Contact information:

Laurel Schaider, Ph.D.
Research Scientist
Silent Spring Institute
29 Crafts Street
Newton, MA 02458
schaider@silentspring.org
(617) 332-4288 x224

Abstract for:

Oral presentation

General topics:

Fate/Transport (e.g. source identification and quantification)
Risk Assessments and Risk Communication (e.g. public outreach)

Abstract title:

Organic wastewater compounds in public and private drinking water wells impacted by septic systems on Cape Cod, Massachusetts

Full Abstract:

Domestic wastewater contains numerous contaminants that have been linked to endocrine disruption. These compounds are discharged to septic systems through the use of products such as pesticides, plastics, and household products, as well as excretion of pharmaceuticals and endogenous estrogens. Silent Spring Institute has been investigating water contamination issues from wastewater disposal on Cape Cod, Massachusetts, for over 10 years. The shallow aquifers of Cape Cod are particularly vulnerable to contamination from septic systems, the predominant form of wastewater treatment in the region, because of the porous nature of the soils and the close proximity between septic drain fields and groundwater levels. Such contamination is of concern because groundwater is the sole source of drinking water on Cape Cod.

In the first phase of this study, we tested for 92 organic wastewater compounds (OWCs) in samples from 20 public drinking water supply wells and 2 distribution systems throughout Cape Cod that encompassed a range of likely wastewater impacts. OWCs were detected in 15 of 20 wells and both distribution systems. Eighteen OWCs were detected, including 9 pharmaceuticals, 1 insect repellent, 5 organophosphate flame retardants, 2 perfluorinated chemicals and 1 alkylphenol. The most frequently-detected chemicals were sulfamethoxazole (antibiotic) and PFOS (perfluorinated compound in consumer products and used in commercial/industrial applications). For some chemicals, detected concentrations spanned the range of concentrations detected in other U.S. drinking water supplies. In particular, for two pharmaceuticals (sulfamethoxazole and dilantin), the highest concentrations in this study equaled or exceeded the maximum concentrations in previous drinking water studies. Wells with higher nitrate and boron concentrations and more extensive residential development in their recharge areas were generally associated with more frequent detections and higher concentrations of OWCs.

While septic systems were likely the primary source of these contaminants, other sources of groundwater contamination are possible; for instance, elevated concentrations of PFOS and PFOA were present in two wells downgradient of a municipal airport and fire training area. In the second phase of this study, we are testing 20 private drinking water wells for a similar set of OWCs. Private wells may be more vulnerable to wastewater contamination than public wells because they are located in residential areas without large buffer zones to separate them from septic systems or other sources of groundwater pollution. Our results provide some of the first results documenting septic system impacts on drinking water supplies and have implications for wastewater management planning and protection of similarly vulnerable water supplies.

From this presentation, the audience will learn about septic systems as sources of OWCs into groundwater and the potential for using wastewater indicators, such as nitrate, boron, and residential land use density, to identify wells that may be most vulnerable to OWC contamination. This research has implications for wastewater management planning and drinking water protection in communities throughout New England that rely on groundwater as a source of drinking water.