Reviewer's report

Title: Divergent effects of fine concentrated air particles on allergic airway responses are related to particle composition and sources

Version: 1 Date: 12 March 2012

Reviewer: Flemming R Cassee

Reviewer's report:

EH2012-1
Wagner et al.

This paper describes a study in which the investigators have exposed rats to ambient fine particles at two locations in Michigan by inhalation. Rats were sensitized with ovalbumin to evoke an asthma-like response. Effects such as inflammation and pathology were assessed after 16 hours of a 8 hr exposure and these experiments were part of a larger study in which the role of the physical characteristics and chemical composition is studied.

Although it is well appreciated that studies using concentrator technologies are expensive and time consuming, it is also clear that temporal variations may often exceed those of the spatial variations. In that sense the major criticism I have for this study is that the authors fully rely on the outcomes of s single studies per site. Now, when only focusing on a (not defined hypothesis) that not the total mass but chemistry of the particles should be taken as dose metric, the outcomes will indeed underpin such a hypothesis and confirm findings of other studies in North America and Europe that have used the same technologies. However, the authors, most likely attracted or distracted by the large number of exposure variable speculate to much on the role of specific components. Indeed, they do not point to one or more constituents in particular. But, in the end, the outcomes cannot be directly related to the sources of emissions using this very limited number of observations. It would have been much better if repeats at the same sites were performed to extend the conclusions that mass it not the most predictive indicator for respiratory diseases. What was the reason not repeating these studies?

As a consequence, several other aspects of this study may put things a bit out of balance. My suggestion is to put less emphasis on the causal constituents (it is very clear that deposited mass itself does not explain the health effects), and focus a bit more on the underlying mechanism of opposite responses for the two locations.

Several smaller remarks not necessarily in order of importance

1. Would be nice if the study was based on a clear hypothesis that can be addressed using this study design
2. The fact that particles have been concentrated is actually not that relevant. So it may also be omitted from the title. What is important is that fact that the Harvard Concentrator only concentrates efficiently above 0.18 um. Now, the authors also speculate on the role of ultrafines in their study, but if ambient ultrafines play a significant role, they could have performed the study without a concentrator. Or they should have added a third group namely those that were exposed to air that has passed a size selective inlet but that did not pass the three stage concentrator. Anyhow, give the number of exposure variables and the lack of statistical power due to the lack on the tox parameters, speculations needs to be done with more care (if needed at all)

3. Backgroud section: the authors suggest that there may be a ‘definitive role fro PM2.5’ Would role do they think of?

4. pg 4. CAPS need to be defined (or there term can be avoided). Line 4 from below’CAP’ should be CAPs to be consistent

5. Only 35 LPM of the concentrator is used for whole body exposures. Data are lacking to verify if there was a sufficient air flow in the whole body chambers. Control animals were exposed to clean filtered air, but was the same negative pressure (and RH plus temp) present in the whole body chambers as in that in which rats were exposed to CAPs? If not, to what extent could that have affected the outcomes. An enrichment factor a 30 is very theoretical. Yet table 2 suggest that even higher ratio were obtained, when comparing these values with those obtained outdoors. This needs to be explained (probably due to the averaging time…).

6. Some chemical species have been measure on Teflon filters and some of quartz. The latter seem to be filters taken from outdoor PM rather than from a CAPs environment, correct? And what are the implications for using those data to explain the health effects? The main problem is that it is unclear how long ambient PM has been sampled (8 hrs, 24 hrs)?

7. With respect to the immunization protocol: was there no need to use an adjuvant?

8. Were the OVA treatments and tissue and BALF collection performed on site in Air Care?

9. Given the history of this group on nasal pathology one would have expected to read about the impact on the nose as well, in particular since a fraction of CAPs will also deposit in the nose. So?

10. Check vendor/supplier of chemicals and methods

11. Were gaseous monitored at the breathing zone of the animals?

12. If space is becoming an issue, the section on sources (pg 15-16) can be deleted.

13. Pg 18 Even if Zn, V and Ni can be identified as the compounds mostly responsible for the observed responses in rats, a better explanation on how that connects with studies from the East coasts may be given

14. Are there signs that inflammasommes play a role in the effects that were
noted?
15. As the authors have stated, endotoxins may also have affected the outcomes. Yet, they were not able to measure this before the submission of the manuscript. Meanwhile, have they done this and would it be that crucial that such data has to be presented anyhow?

16. pg 10 Once again, the notion that the effects were associated with motor vehicle emissions is far to speculative and cannot be based on just experiments with actually only 3 data points on a dose response curve irrespective the metric of exposure.

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

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