Aerosolisation and dispersal of carbapenemase-producing Enterobacteriaceae from hospital waste traps: a laboratory study

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Carbapenemase-producing Enterobacteriaceae

- resistant to ß-lactam antibiotics
- difficult to treat
- associated with high mortality
- have spread globally
- endemic in some European countries

Number of isolates from UK laboratories confirmed to have carbapenemases by PHE’s AMRHAI reference unit
Carbapenemase-producing Enterobacteriaceae

Risk Factors

• severity of illness and malignancy

• invasive devices

• antibiotic exposure

• sharing a room with another colonised patient

• contaminated sinks, waste traps and/or drains?
Sink Design

Gooseneck faucet
positioned 10 inch (25.4 cm) above bowl
water flowed directly into sink drain

High water pressure

Shallow sink bowl
positioned close to preparation area
positioned close to the patient bed
PHE’s Model Sink and Drain System
clinical handwash basin
stainless steel utility sink
waste trap
isolation valve
water supply pipes
waste pipes
cold water softener
hot water calorifier
waste collection/pasteurisation
Hospital Waste Traps

Aerosolisation and dispersal of CPE from waste traps
Sink Design
Air Sampling
Air Sampling

Aerosolisation and dispersal of CPE from waste traps
Results: contaminated waste trap

Number of CPE detected

<table>
<thead>
<tr>
<th></th>
<th>Utility Sink</th>
<th>Clinical Handwash Basin</th>
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<tbody>
<tr>
<td>in air (cfu 0.4 m(^{-3}))</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>on settle plate (cfu plate(^{-1}))</td>
<td>9</td>
<td>0</td>
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</tbody>
</table>

\(~10^8\) cfu ml\(^{-1}\)
**Results: contaminated surface**

~10^8 cfu ml\(^{-1}\)

- **Utility Sink**
  - in air (cfu 0.3 m\(^{-3}\)): 821
  - on settle plate (cfu plate\(^{-1}\)): 42

- **Clinical Handwash Basin**
  - in air (cfu 0.3 m\(^{-3}\)): 1530
  - on settle plate (cfu plate\(^{-1}\)): 5

- **Handwash Basin with fin**
  - in air (cfu 0.3 m\(^{-3}\)): ?
  - on settle plate (cfu plate\(^{-1}\)): ?
Conclusions

CPE can be present in hospital waste traps as can other resistant organisms.

CPE present in waste traps could re-enter the ward environment if present in high numbers.

Sink design can minimise release of CPE from waste traps but may not prevent aerosolisation from the sink basin.

Appropriate disposal of liquid waste is important as is the effective cleaning of hospital sinks.
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The views expressed in this presentation are those of the author and not necessarily those of PHE or any other Government Agency