Reviewer's report

Title: Investigation into Pedestrian Exposure to Near-Vehicle Exhaust Emissions

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Reviewer: Joe Mauderly

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Review of Buzzard et al., “Investigation in Pedestrian Exposure to Near-Vehicle Exhaust Emissions”

Comments are not divided among compulsory, minor, and discretionary revisions. All of the comments should be addressed in some manner, so they must all be "compulsory". However, most require very little effort and in total, I would call the extent of required revisions "minor".

General Comments

This paper addresses an issue of interest – the typical concentrations and inhaled doses of engine exhaust encountered by people near curbside. The results are a useful addition to the literature.

The title is somewhat misleading. The fact that only a diesel vehicle was used in the study should be reflected in the title. Of course, including both diesel and gasoline exhaust would have been even more informative, but the results are useful as they stand.

Too much is made of comparisons to the NAAQS and MSHA standards. The authors do a good job of putting the concentration x time element of the exposure into context regarding those standards, but too often make the point that the concentrations “exceed the standards”. That is not true, because those standards to not pertain to very short-term exposures, and (as the authors point out) typical time-integrated exposures of pedestrians would not exceed the regulatory standards. Make the comparison clear once, but do not repeatedly write of “exceeding the standards”. These exposures exceeded no standards because there is no standard for the types of exposures studied here.

The authors need to take another look at the literature they cited. There is little evidence that they are aware of citations for the health issues that are most relevant to their experiment. This does not denigrate their experiment; in fact, it makes it even more relevant. Understanding current literature on short-term health effects would relieve some of the pressure they feel to relate their work to irrelevant standards.

Specific Comments

P 2, para 2, L 3: Although it is understandable that a mannequin might be named by the technical staff as an amusement, the name is irrelevant in a publication.
The authors are not consistent in using the name anyway. Just call it a mannequin.

P 2, para 3: The comparison to the regulatory standards is of only marginal importance. Those standards are not set for very short-term exposures, although they envision that the exposures will not be constant throughout the time frame. The repeated mention of exceeding the standards is largely nonsensical, but comparison of these exposures to longer time-integrated exposures envisioned by the standards is valid. Do it well once, and let it go at that. Do not state that these exposures are higher than the standards allow. That is simply not true.

P 3, para 1, L 5: The use of the term “insignificant” implies that you have some method of determining significance. Either define the term or delete it.

P 3, para 2, L 2: These references are not good selections. The CARB reference is 10 years old, and there have been more recent reviews. The EPA reference is 7 years old. As I recall, the Frampton reference dealt with carbon black, not diesel PM. Many citations have appeared during the last 5 years. Take another look.

P 4, para 3, L 3: Again, there are no regulations for these exposures.

P 5, para 2: Do a search and find the papers that deal with short-term exposures of human subjects to diesel exhaust. Not only are they much more relevant to short-term exposures, they also use much lower concentrations than 6,000 #g/m3. As a start, search under Sandstrom, Mills, Cruts, Tornqvist, or Peretz. You will find a half dozen or so papers relevant to short-term exposures. Moreover, you should look at the 2004 Peters et al. paper on myocardial infarction (NEJM 351:1721). That paper supports the importance of real-world short-term, near vehicle exposures. You will find an abundance of evidence that your experiment was relevant to current health concerns.

P 5, para 3: First, the cyanide example is of questionable relevance here. Second, although the point is valid that responses are often non-linear with dose, the paragraph does not make clear how the point applies to this study. Third, we are dealing with inhaled mass, not ingested mass.

P 6, para 2, L 5: The point here is not clear. You say that the “topography” is similar to most urban sites, but then note that there are no nearby buildings that might constrain dispersion of vehicle exhaust. Those points seem to be in conflict. Urban areas have all sorts of topography (hills, bridges, intersections, etc.). Decide what point you intend to make, and make it more clearly.

P 8, last paragraph: Here and elsewhere (e.g., page 14) there seems to be discussion of engineering details in excess of its likely relevance to the study. That reflects the authors’ backgrounds, but it becomes a distraction at some level. The relevance of instrument response time to the present study is not clear. We are not dealing here with time delays between “engine out” emissions and concentrations in a dilution tunnel. All you want to know is the concentration curve of particles at the receptor site when a vehicle passes. It is curve shape
and area under the curve that are important – not the timing between engine out and sampling. The key issue is whether or not the data should adequately represent what is inhaled by a person. I’m guessing that instrument delay should be inconsequential for this purpose.

P 11, para 1, L 3: It is not clear what “1-inch square stand” means. Was this the area of the sampling opening? Was this the cross-section of the tubing used to make the stand? Is this dimension important at all?

P 11, para 2: We are told nothing about the fuel or crankcase oil. Was this done pre-2007? We are also told nothing about how clean the pavement was. Part of the drive-by exposure would be resuspended road dust, a portion of which is certainly within the sampled size range. We are told nothing of wind speed or direction. For future studies, idling at stop near the sampling point followed by acceleration to simulate exposures standing near a stop light would be of as much interest as drive-by exposures.

P 15, para 2, next to last sentence: Of course, nobody would stand there or be walking that close to vehicles for 8 hours.

P 18, para 1, last sentence: It is not clear what is meant by this statement. There is a sizable literature on particle dose studies of humans. What is the point?

P 20: First, where is the presentation and discussion of the comparative results with and without the mannequin? That comparison was included in the methods, but then nothing further is said. The default assumption would be that it would make no difference at all, as long as the sampling position, probe diameter, and flow rate were the same. Second, it is stated again that the exposures are “higher than regulations allow”, when that is explicitly not true. There is no such regulation!

**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.