Airport door handles and the global spread of antimicrobial resistant bacteria

Frieder Schaumburg[1], Robin Köck[2], Georg Peters[1], Fabian Leendertz[3], Alexander Mellmann[2], Karsten Becker[1]

[1] Institute of Medical Microbiology, University Hospital Münster, Münster, Germany
[2] Institute of Hygiene, University Hospital Münster, Münster, Germany
[3] Research Group Emerging Zoonoses, Robert Koch Institute, Berlin, Germany

Objectives

Airports are places where people from different parts of the world get directly or indirectly in contact. Therefore, major hubs could be drivers for the global spread of antimicrobial resistant pathogens. The objective of this study was to investigate the bacterial contamination of door handles in airport toilets to assess the risk of frequently touched surfaces for the spread of bacterial pathogens.

Methods:

In a longitudinal study, door handles of lockable toilet cabins in airports around the world were swabbed with moistened cotton swabs (3M Quick Swab, Forrest City, Iowa, USA). Both directly and after enrichment in non-selective BHI broth, swabs were streaked on Columbia blood agar, McConkey agar, and selective media for the detection of *Staphylococcus aureus*, extended-spectrum beta-lactamase (ESBL)-producing *Enterobacteriaceae* and vancomycin-resistant enterococci (VRE). All colonies indicative of *S. aureus*, ESBL-producing *Enterobacteriaceae*, *Stenotrophomonas maltophilia*, *Acinetobacter baumannii* and VRE were subjected to species identification using MALDI-tof (Bruker, Bremen, Germany) and susceptibility testing using Vitek2 automated systems (bioMérieux) with EUCAST clinical breakpoints. *S. aureus* isolates were *spa* sequence-typed and tested for presence of *lukS*-PV/*lukF*-PV (Panton-Valentine leucocidin, PVL).

The ESBL phenotype in ESBL-producing *Enterobacteriaceae* was confirmed by the double disc diffusion test. The beta-lactamase encoding genes bla_{TEM}, bla_{SHV} and bla_{CTX-M} were detected by multiplex PCR.

Results:

Samples
- 331 swabs were analysed
- from 117 Airports
- In 56 countries

The samples were collected at various terminals:
- Arrival (17.6%)
- Departure (80.0%)
- Transit (2.4%)

In total, samples were collected from door handles of ladies‘ (20.5%) and men‘s (79.5%) toilet.

The median time span between sampling and culture was 8.8 days (range: 1-101 days).

Door handles were contaminated with the following species (contamination rate):
- *Staphylococcus aureus* (6.7%)
- *Stenotrophomonas maltophilia* (2.1%)
- *Acinetobacter baumannii* (1.5%)
- *Citrobacter* sp. (0.9%)
- *Enterobacter cloacae* (0.3%)

One methicillin-resistant *S. aureus* (*mecA* positive, *spa* type t1451) was detected in Paris.

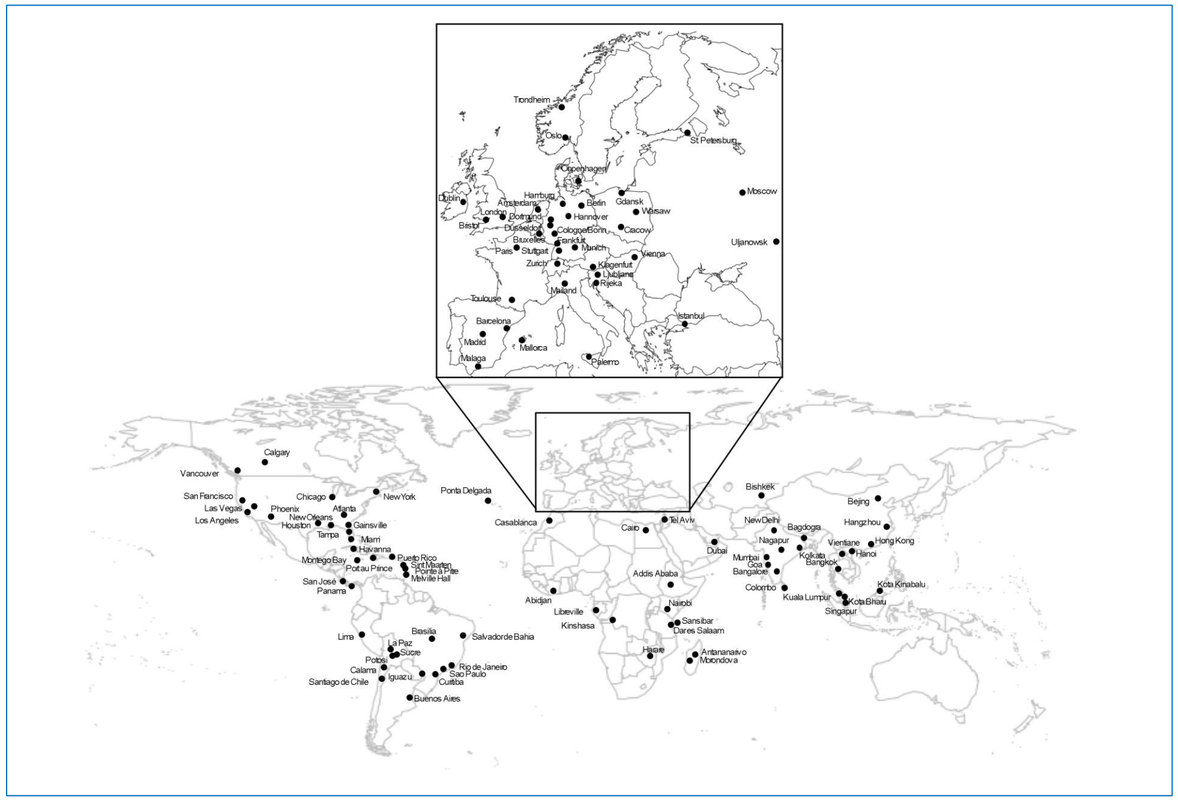

Figure: Sampling sites. The sampled airports are indicated by black dots.

All *S. aureus* isolates were PVL negative.
The following *spa* types were detected: t008, t012, t015, t056, t065 (n=2), t084 (n=2), t148, t164, t174, t571, t648, t706, t1309, t1451, t1459, t1689, t2616, t3165, t3841, t9207.
ESBL-producing *Enterobacteriaceae* (3 *Citrobacter* sp., 1 *Enterobacter cloacae*) were detected in New York, Frankfurt a. M. and Vienna. The *C. freundii* isolate harboured bla_{TEM}.

VRE, carbapenem resistant *Enterobacteriaceae* or carbapenem resistant *A. baumannii* were not detected detected.

Conclusion

Door handles of toilet cabins in airports are contaminated with bacterial pathogens from the skin and intestinal microbiota, but the proportion of multidrug resistant bacteria seems to be rather low.

Tel: +49 (0)251 8352752; Email: frieder.schaumburg@ukmuenster.de