# Contaminated sinks in intensive care units
# An underestimated source of ESBL-producing *Enterobacteriaceae* in the environment of the patient

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**Background and objective:** ESBLE outbreaks in Intensive Care Units associated with contaminated handwashing sinks have been reported. We conducted a regional study to assess whether handwashing sinks in 135 ICU patient rooms are a potential source of contamination, and to identify factors associated with an increased risk of sink contamination

**Methods:** A multicentre study was carried out over a one-month period (January 2013) in 13 of the 16 ICUs of the region (81%), including microbiological testing for ESBLE contamination at 185 sinks located into 133 patient rooms. The micro-organisms isolated were analysed using randomly amplified polymorphic DNA analysis to assess clonal spread in ICUs. Data were collected to document the use of each sink, factors that may contribute to contamination of clinical areas near to the sinks, and routine cleansing procedures for the sinks.

### ESBLE contamination of the 185 sinks sampled in the 9 participating healthcare institutions

| HCI | ICU | Number of patient rooms | Number of sinks per room | Number of sinks studied | Number of ESBLE-positive sinks | Sink contamination rate |
|---|---|---|---|---|---|---|
| 1 | 120-1 | 12 | 1 | 12 | 4 | 33.3 |
| 2 | 122-1 | 11 | 1 | 11 | 9[1] | 81.8 |
| 3 | 127-1 | 10 | 2 | 20 | 9[1] | 45.0 |
| 4 | 134-1 | 10 | 1 | 10 | 0 | 0 |
| 5 | 136-1 | 14 | 1 | 14 | 8[1] | 57.1 |
| 5 | 136-2 | 10 | 1 | 10 | 0 | 0 |
| 5 | 136-3 | 10 | 1 | 9 | 0 | 0 |
| 6 | 145-1 | 11 | 2 | 22 | 8 | 36.4 |
| 7 | 152-1 | 4 | 1 | 4 | 3 | 75.0 |
| 8 | 155-1 | 12 | 1[2] | 13 | 0 | 0 |
| 9 | 152-2 | 4 | 2 | 8 | 0 | 0 |
| 9 | 152-3 | 8 | 2 | 16 | 0 | 0 |
| 9 | 152-4 | 18 | 2 | 36 | 16 | 44.4 |
| All | | 134 | | 185 | 57 | 31.0 |

[1] two different ESBLE were isolated at one sink

[2] one of the 12 patient rooms contains two sinks

### Species distribution of the 60 ESBLE recovered from the 185 sink swabs

| ICU | Number of ESBLE | *Klebsiella pneumoniae* | *oxytoca* | *Enterobacter cloacae* | *aerogenes* | *asburiae* | *Citrobacter* | Others |
|---|---|---|---|---|---|---|---|---|
| 120-1 | 4 | 1 | | 1 | | 1 | 1 | |
| 122-1 | 10 | 1 | 1 | 7 | | | | 1[1] |
| 127-1 | 10 | 4 | | 2 | 1 | | 2 | 1[2] |
| 136-1 | 9 | 6 | | 2 | | | 1 | |
| 145-1 | 8 | 7 | 1 | | | | | |
| 152-1 | 3 | | 2 | | | | 1 | |
| 152-4 | 16 | 10 | | 4 | | | 1 | 1[3] |
| All | 60 | 29 | 4 | 16 | 1 | 1 | 7 | 3 |

[1] *E. coli*, [2] *Pantoae* sp., [3] *S. marcescens*

### Risk factors for contamination of sinks and clinical areas near to the sink for ESBLE-contaminated and ESBLE-free sinks

| | Sinks All | ESBLE-contaminated (n=57) | ESBLE-free (n=128) | *p* |
|---|---|---|---|---|
| Sink use | | | | |
| handwashing only | 51 | 7 | 44 | p < 0.001 |
| patient toilette | 84 | 50 | 34 | |
| Splash risk factor | 67 | 23 | 44 | |
| aerator | 34 | 9 | 25 | |
| water directed directly into the drain | 103 | 39 | 64 | |
| visible splash when tap turned on | 34 | 17 | 17 | |
| Distance between the sink and patient bed | | | | |
| < 1 m | 2 | 1 | 1 | |
| between 1 and 2 m | 56 | 22 | 34 | |
| Splash-barrier | 12 | 1 | 11 | |
| Routine sink disinfection | 158 | 54 | 104 | |
| daily | 116 | 37 | 79 | |
| weekly | 20 | 9 | 11 | |
| Bleach | 39 | 9 | 30 | |
| daily | 19 | 0 | 19 | p < 0.001 |
| weekly | 20 | 9 | 11 | |
| quaternary ammonium compounds daily | 56 | 20 | 36 | |

**Results:** Fifty-seven sinks were contaminated (31%) with ESBLE, mostly *Klebsiella* (N=33) and *Enterobacter*(N=18). In two ICUs, a high contamination rate was associated with clonal spread of an epidemic isolate.

Risk factors for contamination of and by handwashing sinks were frequent: 81 sinks (44%) were used for handwashing as well as the disposal of body fluids. Water from the tap was directed straight into the outlet, allowing splash back from the sink drain trap, in 103 cases (76%); visible splashing out of and close around the sink when the tap was turned on was recorded in 34 cases (25%). The distance between the sink and the patient bed was less than 2m in 57 cases (42%). Barriers to reduce contamination of the areas around the sink by splashes from the drain were installed in only 12 cases (9%). Thus, there was evidence of splash-back risk for 67 of the 185 sinks (36%), including 23 of those contaminated by ESBLE.

Routine sink disinfection was frequent (85%), mostly daily (75%), and involved quaternary ammonium compounds (41%) or bleach (21%). A lower sink contamination rate was significantly associated with use of the sink being restricted to handwashing and to daily sink disinfection using bleach.

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**Conclusions:** In ICUs, contaminated sinks are a potential source of ESBLE in the environment of the patient, a problem that may be underestimated by ICU teams. Relatively simple measures may result in a rapid improvement of the situation, and a significant decrease of the risk of exposure of ICU patients to multiresistant Enterobacteriaceae.

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