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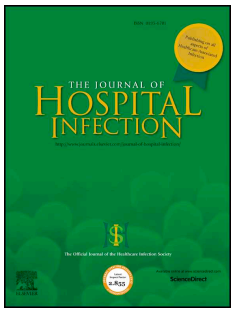

Pilot study to determine if microbial contamination levels in hospital washrooms are associated with hand drying method

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Pilot study to determine if microbial contamination levels in hospital washrooms are associated with hand drying method

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Sir,

We and others have demonstrated that some hand drying methods are associated with a greater risk of dissemination of residual microbes from hands after (particularly sub-optimal) hand washing.[1-4] For example, air bacterial counts in close proximity to hand drying by a jet air dryer were 27-fold higher than measured next to use of paper towels ($P<0.001$).[1] Such results suggest that air dryers may be unsuitable for use in healthcare settings, where they may facilitate microbial cross-contamination via airborne droplet dispersal. Such risks could have very differing implications depending on multiple factors, including the magnitude of dispersal, the particular microorganisms involved and, of course, the setting. In hospitals, general infection prevention and control principles aim to limit the spread of microorganisms given the increased susceptibility of patients to infection, and the greater prevalence of potential and/or antimicrobial-resistant pathogens.

We have carried out a pilot study to demonstrate the feasibility of testing strategies to examine prospectively the levels of environmental bacterial contamination in hospital washrooms associated with two hand drying methods: paper hand towels (Tork H3 classic dispenser with Tork Advanced Towels, MRT213), and jet air dryer (Dyson Airblade, Dyson, UK). We sampled, on 26 occasions over 3 months, two washrooms (for males) within one hospital, both accessed via a large entrance foyer/thoroughfare. Each washroom was utilised by hospital staff, patients and visitors, and had similar footfalls (mean 26-32 people per daytime hour). There were no windows in either washroom and the air in both was maintained by standard ventilation without air conditioning. Both washrooms were routinely cleaned on three occasions daily (am, midday and pm); sampling took place immediately before scheduled cleaning. Each washroom sampling session involved taking two 5-minute air samples as described elsewhere,[1] up to five surface swabs (Polywipe sponges; Microbial wire, Corsham, UK) and collecting a sample of dust using a high-efficiency vacuum cleaner with a flexible extension hose (Dyson, UK). Environmental samples were cultured on both selective and non-selective agars. Bacteria were identified using the Bruker MALDI-Biotyper (Coventry, UK) and antibiotic susceptibilities were tested using a Vitek 2 (Biomerieux, UK). All statistical comparisons were made using the Mann-Whitney U test.

Trends towards and some significant differences were seen, generally showing lower levels of bacterial contamination in the paper towel washroom (washroom 2) than in the jet air dryer washroom (washroom 1). A greater range of bacteria were recovered from washroom 1 compared with washroom 2; in general, the floor, dryer unit and (vacuum cleaner) dust were more heavily contaminated in washroom 1. Over the 7-day testing period, the mean number of micro-organisms recovered from air was 1.6 fold higher in washroom 1 versus 2 (P=0.14). Bacterial burdens on floors were significantly higher in washroom 1 versus 2 (2.0 $x10^4$ CFU/ml vs. $3.3x10^3$ CFU/ml) (P=0.002). Also, the jet air dryer casing had significantly higher counts than the paper towel dispenser ($1.2x10^5$ CFU/ml versus $2.4x10^4$ CFU/ml, *P*=0.01). Notably, higher counts of *Enterococcus faecalis,* which could be related to toileting followed by sub-optimal hand washing, were recovered from washroom 1 versus 2 (Figure). Significantly more *E. faecalis* was recovered from the dryer unit ($3.4x10^3$ CFU/ml) in washroom 1 compared with the paper towel dispenser in washroom 2 (71.4 CFU/ml) (P=0.04).

Measuring within-day levels of environmental contamination (three testing sessions per each washroom during the same day) was not particularly helpful, and may be more prone to confounding by behaviours of people visiting washrooms. Recovery of potential pathogens that are antibiotic resistant bacteria was uncommon in this pilot study. Study of washrooms that are closer to clinical areas may be expected to increase the yield of environmental antibiotic resistant bacteria.

Interestingly, current National Health Service (NHS) building guidance states: 'Hot-air hand dryers reduce paper waste and may be considered for use in public areas of healthcare facilities, but should not be installed in clinical areas as they are noisy and could disturb patients.'[5] Such advice may need to be strengthened to take into account emerging data on the potential for microbe dissemination associated with electric hand dryers. Notably, current World Health Organisation guidance for healthcare settings advocates to 'dry hands thoroughly with a single use towel.'[6] The key issue relating to increased levels of washroom environment microbial contamination is whether this could have adverse infection consequences for washroom users or, in clinical setting, patients. This point remains unstudied. We conclude from this pilot study that it is feasible to carry out longitudinal testing to examine the levels of environmental contamination that is associated with

different hand drying methods. Our pilot data suggest that bacterial burdens may be higher in hospital washrooms employing jet air versus paper towel hand drying, consistent with in situ testing data. We encourage further studies to determine the risks associated with hand drying method associated environmental microbial contamination.

Conflict of interest statement

M.H.W. has received honoraria from ETS for microbiological advice and travel expenses to attend ETS meetings.

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Figure

Mean results for recovery of *E. faecalis* from environmental sites in two washrooms over 7 days of sampling