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A Review of the Draft Diuron Criteria Derivation Document Prepared by Tessa Fojut, Amanda Palumbo and Ronald Tjeerdema

Lenwood Hall
University of Maryland
Wye Research and Education Center
P. O. Box 169
Queenstown, Maryland 21658

The goal of this document was to develop freshwater water quality criteria for the herbicide diuron using a new methodology described in detail in TenBrook et al. 2009. The need for a new methodology was identified by California's Central Valley Regional Water Quality Control Board (CVRWQCB, 2006). My review comments on this document are presented below by section as general comments and specific page by page comments.

General Comments

- In my view, the step by step process for reviewing the toxicity data is cumbersome and somewhat flawed. In the current format, a total of 4 forms need to be completed if the relevance score in Table 3.6 is $\geq$ 70. It would be more logical to first establish criteria that **must** be acceptable before conducting any other evaluation of documents containing the toxicity data. These "Kill Switch Criteria" that must be met for an acceptable study are as follows: (1) Is the control endpoint (survival or growth) acceptable?; (2) Is the document under review the (primary) original source of the data?; (3) Were adverse effects evaluated using exposures of a single pesticide?; (4) Was the duration of exposure reported?; (5) Were the effects reported for relevant endpoints (e.g., survival, growth, or reproduction)?; (6) Was more than one dose/concentration used in the toxicity test?; (7) Was the test species reported?; (8) Was the chemical form (% active ingredient) of the test material reported?; and (9) Was a dose response relationship evident? For example, in the current data review process a study with unacceptable control survival receives a 7.5 point reduction (see Table 3.6 in TenBrook et al. 2009) and can still be rated acceptable for criteria development.

- In Table 3.11 from TenBrook et al. 2009 studies receive scores for both relevance and reliability as follows: N = not relevant/not reliable; L = less relevant/reliable; and R = relevant, reliable. Only scores rated relevant and reliable (RR) are used for criteria derivation as described in TenBrook et al. 2009. However, when the preliminary acute criterion of 168 ug/L was derived on the bottom of page 6 additional analysis was then conducted comparing this value of 168 ug/L with a *Gammarus lacustris* acute value of 160 ug/L despite the fact that the *G. lacustris* study was rated LL (less relevant, less reliable). In other words, a study that was not rated RR and judged unacceptable for criteria development could be used to drive the final criterion. This is illogical and would negate the entire data quality review process.

- The use of a safety factor of 36 for a herbicide, such as diuron, because only 2 acceptable data points were available is questionable (see page 6). This safety factor of 36, as discussed in TenBrook et al. 2009, was based on data from organic insecticides which have different modes of action than herbicides, such as diuron, so there is no scientific rationale for using this safety factor. Perhaps discussions with registrants about filling these data gaps should be pursued in order to make this a more data driven process and avoid the use of unreliable safety factors.

- Since plant data are only used for a chronic criterion with herbicides there is uncertainty when using NOEC, LOEC, and MATC values because these values will be determined by the range of test concentrations (dilution series) and the sample size used in the toxicity test. There are numerous papers in the peer reviewed literature discussing the uncertainty associated with NOEC, LOEC and MATC values in the regulatory process because these values have no statistical confidence (Newman, 2010; among others). For example, a suboptimal design with low statistical power and high error variances may produce higher NOEC and LOEC values in contrast to a superior design that may produce lower NOEC and LOEC values. This is a critical issue because the NOEC value of 1.3 ug/L from a plant toxicity test with *Pseudokirchneriella subcapitata* is used as the final chronic criterion. It is also noteworthy that the UC Davis methodology is in direct conflict with EPA (USEPA, 2003) on this point as EPA uses the same green algae study used in this report as the only acceptable plant data for diuron. However, EPA uses the EC50 value of 2.4 ug/L. I would suggest using either an EC50 or an EC20 value (if it can be calculated) for developing the final chronic criterion and not the NOEC.

- If the control response is adequate and the test is considered valid it seems unreasonable to deduct points in the data evaluation process and require acceptable: (1) tolerance ranges for various water quality parameters (e.g., hardness, alkalinity, conductivity, pH); (2) dilution water information; and (3) information on no prior contaminant exposure (rarely mentioned in a document). In many cases the tolerance ranges for water quality parameters such as hardness, alkalinity, conductivity and pH are simply unknown for a test species. I am concerned that valid toxicity studies could be graded as unacceptable if the current data review process includes the parameters described above.

- There seems to be at least some issues with the transparency of this water quality criteria development process. For example in TenBrook et al. 2009 the following points are given in Table 3.7 for reporting these water quality parameters: hardness (2 points), alkalinity (2 points), dissolved oxygen (4 points), temperature (4 points), conductivity (2 points), and pH (3 points). However, in the current diuron water quality criteria document it is stated on the top of page 5 that dissolved oxygen, hardness, alkalinity, and conductivity were not considered in the reliability assessment and full points were given for these parameters because these parameters are not relevant for plant studies. If these parameters are not considered important for plant study scoring then the original TenBrook et al. 2009 document needs to be changed to address this point.

Specific Comments (page by page)

Page 4, line 13 – The authors state that 84 studies were identified with diuron toxicity data. Does this mean that there were toxicity data for 84 different species?

Page 16, parag 4, line 2 – It is stated that the 4-h averaging period should be protective based on available data. This should be 4-d not 4- h.

Appendix - The data summary forms in the Appendix summarize the relevance and reliability scoring and the notes section briefly mentions where points were lost for various parameters. However, it would be much easier and more transparent for the interested reader if the authors were to include the actual scoring for all the forms in Table 3.6, Table 3.7 and Table 3.8 within the appendix for each species.

References

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USEPA. 2003. Reregistration Eligibility Decision (RED) for Diuron. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, D. C.