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## The overall bioburden by total colony count does not predict presence of pathogens with high clinical relevance in the environment of hospitals and community

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**Background:** Health-care associated infections (HAIs) affect millions of patients and increase morbidity and mortality. Most pathogens from HAIs originate from patient flora, but recent data show that the environment also plays an important role in transmission of pathogens. The study compared the overall bioburden and the frequency of potentially pathogenic bacteria (PPB) from high-touch surfaces in hospitals and in the community.

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**Material/methods:** The total bioburden was assessed by total colony count (TCC) on tryptic soy agar contact plates. Additionally, two selective media for *Staphylococcus aureus* and gram-negative pathogens were used to improve sensitivity for pathogens of high clinical relevance ( e.g. *S. aureus*, Enterobacteriaceae, *Clostridium difficile* or *Acinetobacter baumannii*). Positive cultures were routinely identified by matrix-assisted laser desorption/ionization – time of flight mass spectrometry (MALDI-TOF). For analysis, we applied two definitions for PPB: The first group (BESC) included all isolated bacteria, but

excluded skin contaminants, defined according to CDC 2011 <http://www.cdc.gov/nhsn/XLS/Common-Skin-Contaminant-List-June-2011.xlsx>). The second group (TOP-b) included only highly pathogenic bacteria and was based on the “Top Organisms” list of the CDC’s National Healthcare Safety Network (NHSN): <https://www.cdc.gov/nhsn/xls/master-organism-com-commensals-lists.xlsx>. Additionally, we excluded all skin contaminants from this list to further narrow PPB down to an optimized set of clinically relevant pathogenic bacteria.

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**Results:** 1'431 contact plates were processed from 477 sampling areas: 153 from hospitals and 324 from publicly accessible institutions or devices. In 15% sampling areas,  $\geq 1$  TOP-b grew from cultures. The overall bioburden (TCC) did not correlate with presence of TOP-b ( $r=0.011$ , Spearman’s rho). The lowest level of “TOP-b” organisms was observed on glass surfaces, compared to other surfaces ( $p<0.05$ ). This result was consistent with our broader definition of PPB, the BESC group. Contamination of surfaces with bacteria of the BESC group was higher in publicly accessible locations than in healthcare institutions ( $p<0.01$ ).

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**Conclusions:** TCC did not correlate with presence of TOP-b organisms. Therefore, studies on environmental contamination should determine both TCC and species identification of grown microorganisms. The application of MALDI-TOF allows rapid identification to the species level at low cost, which previously was not feasible with biochemical identification techniques. Further environmental studies should focus on publicly accessible locations since international travel increases the risk of transmission of pathogens by contaminated high-touch surfaces such as touch screens and public keyboards