

Background

The emergence and spread of carbapenem resistant enterobacteriaceae (CRE) are a major global concern, as carbapenems may often be a last resort antimicrobial therapy option.¹

In the UK, **CRE**:

- Prevalence and incidence is **low**.²
- Surveillance is by rectal swabs or faecal samples from **suspected** patients.³
- This approach provides **limited information** on true CRE prevalence.

CRE are increasingly **identified** in wastewater treatment plants and **hospital wastewater**.^{4,5}

- Hospital wastewater has been previously explored as a marker of prevalence.
- **No correlation** was observed between the presence of **CRE in hospital wastewater** and the incidence of **CRE infection** or **colonisation**, although this could reflect missed CRE positive patients.⁵

We carried out a pilot study to evaluate the quantification of CRE in hospital wastewater in a low CRE prevalence tertiary hospital setting.

Methods

The study was conducted at Leeds General Infirmary, a 1103-bed tertiary hospital in Leeds, W. Yorks., UK.

Sample collection: Clean water (500mls x 3) from 3 different taps and wastewater (500mls x 3) from hospital sewage effluent pipes corresponding to 5 different wards (paediatrics, paediatric oncology, orthopaedics x 2 and plastic surgery).

Fifteen clean water samples (100ml) were filtered using 0.45µm cellulose nitrate membrane and screened for CRE using chromID® CARBA agar.

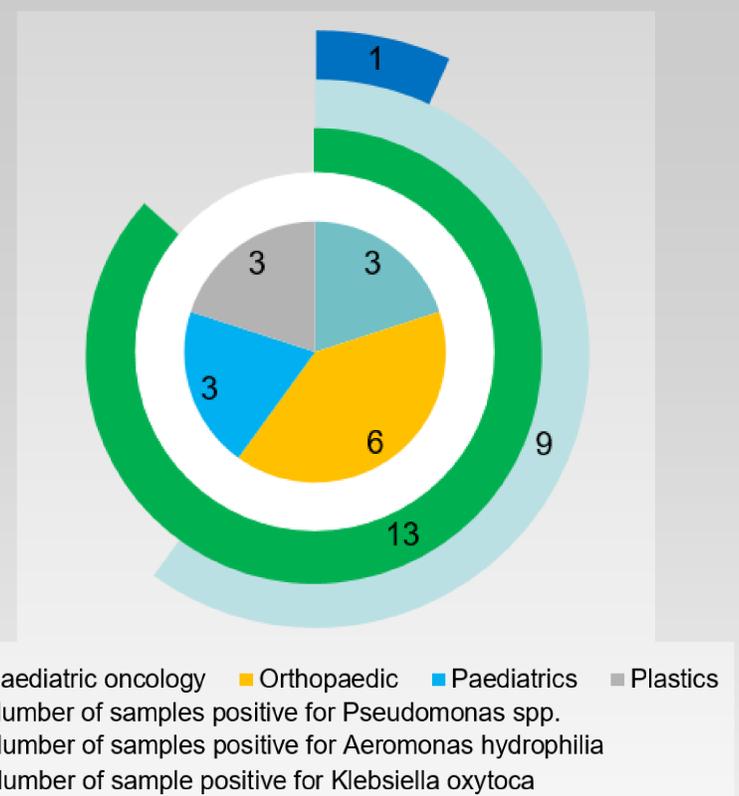
Fifteen wastewater samples (50µL) were screened for CRE using chromID® CARBA agar.

All presumptive CRE colonies sub-cultured onto Columbia blood agar and identified using matrix assisted laser desorption ionisation - time of flight mass spectrometry (MALDI-TOF MS).

Isolates were tested for resistance to meropenem and ertapenem by disc susceptibility testing and confirmed by gradient strip testing according to EUCAST criteria.

Results

Wastewater sample analysis by species and specialty



Carbapenem resistant organisms (CRO) account for 6.66% of bacteria in wastewater and were not isolated from clean water.

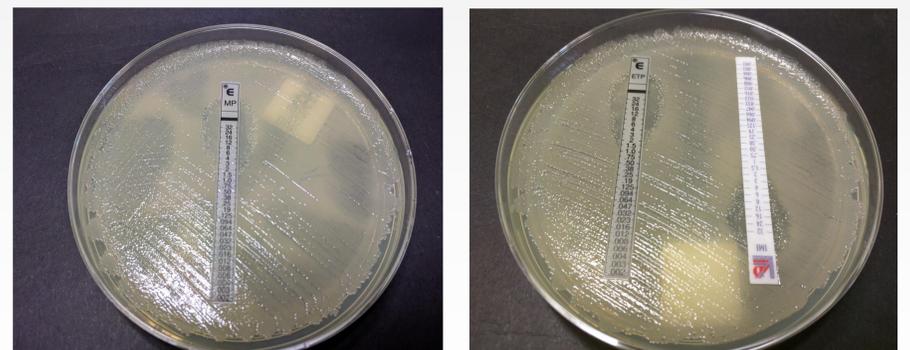


Figure 1: Gradient strip testing for isolated *K. oxytoca* using Meropenem, Imipenem and Ertapenem gradient strip.

Conclusion

Carbapenem resistant *Pseudomonas* spp. can commonly be isolated from wastewater samples. The single example of **CRE** (*K. oxytoca*) was from a **paediatric oncology** ward from which **no recent** (27 months) **CRE patients** had been **identified**. CRO was not isolated from clean water samples.

Targeted sampling of wastewater from areas with high antimicrobial consumption, such as oncology or haematology, may be useful way of **detecting 'missed' CRE** colonisation, and so act as an **early warning** of the increasing prevalence of these key potential pathogens in (perceived) **low CRE prevalence settings**.

References

- 1 - O'Neil J. The review on antimicrobial resistance. Tackling drug-resistant infections globally: final report and recommendations. 2016.
- 2 - Trepanier P, Mallard K, Meunier D, et al. Carbapenemase-producing Enterobacteriaceae in the UK: a national study (EuSCAPE-UK) on prevalence, incidence, laboratory detection methods and infection control measures. The Journal of antimicrobial chemotherapy. 2017;72(2):596-603.
- 3 - Public Health England. Acute trust toolkit for the early detection, management and control of carbapenemase-producing Enterobacteriaceae. 2014.
- 4 - Turolla A, Cattaneo M, Marazzi F, et al. Antibiotic resistant bacteria in urban sewage: Role of full-scale wastewater treatment plants on environmental spreading. Chemosphere. 2018; 191: 761-769.
- 5 - White L, Hopkins KL, Meunier D, et al. Carbapenemase-producing Enterobacteriaceae in hospital wastewater: a reservoir that may be unrelated to clinical isolates. The Journal of hospital infection. 2016;93(2):145-51.