Reviewer's report

Title: Mitigation of asthma triggers in indoor air: An inter-comparison of ventilation/filtration options for residences

Version: 2 Date: 7 April 2008

Reviewer: Zuraimi M Sultan

Reviewer's report:

General comments:
It is well appreciated that the study did work on one of areas of growing importance. This is an interesting and relevant account of modeling studies on residential ventilation and filtration effects in reducing exposures to asthma triggers, and as such it merits publication in EH. Each part of the study appears to have been competently if somewhat summarily executed. This article makes a good point, namely that portable filtration without considerations for the CADR vis-à-vis residence air exchange rates (AER) may render reduced effectiveness of the filtration device. However, the article contains omissions (of other asthma triggers) and some assumptions that are either inappropriate or unrealistic – these need to be explained, discussed or rectified before the article can be accepted for publication. Central to the above, borders on the use of CONTAM for the asthma triggers studied--It would have been nice (and certainly helpful) if the authors had attempted to validate the findings with objective measurements. The authors attempt to assess the accuracy of the models (pg 17-18) cannot be equated with model validation (experimental variables may not be similar in the input CONTAM models) but merely provide suggestive evidence.

Specific comments:

Major
1) Title: It should be made clear in the Title that this article is a modeling study. This is important considering that the CONTAM software has not been validated for characterizing indoor cat allergens, ETS, fungal spores and virus levels (see pt 2). The present title can be misleading.

2) Introduction, P5. 2nd para: In keeping with the above point, it is inaccurate to state “...use a validated indoor air quality modeling system to examine peak and time-integrated concentrations of fungal spores...”. It implied that the model has been scientifically verified for these asthma triggers. To the best of this Reviewer’s knowledge, the CONTAM software has been validated for VOCs only [1]. It would be more appropriate to state that the software is used to characterize the asthma triggers studied.

3) Methods, P8, 1st para: It is interesting to note that the authors had assumed independence of particle deposition rates with AER (citing the works of Thatcher et al.?). Firstly, Thatcher et al (2002) did not report that deposition rates were
independent of AERs but that it varies with air velocities. As such, please move
the ref [34] to between “colleagues” and “and”. Secondly, contrary to the authors
assumptions, studies have shown that for high AERs (in NV residences), indoor
turbulence may be expected to be increased, thus increasing the likelihood that
particles will migrate through the boundary layer and deposit onto surfaces [2,3].
Thus the modeled values may be overestimated for scenario N. Please discuss
in light of these or change accordingly.

4) Methods: Considering the potency of mite and cockroach allergens to
sensitize and exacerbate asthma symptoms [4, 5], these were surprisingly not
included in the models. While, it is acknowledged that particles associated with
these allergens are big and would not remain suspended in the air over long
periods, activities (similar to those described for cat allergens) can re-suspend
them. These are important and controversial points that are of great interest to
Indoor Air scientists. Please explain these omissions.

5) Methods, P10, 1st para: It is true that smaller particles can deposit into deeper
recess of the lungs and thus constitute a higher risk in presenting an asthmatic
outcome. However, fungal spores are not inanimate -- Fungi may produce toxic
secondary metabolites, allergens, and other biologically active molecules derived
from fungi can be transported by means other than intact spores (eg, hyphael
fragments, fragmented spores, and dust particles) [6]. It is also to be noted that
exposures to fungi greater than 5 microns can result in asthma as reported by
Reponen [7]. Discuss the limitations of the assumption of aerodynamic diameter
of 2.5microns for fungal spores.

6) Methods: Numerous reports have documented associations with exposure to
respiratory syncytial virus (RSV) with asthma [5, and references therein, 8].
Again, the article will be significantly enhanced if RSV is used instead of the
common viruses presented. If data is lacking for the input parameters in the
model or for some other reasons, please discuss accordingly.

7) It is unclear if CONTAM can dynamically model accurately removal processes
of viral particle associated with drying [9,10] i.e. at any specific moment viral
particles are entering (decreasing into) a size-range as a consequence of drying
while at the same moment viral particles are leaving (falling out of) that
size-range as a consequence of the same processes as well as air exchange,
gravitational and surface removal. Please discuss.

8) Results, p12, 2nd para: What is the magnitude of the uncertainties? For that
matter, what are the errors associated with modeling the different asthma
triggers?

9) Discussions, p20, 1st para: I would exercise caution in advocating the use of
ducted systems to reduce exposures in mitigating asthma symptoms.
Epidemiological surveys [11, 12] showed that poorly maintained system or
ducted systems are associated with higher odds/risks of health outcomes.
Presumably these are due to microbiologic amplifiers within the systems [11,13].
Please include a caveat and discuss this important point.
Minor
1) Methods, P 9, 2nd para: particle size of ETS…reference should be [41]. Please change.

2) Methods, P 11, 2nd para: please include reference for the qPCR application.

3) Results, p14, 1st para: The lowest spore levels given in Tabl 4 is HE.

4) Discussions, p17, 3rd para: remove extra ‘full-stop’.

5) References: please ensure that all references follow the requirements of EH. e.g. some journals were abbreviated other spelled out, some capitalized others were not.

6) Tables 1-2, 6: references should be numbered as per EH requirements instead of for e.g. Chen et al (2006). It should read Chen et al [21]

7) Table 3: Please include a footnote for definitions of DH28 and DH72.

8) To be consistent with the tile and more accurate, the first rows of Tables 1, 4 and second rows of Tables 1, 3, 4, 5 and 6 should read “Ventilation/filtration” instead of “ventilation” alone.

References


5. IOM (Institute of Medicine). Clearing the air: Asthma and indoor air exposures. 2000; Division of Health Promotion and Disease Prevention, IOM: National Academy Press, Washington D.C, USA.


1. Is the question posed by the authors new and well defined?
   Yes

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work?
   In general, yes. Some assumptions needed to be clarified.

3. Are the data sound and well controlled?
   Yes

4. Does the manuscript adhere to the relevant standards for reporting and data deposition?
   Yes

5. Are the discussion and conclusions well balanced and adequately supported by the data?
   In general, yes.

6. Do the title and abstract accurately convey what has been found?
   It should be made clear in the Title that this is a modeling study.
   Abstract is good.

7. Is the writing acceptable?
   Yes

**Level of interest:** An article of importance in its field
**Quality of written English:** Acceptable

**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 in reviewing this article.