Degradation Kinetics of Antibiotic Resistance Genes (ARGs) and Mitigation of Horizontal Gene Transfer (HGT) using UV-based Sulphate and Hydroxyl Radicals AOPs

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1 INTRODUCTION

- Antibiotic resistance (AR) is a 'silent' pandemic.

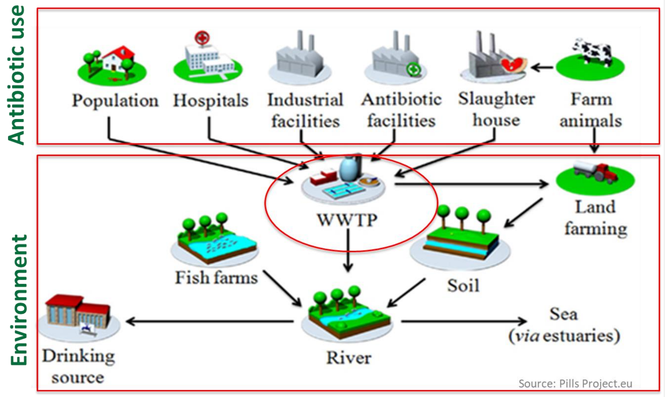


Figure 1: WWTPs as sources of AR dissemination[1]

2 RESEARCH QUESTIONS

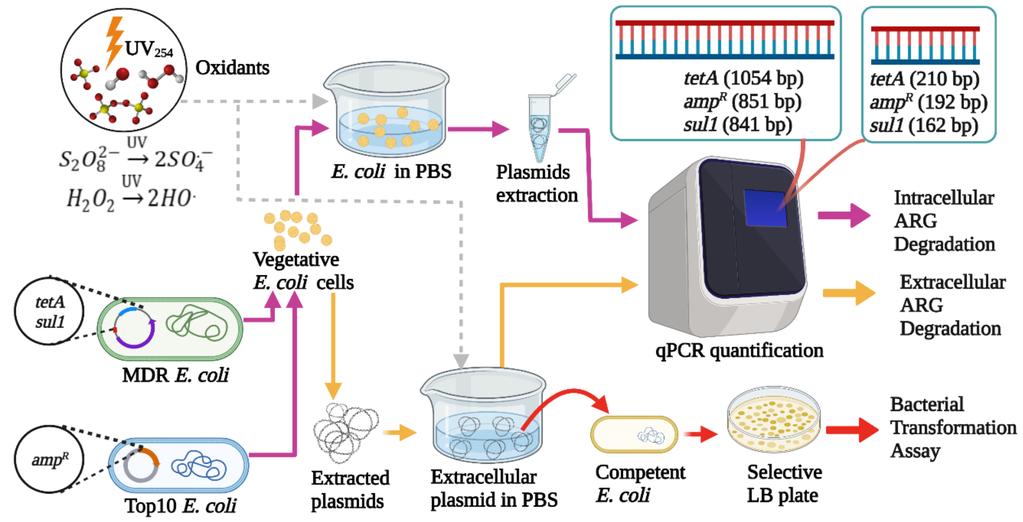
Motivation for the study

- Chlorination and UV inactivate ARB but ARGs are not effectively degraded.
- Advanced oxidation processes (AOPs) are promising technologies for AR mitigation.

Research questions

- What are the effects of target qPCR amplicons on ARG degradation kinetics using UV_{254}, UV_{254} / H_2O_2, $UV_{254}/S_2O_8^{2-}$?
- Can ARG degradation estimate deactivation?

3 METHODS



4 RESULTS & DISCUSSION

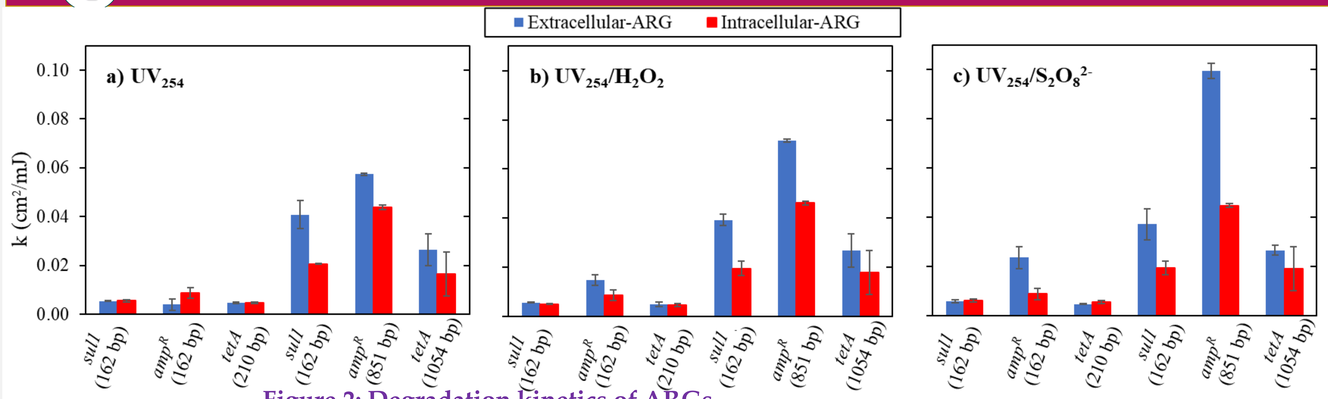


Figure 2: Degradation kinetics of ARGs

Figure 2

- $UV/S_2O_8^{2-}$ degraded ARGs faster than UV/H_2O_2 and UV.
- Extracellular ARG degraded faster than intracellular ARG.
- Higher degradation rate with longer qPCR amplicon.
- Nucleotide compositions of qPCR amplicon influenced ARG degradation kinetics.

Figure 3

- ARG deactivation faster (2.5 times) in $UV/S_2O_8^{2-}$ and UV/H_2O_2 than UV.
- ARG deactivation faster than ARG degradation.
- Long amplicon estimates ARG deactivation better.

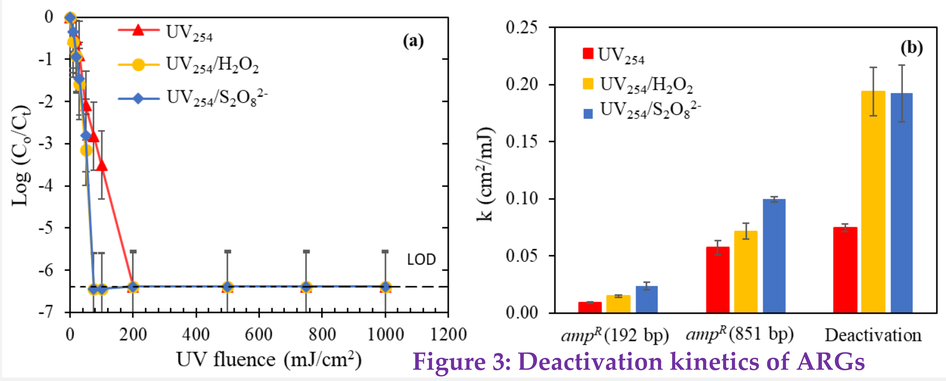


Figure 3: Deactivation kinetics of ARGs

5 CONCLUSIONS

- ARG degradation kinetics followed the order $UV_{254}/S_2O_8^{2-} > UV_{254}$ / $H_2O_2 > UV_{254}$ and were dependent on qPCR amplicon length and nucleotide sequence.
- Overestimation of the potential risks of ARG presence with short qPCR amplicon.

6 ACKNOWLEDGEMENTS

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Reference

[1] Stalder *et al.*, 2012. Front. Microbiol. DOI:10.3389/fmicb.2012.00119.

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