Review of the "Technical" Total Maximum Daily Load (TMDL) for the Pesticide Diazinon in Chollas Creek, San Diego County, California

Provided by

California Regional Water Qualtiy Control Board
San Diego Region

dated April 28, 2000

Reviewed by:

Daniel Schlenk, Ph.D.
Professor
Aquatic Ecotoxicology
Department of Environmental Sciences
University of California, Riverside
Riverside, CA 92521

Date of Review: June 8, 2001

SUMMARY

This document described the problem of excessive aqueous toxicity observed in surrogate bioassays of Chollas Creek. Based upon a toxicity identification evaluation (TIE) reportedly performed by the Southern California Coastal Water Research Project, the causative agent for the observed toxicity was Diazinon.

The document subsequently presented numeric targets for water concentrations of diazinon, and described the potential sources of diazinon. Loading capacity and allocations of diazinon were discussed with limited text devoted to critical conditions, seasonal variation, margin of safety and linkage analyses. Public participation as well as implementation and monitoring strategies were also presented.

Overall, the document provided an excellent overview of the watershed and potential sources of diazinon in this system. However, the rationale for many of the numerical targets was limited and required access to additional documentation by the reviewer. Suggestions are made below to strengthen the scientific rationale for the targeted concentrations provided in this document. As requested in Attachment 2, dated May 9, 2001, the following scientific issues were highlighted in this review.

Summary of Scientific Issues

1. The effects of diazinon dissolved in the water column on the beneficial uses (i.e. aquatic life and wildlife) of Chollas Creek.

Health: It is difficult to make any health assessments without an Ecological Risk Assessment (ERA)in this system. Although it likely this was already performed elsewhere, a summary of, at least the Risk Characterization for this system, should be provided in the document. Based upon the documentation provided, it was not possible to conduct any hazard identification analyses. A better description of "toxicity" should also be provided. For example, what was the percentage of organisms that were killed by the water in the toxicity tests using Chollas Creek water. The only LC50 value provided was 0.5 ug/l as a 16 day LC50 for frogs. No mortality numbers or LC50 values were provided for any of the *Ceriodaphnid* acute toxicity tests. Provision of this data as it pertains to the target concentration of diazinon would strengthen the document.

A revised document might also provide a table of acute and chronic toxicity values for *Ceriodaphnia* as well as other invertebrates and vertebrates reported in the literature. Moreover, a description of the fauna in Chollas Creek, which would be susceptible to toxicity, should also be provided.

Expected Environmental Concentrations (EEC)were not provided. EEC determinations are also critical to ERAs and rely heavily upon the fate and transport of diazinon in environmental media. A discussion regarding the fate and half-life of

diazinon or its metabolites should be provided (Issue 4). Halflives appear to be about 50 d in water, but with enhanced UV light, heat (during summer months) and/or change of pH, values may be significantly less. Enhancement of environmental degradation will reduce the half-life and possibly increase the threshold value (i.e target concentration).

Based upon the chemistry of this compound (Log Kow of 3.8), sediment contamination is also a very likely behavior and should be addressed.

Reproduction: Not provided in this document, but 0.15-30 ug/L appears to be the NOEC for diazinon in Daphnids. (Fernandez-Cassalderrey et al. 1995)

Survivability: Published 48 hour LC50s for *Ceriodaphnids* are approximately 0.5 ug/l, these are the most sensitive freshwater aquatic organism to the acute toxicity of diazinon. *Hyalella azteca* had 96 hour LC50 values around 4 ug/L

Diversity: Cladoceran zooplankton (i.e. *Ceriodaphnids*) were the most sensitive organisms in a 70 d mesocosm experiments showing toxicity at 2 ug/L. Effects on other zooplankton and macroinvertebrates began at 9.2 ug/L, concentrations of 22 ug/L adversely affected fish biomass (survival was affected at 54 ug/L) (See Giddings et al. 1996).

2. Selection of the numeric target for diazinon.

Selection of the target appears to be somewhat conservative, but since the level of uncertainty is high (i.e. no fauna data or sensitivity data for Chollas Creek fauna), a large margin of safety is probably warranted. This needs to be clarified in the text. The USEPA values (0.09 ug/L) which are also highly conservative, is a “one size fits all” type of number that needs to be justified in this particular system. Therefore, justification for the targeted concentrations should be mentioned in the revised document.

3. Toxicity test protocols.

There are no toxicity test protocols provided in the document. Perhaps a table showing acute and chronic test values would suffice. In addtion, tables showing mortality of the *Ceriodaphnid* results would be beneficial. Some abbreviated form of the protocol needs to be provided. A summary of the TIE results should also be provided to justify the TMDL. Perhaps some field-based study results should be provided to determine if aquatic invertebrate populations in the field are being affected. One would think that with the concentrations reported in the document, that there should virtually no cladocerans present in this system. Is this true?

4. Assimilative capacity for diazinon.

This is discussed above, as there is limited environmental fate data provided in the document. Perhaps a table with half-lives or degradative fate of diazinon and its metabolites should be included. Also the potential for diazinon to partition into sediment as a future source of input to the water column (i.e. desorption or re-suspension of sediment) or its ability to evaporate into the air should be discussed. Caution should also be used in using single time point water-borne concentrations in verifying compliance, as diazinon is only moderately persistent. Thus, false negatives in monitoring may occur.

In summary, it is difficult to evaluate the adequacy and validity of the technical analysis and interpretation of the data expressed by the TMDL as there is very limited data present. Certainly the strengths of the document center around mitigation strategies and documentation of the input sources. However, there should be more emphasis on the justification of the target concentration and more in-depth discussions about the monitoring mechanisms (i.e temporal scale with perhaps other aquatic invertebrate species). It is also suggested that laboratories with a high degree of qualtity assurance/quality control be utilized during this monitoring process.