

## **Comments from Dr. Philip K. Hopke**

### **Comments on EPA's Integrated Science Assessment for Lead (First External Review Draft – May 2011)**

*3. Chapter 3 provides a wide range of information to inform the exposure and health sections of the ISA. To what extent are the atmospheric science and air quality analyses presented in chapter 3 clearly conveyed and appropriately characterized? Is the information provided regarding Pb source characteristics, fate and transport of Pb in the environment, Pb monitoring, and spatial and temporal patterns of Pb concentrations in air and non-air media accurate, complete, and relevant to the review of the Pb NAAQS? Does the ISA adequately characterize the available evidence on the relationship between ambient air Pb concentrations and concentrations of Pb in other environmental media?*

The chapter provides considerable information but harkens back to the encyclopedic nature of Criteria Documents. It may be overly detailed and certainly does not provide a concise overview of the critical information needed for informing risk assessments and the ultimate policy assessment. It would seem that with the use of some additional appendices, the information could be better summarized and presented in a manner that makes it easier to read and more useful for its ultimate purpose.

There is some discussion of long-range transport of submicron Pb-bearing particles, but there was no analysis of the data from high elevation rural sites in the Western US to observe if there was any significant Pb transport along with the Asian dust that has been observed. Liu et al. (Liu, W., P. K. Hopke, and R. A. VanCuren, Origins of fine aerosol mass in the western United States using positive matrix factorization, *J. Geophys. Res.*, 108(D23), 4716, doi:10.1029/2003JD003678, 2003) suggested no enrichment in lead at Lassen Volcano or Crater Lake National Parks, but it would be good to discuss the evidence for little or not transported background lead from trans-Pacific sources.

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Similarly, the ISA points out a paper describing transport of Saharan dust to Israel where it is suggested that the enrichment in Pb observed in Israel is the result of transport through regions in which leaded fuels are still used. Since we see significant impacts of Saharan dust in the eastern US, it would be useful to analyze the dust episodes (June to August) at CSN and eastern IMPROVE sites to preclude Pb impacts from transported Saharan dust.

The number of PM<sub>10</sub>/TSP and PM<sub>2.5</sub>/TSP and even PM<sub>2.5</sub>/PM<sub>10</sub> ratios raise some serious questions about the sampling and analysis methods. The number of PM<sub>2.5</sub>/PM<sub>10</sub> ratios greater than 1 raises a serious question regarding the application of XRF to coarse particle samples. There are no particle size or loading corrections applied to the PM<sub>10</sub> data and it is quite possible that the mass of collected material is attenuating the Pb L X-rays resulting in an underestimation of the Pb in PM<sub>10</sub>. These data raise continuing questions of basing the determination of speciation data for coarse particles on a difference method and the need for an effective coarse particle speciation sampler.

The TSP data suggests that if we want to continue to look at TSP as an indicator, we need to find an inlet that is not directionally or wind speed sensitive.

In the section in which the relationships with other measured pollutants are explored, the primary tool is Spearman rank correlation. I am not sure how much that really tells us regarding the relationships. This approach will likely be much more subject to meteorological influence. The fact that the concentrations are in the same order, but are not really linearly related as would be shown using a Pearson correlation coefficient provides a false impression of the degree of covariance between Pb and the other pollutants. It is not clear what this section is supposed to tell us since it really is not helpful in source attribution or atmospheric chemistry. Thus, either there should be a change to Pearson coefficients (if there is anything there) or eliminate the section altogether as irrelevant. The current section provides no useful information relevant to setting a NAAQS or understanding the pattern of measured concentrations

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*4. Chapter 4 describes the multimedia nature of Pb exposure, toxicokinetics of Pb in humans, biomarkers of Pb exposure and body burden, as well as models of the relationship between Pb biomarkers and environmental Pb measurements.*

*a. How well do the choice and emphasis of topics provide a useful context for the evaluation of human health effects of Pb in the ISA? Is the current organization of the chapter clear and logical? Are there ways that information on exposure and toxicokinetics can be more clearly integrated throughout the chapter? Does the ISA adequately describe and balance air-related and non-air related pathways of Pb exposure?*

This chapter seems to be in reasonably good shape as best I can tell. Have there been no TRIM runs to suggest the relative influence of the various exposure pathways? Will there be an effort to assess the nature of the exposure pathways particularly in areas near major Pb sources? It is said that Pb exposure is hard to assess because of the multiple pathways, but was that not why tools like TRIM were developed? Is this not an appropriate place to try it out?

Specific issues:

Several years ago there were considerable problems of lead in toys coming from China, but there seems to be no reference to these problems in Table 4.6. Given that this incident led to substantial action by the CPSC, it should be noted here.