Potential for Atrazine Reintroduction to Prohibition Areas

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Background

The Department of Agriculture, Trade & Consumer Protection (DATCP) has conducted several surveys of pesticides in groundwater and has consistently found atrazine to be the most commonly detected pesticide in groundwater. A survey of randomly selected Grade A dairy farm wells in 1989 detected atrazine in 12% of the wells tested. The latest statewide survey completed in 1996 detected atrazine residues in 5.2% to 12% of Wisconsin wells. This survey also showed that about 1% of Wisconsin wells exceed the atrazine enforcement standard of 3 parts per billion (ppb).

The Wisconsin Agricultural Statistics Service (WASS) has collected information on the use of agricultural pesticides in Wisconsin. According to WASS surveys, atrazine use peaked in the mid-1980's at over 5.1 million pounds of active ingredient used per year. Atrazine was used at an average rate of 1.6 pounds of active ingredient/acre/year.

In response to the problem of groundwater contamination the Atrazine Rule was adopted in 1991. The rule limits how atrazine can be used in Wisconsin and prohibits it's use in areas where atrazine contamination is found in groundwater above the enforcement standard (ES) of 3 ppb. Currently there are 103 prohibition areas in the state covering more than 1.2 million acres. In 1999 WASS reported atrazine was used at an average application rate of 0.80 pounds active ingredient/acre/year. A total of 1.05 million pounds of atrazine were applied in 1999 in Wisconsin.

To evaluate the effectiveness of the Atrazine Rule, DATCP conducted the Atrazine Rule Evaluation Survey between May 1994 and October 1996. The results of the study showed that the concentration of atrazine and its chlorinated metabolites in groundwater declined significantly. The average concentration in the wells declined from 0.96 ppb to 0.54 ppb. No significant change was documented, however, for the percentage of wells containing a detection of atrazine.

Atrazine Prohibition Area Repeal Process

Since atrazine use and levels in groundwater are declining, the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) was asked to design a process to potentially remove prohibition areas where atrazine levels in wells have fallen below the ES. Prior to 1998, DATCP had procedures to create prohibition areas, but had not developed a specific process to remove these areas.

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In 1998, DATCP's *Groundwater Protection Program* rule (ch. ATCP 31, Wis. Adm. Code) was modified to include a process to "repeal" (i.e., remove) pesticide prohibition areas. That same year, specific repeal requirements for atrazine prohibition areas were included in DATCP's *Pesticide Product Restrictions* rule (ch. ATCP 30, Wis. Adm. Code). Repeal of an atrazine prohibition area requires that the following three conditions are met:

1) three consecutive water samples taken at least six months apart from wells that were above 3.0 parts per billion (ppb) must be at or below 1.5 ppb;
2) all other wells sampled in the prohibition area during the same time period must be at or below 1.5 ppb; and
3) research must show that renewed atrazine use will not cause atrazine levels in wells to rise above 3.0 ppb.

To meet the third repeal requirement, DATCP has designed a 5-year monitoring study to determine if renewed atrazine use in prohibition areas will contaminate groundwater, and under what conditions atrazine could be safely reintroduced in these areas. DATCP's Atrazine Technical Advisory Committee helped design the study. Committee members include university researchers, state agency staff, farmers, agribusiness representatives, and an atrazine manufacturer.

Study participants have a 10 - 40 acre field in atrazine prohibition areas where atrazine has not been used since 1993 and other site conditions have been met. The study design consists of 17 sites, representing a range of soil textures, installed around Wisconsin. Fourteen of the sites were installed and have been sampled since spring 1998. Three other sites became active in spring 1999. A line of three monitoring wells is installed within each monitored field, and a fourth well is installed at the field edge to help determine groundwater flow direction under the site. Depth to groundwater underneath these fields is 30 feet or less. The monitoring wells are installed in unconsolidated materials (e.g., not drilled through bedrock).

Participants must plant corn the first year of the project and at least two other project years. Atrazine is applied on corn at or near the highest rate for the field, based on soil texture. Products containing cyanazine or simazine (other triazine herbicides) cannot be used on the monitored field during the study, but other pesticides and fertilizers are applied as needed. The grower chooses the tillage and pesticide application methods best suited for the operation. Participants report their pesticide application, tillage, precipitation/irrigation, and general crop information to DATCP annually. DATCP samples the wells four times a year. Samples are tested for atrazine, atrazine breakdown products, nitrate, and other common herbicides. All wells will be removed at the end of the project.

Atrazine Reuse Research Results to Date

The results of the 14 sites installed in 1998 are discussed here. For the three sites installed in 1999 we only have one pre-application of atrazine sample and four post atrazine application samples, which are insufficient for statistical analysis. For the 14 sites installed in 1998 we have nine quarterly rounds of sample data. The first quarterly result is prior to renewed use of atrazine in the prohibition area, and the remaining eight quarterly results are after renewed atrazine use. Six of the 14 sites have coarse-textured surface soils, and 8 of the sites have medium-textured surface soils.

To determine whether atrazine contamination is increasing or not, the department used the Mann-Whitney U Statistical Test which provides a measure of contamination trend. This test is used by both the Wisconsin Department of Natural Resources and Department of Commerce to evaluate groundwater data at contaminated sites. The method calculates a "U" statistic that indicates an increasing trend in contamination if the "U" value is 13 or greater. A decreasing trend would be indicated by a "U" value of 3 or less. These trends are statistically valid with 90% confidence. Additional information on the test is available at http://www.state.nj.us/dep/srp/regs/techrule/techrl10c.pdf.

The two figures that follow show the median concentration of total chlorinated residues of atrazine (in parts per billion), and the individual compounds of atrazine, for coarse-textured sites and medium-textured sites by sampling quarter. The "U" statistic for total chlorinated residues of atrazine on coarse-textured sites is 14.5 which indicates an "increasing" trend of contamination. The "U" statistic for total chlorinated residues of atrazine on medium-textured soils is 10.0 which indicates "no trend" of contamination. While both coarse- and medium-textured sites show higher levels of atrazine residues after application of atrazine, the fluctuation in values from the medium-textured sites does not allow a trend to be established with 90% confidence.

Figure 1 shows the median value all coarse-textured site's three in-field monitoring well results by sampling quarter. Figure 2 shows the median value of each medium-textured site's three in-field monitoring well results by sampling quarter.

Figure 1. Median Atrazine Results at Coarse-Textured Sites by Sampling Quarter

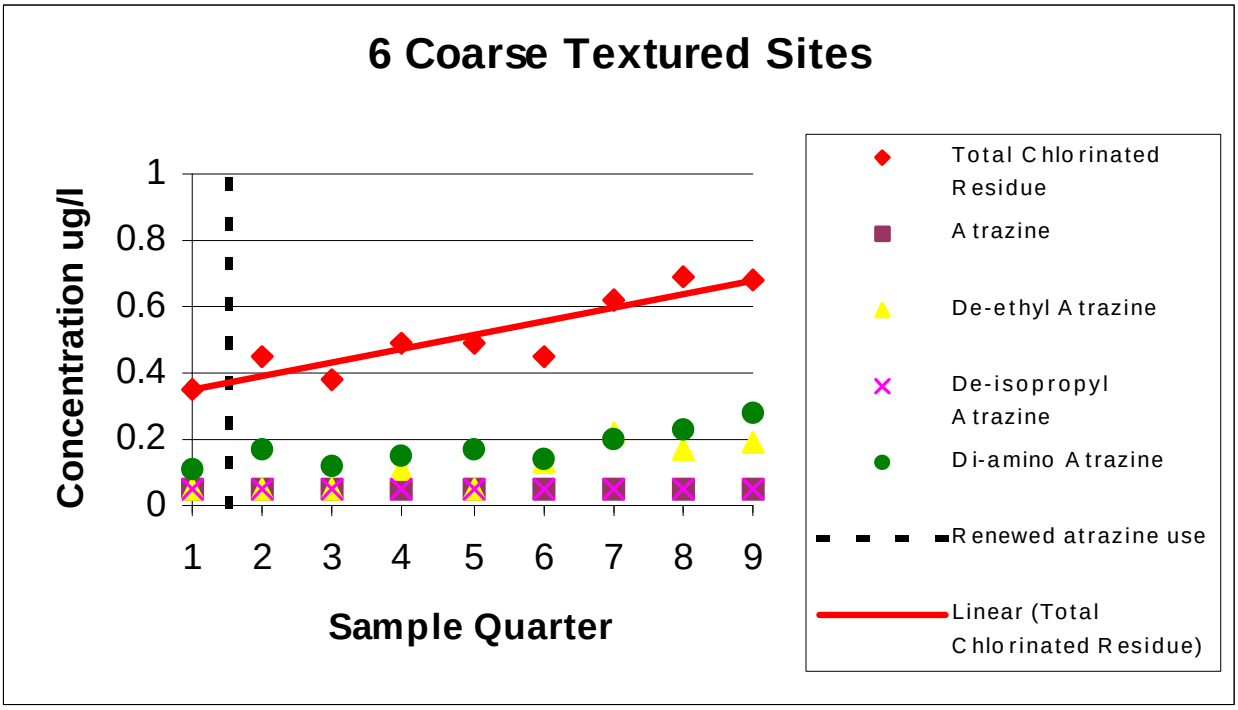

Figure 2: Median Atrazine Concentrations at Medium-Textured Sites by Sampling Quarter