Influence of pH and Target Amplicons on the Degradation Kinetics of Antibiotic Resistance Genes (ARGs) during Hydroxyl and Sulphate Radicals AOPs

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1 INTRODUCTION

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

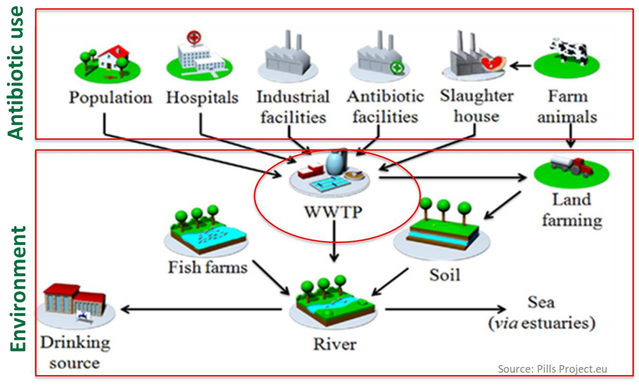


Figure 1: *WWTPs as sources of AR dissemination*[1]

Motivation for the study

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

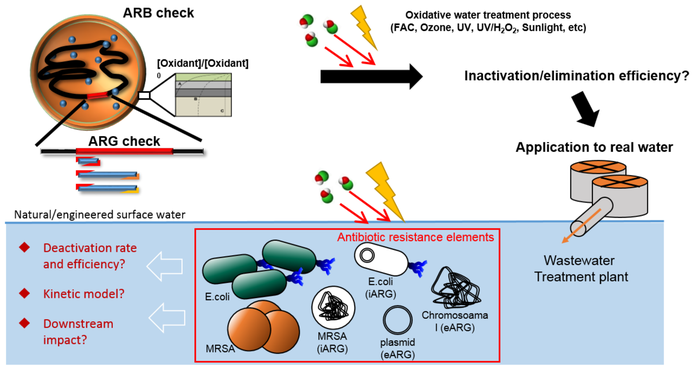
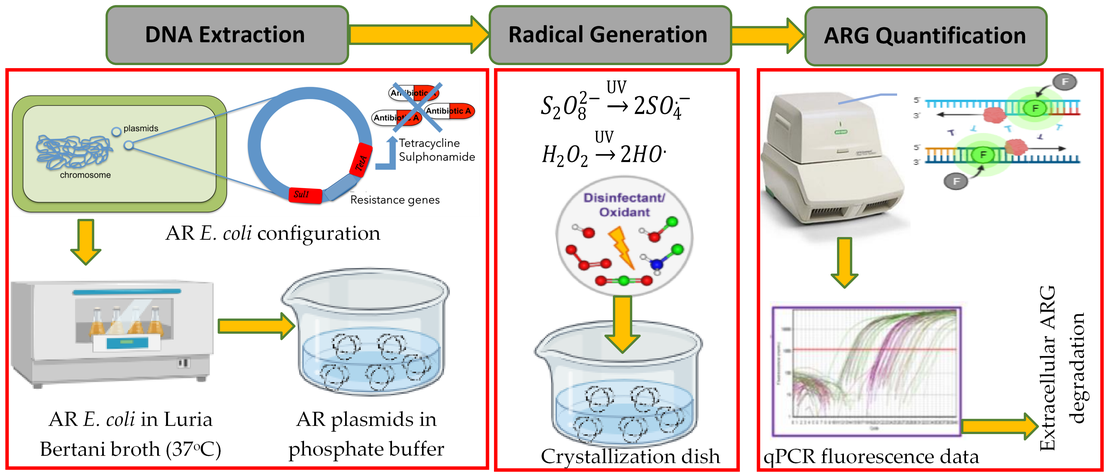


Figure 2: *Evaluating oxidative technologies in AR mitigation* [2]

2 OBJECTIVES

- Evaluate the effects of target qPCR amplicon on ARGs degradation kinetics.
- Examine how water characteristics affect $SO_4^{\cdot-}$ and $HO^{\cdot}$ ARGs degradation rates.

3 METHODS



4 RESULTS & DISCUSSION

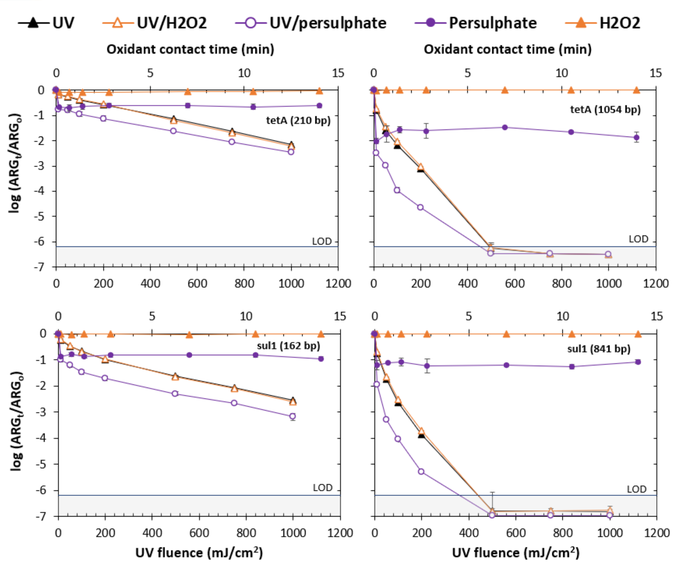


Figure 3: *ARG degradation kinetics using 0.2 mM oxidant (pH 7)*

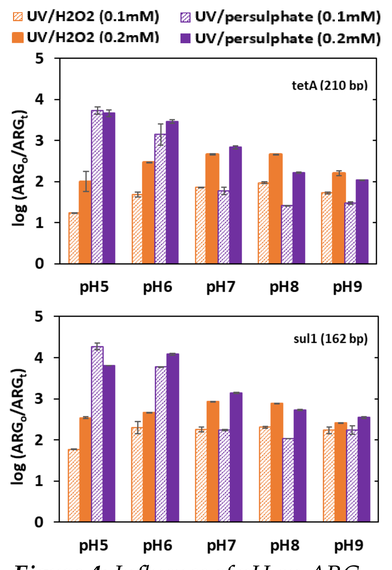


Figure 4: *Influence of pH on ARG degradation (UV = 500 mJ/cm²)*

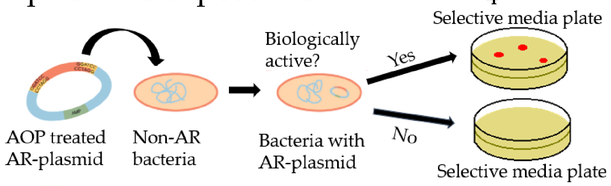
- The rate of ARG degradation was highest with $SO_4^{\cdot-}$ AOP (Figure 3).
- The longer the qPCR amplicon, the faster the degradation rate (Figure 3).
- ARG degradation by $SO_4^{\cdot-}$ decreases as pH increases while $HO^{\cdot}$ shows optimum ARG degradation near-neutral pH (Figure 4).

5 CONCLUSIONS

- $SO_4^{\cdot-}$ and $HO^{\cdot}$ AOPs can serve as a barrier against AR dissemination with <u>optimum treatment conditions</u>.
- $SO_4^{\cdot-}$ AOP is most effective for ARG degradation <u>under acidic pH</u>, while $HO^{\cdot}$ AOP is most effective under <u>pH 7 and 8</u>.
- ARG degradation kinetics is dependent on the monitored amplicon length and the nucleotide sequence.

6 FUTURE WORK

- Obtain the kinetic model parameters.
- Determine the biological activity of AR plasmids exposed to $HO^{\cdot}$ and $SO_4^{\cdot-}$.



7 REFERENCES

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

[2] GIST 2018. https://env1.gist.ac.kr/wqtl/

8 ACKNOWLEDGEMENTS

This study was funded by NC WRRI. We thank Dr Olya Keen and Kelsey Sikon for providing the UV apparatus.

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