

Title: Follow-Up to the Grade A Dairy Farm Well Water Quality Survey

Project I.D.: DNR Project No. 70

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Period of Contract: July 1, 1989 through June 30, 1991

Background/Need: A 1988 survey of well water quality on Grade A dairy farms identified atrazine as the predominant pesticide found in groundwater. At the same time the WDNR adopted groundwater standards for atrazine and alachlor (Lasso™).

Objectives: 1) To resample Grade A dairy farm wells with pesticide detections for comparison to original data, 2) To sample nearby wells to assess the extent of groundwater contamination in the area, 3) To collect data to aid in future assessments of pesticide contamination.

Methods: Of the 71 wells with pesticide detections from the original study, 69 were resampled. In addition, an average of three nearby wells were also sampled. Professional judgement and cooperativeness of well owners were used to select vulnerable wells in the vicinity of the impacted well. Wells were sampled by the DNR District Water Supply staff from October 1989 through September 1990. Considerable variability existed in sample collection sites. Collection methods were identical to those utilized in the original Grade A dairy farm survey. All samples were analyzed by the State Laboratory of Hygiene before the lab had the routine capability to analyze for atrazine metabolites. "Atrazine" as used in this report refers to atrazine parent compound, not to the combination of the parent compound and metabolites.

Results and Discussion: Of the 69 resampled wells, 57 had detectable levels of one or more pesticides. Fifty wells contained atrazine alone while four wells had atrazine and alachlor; one well contained atrazine and metolachlor; one well contained atrazine, alachlor and cyanazine and one well contained alachlor alone. The median atrazine concentration of wells with atrazine detections was 0.36 µg/l, only two wells equaled or exceeded the atrazine enforcement standard (ES) of 3.5 µg/l and 31 of the wells contained atrazine at or above the preventive action limit (PAL) of 0.35 µg/l. All alachlor detections were above the PAL of 0.05 µg/l. Additionally, 67 wells showed NO₃+NO₂ N detections with a median concentration of 9.4 mg/l. NO₃+NO₂ N was found at or above the PAL of 2 mg/l in 66 of the wells and at or above the ES of 10 mg/l in 32 of the wells.

The median atrazine concentration of the 64 wells which originally contained atrazine was 0.38 µg/l which compares to 0.42 µg/l for the same wells in the original study. This difference is not necessarily due to a decrease in groundwater atrazine concentrations. Bias between laboratories, variability in analytical method, and sampling error may have contributed to the observed difference. Environmental factors which might explain such a decline include a reduction in atrazine use between 1985 and 1990. Time may also be a factor. The original Grade A samples were collected during the winter of one of the most severe droughts on record, while the follow-up samples were collected during the spring and summer of a period of more normal rainfall. Also, an average of 482 days elapsed between the two samplings. During this time the well owners may have modified their atrazine handling practices due to their participation in the survey as well as due to the general heightened awareness among farmers about this issue.

212 nearby wells were sampled. One or more pesticides were detected in 63 of these wells. Atrazine alone was found in 57 wells; atrazine and alachlor were found in three wells; one well contained atrazine and metribuzin; one well contained atrazine, alachlor, metribuzin and cyanazine and one well had atrazine and metolachlor. The median atrazine concentration of wells with atrazine detections was 0.31 µg/l. Only one well equaled or exceeded the atrazine ES but 27 wells equaled or exceeded the PAL. A total of 188 wells showed NO₃+NO₂ N detections with a median concentration of 6.5 mg/l. NO₃+NO₂ N was found at or above the PAL in 168 of the wells and in 62 of the wells at or above the ES.

Resampling the 69 wells confirmed the presence of pesticides and nitrate and the differences in detections between Agricultural Statistics Districts (ASD). The data collected were added to the database of information which might aid in future decisions. There was a decrease in reported atrazine concentrations. However, several explanations for the median difference of 0.04 µg/l and decrease in atrazine concentrations are possible. Laboratory error and sampling error could account for the difference and decrease in reported atrazine concentrations between the original and follow-up samples. If the difference was a result of actual declines in amounts of atrazine in groundwater, several environmental factors such as changes in atrazine usage and handling practices, seasonal changes and the time elapsed between samplings are possible explanations for the differences in reported concentrations.

Only 30% of nearby wells had detections of pesticides versus 83% for the resampled wells. Atrazine alone was found in 72% of the resampled wells whereas in only 27% of the nearby wells. NO₃+NO₂ N detections also followed this pattern — from 97% in the resampled wells to 89% in the nearby wells. This is largely due to the contribution of 33 detections from the South Central ASD. Forty of the original 64 wells with atrazine detections had a decrease in atrazine concentrations. Based upon these results, it has been concluded that there was a decrease in atrazine concentrations. These results do not apply to the entire population of all Grade A dairy farm wells statewide.

Related

Publications:

WDATCP, April 1989. Gary LeMasters (WDATCP) and Douglas J. Doyle (WASS) "Grade A Dairy Farm Well Water Quality Survey". DATCP and Wisconsin Agricultural Statistics Service, Madison WI.

WDATCP. "Questions And Answers On The Grade A Dairy Farm Well Water Quality Survey". DATCP, Madison, WI.

Chesters, et. al. 1991. Sources and Extent of Atrazine Contamination of Groundwater at Grade A Dairy Farms in Dane County, WI. Draft Final Report to WDATCP. Water Resources Center, University of Wisconsin - Madison.

Bradbury, K. and McGrath, R. 1991. Field Study of Groundwater Contamination at Grade A Dairy Farms in Dane County, Wisconsin. Draft Final Report to WDATCP. Univ. of Wisc. Extension, Geol. and Nat. Hist. Surv.

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Final Report:

A final report containing more detailed information on this project is available for loan from Wisconsin's Water Library, University of Wisconsin - Madison, 1975 Willow Drive, Madison, Wisconsin 53706 (608) 262-3069.