Review of the Groundwater Pesticide Detections in the 2021 and 2022 Washington Dept. of Health's Public Water Supply System Dataset

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Introduction

The Washington State Department of Agriculture (WSDA) is the agency responsible for developing pesticide use regulations, and managing pesticide use and distribution in Washington State. WSDA has the authority to regulate pesticides and to prevent contamination of surface and groundwater from pesticides statutorily through Washington's Pesticide Control and Pesticide Application Acts (RCW 15.58). Implementation of surface water and groundwater quality protection is partially achieved with active involvement during the federal pesticide registration process and input during state supplemental registrations to ensure that adequate label restrictions protecting surface and ground water quality are developed. Monitoring surface water and groundwater throughout the state is essential to evaluate water quality impacts of pesticide usage and identify concerns that may warrant further investigation.

WSDA has limited monitoring and data resources available to adequately evaluate pesticide occurrences in groundwater or explore (via monitoring) areas identified as vulnerable to pesticides of concern. Public water supply system (PWSS) sampling as required by the Washington State Department of Health (DOH) is the only consistent, ongoing, statewide groundwater monitoring effort at this time.

WSDA reviews the PWSS data annually to compare detected legacy and current-use pesticide concentrations to Environmental Protection Agency (EPA) established drinking water criteria. Drinking water criteria are concentrations of drinking water contaminants that could pose adverse risk to human health. These values are primarily Maximum Contaminant Levels (MCL) and Health Advisory Levels (HAL). This report identifies the pesticide and pesticide-related contaminants detected in the 2021 and 2022 DOH PWSS dataset and compares them to the most current EPA drinking water criteria.

Methods

WSDA staff reviewed samples from the PWSS dataset between Jan. 1, 2021, and Dec. 31, 2022. There were 86 pesticide or pesticide-related chemicals that were tested for. Not every chemical was tested at every well or tested each year. Of the 9,297 sampling locations in the dataset, 2,561 wells were tested for pesticides with a frequency of, on average, once or twice over the two-year sampling period. Of those wells, approximately 23% were tested for over 20 unique pesticides. When a pesticide or pesticide-related chemical detection was identified, the concentration of the chemical was compared to EPA's 2018 Edition of the Drinking Water Standards and Health Advisories Tables (EPA 2018). If a chemical did not have an MCL or Lifetime HAL, then an HAL was calculated with EPA's established reference dose. When detected pesticide concentrations are greater than 20% of an EPA drinking water criteria, WSDA, Natural Resources and Agricultural Sciences team, and Pesticide Management Division, work to identify appropriate responses which could include evaluating potential contributing sources, increased outreach and education, and additional monitoring. WSDA will collaborate with the state and local departments of health (e.g. health authorities) to identify potential risk associated with the concentrations of pesticides detected.

2021-2022 Data Summary

WSDA reviewed the 2021 and 2022 PWSS groundwater data to determine if currently registered or historically used pesticides are leaching into Washington aquifers. Throughout the state, 13 pesticides were detected in PWSS samples (Table 1). Roughly 72% (101 detections) of the pesticide detections had concentrations below 20% of an EPA drinking water criterion. Two pesticides (DCPA acid metabolites and EDB) were detected at concentrations exceeding drinking water criteria at least once in this two-year period.

The data reviewed here provides an overview of the pesticides that are detected in municipal wells DOH requires to conduct sampling. This information may assist in determining how the state should prioritize resources and develop regional studies to learn more about the sources of the pesticides reaching groundwater resources and identify potential groundwater protection measures.

*Table 1 — **List of all pesticides detected between 2021 and 2022 with their associated maximum concentrations and EPA drinking water criteria***

Analyte	Use*	Number of wells sampled	Number of wells with detections	Number of detections	Maximum concentration detected (µg/L)	Drinking water criteria (µg/L)	Type of criteria†
1,2-Dichloropropane	SF-L	2,065	2	4	0.86	5	MCL
Bromacil	H	574	5	5	0.856	70	Lifetime HAL
Bromomethane	SF	2,065	7	10	7.71	8.96	Lifetime HAL
Dalapon	H-L	1,106	2	2	1.10	200	MCL
DCPA acid metabolites	H	1,105	44	67	177.9	70	Lifetime HAL
Dibromomethane	SF-L	2,064	5	5	1.77	--	--
Dicamba	H	1,106	2	2	0.45	4,000	Lifetime HAL
Di-n-butyl phthalate	PMI-L	574	4	9	10.7	640	Calculated HAL
EDB (Ethylene dibromide)	SF-L	154	3	20	0.185	0.05	MCL
Hexachlorocyclo-pentadiene	PMI-L	573	2	2	0.10	50	MCL
Metolachlor	H	574	1	1	0.11	640	Lifetime HAL
Pentachlorophenol	WP	1,106	1	1	0.44	1	MCL
Picloram	H	1,106	6	12	0.45	500	MCL

* *H: Herbicide; SF: Soil fumigant; PMI: Pesticide manufacturing ingredient; L: Legacy pesticide*

† *Type of criteria includes EPA established Maximum Contaminant Level (MCL) and EPA established Health Advisory Level (HAL)*

For additional information on pesticides in groundwater, including brand name examples, current labeled uses, and leaching potential, please refer to the WSDA factsheet "Understanding Pesticide Leaching Potential and Protecting Groundwater" (WSDA 2020).

Elevated Pesticide Concentrations

Table 2 summarizes the pesticides with detected concentrations that were greater than 20% of an EPA drinking water criteria.

*Table 2 — **DOH data 2021 and 2022 elevated pesticide concentrations summary***

Analyte	Number of detections	Number of detections greater than 20% EPA criteria	Number of wells with detections greater than 20% EPA criteria	Percent of detections above 100% EPA criteria
Bromomethane	10	2	2	0%
Pentachlorophenol	1	1	1	0%
EDB (ethylene dibromide)	20	19	3	40%
DCPA acid metabolites	67	17	7	6%

Bromomethane, pentachlorophenol, EDB, and DCPA were the four analytes detected with concentrations above 20% of an EPA drinking water criteria in the DOH 2021 and 2022 sampling periods. Bromomethane, also referred to as methyl bromide, is a fumigant used to control agricultural and shipping pests. The United States has phased out some of the production and consumption of it due to the Montreal Protocol of 1987, but there are many exceptions. Use of bromomethane is expected to continue to decline as more alternatives are available and less product produced (Rothman and Montague 2013). Pentachlorophenol, or PCP, is currently used to treat utility poles and other wood products. This chemical is also being phased out, with full banning of use by the EPA projected to be in effect early 2027 (EPA 2021). EDB was banned for use by the EPA in 1983 (Powell 1997). With no current legal uses, WSDA has no follow-up groundwater sampling investigations planned in response to the detections of this banned pesticide. DCPA, also known as dacthal, is currently registered for use in Washington for several agricultural commodities. The evaluation is ongoing as DCPA continues to be detected at elevated concentrations in Washington State.

Discussion

WSDA will continue to review DOH PWSS data to better understand what pesticides are reaching the groundwater in Washington and compare these values to established drinking water criteria. Although this dataset is the best available resource for monitoring pesticide detections in drinking water in Washington, the testing list is limited. The test panels at DOH (current under WAC 246-390) are not updated annually to incorporate newly registered pesticides. The analyte list used by WSDA includes pesticides that are not on the DOH test panels, some of which have been detected in WSDA-led groundwater quality projects. The DOH PWSS data could be complemented by regional groundwater studies in Washington that include a more robust pesticide analyte list.

In July of 2023, WSDA acquired new funding through the legislature to begin a regional pesticides in groundwater quality monitoring program. The data collected through this program will enhance the states' understanding of pesticide presence and concentrations in groundwater resources. This program will be a collaborative effort between WSDA, DOH, local conservation districts, and the agricultural community. This will assist the state in getting ahead of potential contamination concerns associated with pesticides.

References

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