ATRAZINE REINTRODUCTION TO PROHIBITION AREAS

Bruce D. Rheineck[1]

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. As of December 2001, over 23,000 private water wells have been tested using an immunoassay triazine screen. Thirty-seven percent of these samples have had triazine detected.

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 2000 WASS reported atrazine was used at an average application rate of 0.79 pounds active ingredient/acre/year. A total of 1.4 million pounds of atrazine were applied in 2000 in Wisconsin.

To evaluate the effectiveness of the Atrazine Rule, DATCP conducted surveys in 1994, 1996 and 2001. The results of these surveys showed that the proportion of wells containing a detection of atrazine has had a statistically significant decline from 11.1% in 1994 to 5.1% in 2001.

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.

[1] Senior Hydrogeologist, Wisconsin Department of Agriculture, Trade & Consumer Protection

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.

Several groups have endorsed this project: Wisconsin Fertilizer & Chemical Association, Wisconsin Agribusiness Council, Novartis, Wisconsin Corn Growers Association, GroMark, Wisconsin Farm Bureau, and Wisconsin Federation of Cooperatives. In addition, Novartis has funded the installation of the monitoring wells, laboratory analysis of samples, and incentives for project participants.

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.

Participants planted corn the first year of the project and will plant in 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.

Atrazine Reuse Research Results to Date

The results of the 17 sites are discussed here. The first quarterly result is prior to renewed use of atrazine in the prohibition area, and the remaining quarterly results are after renewed atrazine use. Nine of the sites have medium-textured soils, and eight of the sites have coarse-textured soils.

To determine whether atrazine contamination is increasing or not, the department use the Mann-Whitney U statistical test. This test provides a measure of a trend in concentrations. The Wisconsin Department of Natural Resources and the Department of Commerce The both use the test to evaluate groundwater data at contaminated sites. The method calculates a "U" statistic that indicates an increasing trend in concentrations if the U value is 13 or greater. A decreasing trend is indicated by a U value of 3 or less. The confidence level is 90% using those values of U.

The two figures below show the median concentration of total chlorinated residues of atrazine (TCR) in micrograms per liter by sampling quarter for both the medium and coarse textured sites. While both the coarse and medium textured sites show higher levels of TCR after renewed use of atrazine, a trend for the medium-textured sites is not significant upward at the 90% confidence level.

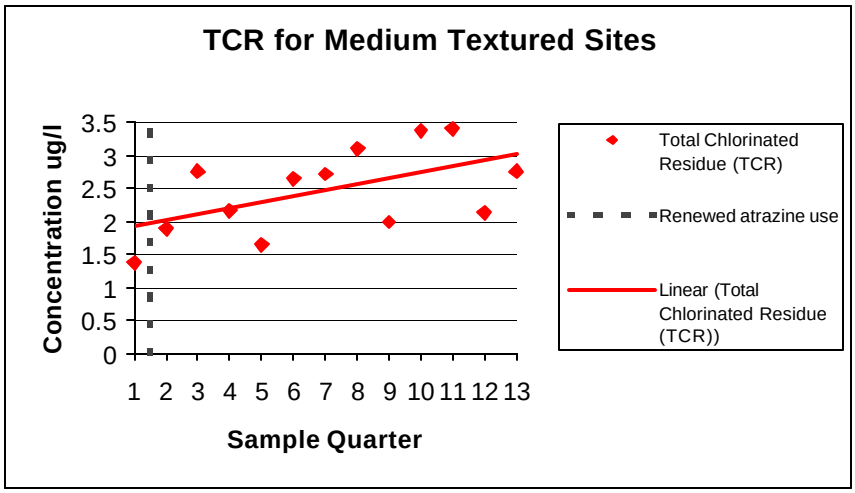

Figure 1 shows the median of each medium-textured site's three in-field monitoring well results by sampling quarter.

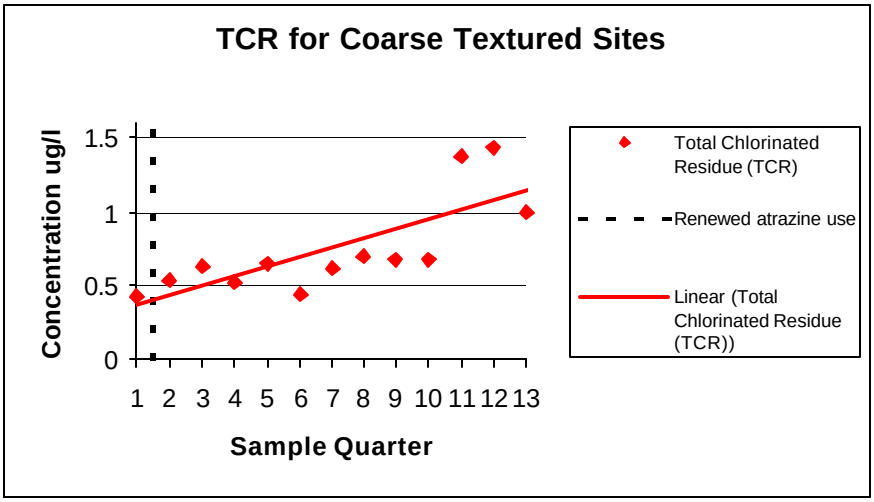

Figure 2 shows the median of each coarse-textured site's three in-field monitoring well results by sampling quarter.

In summary:

<u>Medium Texture Sites</u>

- 8 of 9 sites have gone up (1st quarter to 13th quarter)
- All 9 sites have had individual wells over the ES
- Statistical trend not yet clear

<u>Coarse Texture Sites</u>

- 4 of 8 sites have gone up (1st quarter to 13th quarter)
- 4 of 8 sites have had wells over the ES
- Statistically evident upward trend