Carbamate Cumulative Drinking Water Exposure Assessment

Questions for the SAP:

Selection of regional vulnerable ground water sites:

In both the organophosphate (OP) cumulative assessment and this carbamate cumulative assessment, OPP identified regional drinking water exposure sites for surface water sources of drinking water that would represent one of the more vulnerable surface watersheds in each region. The process, which was deemed a valid approach by the 2002 SAP (USEPA, 2002), identified those areas where areas of high combined cumulative pesticide use coincided with drinking water sources which were particularly vulnerable to runoff. This served as a regional screening assessment in that if the regional cumulative risk assessment finds that exposure in water is not a significant contributor to the overall exposure in that area, it will not be a significant contributor in other areas in the region.

For ground water sources of drinking water, OPP is proposing to use a similar approach (described in Section C.2. of the Drinking Water section of the case study).

Question 1: National coverages of the vulnerability of aquifers to pesticide contamination are limited in availability, and generally refer to vulnerability of the overlying soils and surficial geology to leaching. Does the SAP believe that the sources on relative ground water vulnerability identified in the case study provide an adequate screening-level assessment of the potential for contamination of shallow aquifers to pesticide contamination? If these vulnerability assumptions are inadequate, what can be done to improve the approach?

Use of leaching models for ground-water exposure assessments:

OPP is basing its ground-water exposure assessment on private rural wells drawing its drinking water from an unconfined aquifer. The estimated exposure in drinking water from these wells is based on the concentration estimated at the top of this aquifer.

The three models OPP is considering for use in the cumulative assessment and in refined ground water exposure in aggregate (individual chemical) assessments – LEACHP, PRZM, and RZWQM – are leaching models that predict pesticide concentrations in water at some depth below the surface. As a result, OPP is using estimated pesticide concentrations in the vadose-zone to represent concentrations in shallow ground water. As such, estimates would represent potential drinking water exposure from wells drawing from shallow, unconfined aquifers.

Question 2: Is this approach a reasonable, health-protective approach for use in both cumulative and aggregate drinking water exposure assessments? If this approach produces an exceedance of essentially safe exposure levels, in what manner could a better estimate of exposure to pesticides in water be derived from existing data and modeling approaches?

Addressing the cumulative risk assessment needs:

OPP has considered analyses of the capabilities of three ground water models for use in the carbamate cumulative exposure assessment and in individual chemical (aggregate) assessments. The major areas of evaluation – hydrology, management practices, pesticide transport processes, and ease of use of the model – are described in the background document ***Drinking Water Exposure Assessment: Ground Water Model Evaluation***. For the cumulative assessment, OPP will compare results of all three models with each other and with available monitoring. The ultimate evaluation goal for the models is how well each meets the requirement of providing reasonable, health-protective estimates of pesticide residues for use in aggregate and cumulative drinking water exposure assessments.

Question 3: In the SAP's estimation, how well do the three ground water models OPP proposes to use – RZWQM, PRZM, and LEACHP – compare in addressing hydrology? Macropore flow? Rainfall characteristics? Management practices? Pesticide fate and transport? Formation and movement of transformation products? Can the panel recommend other criteria that should be considered in evaluating the effectiveness of these models for estimating drinking water exposure for regulatory purposes?

Estimating cumulative carbamate exposures in ground water:

Available monitoring data, primarily from the USGS NAWQA program, indicate that more than one carbamate in the cumulative action group may occur together in ground water (see the drinking water exposure section of the case study). Co-occurrence in ground water result when more than one carbamate is used at different times on the same crop, on different crops in rotation on the same fields, or on different crops grown on adjacent fields.

For surface water sources of drinking water, OPP adjusted estimated pesticide concentrations in the modeled reservoir by percent crop area and percent crop treated in the watershed to reflect the dilution of untreated areas on the total pesticide load reaching the reservoir (see the description of the surface water exposure assessment in the analysis methods of the Drinking Water section of the case study).

Question 4: Given that less mixing of water from different fields is expected in shallow aquifers, should OPP use similar adjustments to ground water concentrations estimated from the leaching models? If not, what recommendations does the Panel have to account for the potential contributions from different fields treated with carbamates?

Several carbamates are known to persist for long periods of time after they reach ground water, particularly slightly acidic to acidic ground water (see the drinking water exposure section of the case study). This differs from estimates exposures in surface water, where pesticide concentrations tend to occur as spikes associated with runoff and decline to low or nondetectable levels after runoff events. Pesticide concentrations in acidic ground water are slower to respond to changes in use patterns and mitigation actions than would be expected in surface water.

Question 5: What recommendations does the Panel have for addressing carbamate persistence in ground water in order to provide a reasonable, health-protective estimate of residue levels in shallow ground water sources of drinking water?