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1994 Groundwater Survey for Alachlor in Southern Wisconsin -- Final Report

1994 GROUNDWATER SURVEY FOR ALACHLOR IN SOUTHERN WISCONSIN FINAL REPORT

Introduction

Alachlor is an herbicide used primarily to control grasses in corn and soybeans. Alachlor is manufactured by the Agricultural Group of Monsanto Company and sold under the trade name Lasso. After atrazine, alachlor is the most frequently used herbicide in Wisconsin. The 1990 Pesticide Use Bulletin reports that alachlor was applied to 1,046,500 acres in Wisconsin that year vs. 2,115,900 acres treated with atrazine.

Groundwater Impacts

Alachlor has a moderate potential to leach to groundwater and has an established groundwater enforcement standard of 2.0 parts per billion. Data from DATCP's monitoring well program shows that alachlor can reach groundwater from field use. Of 30 monitoring sites, with fields treated with alachlor, 10 showed some detection of the herbicide.

To estimate the impact of alachlor on groundwater nationally, Monsanto conducted a survey of 1,430 private wells in 89 counties where the herbicide was sold. This National Alachlor Well Water Survey (NAWWS) found alachlor in less than 1% of the wells tested. By contrast, 12% of the wells contained some level of atrazine. Though DATCP believed that the presence of alachlor in groundwater was less widespread than that of atrazine, the department also felt that a better assessment of groundwater impacts was important. As a result, representatives from Monsanto; the Departments of Natural Resources, Health and Social Services, Justice, Agriculture, Trade and Consumer Protection; University of Wisconsin - Extension and the State Laboratory of Hygiene met and outlined the best approach to determine the extent of alachlor contamination of groundwater in Wisconsin.

Some pesticides have breakdown products, or metabolites, which may be of human health or environmental concern. The ethane sulfonic acid metabolite of alachlor (ESA) is formed in the soil and is subject to leaching. A study conducted by the Water Quality Laboratory at Heidelberg College, Tiffin, Ohio found that ESA was present in screening tests which showed false positive results for alachlor. With assistance from Monsanto, DATCP developed an ESA analytical method and began testing for ESA in the summer of 1993. During 1993, ESA was found in groundwater down gradient from a significant number of treated fields in the monitoring well program and in several private water supply wells. It was decided that ESA should be included in the survey of alachlor in groundwater.

Survey Design

The purpose of the survey was to determine the extent of alachlor or ESA contamination in Wisconsin private wells most at risk. To accomplish this, private wells were selected in areas of the state with the highest alachlor use. Selected wells also had either a previous detection of triazines or nitrate over 10 parts per million. These selection criteria were meant to maximize the chance of detecting alachlor or ESA by sampling private wells most at risk of pesticide contamination. The survey was not designed to provide unbiased results statewide, but rather to indicate whether or not a problem exists with alachlor or ESA in wells most at risk. DATCP, DNR and Monsanto provided funding for the survey.

Because alachlor use has been concentrated in the southern part of the state, private wells in eleven counties including Columbia, Dane, Dodge, Grant, Green, Jefferson, Iowa, Lafayette, Rock, Sauk and Walworth were investigated. Owners of about 1,300 wells which met the selection criteria were mailed an immunoassay test kit which detects the presence of alachlor and ESA. They were instructed in proper sampling procedures and were given a postage paid mailer to return the sample to DATCP's lab if they chose to participate. 669 well owners returned immunoassay samples in the 11 county area. Those with a detection were offered a free followup gas chromatography (GC) and high pressure liquid chromatography (HPLC) analysis with sampling by DATCP personnel.

Results

A total of 669 samples were returned for immunoassay analysis, 300 of which showed a detection. These results are summarized by county in Table 1.

Well owners with a detection were contacted and offered a no-cost followup sample. A total of 293 samples were collected and analyzed using GC-HPLC. The results for alachlor and alachlor ESA are shown in Table 2.

Alachlor ESA was the predominant compound detected. It was detected (LOD = 1.0 ug/l) in 206 out of 293 samples. The minimum concentration detected was 1.09 ug/l, the maximum was 26.7 ug/l, and the average concentration for the 206 detections was 4.89 ug/l.

Alachlor was detected (LOD = 0.15 ug/l) in only 12 of the 293 samples. Of these, alachlor ESA was also detected in nine samples, so alachlor was detected in the absence of alachlor ESA in only three samples. The minimum alachlor concentration detected was 0.21 ug/l, the maximum was 6.91 ug/l, and the average concentration for the 12 detections was 2.47 ug/l.

In approximately 30% of the followup samples the analysis did not confirm a detection of alachlor or ESA in the well. In almost all of these cases, the original immunoassay detection was very near the limit of detection of 1.0 ug/l.

Survey Conclusions

The Groundwater Survey for Alachlor in Southern Wisconsin provides useful information about the occurrence of alachlor and ESA and the effectiveness of the immunoassay technique as a screening tool. Immunoassay analysis of the 669 screening samples showed a detection rate of 45%. While the selected private wells were thought to be at higher risk for alachlor contamination, the detection rate was higher than anticipated. Followup GC-HPLC analysis showed that 1.8% of the original 669 wells had detections of alachlor and that 32% had detections of ESA. The immunoassay kit was selected for the survey because it was reactive to both the parent alachlor compound and its breakdown product, ESA. It appears to have been successful in detecting both compounds in private well samples.

DATCP will conduct site investigations around wells with alachlor concentrations at or above 2 parts per billion, which is the health based Enforcement Standard. Wells with levels of ESA above 20 parts per billion, which is the Interim Health Advisory for ESA, will also be investigated. These investigations will identify the source of groundwater contamination. If field use is identified as a source contributing to the contamination, site specific actions will be taken. This would include prohibition of the use of alachlor encompassing the recharge and discharge areas of the well.