Reviewer's report

Title: Influence of pre- and post-usage flushing frequencies on bacterial waterquality of non-touch water fittings

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Reviewer: Joanne O'Toole

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MAJOR COMPULSORY REVISIONS

1. Please clarify the study aim - it is not consistent throughout and the cited literature indicates that accumulation of Pseudomonas aeruginosa is the focus of the paper but discussion is based on results for total bacterial counts (cfu). Also, one of the keywords is Pseudomonas aeruginosa.

The cited literature (both in the introduction and discussion) primarily concerns Pseudomonas aeruginosa bacteria and their accumulation in tap fittings –particularly in the hospital setting. While the authors of this study tested for Pseudomonas aeruginosa these organisms were not detected. Conclusions made about flushing times of the tap fittings are based on total plate counts but there is no mention of how these relate to accumulation of Pseudomonas aeruginosa (i.e. no reference to the differences in accumulation and persistence of Pseudomonas aeruginosa in tap fittings and ease of removal etc compared with other bacteria).

In the Introduction the aim of the study is defined as '..to investigate the number of frequently provided post-flushing times after use of non-touch fittings. Additionally, the effect of pre-rinsing with cold water before use was explored'

Later on (methods section), it is stated that the primary aim of the study ‘is to investigate possible differences in bacterial counts obtained from regularly used fittings (fittings no 3-7) with particular respect to no post-flushing and 2 seconds or 10 seconds of automated post flushing with cold water'

In the discussion paragraph 6 it is stated that '..the aim of the present experimental study was to examine the influence of frequency of usage, the duration of water stagnation, the influence of plastic materials, and post or pre-rinsing with cold water before or after use of non-touch fittings in a controlled laboratory setting..'

This aim should be rewritten to clarify the purpose of the experiments. Was it, as indicated by the literature cited, ‘to investigate the optimum flush (post- and/or pre-) time setting for removal of Pseudomonas aeruginosa’. If this is the case, based on results (i.e. no detectable Pseudomonas aeruginosa) an argument would have to be made that total plate count bacteria (Pseudomonas aeruginosa being included amongst their number) are a sensitive indicator of bacterial
accumulation and removal with flushing and that their use as a marker of Pseudomonas aeruginosa accumulation and removal is justified.

2. Some more detail is required in the Methods section

The methods are generally well described (with the exception of some editorial changes that would make reading this section easier)

2.1 Given that there is much discussion about P. aeruginosa persistence and accumulation – including reference in the discussion to the fact that other authors have found that the ‘source of contamination to be the magnetic valve made of plastic materials and the fitting outlet itself…’ I am surprised that the Methods section does not include a description of type of valves in the fittings used in experimentation. This may be the reason that P. aeruginosa were not detected in this study. Perhaps if the valves were made of a plastic that supported P. aeruginosa growth authors of this study might have observed, even with few incoming P. aeruginosa bacteria, the accumulation of these bacteria after non-use periods and/or failure to remove them with flushing. Please include some detail about the valve material in the fittings used in the experiment.

2.2 Why was it decided not to perform sample dilutions? How was the approximation of >1000 cfu/mL made? Please explain.

2.3 Also, the resolution of the plate count method is usually 250 - 300 colonies per plate – counts are reported above this – but no indication is given that these (counts above 250/300) are approximations. Please explain

3. Results

3.1 Suggest that in results section that ‘None of the water samples yielded P. aeruginosa’ be replaced with P. aeruginosa results were <1 per 100mL for all samples

3.2 Why are there no readings for fitting number 8 in weeks 1, 2, 3, 5,6,7,8, and 20 in Table 2?

4. Discussion and conclusions

4.1 See comments about the aim of the study. The discussion and conclusions should directly address the aims of the study. As it stands the aim is not well defined leading to a discussion primarily about P. aeruginosa accumulation and removal - yet in this study there were no detections of P. aeruginosa. The relationship between total bacterial counts and Pseudomonas aeruginosa should be clarified if total bacterial counts are being used as surrogates for P. aeruginosa removal with flushing.Conclusions should related back to the aims once they are refined and be adequately supported by the data. If the aim is to be the one given in the discussion, results obtained need to be related back to the influence of plastic materials amongst other things requiring a description of plastic fittings and pipes and the material that they are made of.

4.2 The limitations of the work are not clearly stated because the reader is not informed about the relationship between numbers of total bacteria colony forming
units and P. aeruginosa. If total bacteria colony counts are being used as a measure of the accumulation and subsequent removal with flushing of P. aeruginosa – the assumptions made in doing this must be stated.

MINOR ESSENTIAL REVISIONS
This paper needs significant language corrections before being published
1. Choice of prepositions used throughout the paper should be reviewed. Some examples - there are more - : bracketed prepositions are those in current version and suggested prepositions* have been inserted.
   Introduction, 2nd last paragraph: ‘Aside (of) *from* the materials used…’
   Discussion, paragraph 2, sentence 3: ‘similar findings were reported (from) *by* other authors’
2. Choice of words sometimes is not ideal or wrong. Some examples (there are more):
   Introduction, paragraph 4: ‘Regretfully, the (later) *latter* aspect together with the technical requirement…’
   Discussion, last paragraph: ‘Such a concept would (bear) *have* further advantages…’
   Discussion, paragraph 6: sentence 1 ‘Therefore, it remained (open if) *debatable whether* bacterial colonization and accumulation are supported by a ..’
3. Grammatical errors (e.g. missing verbs) and/or long sentences mean that the text is somewhat difficult to understand. Some examples (there are more):
   a) Introduction, paragraph 2: CURRENTLY READS: ‘Among other microorganisms, Pseudomonas aeruginosa presumably originating from drinking water, water used for cleaning machines, wound cleaning, and other procedures bringing water in contact to patients, has been reported having a significant health impact in hospitals and nursing homes, resulting in longer hospital stays and deaths. Because of this, the World Health Organisation had placed particular emphasis on water safety in health care facilities, since to the high number of patients at risk the requirement on the microbiological quality of water is higher than in a domestic setting’.

   SUGGESTED CHANGE: ‘The World Health Organization had placed particular emphasis on water safety in health care facilities because of the concentration of susceptible persons in these, as compared with, domestic settings. Amongst other microorganisms, Pseudomonas aeruginosa has been reported as having a significant health impact in hospitals and nursing homes, resulting in longer hospital stays and deaths. Drinking water that is used for cleaning machines, wound cleaning, and other procedures that bring water in contact with patients provides a potential transmission route for these microorganisms…”
   b) Introduction, paragraph 3: ‘Non-pathogenic micro-organisms (habitat) *may be* embedded and protected in biofilms, which may frequently be found in water pipes and water fixtures..’
c) Discussion, paragraph 6: ‘Pre-flushing of 30 seconds with cold water was the most effective method to *prevent* bacterial accumulation in the tested non-touch fittings’

- Discretionary Revisions
None

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests