UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

MEMORANDUM

Date: March 29, 2012

Subject: Glufosinate Ammonium. Report of the Residues of Concern Knowledgebase Subcommittee (ROCKS).

PC Code: 128850
Decision No.: 424395
Petition No.: NA
Risk Assessment Type: Single Chemical Aggregate
TXR No.: NA
MRID No.: NA

DP Barcode: D397644
Registration No.: NA
Regulatory Action: Section 3 Registration
Case No.: NA
CAS No.: 77182-82-2
40 CFR: 180.437

From: Ideliz Negrón-Encarnación, ROCKS Alternate Secretary
Health Effects Division (7509P)

Through: Christine L. Olinger, ROCKS Co-Chair
Edward J. Scollon, ROCKS Co-Chair
Health Effects Division (7509P)

To: Glufosinate Ammonium Risk Assessment Team
Risk Assessment Branch V
Health Effects Division (7509P)

The ROCKS met on January 11, 2012 to discuss the residues of concern for the herbicide glufosinate ammonium in drinking water. The residue of concern recommendation was subjected to electronic review to consider a subsequent ToxSAC report (02/21/2012).

Team Members Attended:

John Doherty, Chuck Peck, William Donovan, Mike Metzger, and Marietta Echeverria

ROCKS Members Attended:

Christine Olinger, Edward Scollon, Ray Kent, Richard Loranger, Elizabeth Holman, William Irwin, Leung Cheng, George Kramer, Reuben Baris, Dennis McNeilly and Ideliz Negrón

Material Reviewed:

Briefing Materials: Glufosinate Ammonium ROCKS Submission

Background

The residues of concern of the herbicide glufosinate ammonium in plants, rotational crops, livestock and drinking water were previously evaluated (Txt# 0050727, T. Bloem, 05/09/2002). The risk assessment team solicited the ROCKS a re-evaluation of the residues of concern in drinking water. Supplemental toxicity information for water degradates was provided for the ROCKS consideration. Based on input provided by the ToxSAC (02/21/2012), the recommendation from the ROCKS meeting held on January 11, 2012 was amended. The amended decision memo was circulated electronically to the ROCKS committee on February 28, 2012 for comments.

Committee Recommendation

Summary of Degradates to be included in the Risk Assessment		
Matrix	Residues included in Risk Assessment	Residues included in Tolerance Expression
Drinking Water	Glufosinate Ammonium [1,2]	Not Applicable

[1] Glufosinate ammonium is butanoic acid, 2-amino-4-(hydroxymethylphosphinyl)-monoammonium salt. Although glufosinate ammonium will be dissociated in water, for risk assessment purposes it is described as the salt in order to aggregate the residues in drinking water with those in food where the concentration is expressed in terms of the salt.

[2] Since MPP is likely less toxic than the parent compound and should not be aggregated with the parent, if MPP EDWCs are not significantly greater than those for glufosinate, the risk assessment for the parent will be protective of any toxicity associated with exposure to MPP in drinking water and a quantitative risk assessment for MPP will not be required.

Summary of Briefing Materials Considered

Glufosinate ammonium [ammonium-DL-homoalanin-4-yl-(methyl)-phosphinate] is a non-selective foliar herbicide that acts by inhibiting glutamine synthetase. In addition to the complete toxicity database for the parent compound, subchronic toxicity and developmental studies are available for the environmental degradates MPP, MPA and NAG (structures are shown in Appendix 1). MPA is at least 100 fold less potent than glufosinate ammonium based upon the lack of effects in a 90-day study in rats. Rabbit developmental studies are also available for GA, NAG, and MPP to aid in relative potency comparisons. NAG and MPP were 5- to 10-fold less potent than the parent; however, the maternal effects noted were different than those observed than the parent glufosinate ammonium.

Glufosinate ammonium is readily miscible in water. Glufosinate will not volatilize significantly due to a low vapor pressure, and is moderately mobile. Glufosinate is considered stable to photolysis in water but degrades in soil due to photolysis with a half-life of 17 days. The metabolism studies showed that glufosinate degrades in aerobic soil and aqueous environments, with soil half-lives ranging from 8.5 to 23 days, and aquatic half-lives ranging from 11 to 87 days. Glufosinate in the anaerobic soil environment degraded with a measured half-life of 37 days in one study, but the chemical was persistent in the anaerobic aquatic environment, with a measured half-life of 415 days in another study.

MPP was a major degradate in the soil photolysis study, reaching a maximum of 60.4% (Day 30). MPP was also a major degradate in all metabolism studies with the exception of the anaerobic aquatic study. In aerobic systems, maximum MPP values ranged from 26 to 55% in soil and 17 to 80% in aquatic environments. In anaerobic soil, MPP reached a maximum of 42% at the end of the study (Day 60).

MPA was a major or minor degradate in all of metabolism studies with the exception to the anerobic aquatic metabolism. In aerobic systems, maximum MPA values ranged from 3 to 28% in soil and 7 to 20% in aquatic environments. When MPA was a major degradate, it tended to form at the end of the study, supporting the supposition that it forms as a result of MPP degradation. In anaerobic soil and soil photolysis, MPA was a minor degradate.

NAG was major degradate of photolysis in soil, reaching maximum of 17.7% (Day 4). It was a minor degradate in one of two aerobic aquatic studies and not detected in the other. In addition, it was not detected in the anaerobic aquatic study, and aerobic and anaerobic soil studies.

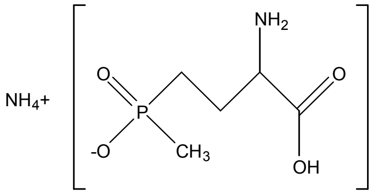
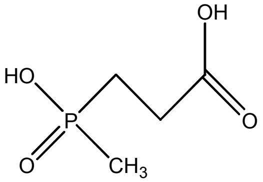
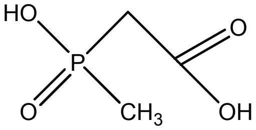
Rationale

MPA: A 90-day rat feeding study showed no effects at the highest dose tested which is about 100-fold higher than the NOAEL of the parent; therefore, MPA is considered less toxic than the parent. Even though it is a major degradate in some studies, considering its much lower toxicity than the parent, ROCKS recommends its exclusion as a residue of concern in drinking water.

NAG: Based on the rabbit developmental studies NAG can be considered slightly less toxic than the parent. It was only observed as a major degradate during photolysis in soil; therefore, its exposure is significantly lower to that of the parent in drinking water. The ROCKS recommends its exclusion as a residue of concern in drinking water.

MPP: The ROCKS noted that MPP may have different toxicity than the parent and is likely to have a lower toxicity but not so low that it could be definitely excluded from consideration. After the ROCKS meeting, the team consulted with Health Effects Division ToxSAC regarding the toxicity of MPP (J. Kidwell, 02/21/2012). The consensus of the ToxSAC was that glufosinate ammonium, the parent, and MPP, the degradate, show different toxicities, such that they should not be aggregated. Moreover, the Environmental Fate and Effects Division have indicated that the acute concentrations of MPP are not likely to be significantly greater than that of glufosinate in drinking water. However, given the minimal fate data available for MPP that indicates MPP does not degrade in aerobic aquatic environments, it is unclear if this will be true for chronic concentrations of MPP and glufosinate. Since MPP is likely less toxic than the parent compound and should not be aggregated with the parent, if MPP EDWCs are not significantly greater than those for glufosinate, the risk assessment for the parent will be protective of any toxicity associated with exposure to MPP in drinking water. Therefore, a quantitative risk assessment for MPP in drinking water will not be required.

Appendix 1. Glufosinate Ammonium and it major degradates in water.

Common Name	Chemical Name	Structure
Glufosinate ammonium (parent) (HOE 039866)	IUPAC name: ammonium-DL-homoalanin-4-yl-(methyl)-phosphinate CAS name: butanoic acid, (±)-2-amino-4-(hydroxymethylphosphinyl)-, monoammonium salt	
MPP **(**HOE 061517)	CAS Name: 3-methylphosphinico-propionic acid	
MPA **(**HOE 064619)	CAS Name: 2-methylphosphinico-acetic acid	
NAG **(**HOE 085355/HOE 099730)	CAS Name: 2-acetamido-4-methylphosphinico-butanoic acid