

Results of the National Survey of Pesticides in Drinking Water Wells¹

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Abstract. --The U.S. Environmental Protection Agency (EPA) has completed its five-year National Survey of Pesticides in Drinking Water Wells (NPS). Between 1988 and 1990, EPA sampled approximately 1300 community water system (CWS) wells and rural domestic wells for the presence of 101 pesticides, 25 pesticide degradates, and nitrate (127 analytes). The Survey results statistically represent approximately 94,600 drinking water wells at 38,300 community water systems and 10.5 million rural domestic wells throughout the United States. This paper provides an overview of the initial findings of the Survey.

INTRODUCTION

EPA designed the Survey with two principal objectives: (1) to determine the frequency and concentration of the presence of pesticides and nitrate in drinking water wells nationally; and (2) to improve EPA's understanding of how the presence of pesticides and nitrate in drinking water wells is associated with patterns of pesticide use and the vulnerability of ground water to contamination. The focus of the Survey was on the quality of drinking water in wells, rather than on the quality of ground water, surface water, or drinking water at the tap. The Survey was designed to yield valuable information on both the frequency and levels of pesticides, pesticide degradates, and nitrate present in rural domestic (private) wells and community(public) drinking water wells on a nationwide basis. The Survey, however, was not designed to provide an assessment of pesticide contamination in drinking water wells at the local, county, or State levels.

Of the 127 analytes, nitrate was most frequently detected in NPS wells. EPA analyzed well water samples for the combined presence of nitrate and nitrite measured as nitrogen, which are reported as a single concentration of nitrate. Based on the results of the NPS, EPA estimates that nitrate is present, at or above the analytical minimum reporting limit of 0.15 mg/L used in the Survey, in about 49,300 (52.1%) CWS wells and

5,990,000 (57.0%) rural domestic wells nationwide. Considering the precision of the Survey, EPA estimates that the number of CWS wells containing nitrate at or above the minimum reporting limit could be as low as 45,300 or as high as 53,300, and the number of rural domestic wells could be as low as 5,280,000 or as high as 6,700,000 as indicated by the associated 95% confidence intervals. A major source of nitrate in cultivated soils is from inorganic fertilizers. Nitrate fertilizers are applied to enhance plant growth and nitrogen is necessary in the synthesis of plant proteins. Other sources of nitrate in soil and water include animal wastes, septic systems, plant residues, and fixation from the atmosphere.

SURVEY RESULTS

EPA estimates that 9,850 (10.4%) CWS wells and 446,000 (4.2%) rural domestic wells in the United States contain at least one pesticide or pesticide degradate at or above the minimum reporting limits used in the Survey. The two pesticide analytes most frequently detected were DCPA acid metabolites and atrazine.

DCPA acid metabolites, a degradate of DCPA (dimethyl tetrachloroterephthalate), is the most commonly detected pesticide or pesticide degradate in the Survey. The estimated numbers of CWS wells and rural domestic wells containing DCPA acid metabolites, at or above the Survey minimum reporting limit of 0.10 ug/L, are 6,010 (6.4%) and 264,000 (2.5%), respectively. The parent compound DCPA, is extensively used on home lawns, golf courses, and farms for control of many annual grasses and broadleaf weeds.

Atrazine is the second most commonly detected pesticide. EPA estimates that atrazine is present

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at or above the Survey minimum reporting limit of 0.12 ug/L, in about 1,570 (1.7%) CWS wells and 70,800 (0.7%) rural domestic wells nationwide. Atrazine is known by the common names AAtrex, Atratol, Gesaprim, and Zeaphos, and is used to control many annual broadleaf weeds and certain grasses on cropped land. It is also used for general weed control on non-cropped industrial land, selective weed control in conifer restoration and Christmas tree plantations, and non-selective control of vegetation on fallow land.

In addition to DCPA acid metabolites and atrazine, ten other pesticides were detected above Survey reporting limits. With sane exceptions, these analytes were detected at both CWS wells and rural domestic wells. The following list identifies all pesticides or pesticide degradates that were detected above minimum reporting limits and whether they were detected in a CWS well or rural domestic well:

- o CWS wells: atrazine, DCPA acid metabolites, dibromochloropropane, dinoseb, hexachlorobenzene, prometon, and simazine; and
- o rural domestic wells: alachlor, atrazine, bentazon, DCPA acid metabolites, dibromochloropropane, ethylene dibromide, ethylene, thiourea, gamma-HCH (lindane), prometon, and simazine.

COMMUNITY WATER SYSTEM WELLS

CWS wells were defined for the NPS as wells in systems of piped drinking water that either have at least 15 connections or serve at least 25 permanent residents. To be eligible, a system must have had at least one operating well (at the time of sampling) that was being used to supply drinking water. EPA targeted two categories of CWS wells in the Survey:

1. Community water system wells nationally, which included all CWS wells in the continental United States plus Alaska and Hawaii; and
2. Community water system wells in counties with high ground-water vulnerability, which made up about 22% of all CWS wells.

RURAL DOMESTIC WELLS

Rural domestic wells were defined for the NPS as drinking water wells supplying occupied housing units located in rural areas of the United States, excluding government reservations. Rural households outside of incorporated or unincorporated places with a population of 2,500 or more and outside of urban fringe areas as defined by the U.S. Bureau of the Census. EPA targeted five categories of domestic wells in the Survey:

1. Rural domestic wells nationally, which includes all rural domestic wells in the continental United States plus Alaska and Hawaii;
2. Rural domestic wells in counties with high pesticide use;
3. Rural domestic wells in counties with high ground-water vulnerability;
4. Rural domestic wells in the "cropped and vulnerable" areas of counties; and
5. Rural domestic wells in counties with high pesticide use and high ground-water vulnerability.

SUMMARY AND CONCLUSION

The water well survey provides, for the first time, national estimates of the frequency and concentration of pesticides and nitrates in community and rural domestic drinking water wells. In addition to the Phase 1 report, EPA is preparing a second report (Phase 2) which examines the relationship between the presence of pesticides and nitrates in ground water and the patterns of pesticide use and the vulnerability of ground water to contamination.

The Survey findings indicate that a vast majority of drinking water wells in this country do not have levels of pesticides or nitrates that would pose a risk to public health. However, there is enough evidence of contamination to stimulate some concern. In addition, the findings underscore the need to be ever vigilant in order to avoid more serious problems in the future. Consequently, EPA is aggressively developing pro-active programs which reduce the threat of contamination to drinking water supplies.