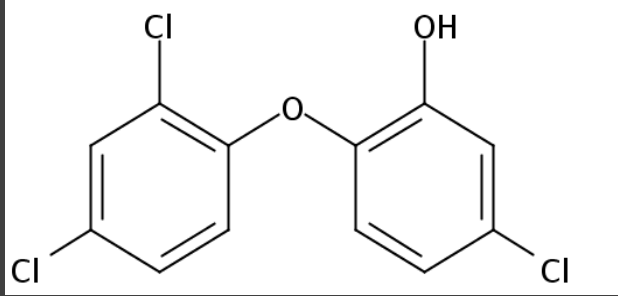


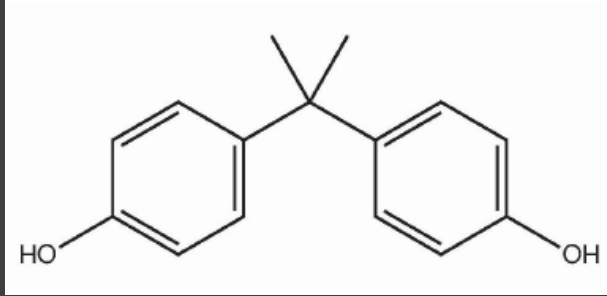
# Emerging Contaminants and Antimicrobial Resistance

Izzie Alderton, Jack A. Heinemann, Brigitta Kurenbach, Barry R. Palmer, Maria J. Gutiérrez-Ginés, Bridget Armstrong, Jacqui Horswell, Louis A. Tremblay

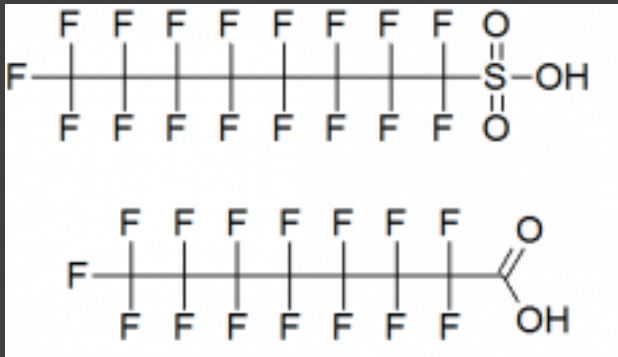
# Emerging contaminants (ECs)



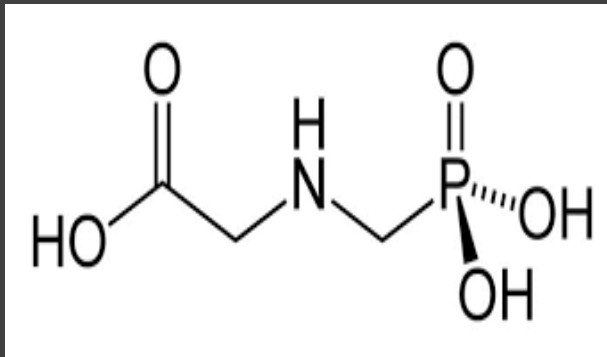
Triclosan



Bisphenol A



PFAS and PFOA



Glyphosate

- Synthetic or naturally occurring chemicals
  - Use and discharge – not regulated
  - Not commonly monitored
  - Potential to cause ecological and/or human health effects
- 
- Consists of:
    - Pharmaceuticals
    - Pesticides
    - Industrial chemicals
    - Personal care products
    - Endocrine-disrupting compounds

# Why are they important?

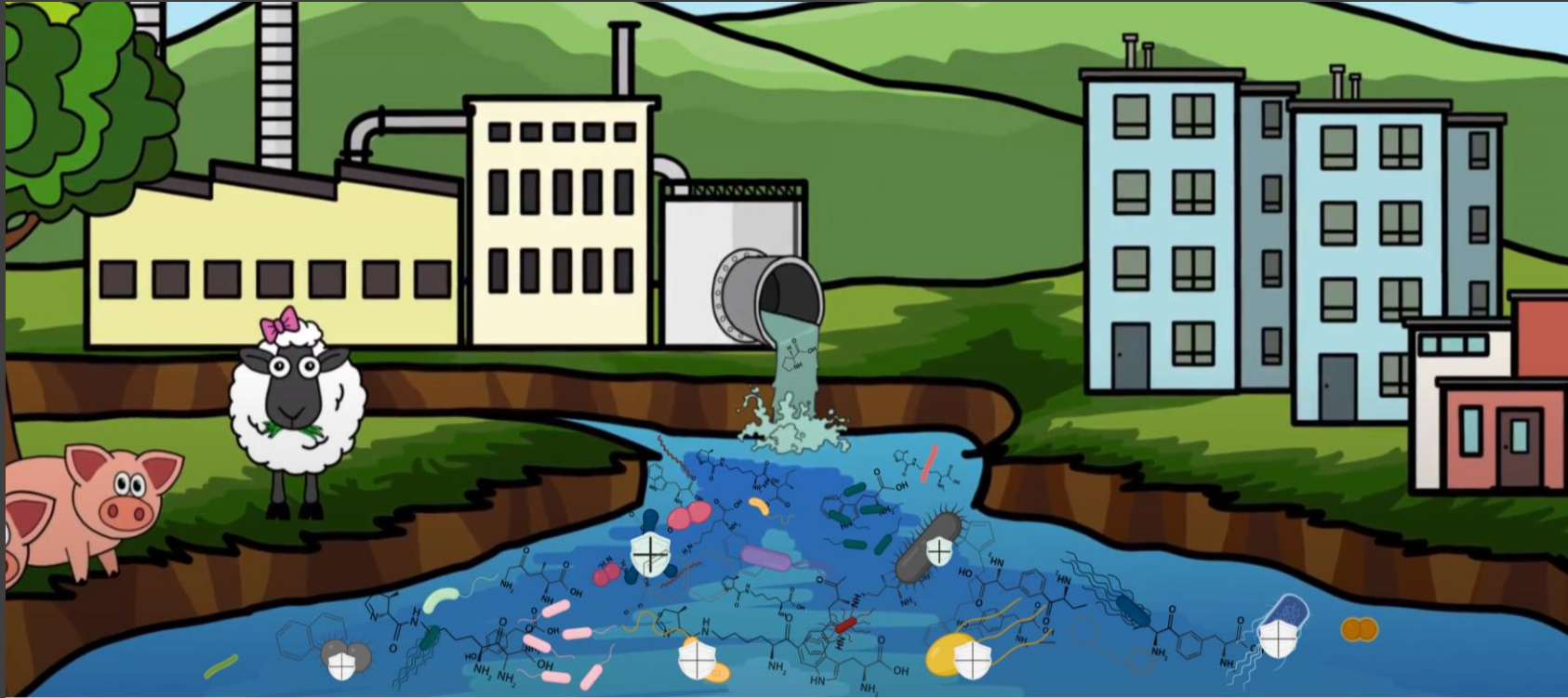


- Unintended environmental effects
- Persistent and bio-accumulative
- Wicked problem
  - Complex – many components & stakeholders
  - Many viewpoints
  - No one solution fits all
  - Problem constantly evolving
- Requires integration of disciplines and expertise
- How to manage benefit vs risk?

# Why are they important?



# Our environment



- Environment is key to spread
- Increased release of contaminants
  - Storm water
  - Municipal waste
  - Industrial waste
  - Agricultural waste
  - Waste to land
- Hot spots



# Emerging organic contaminants:

*Managing risk for a safer NZ environment and economy*

- 5 yr. programme
  - Identify emerging contaminants
  - Characterise risk
  - Antimicrobial resistance
- National advisory panel
- Vision for EOCs
  - Whakahaumarutia to tātou taiao i te aranga ake o ngā tāwahawaha kikino

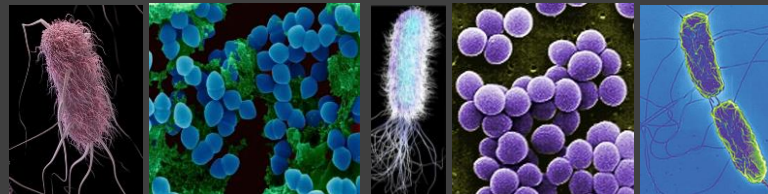


# Research questions & Outcomes

1. Can EOCs promote antimicrobial resistance in the environment?
  2. Which ones are of most concern?
- Elucidate resistance mechanisms
  - Determine risk of EOCs to spread of resistance
  - Highlight priority chemicals – ban/control?

# The story so far...

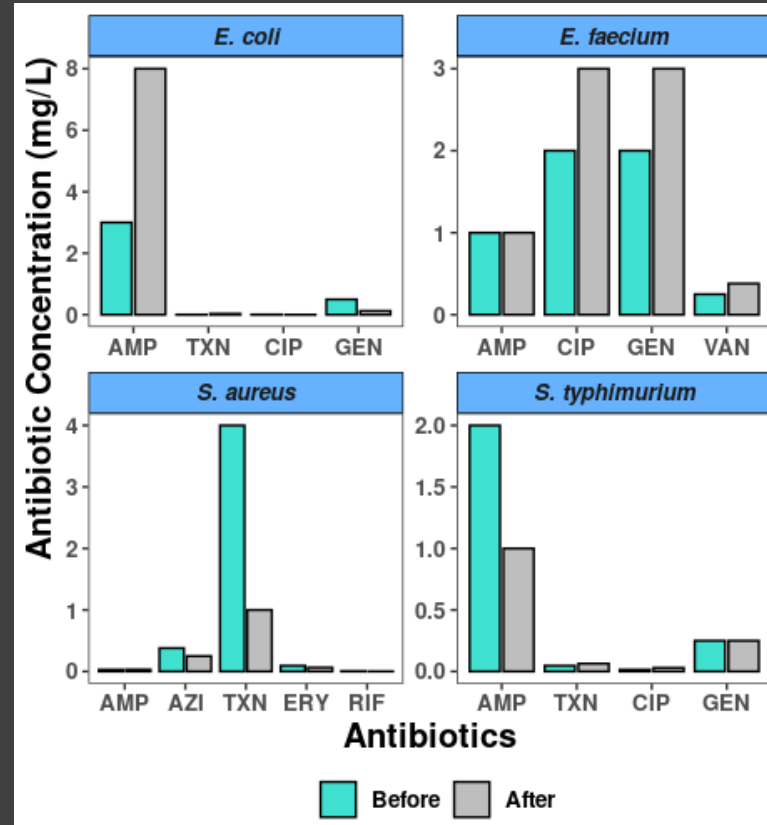
- Triclosan
  - Triclocarban
  - Diclofenac sodium salt
  - Carbamazepine
  - Fluoxetine
  - Methyl paraben
  - Ibuprofen
  - Clotrimazole
- *Escherichia coli*
  - *Enterococcus faecium*
  - *Pseudomonas aeruginosa*
  - *Staphylococcus aureus*
  - *Salmonella enterica* serovar typhimurium
- Fluoroquinolones
  - 3rd & 4th generation cephalosporins
  - Macrolides
  - Glycopeptides



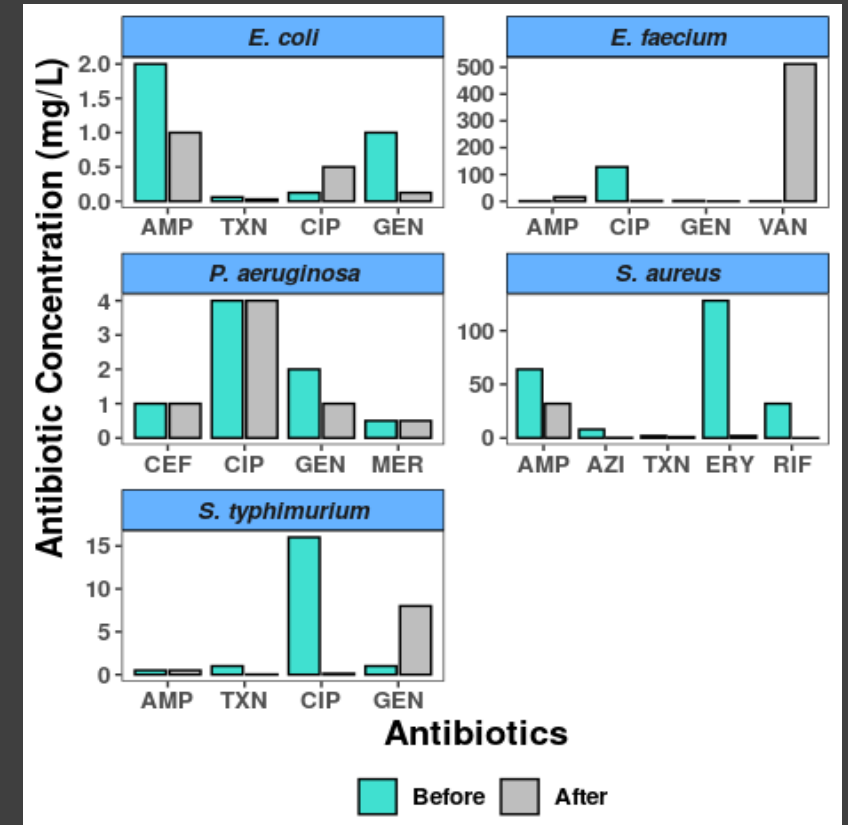


# Stage 1: EOC exposure

- 5 bacteria screened against 5 EOCs
- Changes in susceptibility



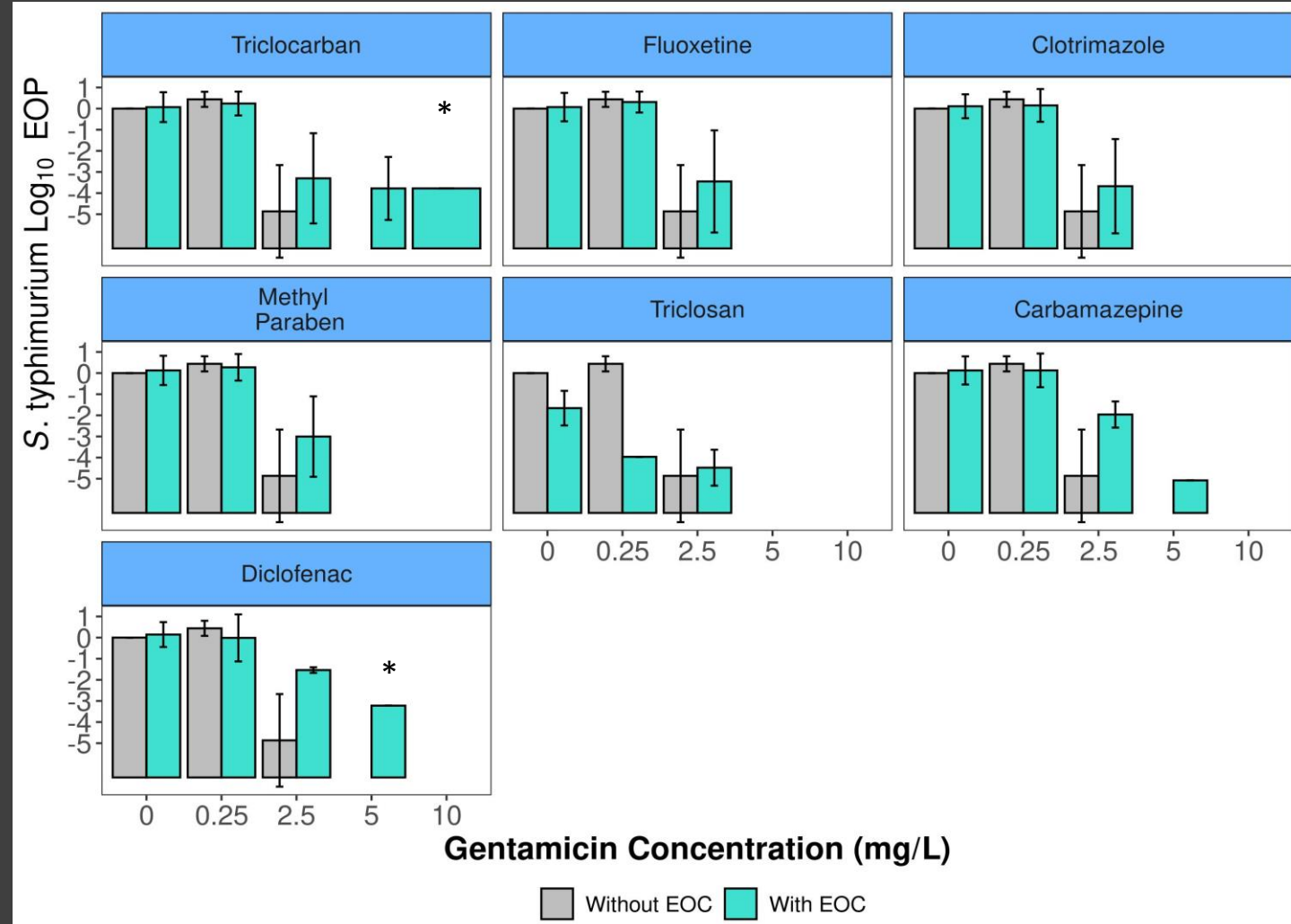
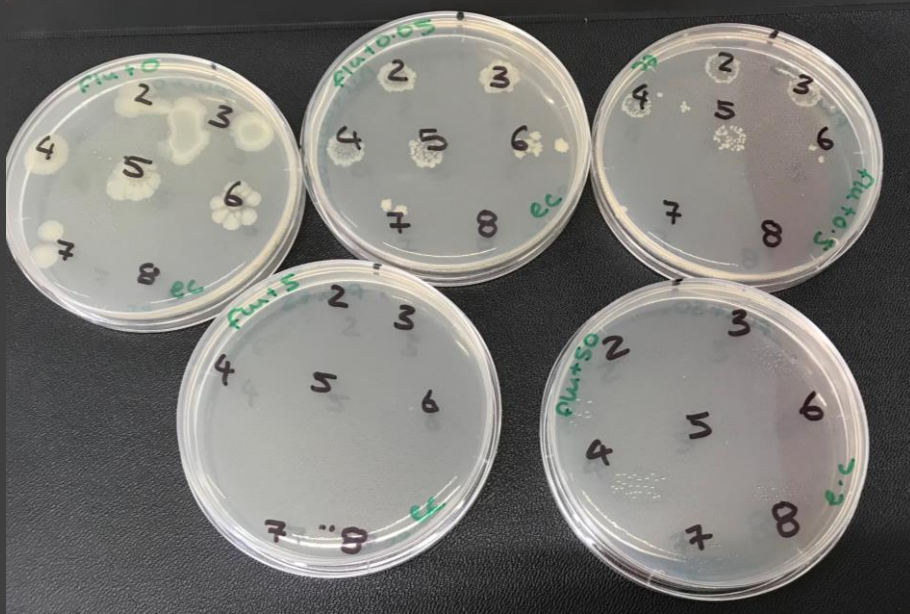
Triclosan



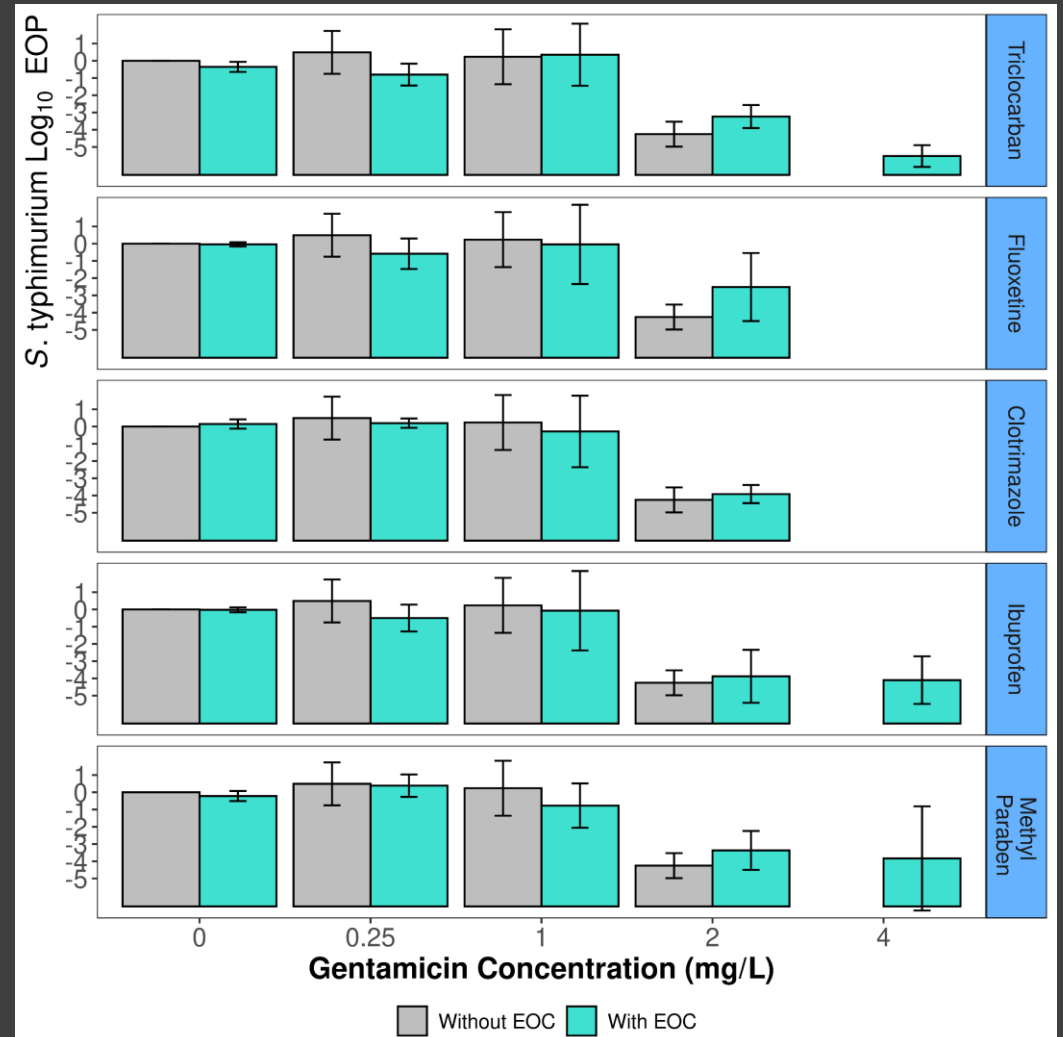
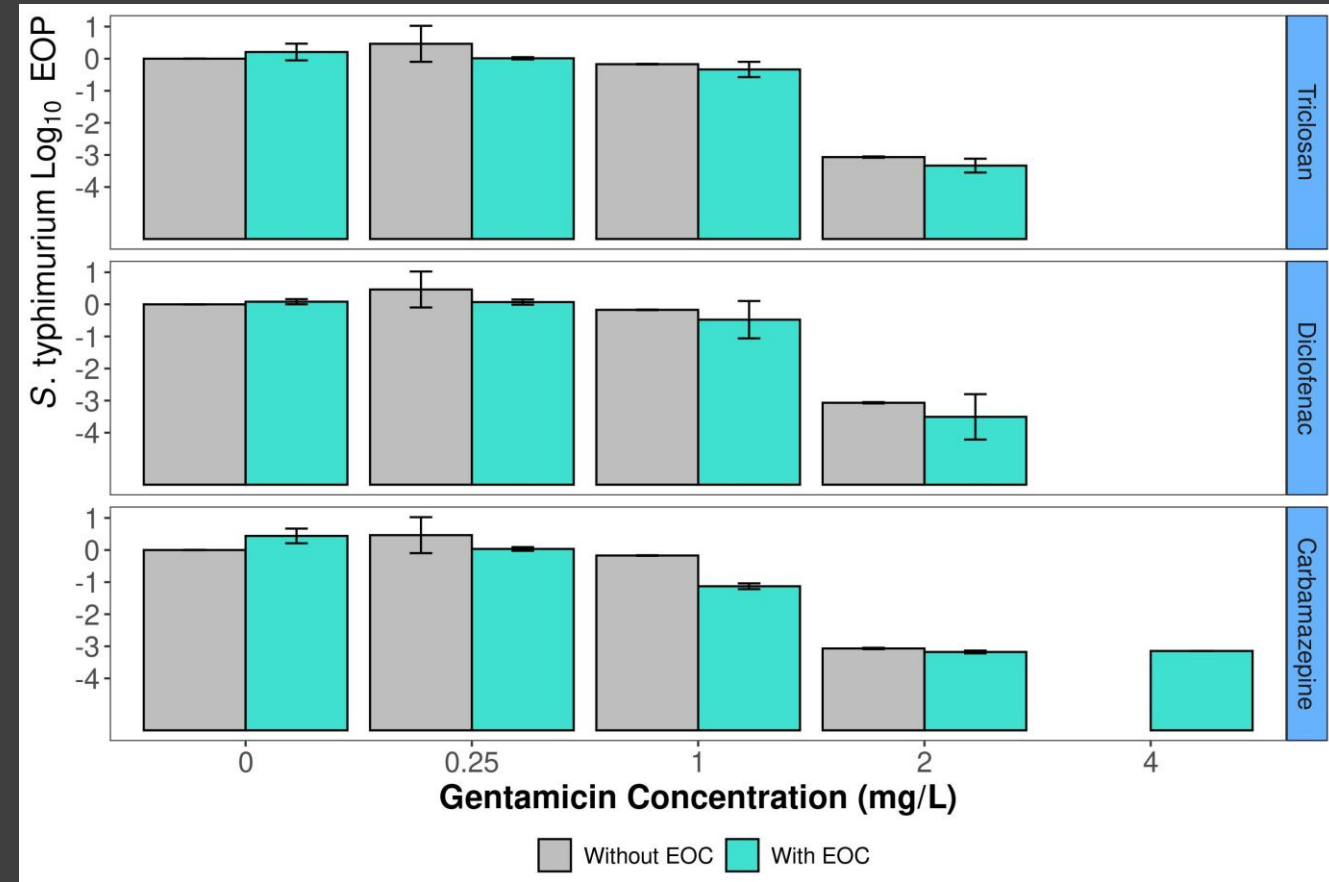
Fluoxetine

# Stage 2: EOC & Antibiotic co-exposure

- 1 bacteria screened against 8 EOCs
- Changes in susceptibility



# Stage 2: EOC & Antibiotic co-exposure



# Next steps

- Trial additional antibiotics with the eight EOCs
- Sequencing – mechanisms used

# Acknowledgements

- MBIE funding - CAWX1708
  - Project leader – [louis.tremblay@cawthron.org.nz](mailto:louis.tremblay@cawthron.org.nz)
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