Alternative types of sinks in the ICU to prevent CPE infections

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BACKGROUND

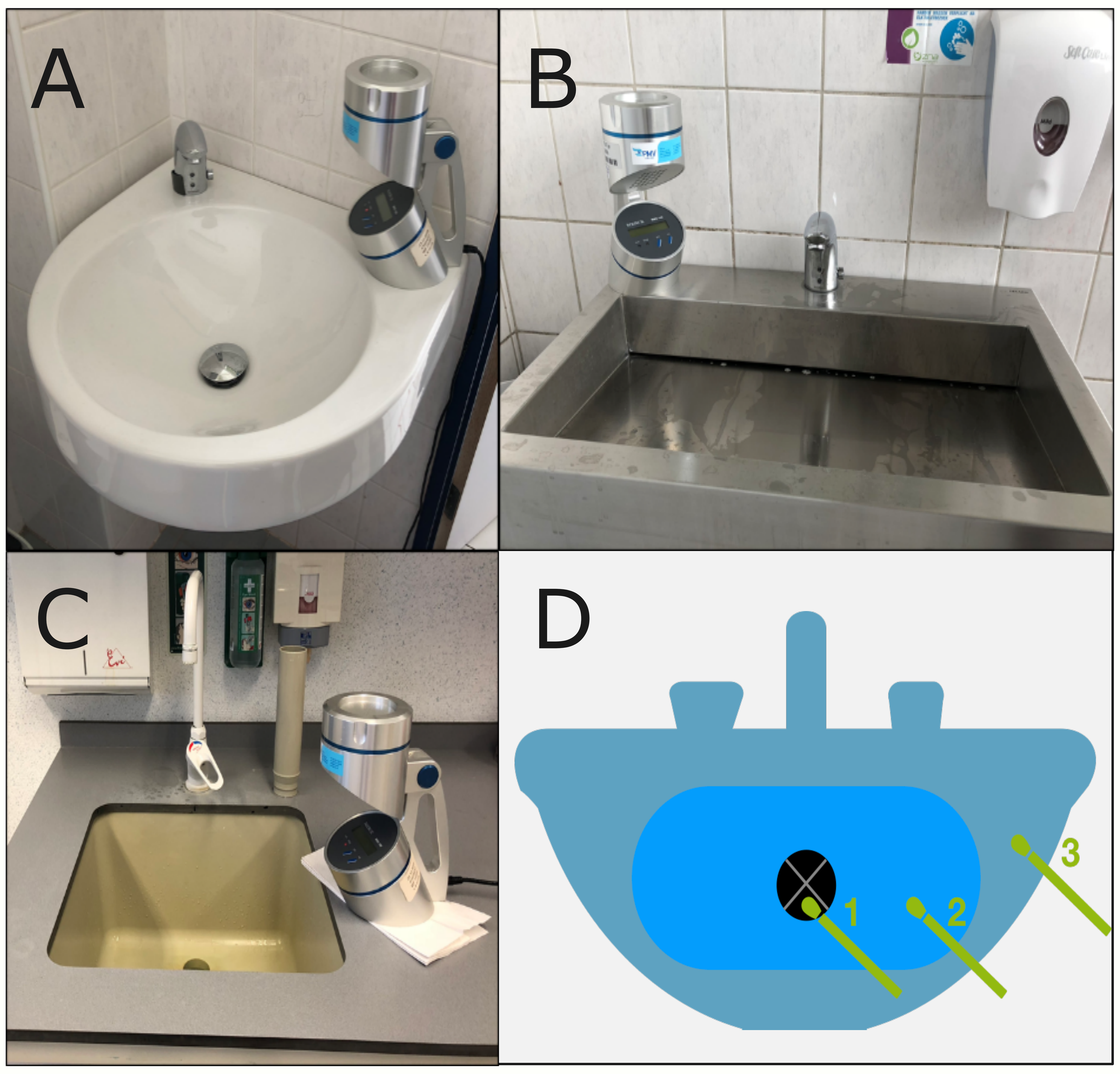
CPE are an emerging multi-resistant group of bacteria causing excess morbidity and mortality at hospital wards. They especially pose a risk in an ICU. CPE are part of a broader spectrum of MDR-GNB (multi-drug resistant gram negative bacteria). Since the 1970s sinks have been associated with in-hospital infections due to MDR-GNB. The way of transmission is probably due to droplets and/or aerosolization of contaminated water from the sinks. It is theorized that the initial colonization of the siphons is due to body fluids being disposed of in the sinks. Subsequently patients acquire MDR-GNB from this environmental reservoir. When we stop this way of transmission, less infections and mortality due to CPE infections in the ICU can be expected.

We want to confirm the way of transmission in an experimental setting. We also tried to find alternative sinks that do not have this risk of transmission.

HYPOTHESIS

Colonized sinks and their siphon are a reservoir for CPE. At our ICU the faucets in patient rooms flow straight into the sink drain. These sink drains are not protected by a cap or a filter.

We hypothesize that there is aerosol and droplet forming from these unprotected sink drains in the environment. We think that when running the faucet the CPE from the sink drain can temporarily colonize the inside and the outside of sink. These colonized places can in turn colonize hospital personnel and patients in the room.



METHODS & INTERVENTION

We used different sink designs to test our hypothesis. We sampled each the same way. We did swabs and cultured them on gram negative selective agars (McConkey). We performed air samples with a MAS-100 air sampler (Merck) to test for aerosol formation in 250L of air.

We did one negative control measurement on each sink with swabs and the MAS-100. We then colonized all of the sinks with K. Pneumoniae (CPE).

We took all measurements while vigorously washing our hands and running the faucet.

A. Alternative sink A: the sink drain is covered with a protective cap. This cap, we hypothesize, wil make sure water flows in softer and aerosol will be kept in the siphon.
B. Alternative sink B: the sink has a hidden sink drain behind the backside of the sink. Here, we hypothesize, water flows in softer and aersol wil be kept in the siphon.
C. This is the same sink design as in the ICU rooms. Water flows straight in the sink drain, with no protective cap.
D. We sample three regions in each sink: the siphon of the sink, the inner walls and the surface around the sinks.

RESULTS

The negative control measurement did not show any K. Pneumoniae. We only found some environmental pathogens such as Paracoccus Yeei, Pantoea agglomerans and Pseudomonas libanensis. After colonizing the sink with K. Pneumonia by pouring 5 mL of 4 McFarland K. pneumoniae directly on the bottom of the sink, all sinks became positive for K. Pneumonia in the sink drain and inner walls. After this we vigorously washed our hand and did a MAS-100 air sample at the same time.

When sampling after washing hands, in sink A and B the K. Pneumoniae was still countained within the sink. In the control sink the surface around the sink became positive.

Sample Type	SINK A	SINK B	SINK C (control)
Sampling (before)	**1. K. pneumoniae** **2. K. pneumoniae** 3. negative	**1. K. pneumoniae** **2. K. pneumoniae** 3. negative	**1. K. pneumoniae** **2. K. pneumoniae** 3. negative
MAS (during)	negative	negative	**K. Pneumonia** (17 colonies)
Sampling (after)	**1. K. pneumoniae** **2. K. pneumoniae** 3. negative	**1. K. pneumoniae** **2. K. pneumoniae** 3. negative	**1. K. pneumoniae** **2. K. pneumoniae** **3. K. pneumoniae**

CONCLUSION

We conclude that an alternative sink design constitutes a major advantage for infection control. With the control sink, there is aerosol and droplet forming which can contaminate the environment with CPE. This causes a known risk in health care. The alternative sinks did not show any sign of droplets outside of the sink or aerosol forming. This way it is possible to break the cycle of CPE infection and protect health care workers and patients.