Reviewer's report

Title: Characterization of exposures to cleaning products used for common cleaning tasks in hospitals - a pilot study

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Reviewer: Peder Wolkoff

Reviewer's report:

Relevant and mandatory papers, but not mentioned by the authors, are inserted.

Cleaning products and potential health effects have received much focus recently, e.g. (Rosenman, 2007), not only occupational, but also indoors. Detailed evaluation of some of the major studies, including some of the major compounds in cleaning agents have already been reviewed and evaluated, including classic components, surfactants, and QUATs (Nielsen et al., 2007a), and ammonia (Nielsen et al., 2007b). The interest is also due to a number of epidemiological findings, e.g. (Henderson et al., 2008), and ozone-initiated reactions with unsaturated VOCs, like terpenoid compounds in fragrances and solvents, e.g. (Singer et al., 2006), producing new, possibly more harmful compounds, gaseous and ultrafine particles.

In addition, the sensory irritation effect of many non-reacting VOCs, e.g. 2-butoxyethanol (2-BE), can be obtained from (Nielsen et al., 2007b; Schaper, 1993) according to (Kuwabara et al., 2007).

I am surprised that formaldehyde (or releasers) is not included. It is most likely used to some extent as an antibacterial agent.

Specific comments:

Page 9:

Identification of "hazardous" ingredients should be based on cited literature documentation, TLV, or use of the data by the mouse bioassay (irritant). For example, if a compound is doomed a sensitizer, this should be documented, cf. (Dales et al., 2004) and many others. Regarding 2) What is a “high” concentration.

Regarding 4) quats are not volatile, but may be inhaled via aerolization? Are all criteria (1-4) a prerequisite?

Page 12-13:

See results and discussion in (Nielsen et al., 2007a) and the above, including RD50 data and TLVs. I recommend to downplay case stories. The evaluation of the compounds needs to be much more thorough and semi-quantitative.
All boiling points should be deleted, they are in Table 3.

Page 14:
I do not understand why 2-BE is a low volatile compound? The distinction between low, very low or high volatile is unclear.

Page 14-15:
The presentation of the various compounds, e.g. isopropyl alcohol is trivial. These compounds should be much better characterized according to relevant health data.

Page 18:
The authors should use RD50 values and other relevant and documented data for the exposure evaluation. A simple semi-quantitative approach/condition should be applied. This could be:

- A standard room with no air exchange, i.e. static situation (max achievable concentration) or a default exchange rate.
- Instantaneous evaporation of all volatiles applied.
- Calculate max concentration and use this for semi-evaluation.
- In addition, it should be taken into account that the evaporation of VOCs in aqueous solutions, in particular the polar ones, is delayed to after the evaporation of water, while the non-polar ones usually evaporate instantaneously upon application.
- There is a need for documentation that the aerosolized particles are respirable?

Page 19:
Is there documentation that stripping and buffing will increase not only the concentration of particles, but they are respirable?

Page 21:
RD50x0.03 for 2-BE is 409 mg/m3, a rather high threshold concentration for sensory irritation. If we assume a 20 m3 room (4 by 2 by 2.5 m), no exchange rate and complete and instantaneous evaporation, this would equate to about 8.2 g applied of the pure compound. This would correspond to about 100 g solution ~ 100 ml for a 10% solution. As mentioned above, the evaporation of 2-BE will be delayed. I think this kind of exercises would be useful, at least for the volatile compounds, and including data from reported studies.

Quats should be discussed in context of (Nielsen et al., 2007a).
Several cases of reported aggravation of asthma: I doubt if such information is relevant without quantified documentation.
Page 22:

It is likely that even concentrations above odor threshold may cause subjective sensory irritation, see also (Shusterman, 2007).

Reference 42 deals with ultrafine formation in ozone-initiated limonene reactions, but not sensory irritation, at all.

Is there documentation VOCs (which kind?) reach a peak within minutes?

Page 23:

The discussion here about a two phase emission profile should be documented. The “slow” release of glycol ethers is probable, but disagrees with previous statements in the paper.

That the volatiles should be judged according to their odor threshold, why is it so? And such odor threshold evaluation would be possible by the proposed model above, provided state-of-the-science odor thresholds are used.

Tables, in general, contain a large number of spelling mistakes, and should be checked carefully by an organic chemist.

Table 3:

• Formulas should be checked.
• RD50 and TLV values should be added where appropriate, and key literature.
• Relevant citation should be added for substantiation of statements.
• More consistent in reporting data, e.g. regarding 2-BE: “Has a boiling point …..” and low volatility.
• The formulations in Inhalation exp., skin exp. and sensitization should be normalized.

In summary, although the topic is relevant, it will require a substantial effort before the paper can be accepted for publication.

Reference List


