The potential utility of surveillance for carbapenem resistant enterobacteriaceae (CRE) in hospital wastewater in a low prevalence tertiary hospital setting

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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.

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.

Conclusion

References