Learned Discourses: Timely Scientific Opinions

The Single Chemical Probabilistic Risk Assessment Approach is Inadequate-for OP Pesticide Aquatic Life Toxicity[1]

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Stormwater runoff in some agricultural and many urban areas in California and elsewhere has been highly toxic to *Ceriodaphnia* and *Mysidopsis* due to the organophosphate pesticides diazinon and chlorpyrifos. This situation has caused regulatory agencies to list waterbodies on the US EPA 303d list of "impaired" waterbodies for which TMDLs must be developed within a few years to control the *Ceriodaphnia* toxicity caused by OP pesticides. Lee et al. (1999) discuss some of the regulatory issues that should be considered in appropriately regulating this *Ceriodaphnia* toxicity. Probabilistic risk assessments have been proposed for regulating this toxicity. Novartis (1997) and Giesy et al. (1999) have developed probabilistic risk assessments for assessing the water quality significance of *Ceriodaphnia* toxicity associated with the use of diazinon and chlorpyrifos, respectively.

These risk assessments purport to show that there is a potential impact of OP toxicity on the aquatic life resources of a waterbody. However, this impact is within the promoted level of aquatic life toxicity that is claimed to be acceptable, i.e., 10% of the species within a waterbody can be killed 10% of the time without significant adverse impact on ecosystem functioning (SETAC 1994). The OP pesticide ecological risk assessments that have been done thus far indicate that there are potentially significant water quality problems associated with OP toxicity that need to be better understood before it can be concluded that this toxicity is not significantly detrimental to the designated beneficial uses of a waterbody.

Issues such as additive and synergistic effects of various toxicants, including other OP pesticides, are thus far not addressed in the probabilistic risk assessments that have been conducted. The probabilistic risk assessment shows that the cladoceran *Ceriodaphnia* is highly sensitive to OP pesticide toxicity. It is not however, the most sensitive organism known. The amphipod *Gammarus fasciatus* is about twice as sensitive to diazinon toxicity as *Ceriodaphnia dubia* (Novartis 1997). There is a potential, through further study, that other organisms will be found to have even greater sensitivity to diazinon and chlorpyrifos toxicity than *Ceriodaphnia* and *Mysidopsis*. As a result of attempting to use the ecological risk assessment approach for regulating OP toxicity, it is clear that there is a need to better understand the ecological role of cladocerans such as *Ceriodaphnia* and amphipods in providing food for key higher trophic-level aquatic organisms of concern to the public.

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[1]Reference as: Lee, G. F. and Jones-Lee, A., "The Single Chemical Probabilistic Risk Assessment Approach Is Inadequate for OP Pesticide Aquatic Life Toxicity," Learned Discourses, SETAC News**19**(6):20-21 November (1999).

An ecological risk assessment is an interesting initial step in evaluation of the potential water quality significance of OP pesticide caused toxicity. However, at this time ecological risk assessment falls far short of providing the information needed to assert that the toxic pulses caused by OP pesticides that occur in receiving waters for urban area and some agricultural area stormwater runoff are not adverse to key aquatic organisms. Further, as discussed by Solomon (1996), the ecological risk assessment approach places great demand for high quality data far beyond that available. There is need for those who want to maintain the use of OP pesticides, such as the chemical manufacturers, agricultural interests, and the members of the public who wish to use these pesticides, to fund the studies needed to reliably evaluate the potential ecological significance of toxic pulses of OPs associated with stormwater runoff from urban areas and some agricultural areas. The OP toxicity problem has been known for many years. Little has been done, however, to obtain the necessary information to properly evaluate the ecological significance of OP toxicity associated with urban area and some agricultural area stormwater runoff.

It needs to be understood that environmental groups, who are largely behind the current pressure to control OP toxicity, will not likely accept the premise that OP pesticides can kill 10% of the species and not be adverse to the beneficial uses of a waterbody of concern to the public. In order to make a convincing argument for this position, it will be necessary to provide substantial, site specific data. Stating, as was done through SETAC (1994), that the appropriate approach for protecting ecosystems is to only protect 90% of the organisms 90% of the time, is not adequate. There is no justification for this approach that would be acceptable to the majority of the environmental groups, or to many regulatory agencies and members of the public.

Environmental groups have for years been trying to get the US EPA and states to implement the Clean Water Act in accord with regulatory requirements. There is considerable justified concern about the appropriateness of some of the Clean Water Act requirements as set forth in the original Act and in various amendments to the Act. However, until the Clean Water Act is changed, the US EPA and the states have no choice but to fully implement its requirements for the control of exceedences of water quality standards, including the narrative standards of Ano toxics in toxic amounts." The special regulatory provisions provided to pesticides of requiring the control of pesticide-caused toxicity that is significantly adverse to the beneficial uses of the waterbodies will not likely prevail over long periods of time in the current regulatory situation.

References

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