UTS
UNIVERSITY OF TECHNOLOGY, SYDNEY

INCREASING THE VALUE OF AUSTRALIAN HONEY AS A HEALTH FOOD

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NSWAA ANNUAL CONFERENCE
TAMWORTH, 2021

Why the interest in honey?

- Used as a medicine for centuries
- Broad-spectrum antimicrobial
- Topical and digestive ailments

Preparation of medicine from honey, Iraq 1224 AD

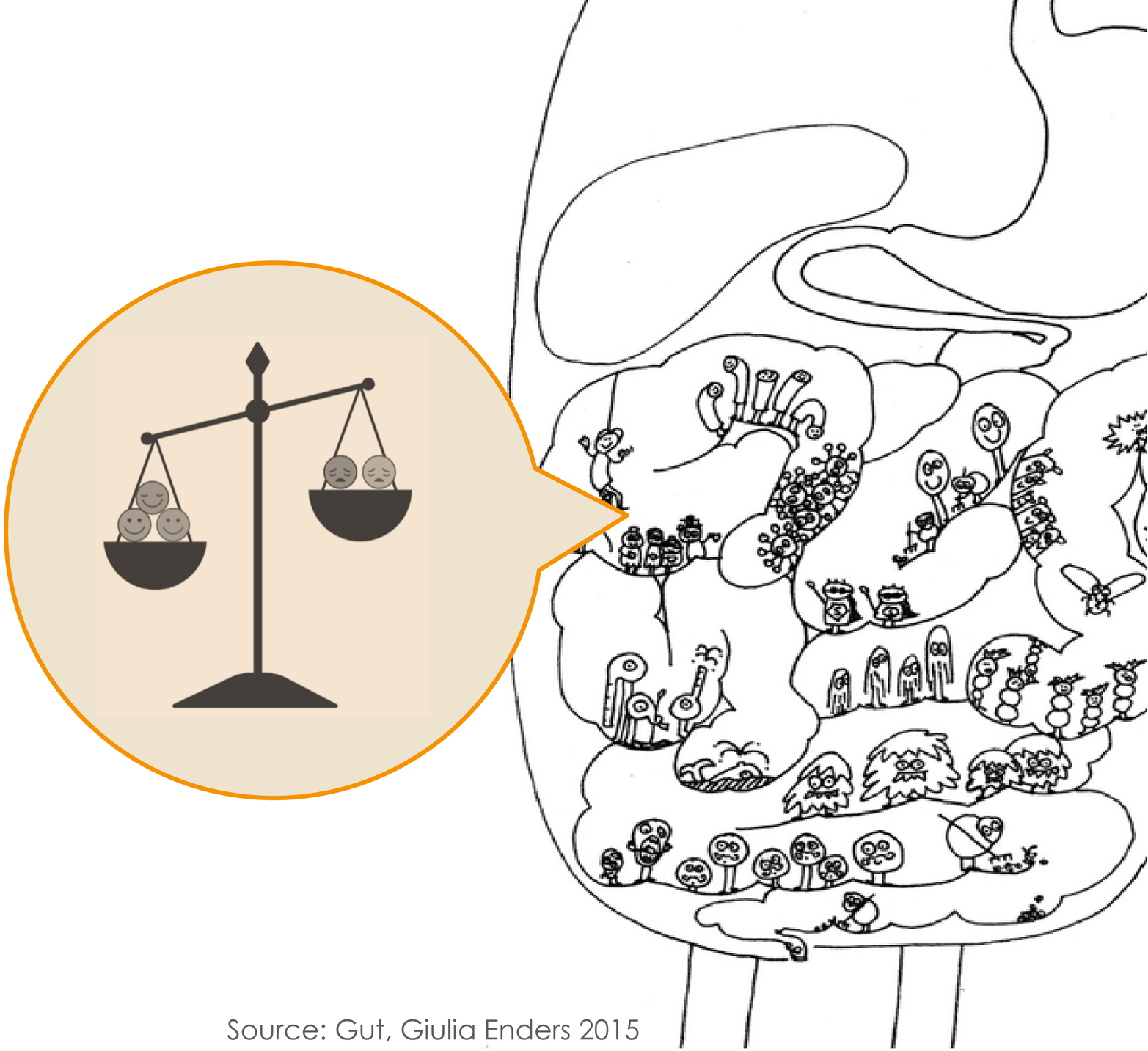
Source: Gut, Giulia Enders 2015

Why are gut bacteria important?

- Influence nutrition and health
- Help protect against infections + diseases
- Digest + harvest energy from food
- Make essential vitamins
- Remove toxins
- Influence hormones
- Help regulate immune system

What makes a ‘healthy’ gut?

- Diversity is key
- Balance between beneficial and potentially harmful types



Source: Gut, Giulia Enders 2015

What happens when the balance is disrupted?

Bowel diseases

e.g. colon cancer, IBS

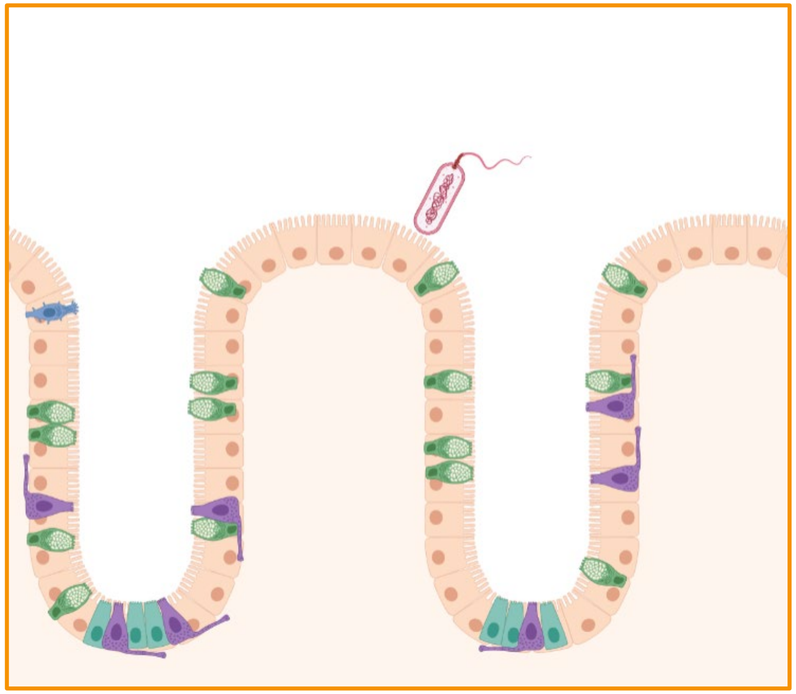
Allergies

Asthma

Obesity

Heart disease

Mental health issues



***Clostridioides difficile* infection**

- Usually presents after course of antibiotics
- Can progress to life-threatening inflammation of the bowel

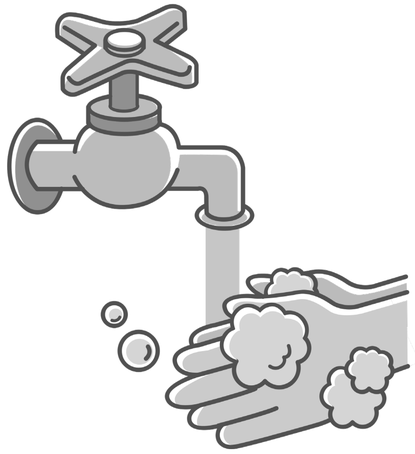
<u>Current treatments</u>

Invasive

Limited efficacy

Recurrence rate is high

How can we change the balance of our gut?



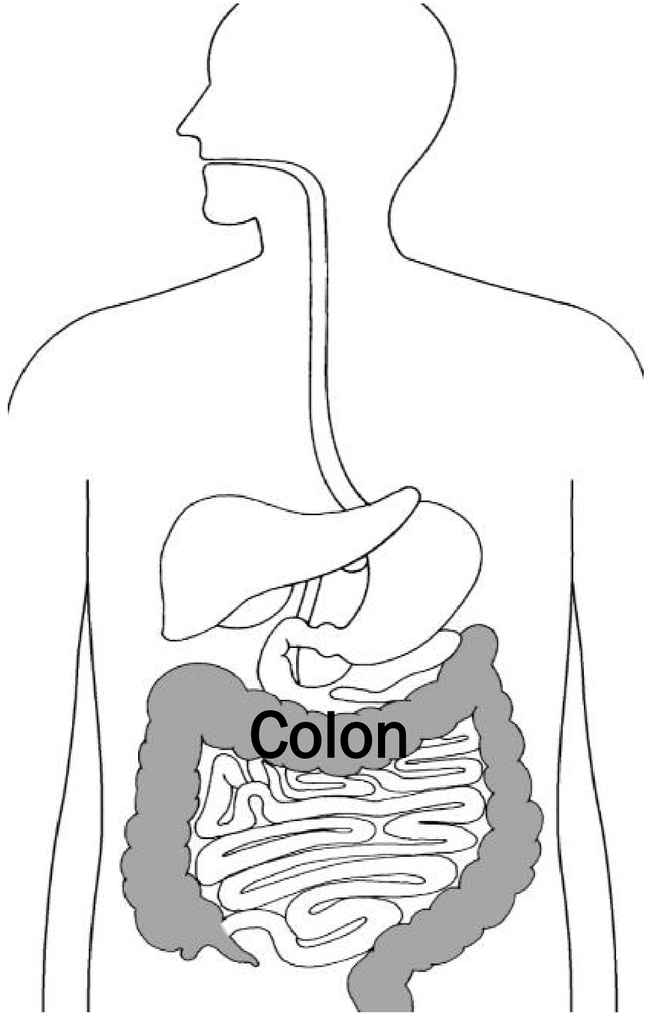
Hygiene

Antibiotics

Lifestyle

Diet
(e.g. prebiotic foods)

Source: Gut, Giulia Enders 2015



What is a prebiotic food?

Complex carbohydrates or sugars that are:

- **not digested** in the upper gut → reach the colon (large intestine) intact
- used as a **food source** by our gut bacteria for beneficial outcomes

Is honey a good prebiotic?

Preliminary studies

Simple sugars
Fructose (~50%)
Glucose (~36%)

Complex sugars
Oligosaccharides
(~6%)

Laboratory Gut Model

>20 Aus honey samples

All honeys had prebiotic potential:

↑ Beneficial bacteria

↓ Harmful bacteria

↑ Production of beneficial compounds

Nural Cokcetin, Shona Blair & Patricia Conway, UNSW

Is honey a good prebiotic?

Pilot Clinical Study

40 healthy human volunteers

20g of honey a day

Major bacterial groups enumerated

Beneficial compounds produced analysed

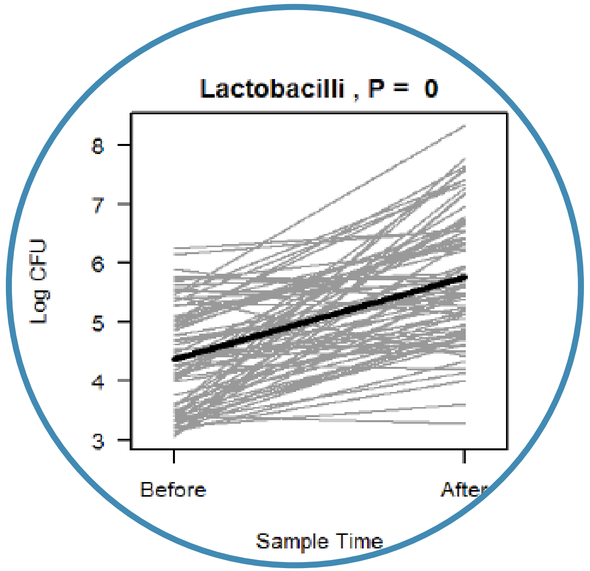
Results

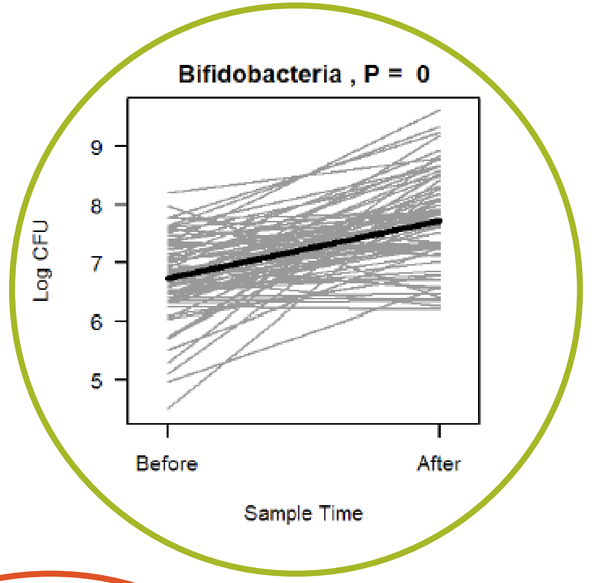
↑ Beneficial compounds

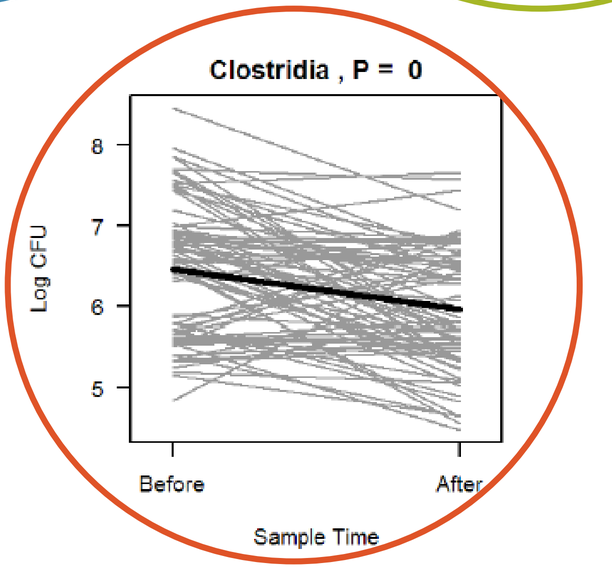
↑ Lactobacilli and bifidobacterial

↓ Clostridia

Prebiotic activity not linked to floral source







Nural Cokcetin, Shona Blair & Patricia Conway, UNSW

Current project: Increasing the value of Australian honey as a health food

NSW honeys: yellow box + ironbark

Clinical study: how honey changes the gut microbiome in healthy humans
microbial populations, metabolites, immune response

→target certain gut conditions

→ recruitment underway (delayed due to COVID)

Laboratory gut models: can honey help target certain gut infections?

AgriFutures™ Honey Bee & Pollination

GOLDFIELD Honey Australia Pty Ltd

MRC Microbiome Research Centre

Can honey prevent or treat gut infections?

Research questions

I. Can honey reduce the number of potential pathogens already living in the gut?

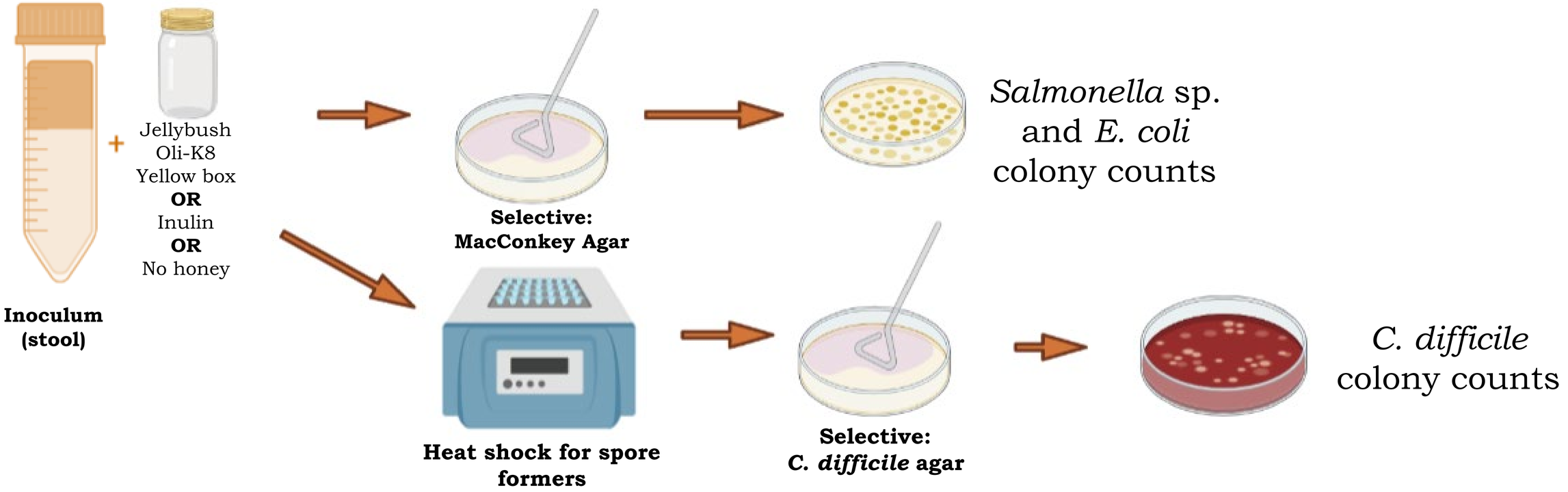
II. Can honey reduce the number of *C. difficile* in a simulated infection (model)?

III. Does honey help our gut microbes produced compounds that can kill common pathogens that cause gut infections?

Jellybush	**Oli-K8**	**Yellow box**
High antibacterial activity	Low antibacterial activity High oligosaccharides	Low antibacterial activity

Inulin – commercial prebiotic (positive control)

Can honey reduce the number of potential pathogens already in the gut?



Isabella Wilson, Hons Project, 2021

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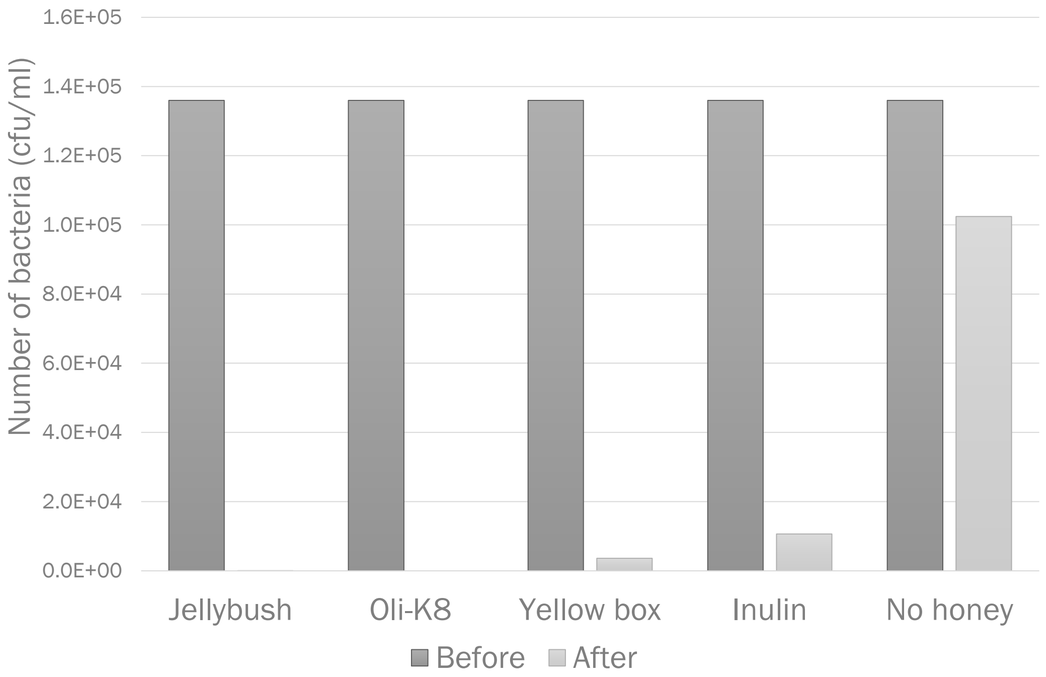
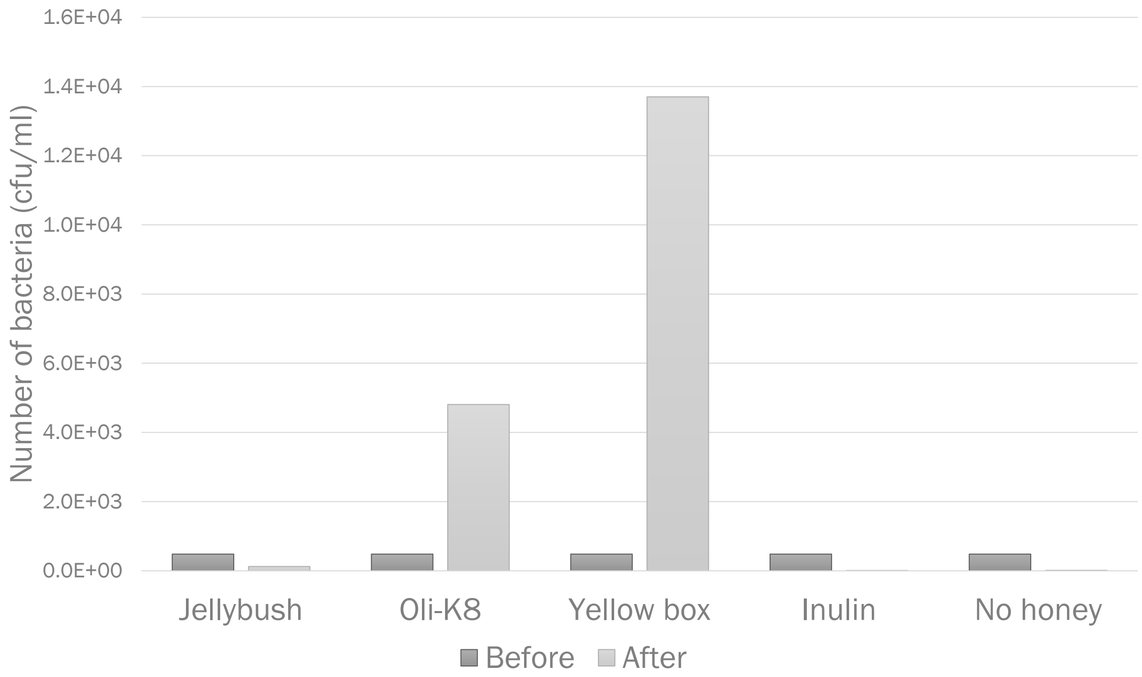
Can honey reduce the number of potential pathogens already in the gut?



Salmonella sp. and *E. coli*

Honey reduces numbers of *Salmonella* and *E. coli* compared to negative control and inulin



C. difficile

Honey does not reduce numbers of *C. difficile* compared to the negative control or inulin

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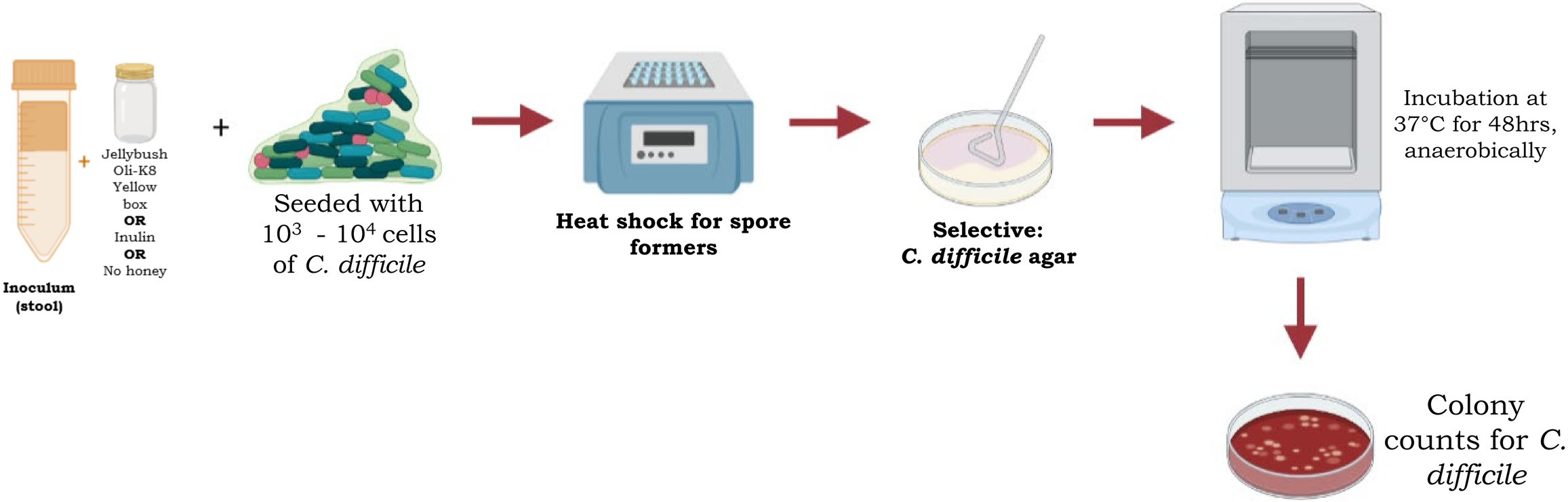
Can honey reduce the number of *C. difficile* in an infection model?



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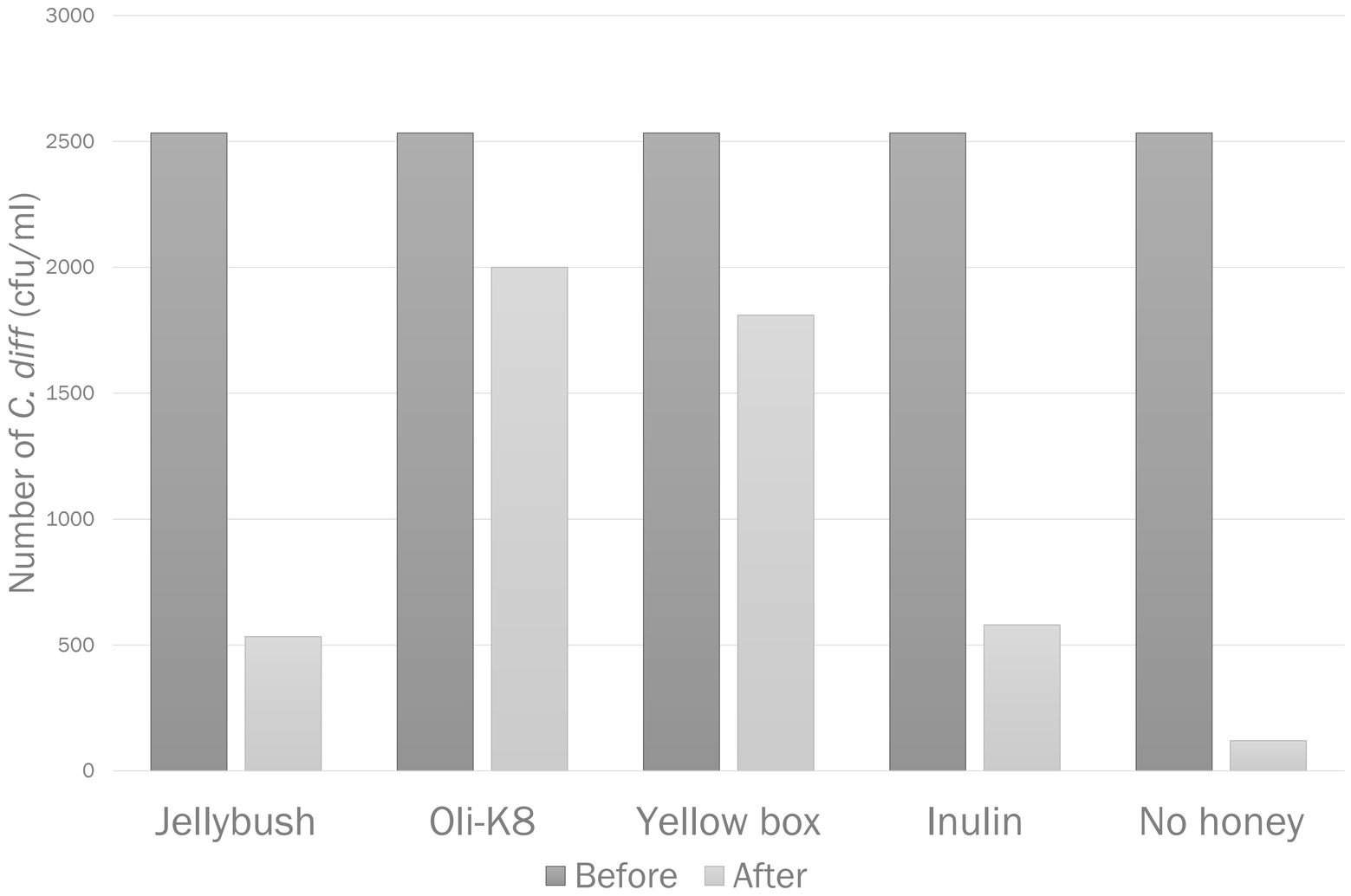

Can honey reduce the number of *C. difficile* in an infection model?

- Honey reduces no. of *C. difficile* in infection
- ***But*** microcosms with honey had higher no. of *C. difficile* than no honey

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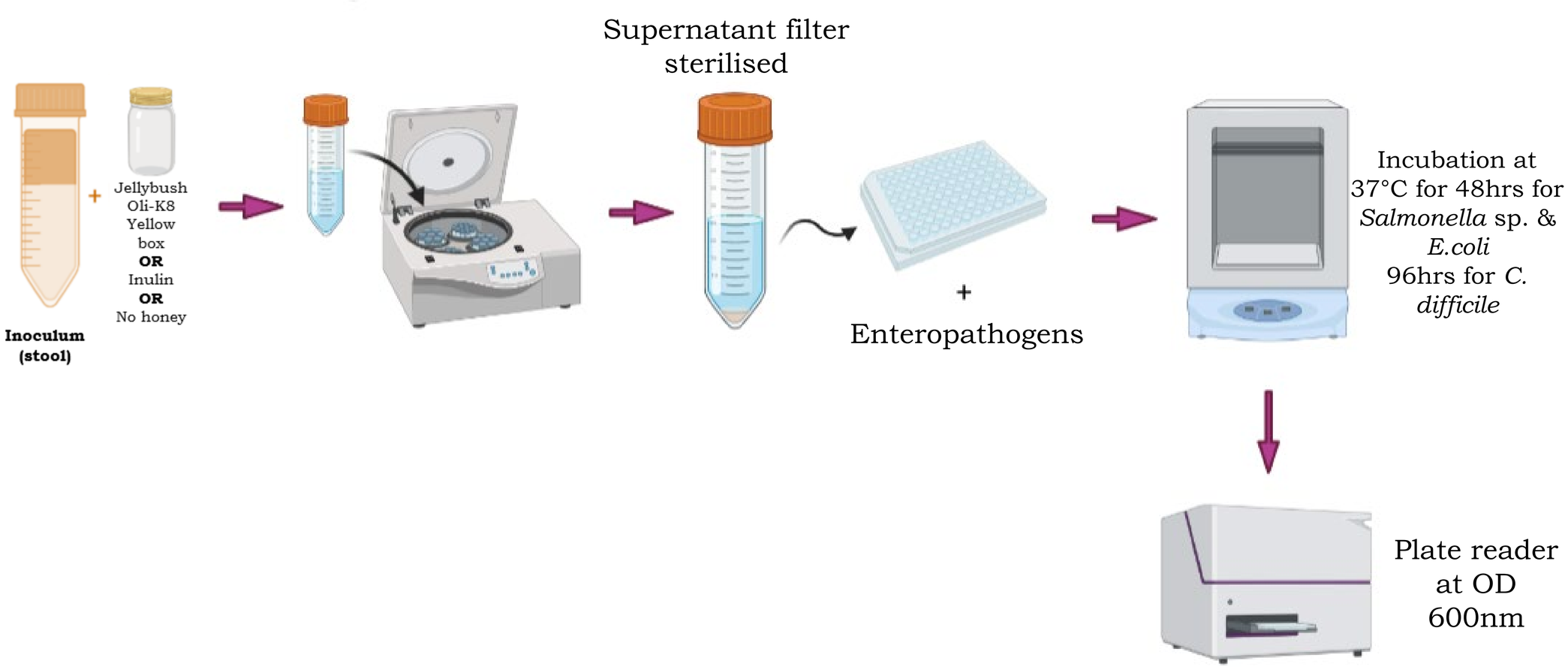
Does honey help our gut microbes produce compounds that inhibit enteropathogens?



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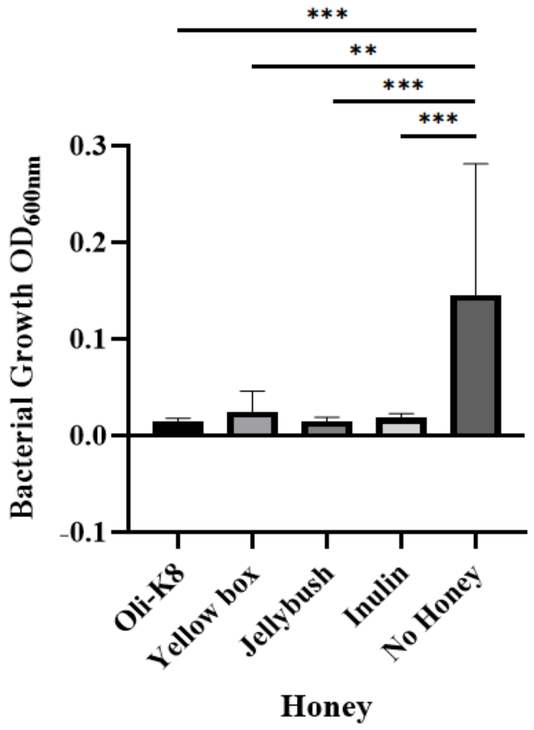
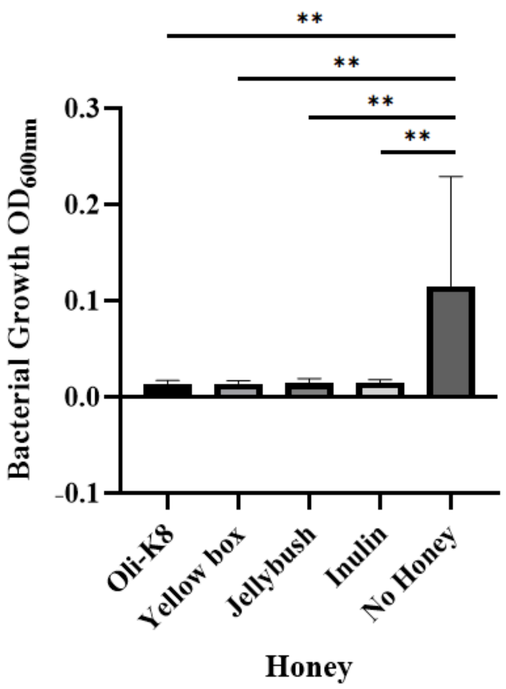
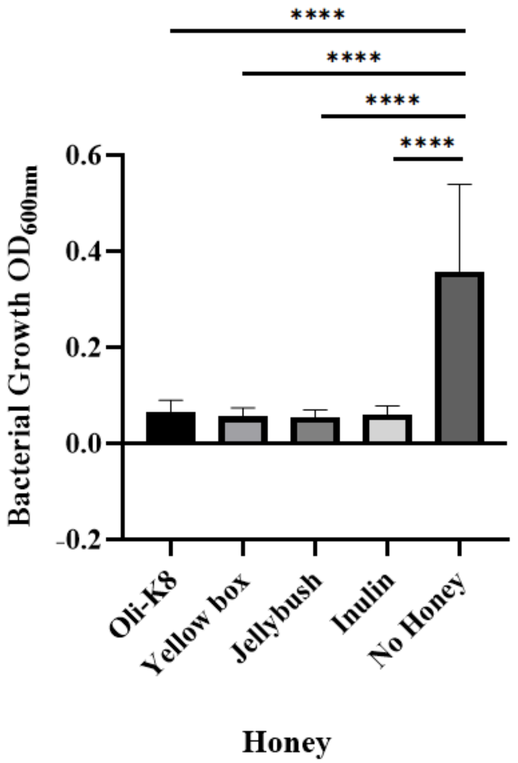


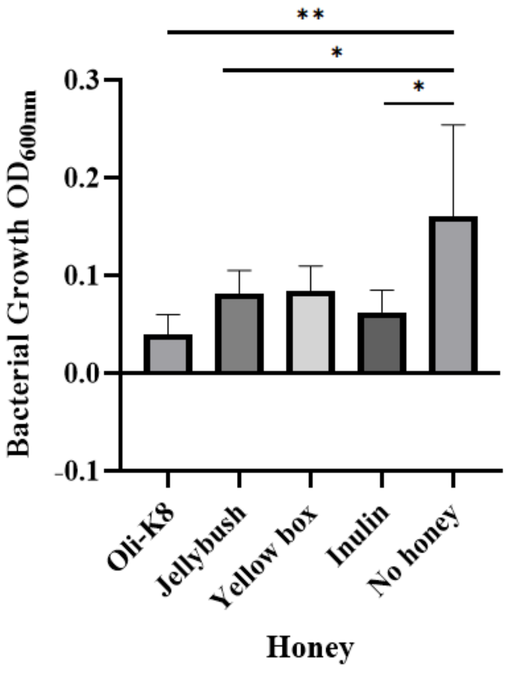
S. typhimurium PH206



S. typhimurium PH296



E. coli UTI89



C. difficile 5077

Summary

- Honey reduces numbers of the potential pathogens already living in the gut (*Salmonella, E. coli* and *C. difficile)*
- Honey can inhibit the growth of *C. difficile* in an infection model – but more work needed here
- Gut microbiota produce compounds that inhibit gut pathogens in the presence of honey
- More promising as a prevention vs treatment?

Different honeys with different bioactive properties = different health benefits

Acknowledgements

UNIVERSITY OF TECHNOLOGY SYDNEY

Prof Liz Harry
Dr Shona Blair
Daniel Bouzo
Isabella Wilson
Rose Farlow
Dr Cath Burke

MRC Microbiome Research Centre

Prof Emad El-Omar
Dr Fatima El-Assad

THE UNIVERSITY OF SYDNEY

Prof Dee Carter
Karel Liu
Anttoni Hakola-Parry
Krish Krishnakumar
Annabel Guttentag

UNSW SYDNEY

Prof Trish Conway
Dr Shona Blair
Dr Lai Tran
Dr Meera Esvaran
Dr Shaun Nielsen
Prof Torsten Thomas

University of the Sunshine Coast

Dr Peter Brooks
Simon Williams

NSW beekeepers
with special thanks to:
Dr Doug Somerville
Jon Lockwood
Michael Howes
NSWAA executive

AgriFutures Australia

AgriFutures™ Honey Bee & Pollination

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