
Article:
Redway, K, Barbut, F and Wilcox, MH orcid.org/0000-0002-4565-2868 (2019) 'The method used to dry washed hands affects the number and type of transient and residential bacteria remaining on the skin'. The Journal of Hospital Infection, 102 (4). pp. 473-474. ISSN 0195-6701

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Sir,

We were interested to read the study by Mutters and Warnes concerning the claimed effects of hand washing and drying on bacteria remaining on hands [1]. We believe that some omissions in the report should be clarified as, currently, experimental repetition would not be possible. In addition, we would like to highlight some limitations of the study.

The hand washing regime (sic) used potash soap for 1 minute and as such does not represent real world practice. We realise this is an EN standard, but emphasise that it will likely disturb/dislodge more resident bacteria than a real world hand wash; both NHS and WHO guidance recommend approximately 20 seconds of hand washing [2,3]. A 1 minute process is excessive unless the hands are heavily contaminated with, for example, grease, which was not the case here.

We also note that the drying time used with the jet air dryer was 1 minute. Again, this is unrealistic and actually contradicts the manufacturer's instructions for using a Dyson Airblade, which state 10-12 seconds [4]. Moreover, this type of dryer usually cuts out after a set time, and so we assume, but it is not stated, that the timer was deactivated for this study. No drying time is specified for the use of paper towels; was this the same as with the jet air dryer, i.e. 1 minute? If so, this is excessive and unnecessary since towels (both textile and paper) and jet air dryers achieve approximately 90% dryness within 10 seconds. It is impossible to achieve 100% dryness even after 1 minute [5]. The use of an excessive drying time with paper towels is likely to have caused further disturbance of resident bacteria and release of skin squames. The manufacturer given, Torck (sic), of the paper towel used in this study make a number of different specifications, which vary in softness and absorbency, but this was not specified and would affect results, especially when the drying time is excessive, due to possible unnecessary abrasion of the skin and release of resident dermal bacteria.

In our opinion the results presented in Table I are confusing. Column 3 headed 'Mean no. of *E. coli* recovered' and the last three rows suggest that the researchers considered some of the *E. coli* isolated as residential (sic), when it is actually a

transient bacterium on the hands. We are surprised by the results shown in Figure 1. The numbers of 'faecal coliforms' (presumably meaning the *E. coli* indicator strain) seem very high for any of the drying methods following hand washing, which we would expect to remove most of the artificial contamination. Drying for 1 minute would further reduce the numbers of Gram-negative bacteria, which are susceptible to desiccation. This result deserves more explanation. Did the volunteer wear jewellery or did they have uncut or artificial nails that could explain this result? In Figures 1 and II there is over a thousand-fold variation in some of the results, which is surprisingly high.

We consider the list of bacteria recovered from washed hands in Table II as puzzling. After hands have been washed and dried, by whatever means, we would not expect to find such a wide range of Gram-negative bacteria (for the reasons cited above). *Pseudomonas* spp. are ubiquitous in the environment, including some water sources, but we would not expect isolation of these bacteria from washed hands, unless perhaps the washing liquid was contaminated.

The mention of hot air dryers and the Snelling *et al.* study seems curious since this type of dryer it is not directly relevant to this current study [6]. Moreover, the article fails to mention that Snelling *et al*. concluded that using paper towels was the best means of reducing the bacterial load on the fingertips. Similarly, the discussion of the aerosolization of pathogens by dryers, the attempt to explain the results of the Best *et al.* study, and a particular selected extract favouring a jet air dryer also appear to be unbalanced [7]. We note that the study report does not provide an explanation of any limitations of the study and does mention whether ethical approval was sought/obtained. We are also surprised that no conflict of interest was declared when the study, described as 'independent', was funded by a commercial organization.

In conclusion, we believe that interpretation of the results and conclusions drawn by this study report are limited by omissions and much imprecision, in addition to hindering others to demonstrate experimental reproducibility.

Conflict of interest statement and funding sources

The signees of this letter are members of the Scientific Expert Panel on Hygienic Hand Drying of the European Tissue Symposium (ETS) and have received honoraria for microbiological advice and travel expenses to attend scientific meetings. Some of their research projects in hand hygiene have been funded by ETS.

References

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