

Reviewer's report

Title: PCB-containing wood floor finish as a likely source of elevated PCBs in residents' blood, household air and dust

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Reviewer: Donna Vorhees

Reviewer's report:

General

Indoor sources of PCBs have been the subject of scientific research articles as early as 1980 (MacLeod, K. E. Environ. Sci. Technol. 1981, 15 (8), 926-928). Since that time, numerous articles have been published in the scientific literature that hypothesize or demonstrate the existence of indoor PCB sources. In addition, I've worked as a consultant to address indoor sources in 4 different buildings, but such consulting work is often not published. Despite this work, I'm aware of no efforts to systematically research indoor sources of PCBs to reduce human exposures, while at the same time hundreds of millions of dollars are spent to remediate sediments contaminated with PCBs. Both the indoor and outdoor environments warrant attention if we truly want to reduce human exposure to PCBs. The authors' paper, while it does not directly measure an indoor source of PCBs, advances the hypothesis that understanding indoor sources of PCBs is important for reducing human exposure to these chemicals.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

Abstract: the authors refer to "widespread use of PCB-containing wood floor finish" but nowhere in the paper do they support this assertion. Either support this statement or modify the language. In the Conclusions section, the authors refer to "...potentially widespread use..." but, again, do not say why they think this particular product might have been the subject of "widespread" use.

Methods (last paragraph): The authors provide only a two-sentence description of laboratory analytical methods for serum samples with no reference to where a more detailed method description can be found. A more detailed description of methods is typically provided in scientific research articles, similar to what the authors report for air and dust sampling. Also, were serum samples blank-corrected? How were results below detection limits handled?

Results (PCBs in indoor air and PCBs in dust): The authors' need to explain why they think it is appropriate to scale their measured concentrations upward to estimate "total PCBs" using congener relationships measured in Vorhees et al. (1997 and 1999). The authors are hypothesizing the presence of a significant indoor source of PCBs that might influence the patterns of congeners present in

dust and air such that they differ from the congener patterns measured by Vorhees et al. (1997 and 1999). Did the authors attempt to examine congener patterns in indoor air samples reported elsewhere to support their scaling? In the absence of a sound rationale for scaling, I recommend that the authors limit their analyses to the congeners that they measured. Even if the author's have a sound rationale for believing that PCB congener patterns in the two Cape homes and the homes in Vorhees et al. (1997 and 1999) are similar, they should acknowledge measurement variability and report a range of estimated "total PCB" concentrations. Keep in mind that Vorhees et al. (1997 and 1999) measured 65 congeners, which do not necessarily represent "total" PCB concentrations; instead, these authors refer to "sum of congener concentrations."

Results (PCBs in dust): I disagree that the USEPA Region 9 preliminary remediation goal for soil is an appropriate base of comparison for dust concentrations. Dust and soil differ with respect to who might be exposed (i.e. soil PRG is not designed to account for an infant's exposure) and bioavailability of PCBs might differ given that dust can have a higher organic carbon content than many soils). In addition, comparisons of air and dust concentrations to USEPA Region 9 preliminary remediation goals are questionable given the scaling issue discussed above.

Results (PCBs in serum): The authors collected and analyzed blood samples from 3 women and 1 man. They report that the women are white and over 60; therefore, they compare their serum concentrations to NHANES results for white women older than 60, including only the 10 congeners measured in both studies. This comparison is reasonable, but why was the male participant's result compared with NHANES data for women? In Table 1, the authors do not indicate which participant is male. The authors refer to participants' blood serum being "elevated compared with those reported in" in NHANES, but what do they mean by elevated? Two are close to or above the 95% percentile, one exceeds the maximum concentration, and one is below the median (although the authors explain that this participant only lived in the house for less than 6 months). If the participants with concentrations close to or above the 95th percentile are all women, then it is fair to say that their serum concentrations are at the upper end or slightly above the concentration distribution measured in NHANES. But if one of these participants is male, how do his results compare to comparable concentration data from NHANES? In making these comparisons, it also would be useful to explain whether results from each data set were handled in a comparable manner (e.g., blank correction, treatment of results below detection limits).

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Background (second paragraph, last sentence): Current sentence structure seems to suggest that studies bioaccumulate, not PCBs.

Methods (second paragraph, last sentence): During the original 1999-2001 sampling, did the authors question homeowners about potential PCB sources or conduct visual surveys of all houses? Or were the visual surveys and questions limited to the two homes sampled in 2004-2005? I believe the search for PCB sources was limited to two homes, but please clarify. It would be useful to know if the authors looked for but found no evidence of indoor PCB sources in the other homes.

Discretionary Revisions (which the author can choose to ignore)

I have several suggestions to improve the clarity of an otherwise well-written paper:

Throughout the paper: Consider substituting “concentration” for “level” because the former term is more precise. Also, the word “data” is plural.

Abstract (last sentence of results): Re-write to avoid “...was reportedly used...” Instead, say that a resident reported use of a PCB-containing floor finish.

Introduction: The second to last sentence would be clearer if the authors added the concentration range measured in other houses and these two houses so that the reader understands what they mean by “much higher air and dust PCB levels.” The concentration ranges could be added parenthetically to this sentence.

Methods (third, fourth, fifth paragraphs): Since the authors used the same methods as those previously reported, they could reduce the length of this paper by eliminating details of the methods presented here.

Results (second paragraph, third sentence): The authors compare the concentration of the sum of three congeners that they measured with the sum of 65 congeners that I reported previously (Vorhees et al. 1997 and 1999). They can leave as is, but it would be better to compare concentrations of just the three congeners. I provided the authors with the air and dust concentration data from our studies, so they have the information to make this comparison. It won't change their conclusions, but improves clarity.

Discussion (last sentence in first paragraph): The value of this paper would be greatly enhanced by analyzing the alleged PCB source material for PCBs; however, I understand the authors' dilemma in generating such information. Is it possible to explain how they are “working to develop helpful and appropriate follow up in this context?”

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

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.