I. INTRODUCTION

By James Hetrick

With the passage of the Food Quality Protection Act (FQPA) of 1996, Office of Pesticide Programs (OPP) is required to routinely incorporate pesticide exposure through drinking water into dietary exposure assessments. In order to promptly address FQPA issues, OPP used existing aquatic exposure modeling scenarios as an interim process to estimate pesticide concentrations in surface water used for drinking water. The surface water models, GENeric Estimated Environmental Concentrations (GENEEC) and a linked Pesticide Root Zone Model-EXposure Analysis Modeling Systems (PRZM-EXAMS), are used in the interim process as screening models. The screening models are designed to provide conservative estimates of pesticide concentrations in surface waters. These estimates are compared to levels of concern (LOC) established for human health endpoints. Non-exceedance of LOCs provides a high degree of confidence that adverse effects from drinking water are not expected from the use of the pesticide. Exceedence of LOCs, however, does not indicate a definitive risk because of the inherent conservativeness in the screening models.

The interim process for conducting FQPA drinking water exposure assessments was peer reviewed by the FIFRA Science Advisory Panel (SAP) and the International Life Science Institute (ILSI) Expert Panel in 1997. Both expert panels indicated that the aquatic exposure model scenario is expected to predict conservative pesticide concentrations in surface waters used for drinking water (Background documents 1, 2, and 3). This conclusion is based on several factors: 1) the aquatic exposure modeling scenario is not representative of a basin scale watershed containing surface water bodies used for drinking water; 2) the aquatic exposure modeling scenario assumes 100% of the watershed is cropped and treated with pesticide; and 3.) the static nature of the farm pond used in the modeling scenario does not account for dilution. Therefore, they recommended that OPP should investigate the use of basin-scale mechanistic, regression, and meta-models to predict more accurately pesticide concentrations in surface waters used as drinking water sources.

As a short-term approach to implement basin-scale modeling into FQPA drinking water assessments, OPP is developing an index reservoir scenario as a replacement water body for the traditional farm pond used in the aquatic exposure modeling scenarios. OPP is also working to move beyond this approach by establishing a tiered system of basin-scale models for estimating pesticide concentrations in surface waters used for drinking water. As part of this effort, OPP is evaluating preliminary and established basin-scale models which are capable of estimating pesticide concentrations in flowing water and reservoirs. The basin-scale models under evaluation are:

- Generic surface water regression model approaches;
- Conceptual Flowing Water and Reservoir Model (CFWRM);
- Modified linkage of Pesticide Root Zone Model (PRZM)- EXposure Analysis Modeling System (EXAMS);
- RIVer Water Quality (RIVWQ);
- USEPA Better Assessment Science Integrating Point and Non-Point Sources (BASINS);
- USDA Soil Water Assessment Tool (SWAT); and
- USDA Annual AGricultural Non-Point Source (AnnAGNPS).

Finally, OPP is planning a preliminary model validation process to assess the predictive capabilities of the various basin-scale models.

This document contains five chapters detailing OPP's efforts to implement basin scale modeling into the FQPA drinking water assessment. The remaining chapter contents are as follows: Chapter II is background material on the aquatic exposure models used in the interim approach (PRZM-EXAMS); Chapter III provides an assessment of drainage area to normal volume capacities for reservoirs used for drinking water across the United States (this assessment provides underlying information used to evaluate the relative vulnerability of the potential index reservoir scenario); Chapter IV provides the documentation and a technical assessment on the development of an index reservoir, which would serve to replace the farm pond in drinking water assessments; Chapter V is a technical assessment of developing and available basin-scale models and modeling approaches capable of estimating pesticide concentrations in flowing water and a reservoir; and Chapter VI is OPP's integrated assessment of the capabilities of the basin-scale models.

OPP is seeking scientific advice on the suitability of an index reservoir scenario in lieu of the farm pond as a short-term approach for addressing FQPA drinking water exposure assessments. Additionally, OPP is seeking guidance on the suitability of various basin-scale models and their respective role in FQPA drinking water exposure assessments. Specific questions for the SAP are shown below.

Index Reservoir

1. Is the Index Reservoir a suitable interim replacement for the standard pond for drinking water assessments?

2. Given the that the Index Reservoir has a drainage area to normal capacity ratio that is greater than ninety percent of drinking water supplies, does the SAP believe that the Index Reservoir represents a conservative but reasonable scenario for screening level assessments for drinking water exposure?

3. Does the process and criteria used to select the Index Reservoir represent a reasonable approach? Are there other criteria we should consider when we reassess the reservoir scenario in the future?

4. OPP has discussed a number of possible refinements to the reservoir approach and to its screening approach in general. Does the SAP view certain of these refinements as higher priority than others?

Model Evaluation

1. Is our current broad exploratory approach to selection of a suitable model or models appropriate at this stage? Or, do we know enough now about the various approaches to make a decision to focus our efforts exclusively on one or two modeling approaches?

2. We have sketched out a potential tiering system for model use in a FQPA drinking water assessment. Is the level of effort required at each level and the degree of added sophistication appropriate in the proposed tiered system? How much accuracy is gained through the added sophistication of each tier of modeling? Is the degree of increased accuracy worth the cost?

3. We have selected two sub-basins of the White River watershed in Indiana as a preliminary model validation and comparison effort. Can data from these watersheds provide a reasonable validation given model capabilities and watershed characteristics?

4. Is the panel aware of any inaccuracies or mischaracterizations of model features or capabilities in our evaluation?

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