



Department of Pesticide Regulation



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MEMORANDUM

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TO: John S. Sanders, Ph.D.
Environmental Program Manager
Environmental Monitoring

FROM: Lisa Ross, Ph.D.
Environmental Program Manager I
Environmental Monitoring Branch

Original signed by

DATE: June 9, 2010

SUBJECT: LEGAL AGRICULTURAL USE DETERMINATION FOR HEXAZINONE
RESIDUES IN GROUND WATER AND REQUEST TO PROCEED WITH THE
DETECTION RESPONSE PROCESS

Summary

Hexazinone residues in California ground water were reported in a “Z-study” conducted in 1997 (Weaver, 1997). These detections resulted in a legal agricultural use determination by Environmental Monitoring Branch (EMB) staff (Attachment 1) and a recommendation to enter hexazinone into the decision-making process described in section 13149 of the Food and Agriculture Code. Management review of that determination and the data provided led to a different conclusion, that the residues may have been transient and instructed EMB to continue monitoring (Attachment 2).

Subsequent ground water monitoring (November 1997 through August 2009) resulted in 22 additional detections of hexazinone in 19 unique wells located in seven counties (Attachment 3). The most concentrated detections have occurred in Fresno and San Joaquin counties (Nordmark, 2008 and Nordmark, 2010, respectively). Hexazinone was detected in three wells within a single section (17S/19E-36) in Fresno County and in two wells in adjacent sections (02S/06E-19 and 02S/06E-30) in San Joaquin County. Two of the detections in Fresno County were from wells sampled in September 2007. The third detection was found in the same section during a follow-up “Z study” conducted in January 2008. The hexazinone detections in San Joaquin County were from wells sampled in April and July 2009, during our annual ground water monitoring survey. The analytical method used to detect hexazinone in well water was determined to meet our unequivocal detection criteria (Fatah, 2008). Therefore, these hexazinone detections are deemed unequivocal, as required by Food and Agriculture Code section 13149 (d).

Based on historical precedent, a confirmed or unequivocal detection of an active ingredient (AI) in a minimum of two wells in a single section or adjacent sections triggers an investigation into the legal agricultural use of that AI in those sections. Staff verified legal agricultural use of hexazinone in the sections where positive wells were found using pesticide use reports and land use surveys (Nordmark, 2008 and Nordmark, 2010). Hexazinone has been used historically (1995-2004) on alfalfa in these sections. In addition, research into the fate of hexazinone after



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application to an alfalfa field provided direct evidence for the movement of hexazinone in irrigation run-off water to an adjacent pond, and subsequently into shallow ground water (Prichard, et al., 2005). In addition, a study conducted by the registrant found hexazinone residues in shallow ground water in California as a result of agricultural use (Du Pont, 2000). Finally, investigations by the Enforcement Branch found no evidence of point sources within a one-quarter mile radius of the hexazinone contaminated wells (Attachments 4 and 5). These findings, collectively, have led staff to determine that hexazinone residues found in ground water were the result of legal agricultural use.

Based on these investigations and evidence of the movement of hexazinone residues from alfalfa field applications to shallow ground water, scientists in EMB have determined that residues found in ground water are in fact not transient, but the result of legal agricultural use. We therefore recommend hexazinone be entered into the detection response process in accordance with Food and Agriculture Code sections 13149 and 13150.

Background

Historical information on ground water monitoring for hexazinone in California and its use is summarized in Attachment 3. Hexazinone is an active ingredient in several herbicide products used mainly for weed control in the production of alfalfa (63 percent of all use) and timber crops (34 percent) (CDPR, 2008). Registered in California in the late 1970s, it was added to the ground water protection list (Title 3, California Code of Regulations section 6800[b]) in 1992 due to its persistence and mobility in soil. The EMB began sampling for hexazinone in 1993 and first detected it in 1994. Including this initial detection, hexazinone has been found in 26 unique wells ranging in concentration from 0.05 to 0.27 parts per billion.

In October 1996, hexazinone was detected in two wells located in adjacent sections of San Joaquin County (Weaver, 1997). Efforts to make an agricultural use determination were confounded by trace and spatially variable hexazinone detections found in well water (Attachment 2). These detections were also complicated by the presence of “pits” in the vicinity of the positive wells (Attachment 1). It was uncertain if these “pits” served as a point source of hexazinone. It was conjectured that “pits” may be used as a dumping location for pesticide containers. Later investigations by staff determined these “pits” were in fact ponds used to collect and retain runoff water from neighboring agricultural fields (Attachment 6). The connection between ponds and ground water remained to be demonstrated as EMB staff continued monitoring for hexazinone in ground water.

A subsequent research study provided direct evidence for the connection between hexazinone runoff from fields, to ponds, and then to shallow ground water. The movement of hexazinone residues in runoff water from an alfalfa field was tracked to an adjacent pond, and then finally to shallow ground water (Prichard et al., 2005). The soil in the alfalfa field was a fine-textured clay

soil with properties of a cracking clay soil. The alfalfa crop received border-check, flood irrigations. Hexazinone residues were detected in irrigation-runoff water that flowed into the adjacent pond. Residues were also measured in sub-surface water collected from observation wells located adjacent to the pond. The water in the pond was found to move rapidly downward, recharging the shallow ground water located at approximately 15 feet below ground surface, about 8 feet below the bottom surface of the pond. Hexazinone residues were also measured in ground water sampled from a well located near the pond. This study provided direct evidence for the movement of hexazinone in runoff water generated from alfalfa fields into an adjacent pond and, subsequently, to shallow ground water.

In parallel investigations, ground water monitoring for hexazinone continued and in 2008 hexazinone was detected in three unique wells located in one section in Fresno County (Nordmark, 2008). In addition, hexazinone was detected in 2009 in San Joaquin County in two wells located in adjacent sections (Nordmark, 2010). In all sections with positive wells, well integrity was confirmed, hexazinone use had been reported (1995-2004), and historical and current sites of hexazinone use were verified. In addition, a field investigation by the Enforcement Branch determined that point sources of hexazinone were not apparent in the area immediately surrounding each positive well in Fresno County (Attachment 4). Another Enforcement Branch investigation in San Joaquin County noted a sales facility approximately one-half mile from one of the positive wells (Attachment 5). However, this facility was approximately one quarter of a mile from a well without hexazinone residues providing some evidence that it is not likely a source of hexazinone contamination. In addition, no point sources were noted within one mile of the second hexazinone contaminated well in San Joaquin County.

One last piece of evidence for hexazinone's high mobility to ground water was the submission by the registrant of results of a prospective ground water study conducted in an alfalfa field in Stevinson, California (Du Pont, 2000). The study was initiated in January, 1996, with periodic sampling through October, 1997, and the results were submitted to the Department in June, 2000. Prospective ground water studies are required by the U.S. Environmental Protection Agency for pesticides that possess physical-chemical properties reflective of high potential for ground water contamination, e.g. very low sorption to soil and long persistence in degradation and dissipation studies. The soil at the study site was coarse-textured, the ground water level was shallow at around 15 feet below ground surface, and the alfalfa crop received a normal border-check irrigation schedule. These studies require the addition of bromide to the soil to trace the movement of water because bromide is highly water soluble, not reactive with soil components, and does not degrade. Soil water was sampled periodically over time using soil lysimeters placed 3, 6, 9, and 12 feet below the ground surface. Ground water was also sampled from installed monitoring wells. Hexazinone residues were measured in all soil lysimeters and monitoring wells and the timing of detections was very near the detection of bromide. An additional concern was the simultaneous detection of one of the breakdown products at similar concentrations to

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hexazinone. The results of this study provide direct evidence for rapid downward movement of hexazinone and one of its breakdown products under normal agricultural use in California.

Recommendation

Due to:

1. continued detections of hexazinone residues in well water.
2. direct evidence for the movement of hexazinone from alfalfa fields to shallow ground water.
3. the determination that legal agricultural use has occurred in the vicinity of positive wells found in both counties.
4. the lack of point sources in the immediate vicinity of each positive well.
5. the direct measurement of rapid downward movement in the prospective ground water study conducted in California.

EMB staff recommends the Department of Pesticide Regulation proceed with the detection response process in accordance with Food and Agricultural Code sections 13149 and 13150.

Attachments

cc: John Troiano (w/o Attachments)
Lisa Quagliaroli (w/Attachments)
Craig Nordmark (w/o Attachments)

bcc: Ross Surname File (w/Attachments)

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