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Emerging Pollutants: Protecting Water Quality for the Health of People and the Environment

Antibiotic Resistant *Campylobacter* as an emerging pollutant in the Swartkops River, Eastern Cape, South Africa

Mary Chibwe

Institute for Water Research,

Rhodes University

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Introduction

- *Campylobacter spp*. are among the leading etiological agents of gastroenteritis in humans worldwide
- These pathogens that are becoming resistant to clinically relevant antibiotics such as fluoroquinolones, tetracycline and macrolides.
- *Campylobacter* infections have been mainly attributed to the consumption of contaminated food but ingestion of contaminated water is a risk factor.

Introduction

- There is evidence suggesting that rivers play an important role in the spread and transmission of Antibiotic Resistant Bacteria (ARB) in the community (Abia et al., 2018)
- The presence of ARBs such as *Campylobacter* species in river water is due to wastewater, animal excreta and livestock farming practices.
- The Swartkops River flows through urban areas of the Nelson Mandela Bay Metro Municipality and is impacted by various anthropogenic activities
- Antibiotic Resistant *Campylobacter* is an emerging pollutant in river water as it has been detected at high concentrations higher than expected.

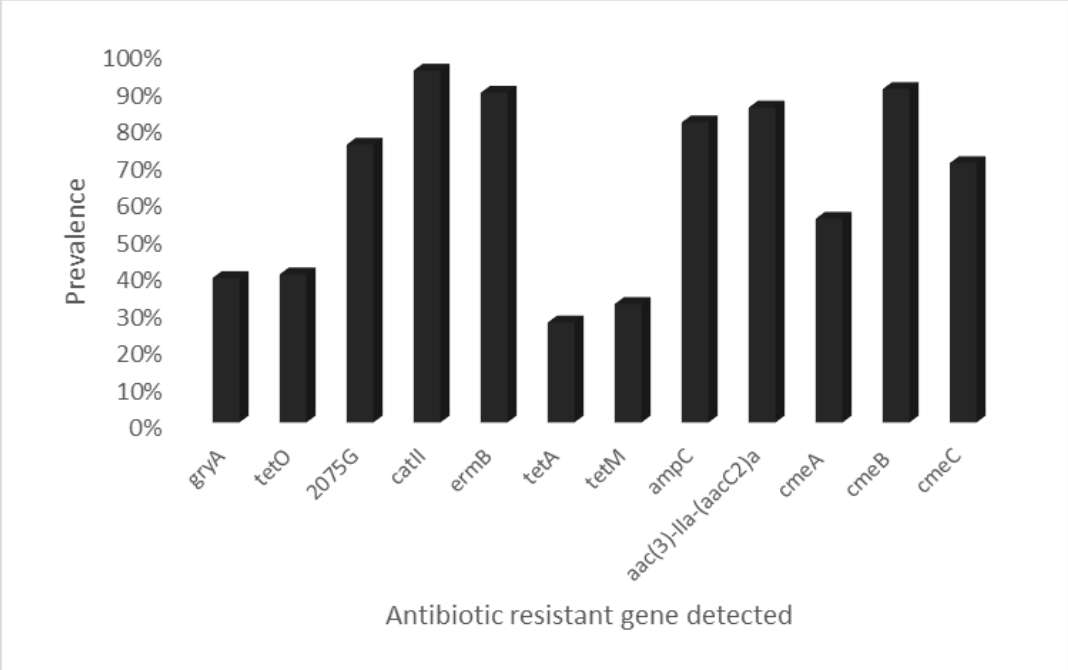
Objective:

This study investigated the local prevalence of antibiotic resistant *Campylobacter* in source waters and the factors that lead to their presence in the Swartkops River.

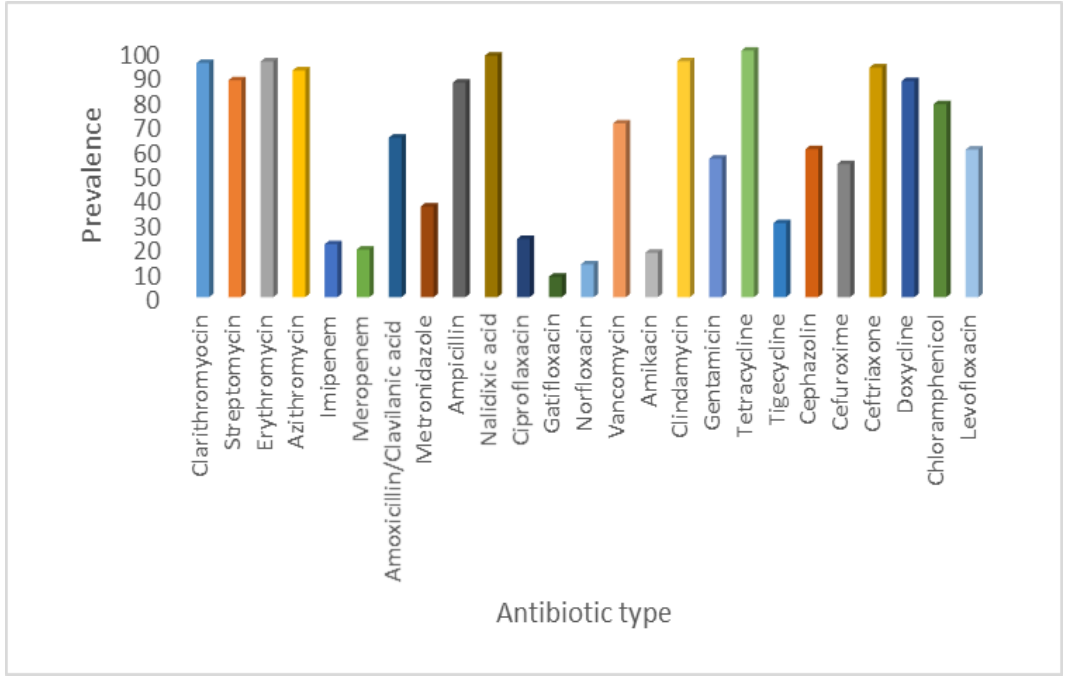
Methods

- This study conducted a comprehensive review of scientific databases to investigate prevalence of antibiotic resistance among *Campylobacter* species in South Africa in water.
- Then, information on the drivers of *Campylobacter* pollution in the Swartkops River was collected through a questionnaire survey (183 households) and a participatory workshop involving the community (60 participants).
- Lastly, an exploratory study was conducted to assess the occurrence of *Campylobacter* spp and *Campylobacter* antibiotic resistant genes in the Swartkops river.

Results: Prevalence of antibiotic resistance among *Campylobacter* species in water



Antibiotic resistant genes detected in *Campylobacter* species isolated from water Igwaran and Anthony Ifeanyi Okoh, (2020); Chukwu et al., (2019); Otigbu et al., (2018).



Campylobacter resistance to selected antibiotics Igwaran and Anthony Ifeanyi Okoh, (2020); Chukwu et al., (2019);

Results: Factors leading to the occurrence of antibiotic resistance *Campylobacter*

The factors that lead to the presence of AR *Campylobacter* in the catchment are categorised as Society, Technological, Economic, Environment, Political and Historical (**STEEP-H**)

Society	Technology	Environment	Economy	Politics & Governance	History
▪ Poor WASH ▪ Overcrowded households ▪ Poor solid waste management ▪ limited access to potable water ▪ Overuse, inappropriate use and handling of antibiotics	▪ Poor treatment of wastewater& industrial effluent ▪ Poor management of urban run-off ▪ insufficient &poorly maintained WASH infrastructure	▪ Inadequately treated wastewater ▪ Indiscriminate solid waste dumping ▪ urban run-off, livestock& agricultural run-off	▪ Poverty and material deprivation ▪ Poor investment in WASH infrastructure	▪ poor delivery of water sanitation services. ▪ poor governance ▪ Failure by the local municipalities	▪ Historical Spatial apartheid planning ▪ Living in close proximity with livestock due to limited access to land ▪ Poor WASH in townships

Results: Detection of *Campylobacter* spp and antibiotic resistant genes

- *Campylobacter* was detected in 58.33% (21/36) of the water samples that were collected along the Swartkops River

- Tetracycline resistant genes (*tetO*) were detected in 76% of the Campylobacter positive samples.

- Among the *Campylobacter* positive samples, *Campylobacter* multidrug resistant genes; *cmeA, cmeB* and *cmeC* were detected in 20%, 65% and 10% respectively

Conclusion

- The presence of antibiotic resistant *Campylobacter* in source water is a public health threat
- Infection prevention and control through improved WASH at community level should be promoted
- There is need for more awareness on the environmental effects of antibiotic resistance
- Compliance and enforcement of regulation antibiotic use in humans and animals
- Improved monitoring and surveillance of ARB and ARGs in water
- At a policy level, ARB, ARGs concentrations in water should be included in water quality guidelines and standards
- Incorporation of Innovations and technology for removal/reduction of ARB and ARGs in effluent treatment eg. constructed wetlands
- Policy measures for curtailing the spread of antibiotic resistance from environmental hot spots.

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Thank you