UQ Exeter Institute

Like Parent, Like Metabolite:

Do antibiotics and their transformation products exert comparable selective pressures?

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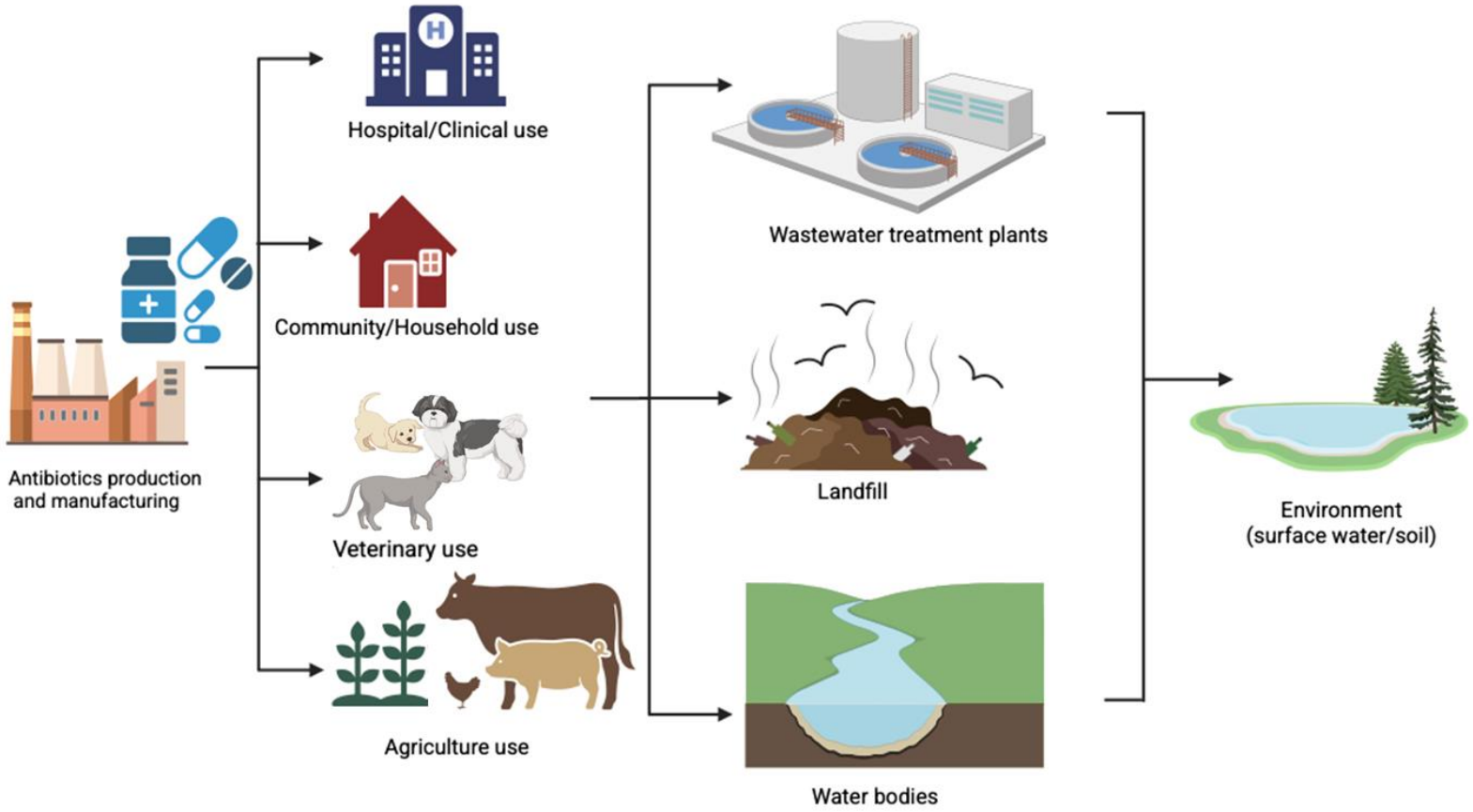
A partnership between

The University Of Queensland AUSTRALIA

University of Exeter

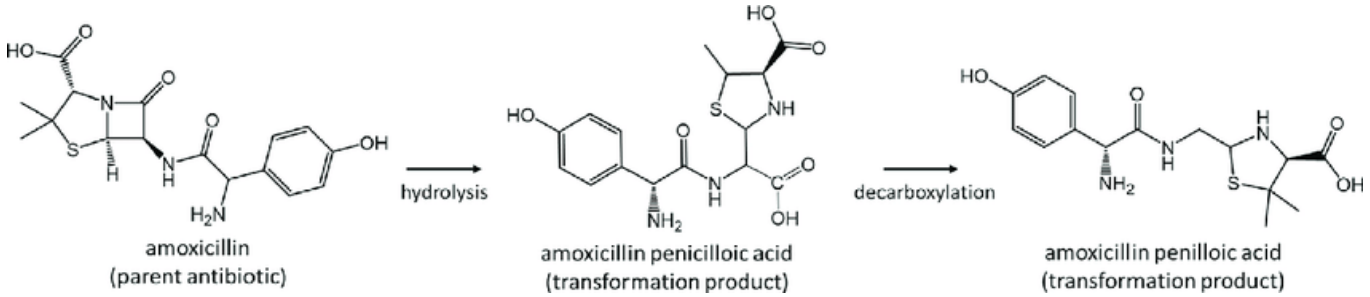
The environment plays a major role in resistance evolution



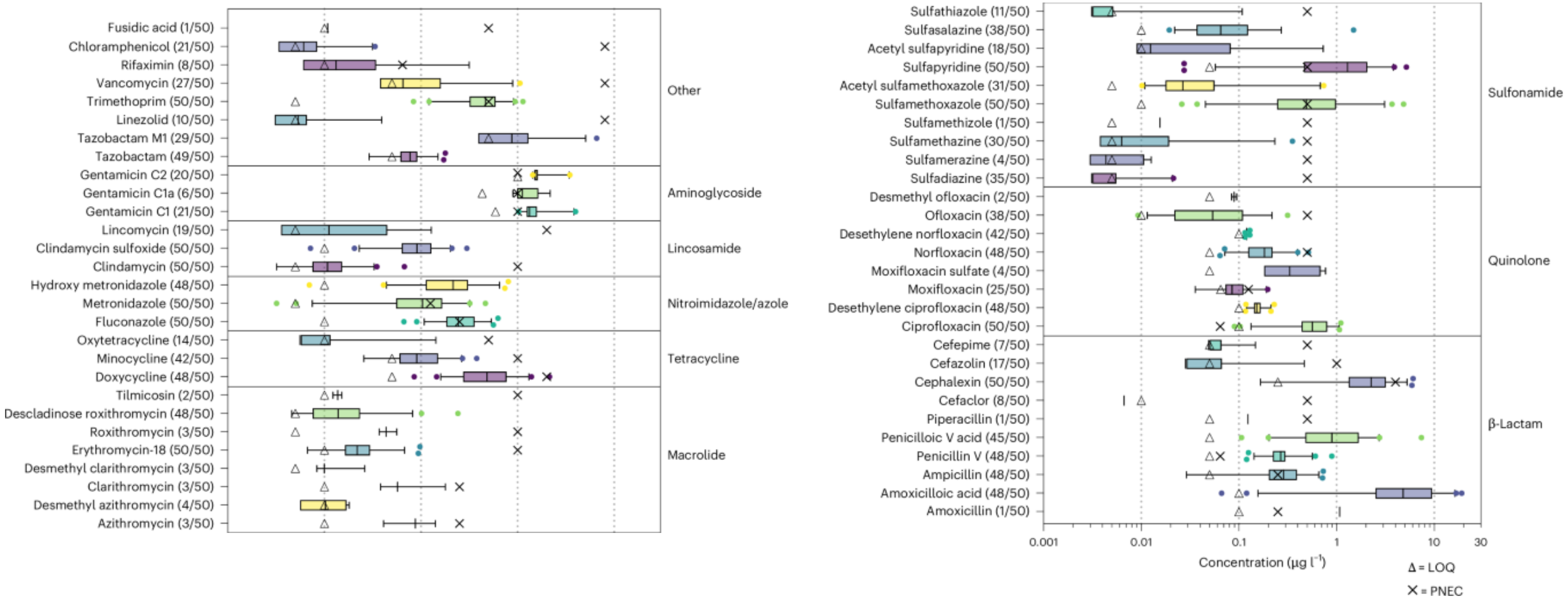
What are antibiotic TPs?

Modified breakdown products of antibiotics — but not necessarily harmless.

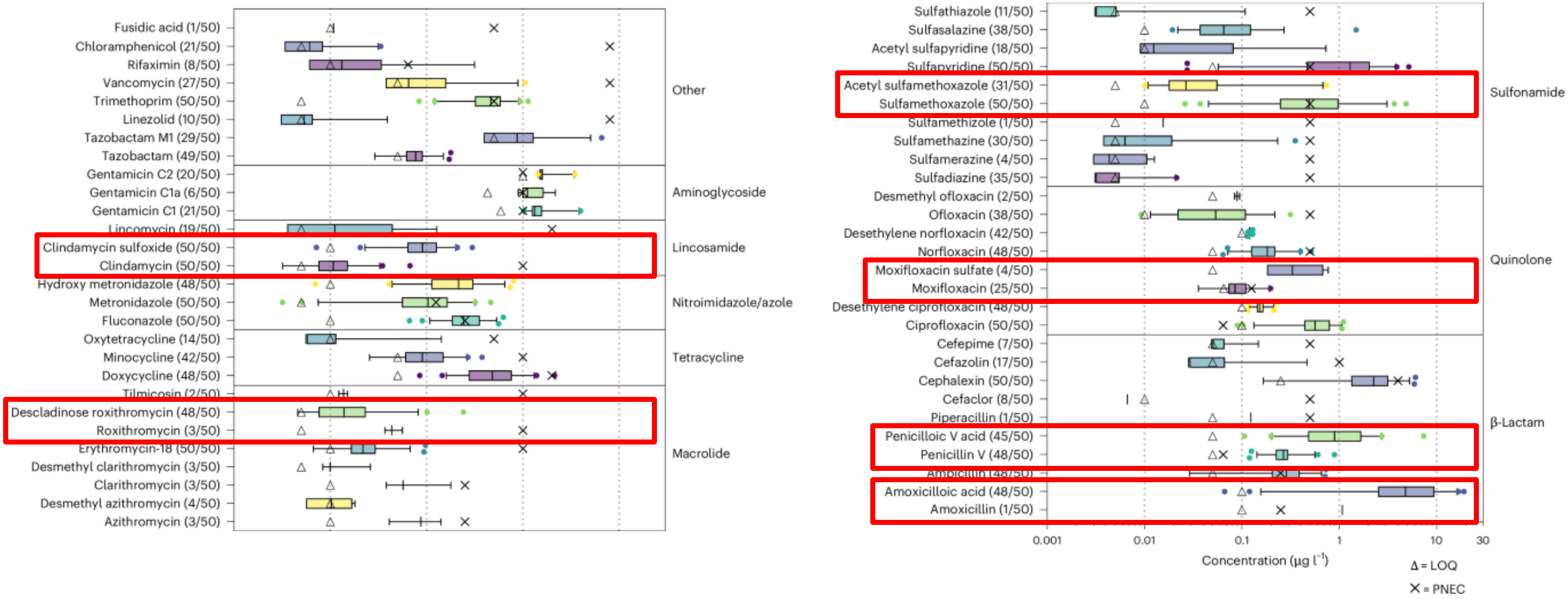
Process	Examples
Biological	Microbial metabolism
Chemical	Hydrolysis, oxidation
Physical	Photodegradation



Why it matters: Transformation products can **persist**, may remain **biologically active**, and potentially **contribute to AMR selection** — yet they're often ignored in risk assessments.



Concentration of antimicrobials and the TPs in wastewater influent in Australia. (Li et al. 2024)



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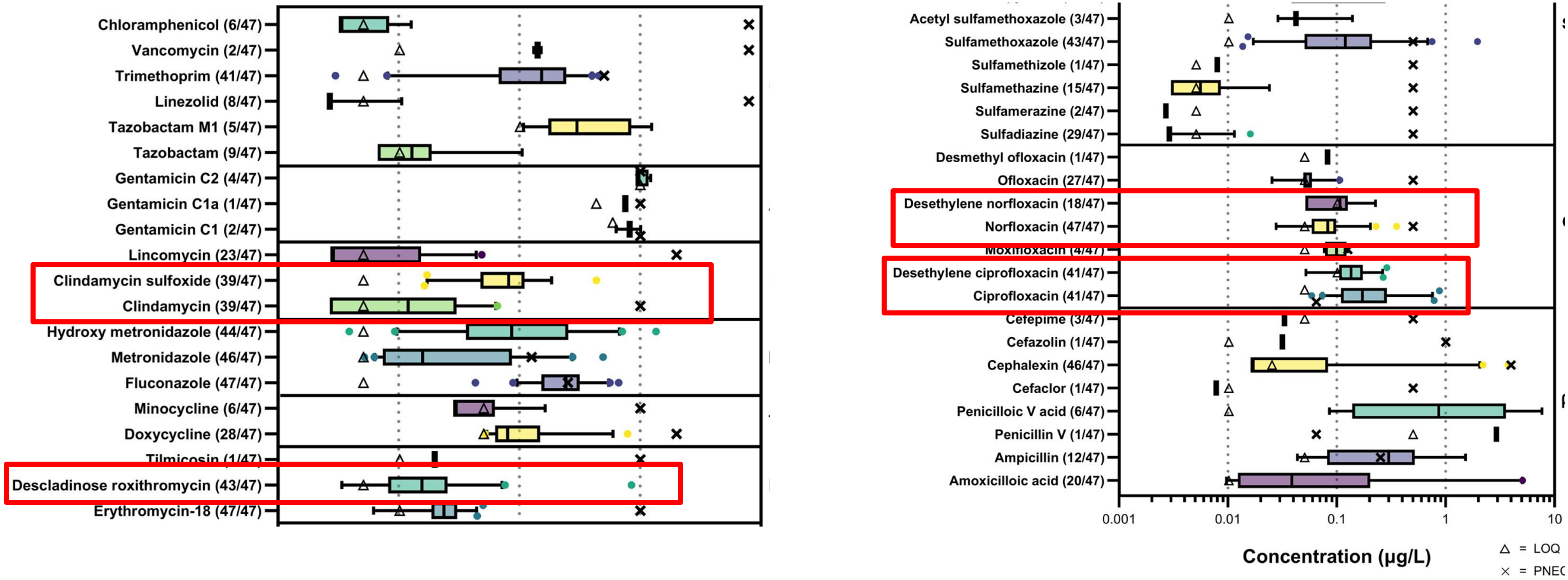

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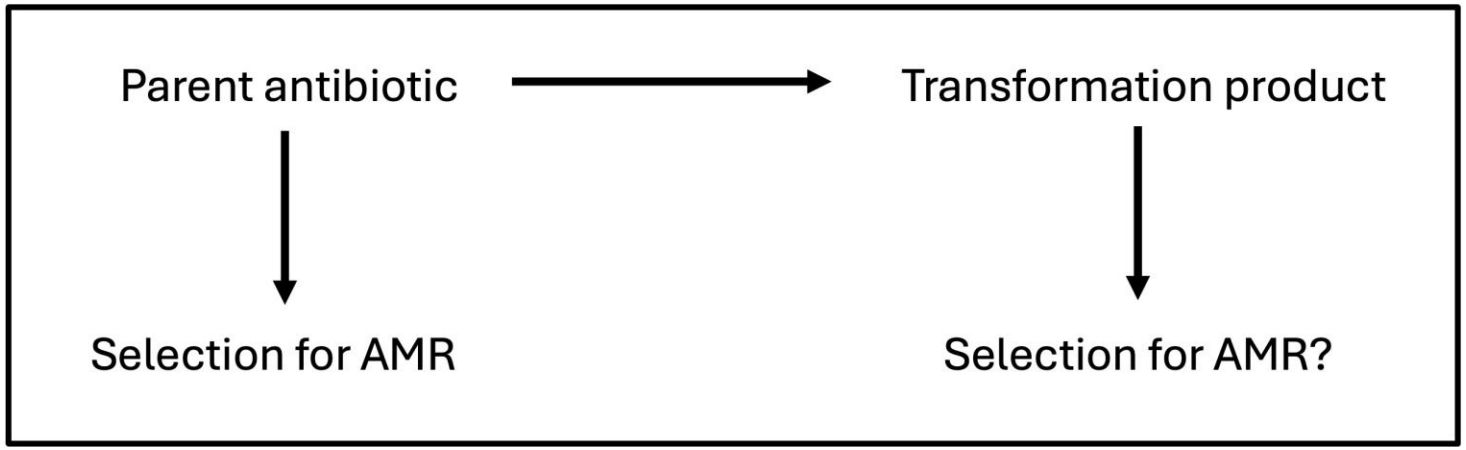
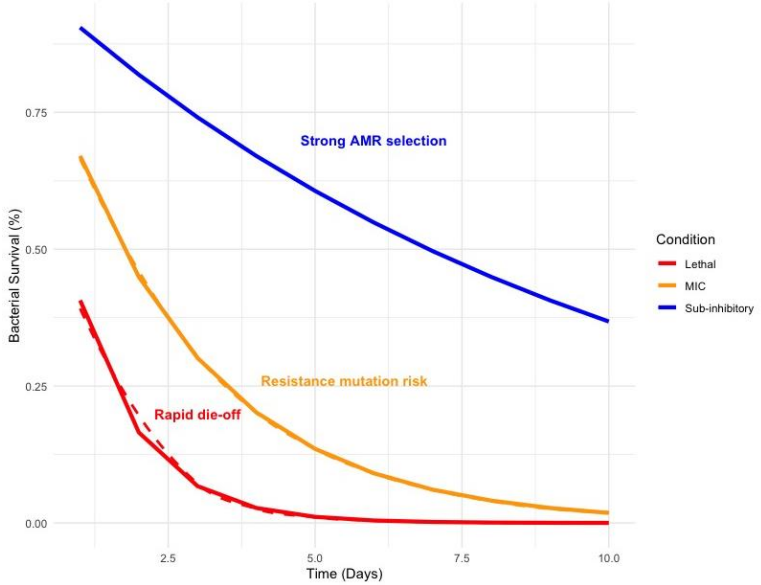
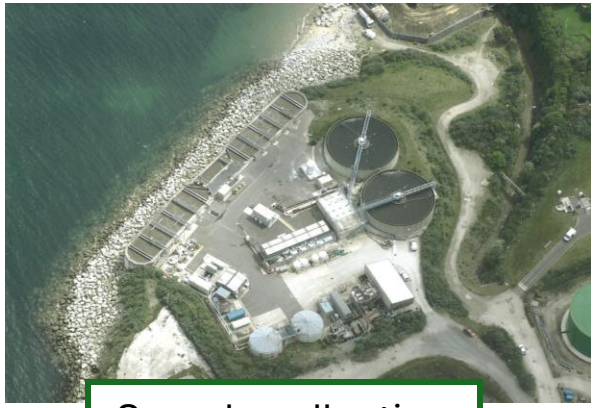
From detection to impact: Do TPs drive antibiotic resistance?

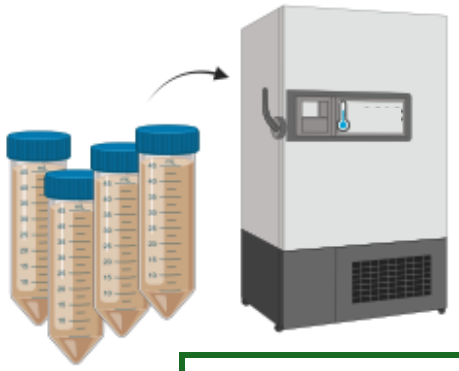




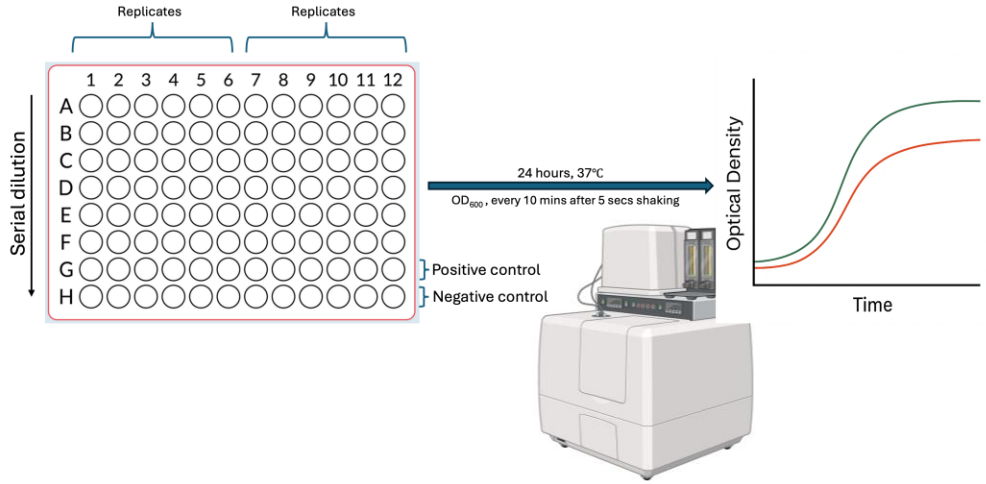
Bacterial survival under different antibiotic concentrations over time.



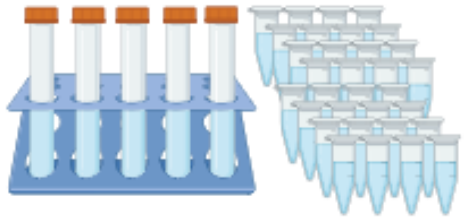
Sample collection



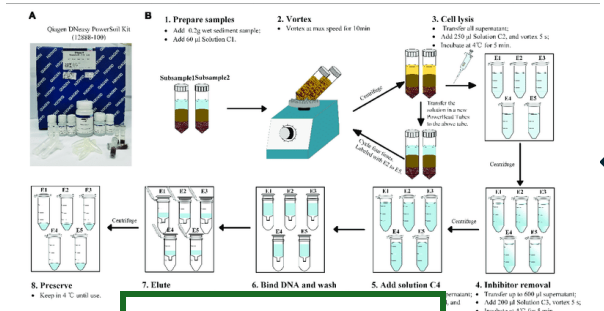
Aliquot and freeze



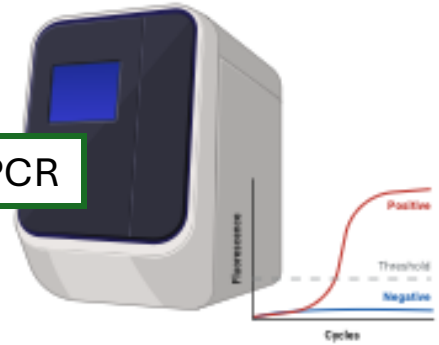
SELECT Assay



Evolution experiment



DNA extraction



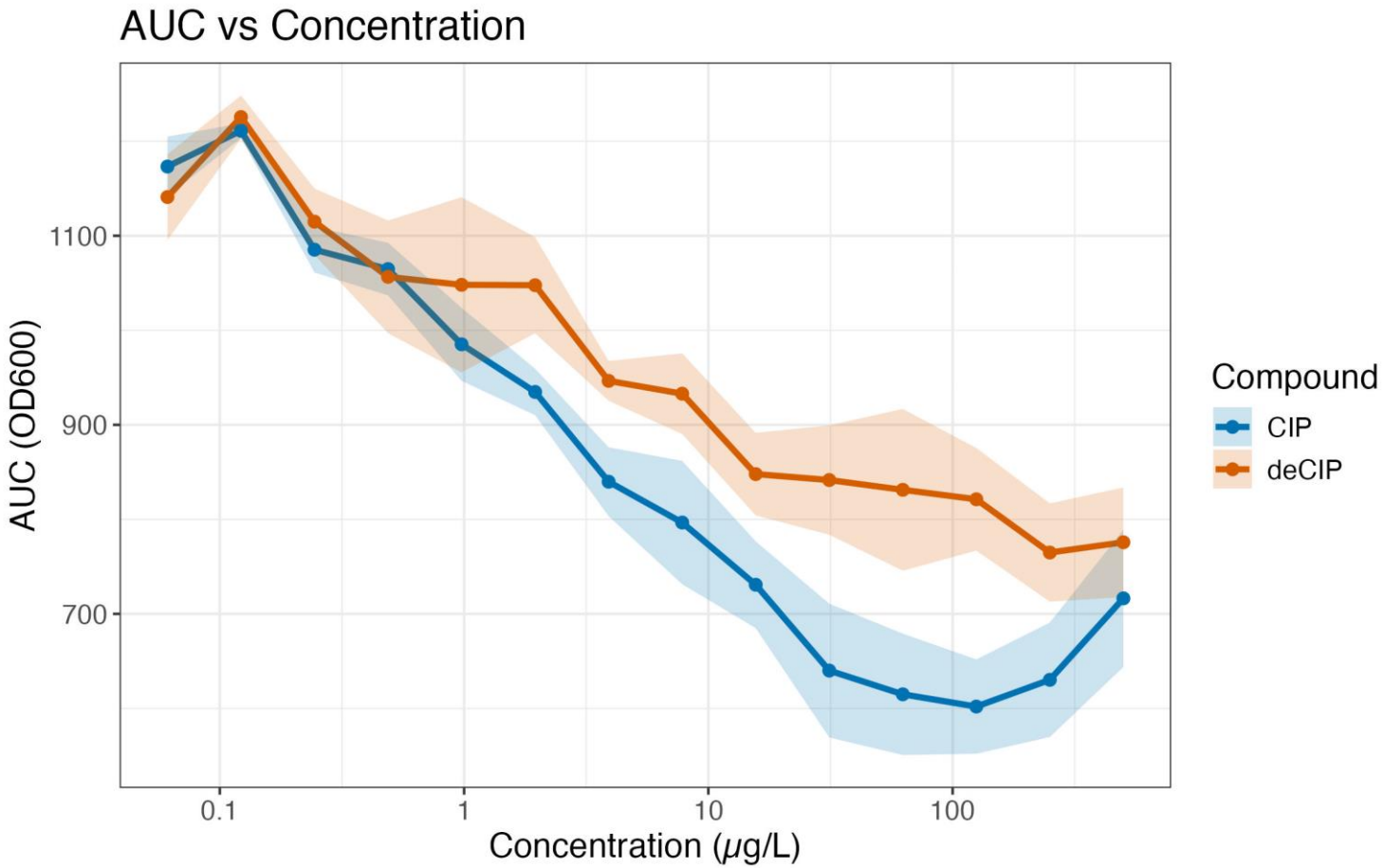
qPCR

Target genes:

- ***intI1***
- **16S rRNA**

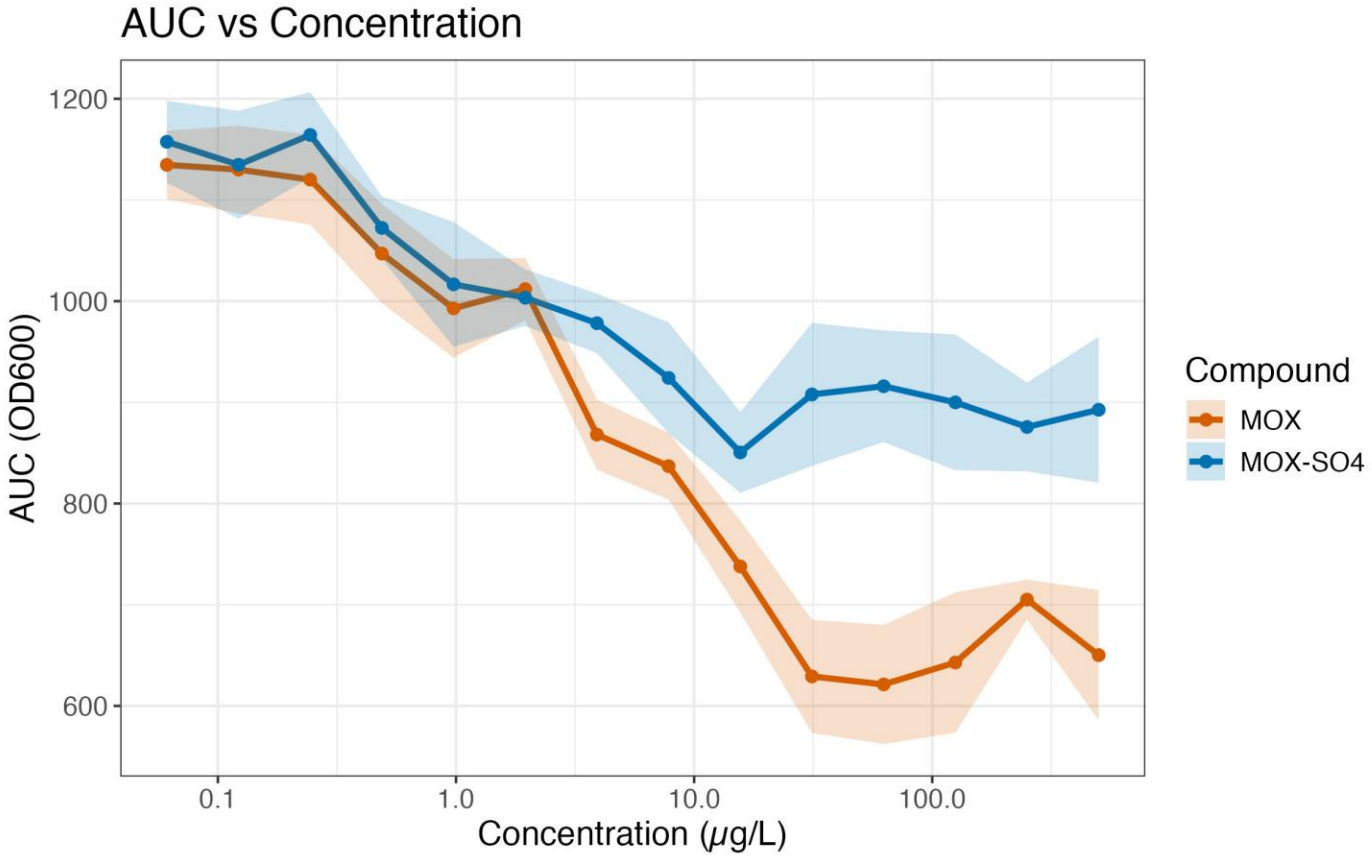
Data analysis

Growth inhibition profiles for Ciprofloxacin and Desethylene ciprofloxacin (SELECT Assay)

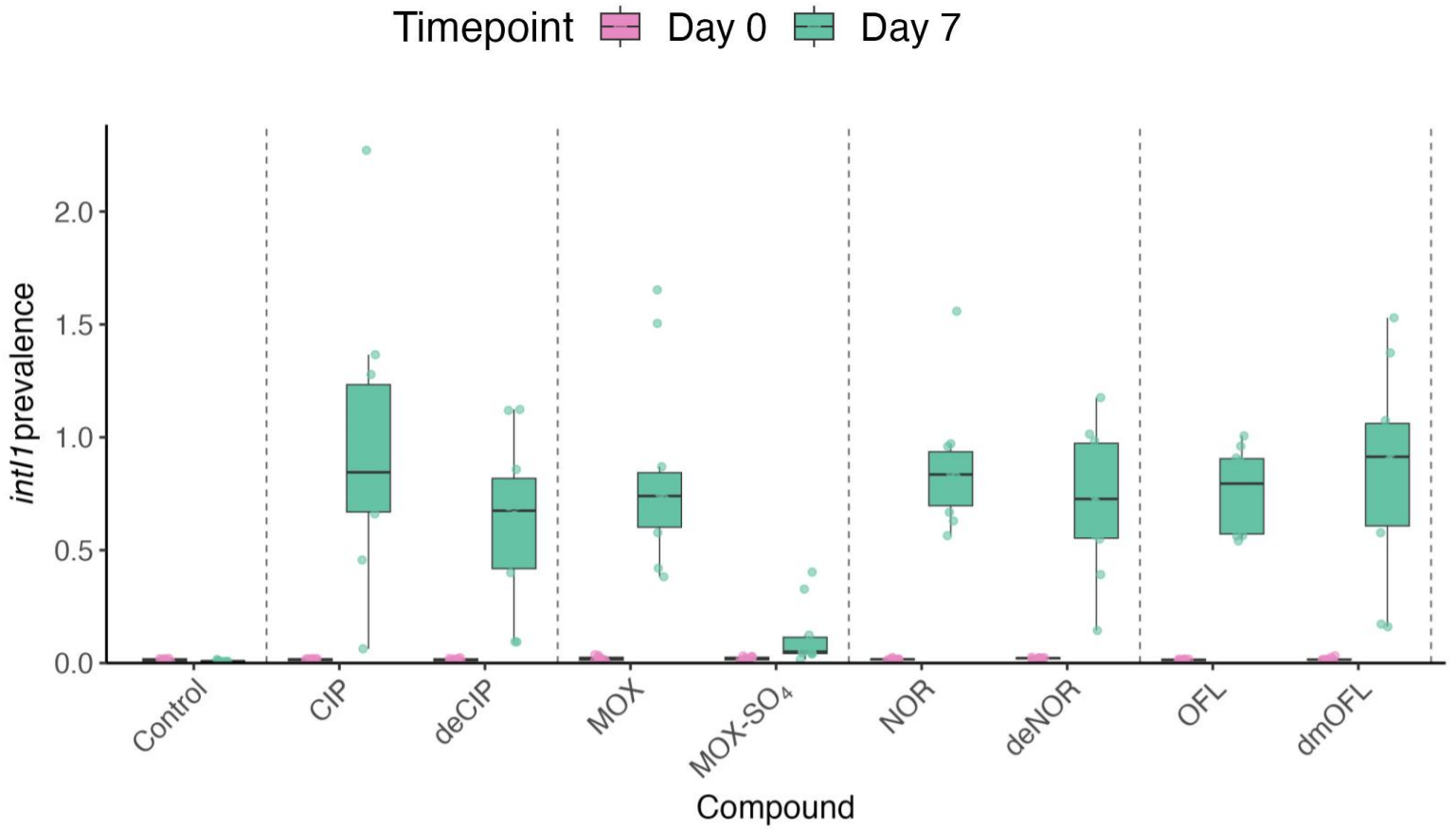


Area under the curve (AUC) of bacterial growth (OD600) in response to increasing concentrations of CIP and deCIP.

Growth inhibition profiles for Moxifloxacin and Moxifloxacin-N-sulfate (SELECT Assay)

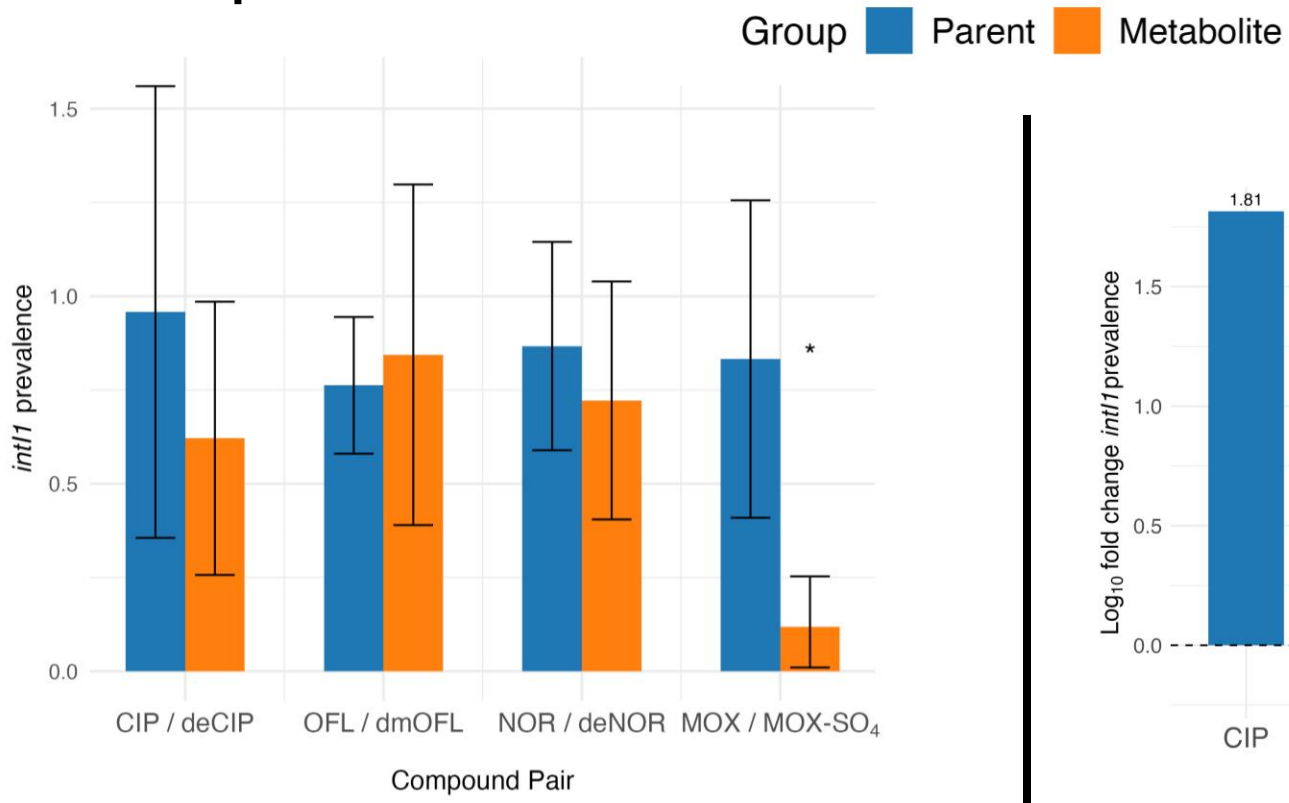


Fluoroquinolones

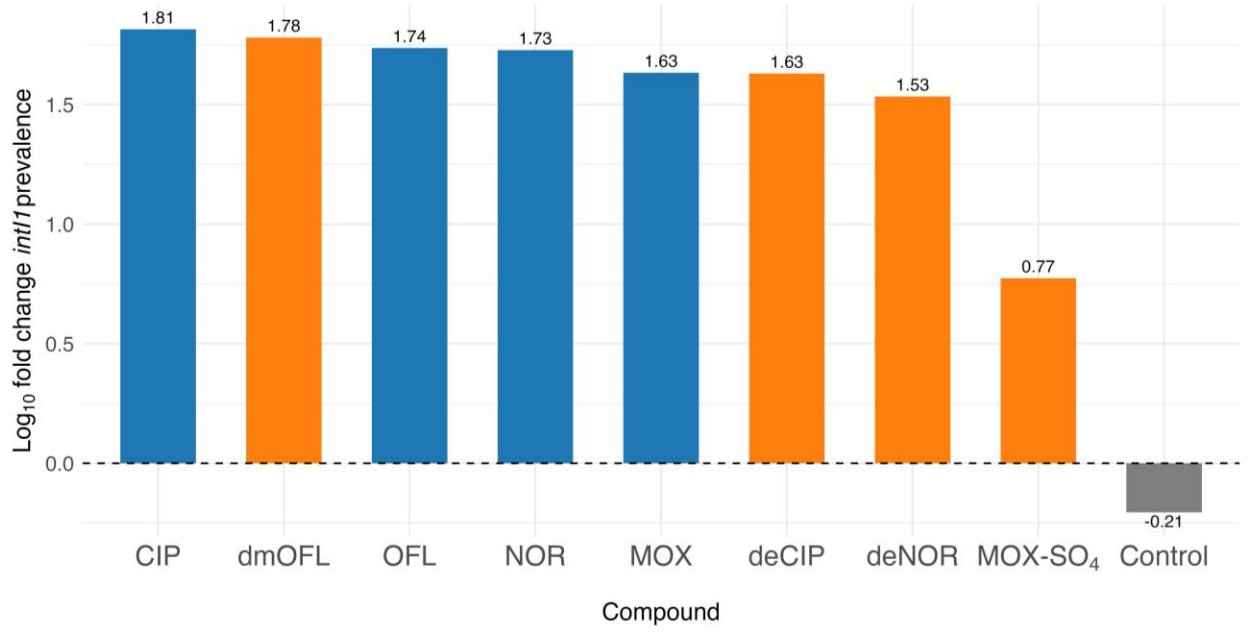


Effect of fluoroquinolone antibiotics and their transformation products on *intI1* prevalence over 7 days.

Fluoroquinolones



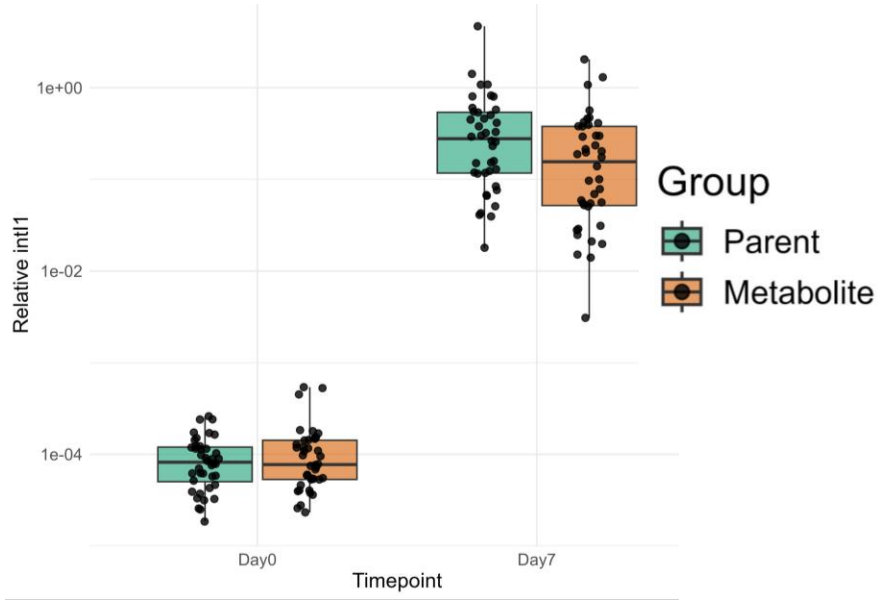
Comparison of mean *intI1* prevalence between antibiotics and their TPs. Bar plots show the average *intI1* abundance across replicates for each compound pair after 7-day exposure.



Log_{10} fold change in *intI1* prevalence (Day 7 relative to Day 0) across compound treatments.

Conclusion

- All TPs tested showed some ability to increase *intI1* prevalence, indicating potential for AMR selection.
- In most cases, TPs had lower selective pressure than parent antibiotics. However, some metabolites (e.g. dmOFL) showed comparable or even higher enrichment than parents, highlighting compound-specific risks.
- Transformation products should not be ignored in AMR risk assessments.



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