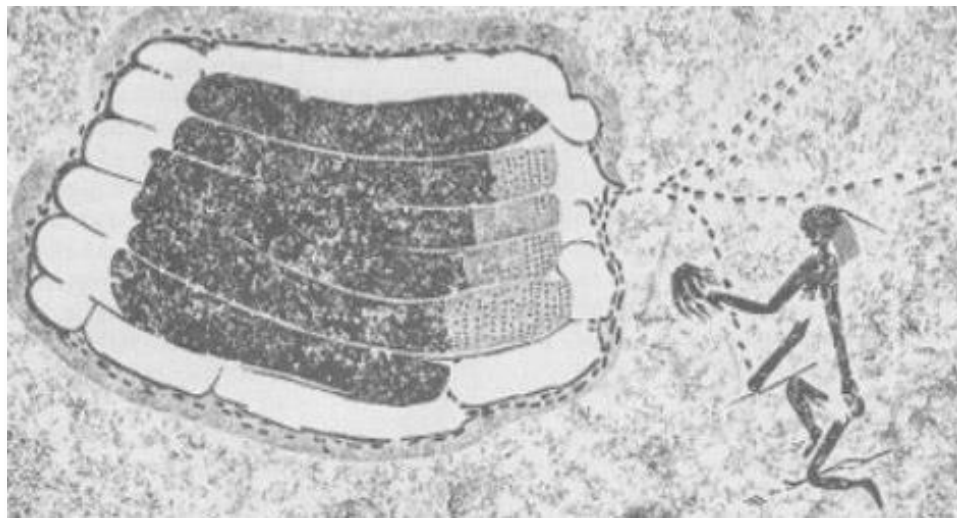
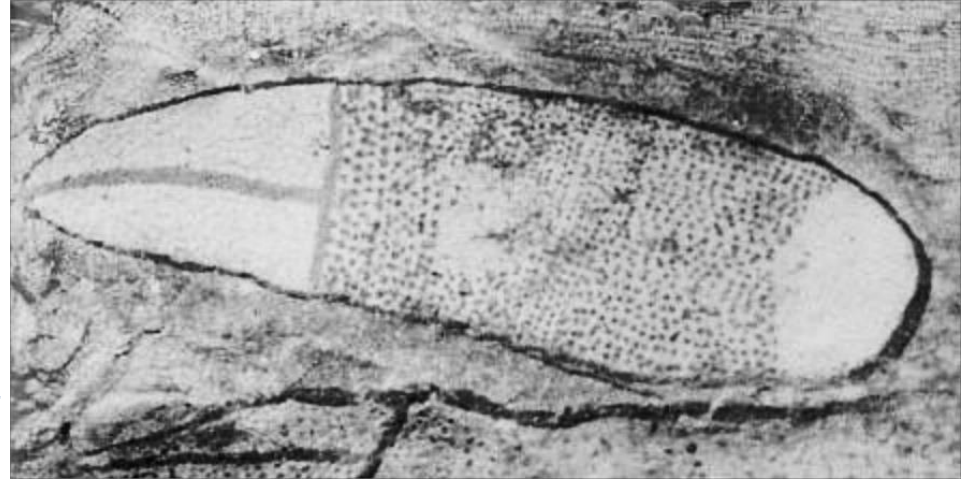


Honey hunting

Spain
~6,000 BC



Australia
~10,000 BC



Zimbabwe
~8,000 BC

Honey hunting

Nepalese
Himalaya
s



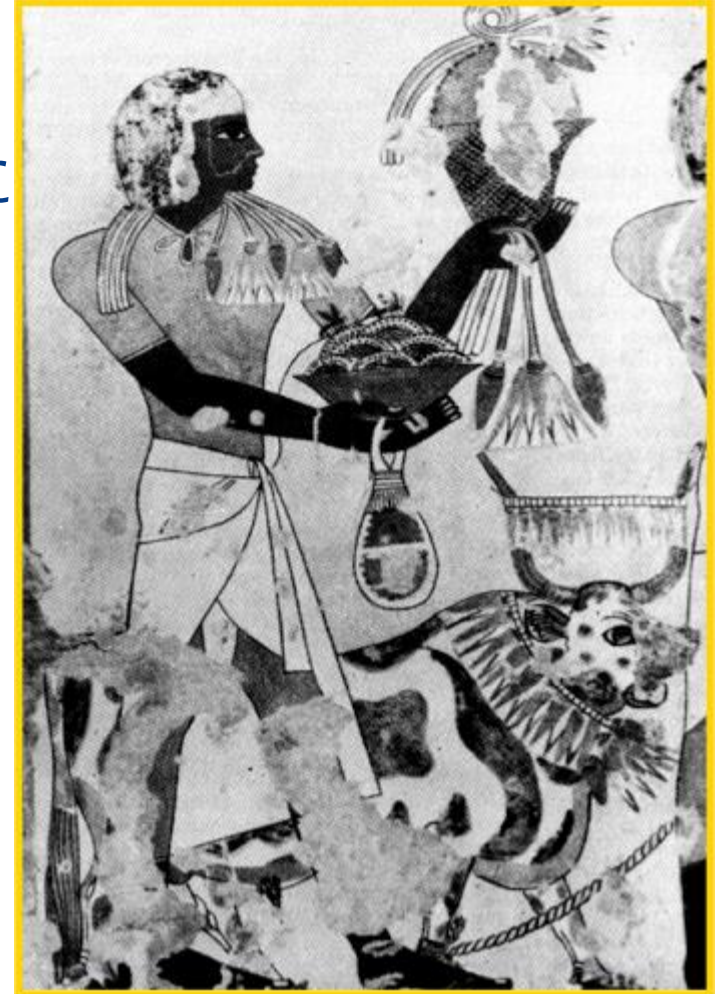
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Andrew Newey - Daily Mail

Beekeeping



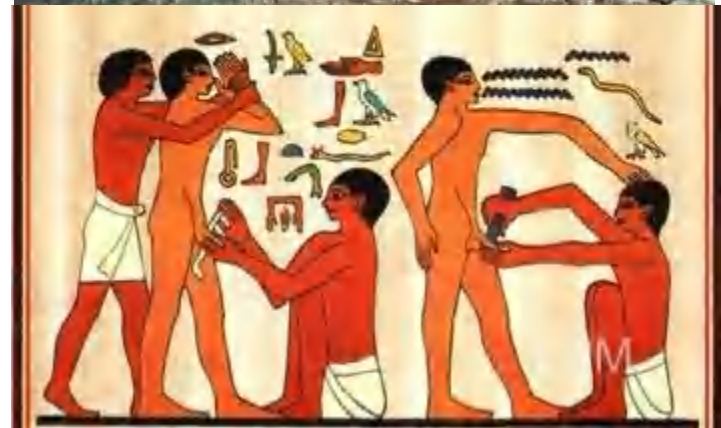
Ancient Egypt
Records from ~3100 BC



Medicinal honey

Honey was used as a medicine by many cultures

- Aztecs
- Arabs
- Hindus
- Greeks
- Romans
- Chinese
- Celts
- Koreans
- Native Americans
- Scandinavians
- Indigenous Australians
- Ancient Egyptians
- African cultures



Medicinal honey

Conditions traditionally treated with honey

- Gastroenteritis
- Throat infections
- Influenza
- Schistosomiasis
- Asthma
- Diphtheria
- Contraception
- Syphilis
- Wound infections
- Insect bites
- Burns
- Ulcers
- Eye infections
- Abscesses

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Consistently popular as a wound dressing > *until modern antibiotics*

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Consistently popular as a wound dressing > *until modern antibiotics*

But now “superbugs” and other issues mean honey is being used again...

Medicinal honey

Antimicrobial (germ-killing) activity

- Low water activity
 - Low pH
- } Similar in most honeys



Medicinal honey

Antimicrobial (germ-killing) activity

- Low water activity
 - Low pH
 - Hydrogen peroxide
- } Similar in most honeys
- From bee enzyme



Medicinal honey

Antimicrobial (germ-killing) activity

- Low water activity
 - Low pH
 - Hydrogen peroxide
 - Non-peroxide activity
- Similar in most honeys
- Varies greatly between honeys



The unusual properties of *Leptospermum* honey

- Non-peroxide activity
- 1st discovered in New Zealand
 - manuka
- Professor Peter Molan
 - *The father of modern medical honey research*



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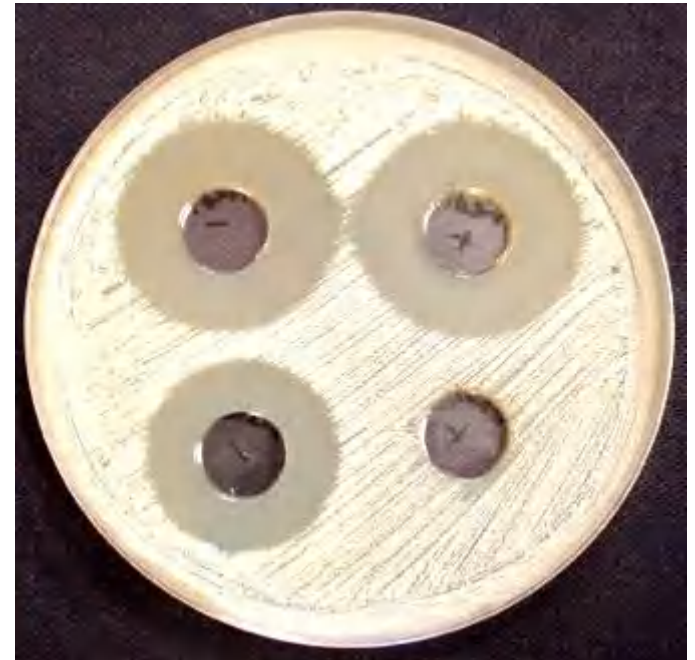


- Then it was discovered in Australia

Antimicrobial honey

Understanding non-peroxide activity

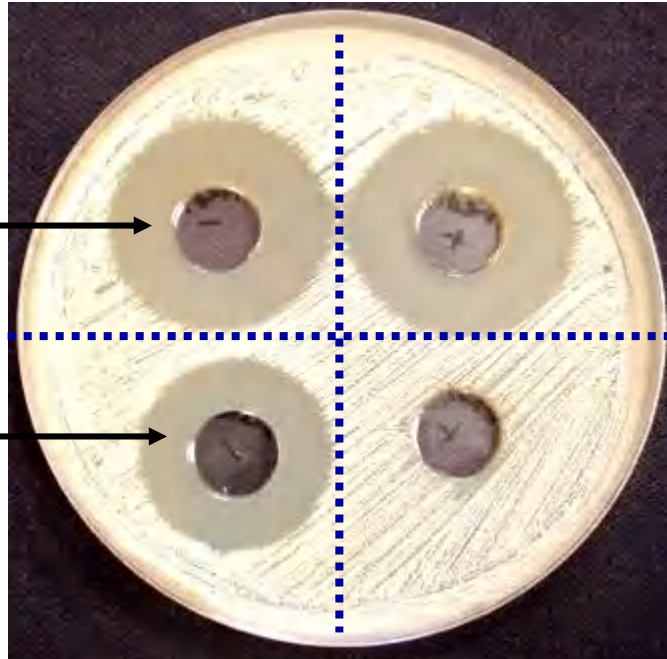
- Very rare
 - Mostly in Australian and New Zealand *Leptospermum* honeys
 - Manuka (NZ) / jelly bush (Aust)
- Can have very powerful “germ-killing” powers
- “UMF” and “NPA”
- Determined using a test against *Staphylococcus aureus* (aka golden staph) – developed by Prof Molan’s research group in New Zealand



Antimicrobial honey

Leptospermum honey

Eucalyptus honey



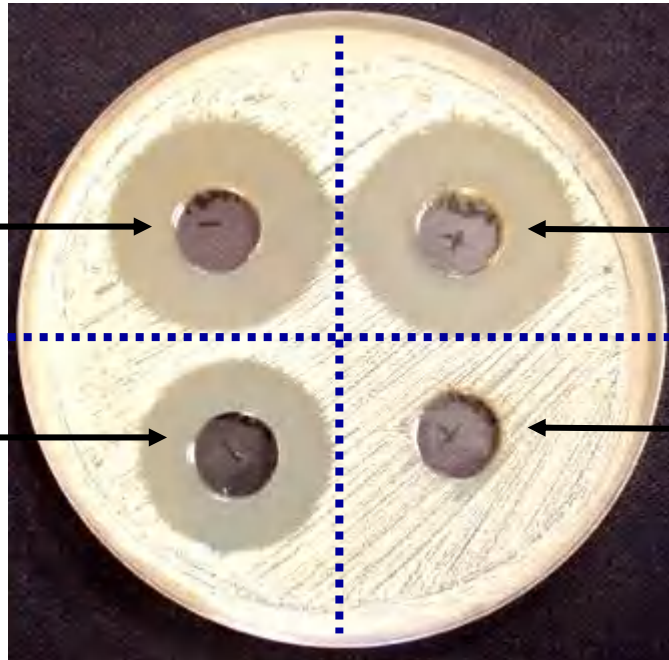
Antimicrobial honey

Leptospermum honey

Leptospermum honey
+ catalase

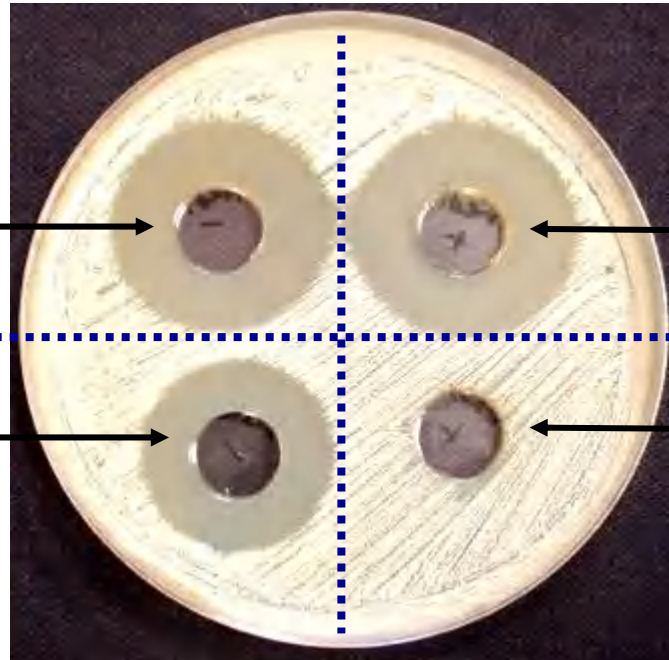
Eucalyptus honey

Eucalyptus honey
+ catalase



Antimicrobial honey

“Non-peroxide” type activity



Leptospermum honey

Leptospermum honey
+ catalase

Eucalyptus honey

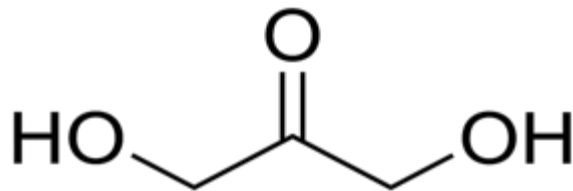
Eucalyptus honey
+ catalase

“Hydrogen peroxide” type activity

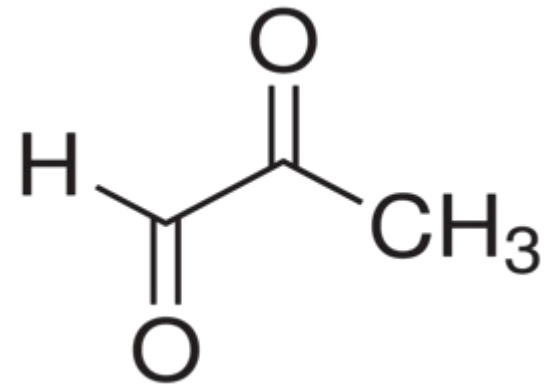
Antimicrobial honey

Non-peroxide activity

- High levels of MGO – discovered in NZ manuka honey
- This correlated with much of the non-peroxide activity
- MGO comes from DHA in the nectar



Dihydroxyacetone (DHA)

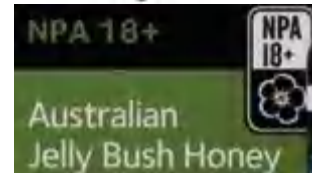


Methylglyoxal (MGO)

Antimicrobial honey

Non-peroxide activity

- **Bioassay**
 - Directly measures how honey affects test organism (usually “golden staph”)
 - Peroxide and non-peroxide activity can be determined
 - Usually reported as 10+, 15+, 20+, etc.
 - Example - NZ manuka UMF rating system

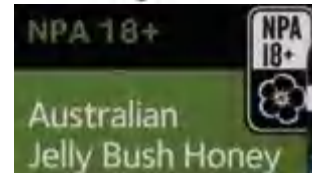


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Non-peroxide activity

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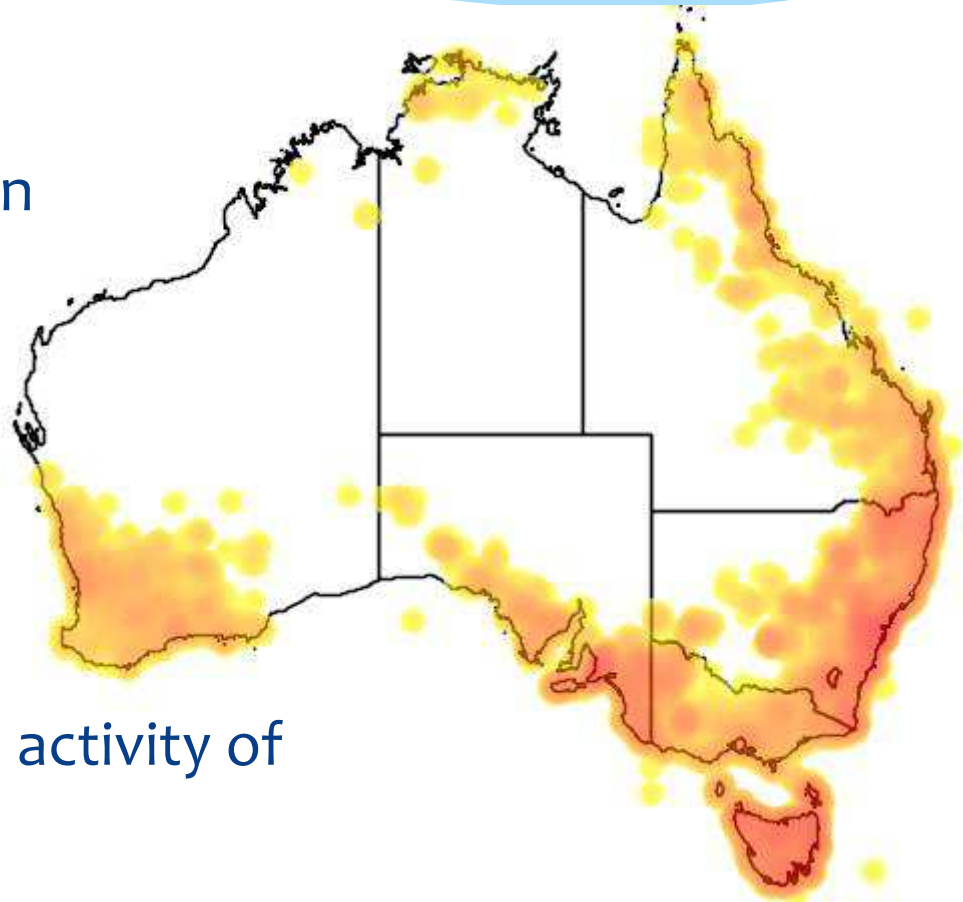
- **Chemical analysis**

- Measuring specific components
- Quantity of MGO and DHA is measured
 - Does not determine peroxide activity
- Usually much higher number – e.g. 500 ppm



The unusual properties of *Leptospermum* honey

- 2 *Leptospermum* species in New Zealand
- 80 + *Leptospermum* species in Australia
- So, we are looking for more sources of this type of medicinal honey in Australia

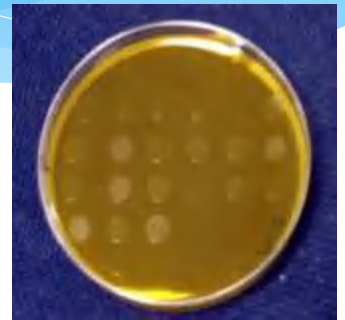


And discovering more about the activity of these Aust and NZ honeys

Is honey effective against “superbugs” ?

What are superbugs?

- * Strains of microbes with multi drug resistance due to selective pressure from over use of antibiotics
- * Pathogens that are inherently resistant to modern antibiotics and/or difficult to treat
 - * Fungal infections
- * Huge problem in hospitals and the community, around the world

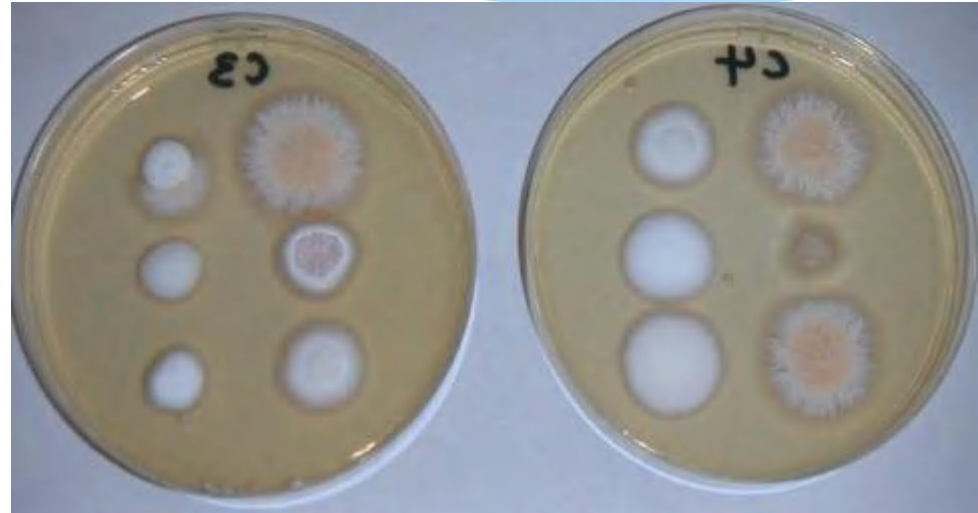
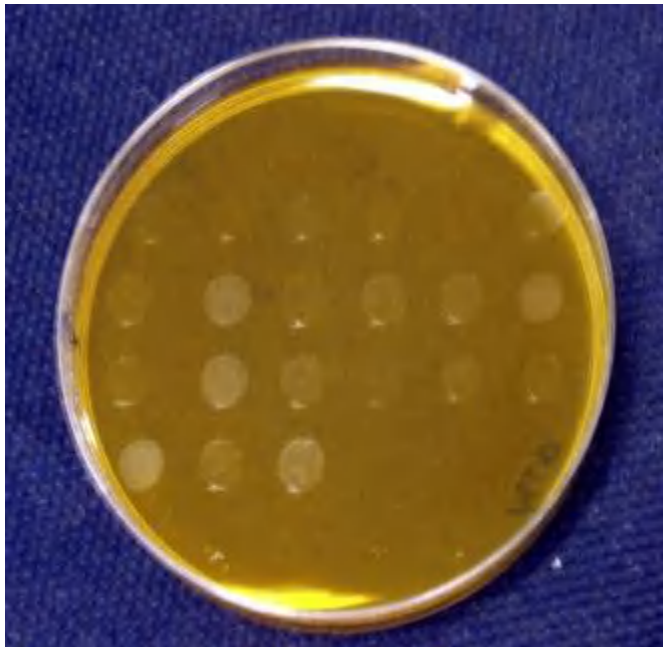


Honey and “superbugs”

Multi drug resistant
bacteria

Anaerobic bacteria

- Bites
- Acne
- Wounds



Fungal infections

- Tinea
- Candida



Medicinal honey

Is honey a practical solution...?

- A face covered in honey?
- A shoe full of honey?



Medicinal honey

Is honey a practical solution...?



- A face covered in honey?
- A shoe full of honey?
- Ancient Egyptian prescription: 1/3 honey in a base cream
 - Unbroken skin
- Pure honey works well on open wounds
- Other healing properties...

Honey = ideal wound dressing

- Prevention/clearing of infection
- Moist environment
- Promotes re-epithelialization and formation of healthy tissues
- Draws exudate and foreign bodies from the wound
- Combats odour
- Anti-inflammatory action
- Prevents dressing pads from sticking to wound bed



Honey as a wound dressing

88 year old woman

- Extensive ulcers on both lower legs (50 years!)
- Recurrent infections, including MRSA
- Extremely painful (high levels of analgesia required)
- Doctor was considering amputation

75 year old man

- Venous ulcer for 9 months
- Skin graft had failed
- Compression bandaging could not be used due to hypersensitivity
- History of recurrent infections requiring antibiotics every 3 – 4 weeks

Honey as a wound dressing

88 year old woman



75 year old man



Honey as a wound dressing

88 year
old
woman



Week 5



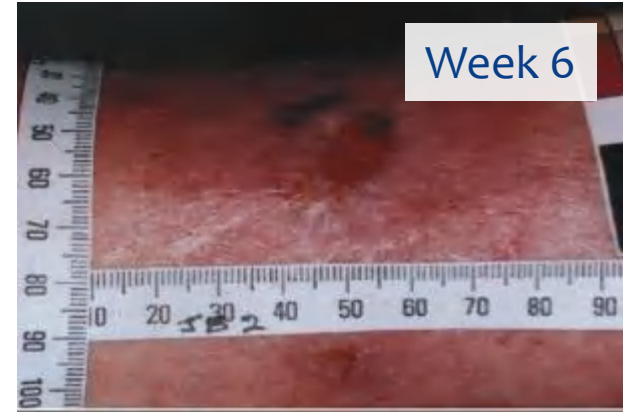
Week 10



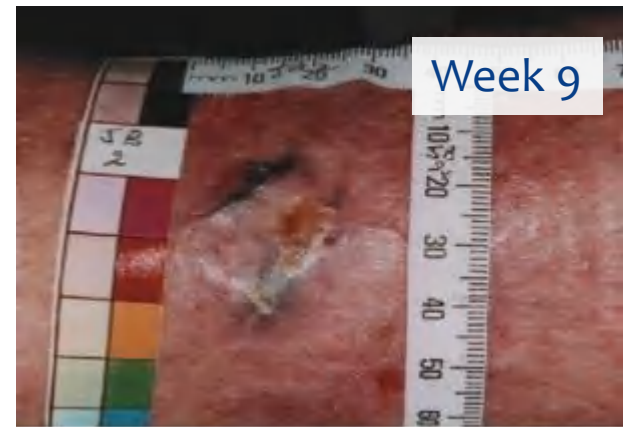
75 year
old man



Week 6



Week 9



Honey as a wound dressing

88 year
old
woman



Week 5



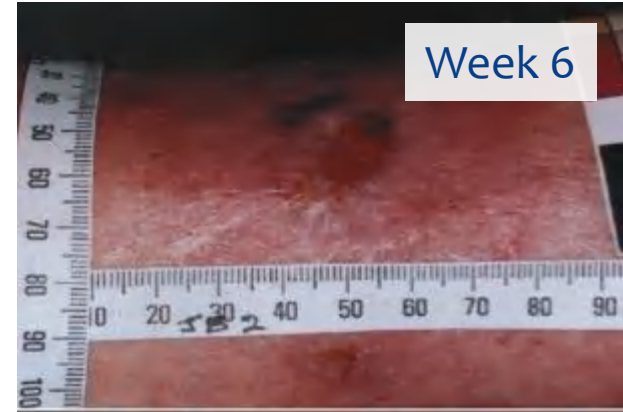
Week 10



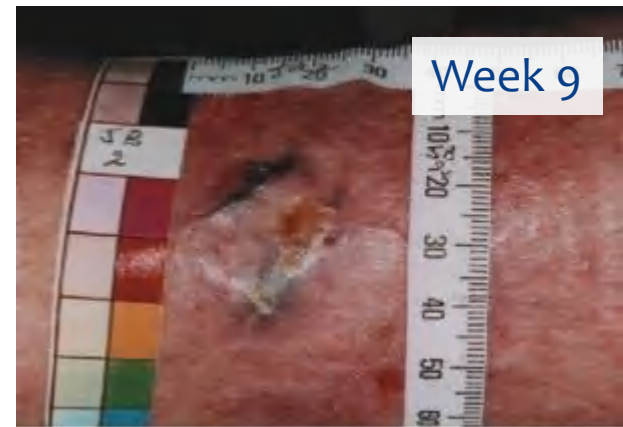
75 year
old man



Week 6



Week 9



Honey saved
their legs –
but these
are just case
studies...

Modern medicinal honey

- Abrasions
- Amputations
- Abdominal infection
- Bed sores
- Burns
- Burst abdominal
 - post caesarian
- Cervical ulcers
- Chilblains
- Cracked nipples
- Cuts
- Eye infections
- Fistula
- Fournier's gangrene
- Infected trauma
- Large septic wounds
- Measles (eye)
- Meningococcal lesions
- Postop neonatal infections
- Skin graft dressing
- Surgical wounds
- Ulcers
 - diabetic / leprosy / leg / sickle cell / tropical / varicose



What about eating honey...?

Honey is good for wounds,
but...

...is it good for us if we eat
it?

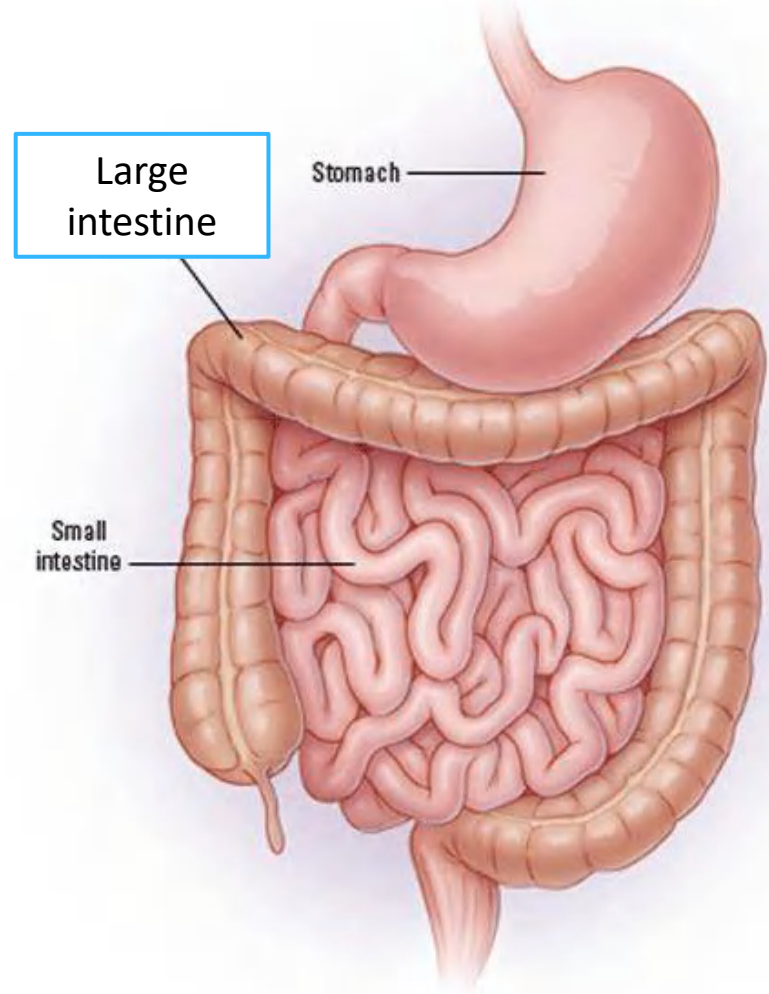


Probiotics and prebiotics

Probiotics =
Live good bacteria



Prebiotics =
Food for good bacteria



Measuring prebiotic effects

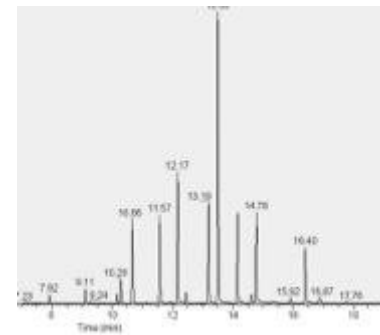
Prebiotics = food for good bacteria – if we provide this, do we see a benefit?

- We measure changes in the number of “good” compared to “bad”
- We also measure the products produced by our gut bacteria that we know are good for our health (e.g. butyric acid)



Bacterial counts

(no. of good vs. bad bacteria)



Chemical analysis

(beneficial products)

Eating honey is good for you

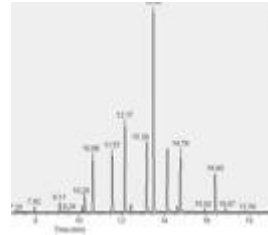
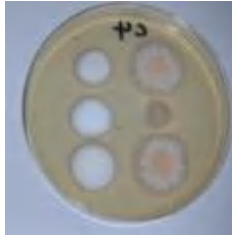
Honey type	Sample	Boost good bacteria		Reduce bad bacteria		Good bacteria outnumber bad	Production of butyric acid
		<i>Lactobacilli</i>	<i>Bifidobacteria</i>	<i>Clostridia</i>	<i>Enterics</i>		
Jarrah	Sample 1	●	●	●	●	●	●
	Sample 2	●	●	●	●	●	●
	Sample 3	●	●	●	●	●	●
	Sample 4	●	●	●	●	●	●
	Sample 5	●	●	●	●	●	●
Red stringybark	Sample 1	●	●	●	●	●	●
	Sample 2	●	●	●	●	●	●
	Sample 3	●	●	●	●	●	●
	Sample 4	●	●	●	●	●	●
	Sample 5	●	●	●	●	●	●
Spotted gum	Sample 1	●	●	●	●	●	●
	Sample 2	●	●	●	●	●	●
	Sample 3	●	●	●	●	●	●
	Sample 4	●	●	●	●	●	●
	Sample 5	●	●	●	●	●	●
Yellow box	Sample 1	●	●	●	●	●	●
	Sample 2	●	●	●	●	●	●
	Sample 3	●	●	●	●	●	●
	Sample 4	●	●	●	●	●	●
	Sample 5	●	●	●	●	●	●
Canola	Sample 1	●	●	●	●	●	●
	Sample 2	●	●	●	●	●	●
Manuka	Medihoney™	●	●	●	●	●	●

Key	Level of beneficial effect
●	Excellent
●	Very good
●	Good
●	None

Conclusion:

Honey should be used more in modern medicine!

- Broad spectrum antimicrobial agent - drug resistant microbes
- Ideal dressing properties
- Stimulates healing
- Excellent prophylaxis
- Shows great potential as a prebiotic
- No reported side effects
- Very cost effective
- Honey type is important



Professor Peter Molan

Dr Nural Cokcetin

Professor Dee Carter

Professor Trish Conway

Professor Liz Harry

Australian beekeepers – our
honey suppliers!

Capilano honey

Comvita

Rural Industries Research &
Development Corporation



APIMONDIA 2015

Daejeon, Korea