

Phosphoric Acid Derivatives – Comments of Environmental Defense

(Submitted via Internet May 15, 2002)

Environmental Defense appreciates this opportunity to submit comments on the robust summary/test plan for Phosphoric Acid Derivatives, Tris(2-ethylhexyl) Phosphate, CAS # 78-42-2 and 2-Ethylhexyl Phosphate, CAS # 12645-31-7.

The Test Plan/Robust Summary submitted by the Phosphoric Acid Panel of the American Chemistry Council presents somewhat limited data for tris(2-ethylhexyl) phosphate and almost nonexistent data for 2-ethylhexyl phosphate. Data describing the SIDS elements for three additional compounds, dibutyl hydrogen phosphate, tributyl phosphate and bis(2-ethylhexyl) phosphate are provided to support structure/activity comparisons and extrapolations to predict those SIDS elements for the primary chemicals where data are not available. However, extrapolations proposed in the Test Plan are not always well supported by a review of data presented in the Robust Summaries.

The Test Plan presents a case for tris(2-ethylhexyl) phosphate and 2-ethylhexyl phosphate being considered together as a category. We do not agree that these two chemicals constitute a category, because they differ significantly in molecular structure, physical and biophysical properties. Further, there is evidence that the toxicity of tris(2-ethylhexyl) phosphate is due, in part, to its metabolism to 2-ethylhexanol. No evidence is presented to indicate that 2-ethylhexyl phosphate is metabolized to 2-ethylhexanol.

The Test Plan/Robust Summaries for these chemicals contain numerous deficiencies and unsupported proposals for “bridging” or extrapolations of data to predict SIDS elements for which there are no data. The following is a brief discussion of what we would consider deficiencies and unsupported extrapolations in this Test Plan.

Comments:

1. Page 6 of the Test Plan states that “Adequate biodegradation data exist for four of the chemicals in this category; (degradation) bridging will be used to fill the remaining requirement.” Data presented in Table 2 of this Test Plan indicate that biodegradation of chemicals in this category may range from 0 to 92%. Further, 2-ethylhexyl phosphate is the only monoalkyl phosphate for which data are presented. Thus, we do not agree that the data adequately support “bridging” to predict the biodegradation of 2-ethylhexyl phosphate.
2. We do not agree with the following statement on Page 6 of the Test Plan, “The low water solubility suggests that the acute aquatic toxicity of these chemicals should be low.” First, data presented in Table 1 of the Test Plan indicate that most of these chemicals have appreciable water solubility. (Note: The water solubility of tris(2-ethylhexyl) phosphate is given as 2 mg/l. Two other sources list the water solubility of tris(2-ethylhexyl) phosphate to be 1 g/l. The low water solubility of this chemical should be confirmed.) Second, whereas these chemicals may not be highly toxic to fish, invertebrates and algae this fact is not due to their lack of water solubility. There are many relatively insoluble chemicals, e.g. many pesticides, which are quite toxic to these organisms.
3. We do not agree with the prediction on page 6 of the Test Plan and 4.3 of the Robust Summary for tris(2-ethylhexyl) phosphate that the acute Daphnia LC50 of tris(2-ethylhexyl) phosphate is >42 mg/l. 2-Ethylhexyl phosphate, on which this extrapolation is based, is considered insoluble in water and tris(2-ethylhexyl) phosphate has appreciable water solubility. Further, no data are presented for other compounds that might be used for comparison. Thus, the data are not sufficient to support the speculation that 2-ethylhexyl phosphate will be more toxic to algae than tris(2-ethylhexyl) phosphate.
4. Although we do not believe that studies of acute animal toxicity of 2-ethylhexyl phosphate are needed,

we do not agree with the statement page 7 of the Test Plan that the toxicity of 2-ethylhexyl phosphate should be similar to that of dibutyl hydrogen phosphate because they have similar molecular weights. There are some very significant differences in the molecular structures of these two compounds. Most notably, one compound is a di-alkyl phosphate while the other is a mono-alkyl phosphate, and water solubility varies dramatically (from 18 g/l for dibutyl hydrogen phosphate to virtually insoluble for 2-ethylhexyl phosphate). Thus this statement is unsupported speculation and should be removed.

5. Again on page 7 of the Test Plan, the speculative statement that 2-ethylhexyl phosphate will have minimal dermal toxicity just because two appreciably different compounds - namely tributyl phosphate and tris(2-ethylhexyl) phosphate - have low dermal toxicity is not supported. These are very different compounds.

6. As discussed in comment #4 above, bridging existing data to predict 2-ethylhexyl phosphate toxicity in repeat dose studies based on the fact that its molecular weight is similar to that of dibutyl phosphate is not acceptable.

7. We do not agree with the statement on page 8 of the Test Plan that reproductive and developmental toxicity can be predicted for the group based on existing data. Only two related chemicals have been tested. Neither of those chemicals is in the proposed category and neither is metabolized to 2-ethylhexanol.

8. Section 4.2 of the Robust Summary for tris(2-ethylhexyl) phosphate: The logic of SAR comparisons used here falls apart when one compares the acute invertebrate toxicity of tributyl phosphate and dibutyl phosphate. That is, it is reasoned here that since 2-ethylhexyl phosphate and bis(2-ethylhexyl) phosphate have an acute invertebrate toxicity of 42 mg/l or higher then tris(2-ethylhexyl) phosphate will have similar or lower toxicity. This logic is inconsistent with data presented in this report for dibutyl and tributyl phosphate which indicate that tributyl phosphate is more than ten times as toxic as dibutyl phosphate (see Test Plan, Table 3). If this relationship holds for bis(2-ethylhexyl) phosphate vs. tris(2-ethylhexyl) phosphate then the toxicity of the latter chemical would be less than 4 mg/l.

9. A review of the Robust Summary for tris(2-ethylhexyl) phosphate indicates that many of the studies were poorly conducted or documented. That is, many of these summaries do not list strain, sex, number of animals, year conducted or in some cases not even the compound tested. In many other studies the purity of the test substance is listed as unknown.

Conclusion:

We do not agree that 2-ethylhexyl phosphate and tris(2-ethylhexyl) phosphate constitute a chemical category. As discussed above, both their chemical and biological properties are too different to be considered together. Accordingly, we urge the sponsor to submit separate test plans for these chemicals.

Thank you for this opportunity to comment.

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