

# *Non-traditional Contaminants And Septic Systems*



## *Maine Center for Disease Control and Prevention*

*An Office of the  
Department of Health and Human Services*

*Paul R. LePage, Governor*

*Mary C. Mayhew, Commissioner*

# *Non-traditional Contaminants And Septic Systems*

## Issues for Discussion

1. What are pharmaceuticals and personal care products?
2. Why are pharmaceuticals and personal care products of concern?
3. What is the relationship between septic systems and pharmaceuticals and personal care products?

# *Non-traditional Contaminants And Septic Systems*

What are pharmaceuticals and personal care products?

PPCPs are any product used by individuals for personal health or cosmetic reasons or used by agribusiness to enhance growth or health of livestock.

PPCPs comprise a diverse collection of thousands of chemical substances, including prescription and over-the-counter drugs, veterinary drugs, fragrances, cleaning agents, and cosmetics.

Studies have shown that pharmaceuticals are present in our nation's waterbodies. Further research suggests that certain drugs may cause ecological harm.

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What are pharmaceuticals and personal care products?

The emphasis on research and documentation of PPCPs has been upon municipal wastewater treatment plants, and their impact upon surface waters via treated discharges.

Maine, being largely rural, has a significant number of households which utilize onsite sewage disposal systems.

These bioactive chemicals (substances that have an effect on living tissue) have been around for decades. Their effect on the environment is now recognized .

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What are pharmaceuticals and personal care products?

The impact of PPCPs from septic systems upon ground and surface waters is an under-examined phenomenon.

The impact of individuals directly contributing to the introduction of chemicals in the environment has been largely unrecognized until the past few years.

PPCPs in the environment illustrate the immediate connection of the actions/activities of individuals with their environment.

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How do PPCPs get into septic systems?

People flush expired prescriptions and OTC medicines down the toilet.

People excrete un-metabolized medications via urine and feces.

Soaps and perfumes, etc. are washed off during bathing and laundry.



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## Transport of PPCPs

Septic systems are not intended to prevent effluent from reaching ground water. They are designed to clean the effluent before it reaches ground water.

Septic systems, much like treatment plants, are good at removing nitrogen, phosphorus, and pathogens. And much like treatment plants, they are poor at removing PPCPs.

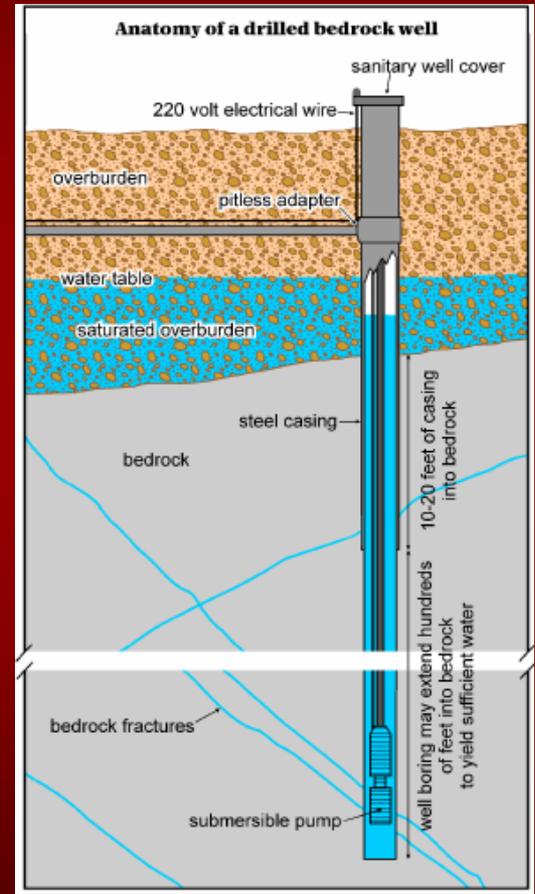
Most PPCPs end up in ground and surface water because the compounds are difficult if not impossible to metabolize. Therefore, they pass through systems relatively unchanged.

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## Transport of PPCPs

Contamination of drilled wells by septic systems generally occurs through poor sealing or broken casing, or through transmission of pollutants through soil and bedrock fractures.

Swan's Island. Nine people contracted HAV and one died in summer of 2009. A laundry room had been separated from the system and was discharging to a hole in the ground. This contaminated the water supply & exposed the occupants to the virus, resulting in the death.



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## Transport of PPCPs

This flow through soils and fractured bedrock also is thought to be the mechanism through which PPCPs are introduced to surface waters by septic systems.

Whereas conventional pollutants are removed in the treatment process, PPCPs remain and are transported by groundwater flow to waterbodies.



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## Transport of PPCPs

The USGS has reported that PPCPs such as steroids, prescription and nonprescription drugs, antibiotics, hormones, and fragrances have been detected in water samples collected from streams that had the potential to receive wastewater from urban sources and from livestock operations.



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## Transport of PPCPs

### **PORTLAND PRESS HERALD**

#### **Product chemicals detected in Sebago Lake**

*By JOHN RICHARDSON, Staff Writer*

**October 8, 2009** Chemicals from pharmaceutical and other consumer products have been found for the first time in Sebago Lake, the source of the Portland area's drinking water.

The trace amounts of a common pain medication, an ingredient in antibacterial soaps and a chemical that prevents carpet stains don't violate any safety standards or pose any known health threat.

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## Transport of PPCPs

To put this into perspective:

- Sebago Lake's watershed is 440 square miles
- Volume is 995 billion gallons
- Detections were low parts per trillion, and were not replicated in later sampling
- Hypothesis: many small discharges from a large number of sources of ibuprofen (painkiller), triclosan (antibacterial agent) and perfluorooctane sulfonate a.k.a Teflon (stain repellent).
- Most likely sources are septic systems.
- Loading rate from the watershed of some tens of pounds of each compound, assuming the lake is well-mixed

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## Transport of PPCPs



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## Maine Case Study: Estrogenic Compound in Water

A large subsurface system had served a jail that was seriously overcrowded, stressing the system.

The jail was closed when a replacement facility was constructed.

The old system was monitored, and high nitrates were found near the system.



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## Maine Case Study: Estrogenic Compound in Water

Monitoring wells near the system were tested, and several PPCP's were found, including some anti-psychotic drugs.

Then other wells were tested and found to contain trace estrogenic compounds (birth control pills).



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## Why Are We Concerned About PPCPs?

The National Institute of Environmental Health Sciences noted in 2007 “although limited scientific information is available on the potential adverse human health effects, concern arises because endocrine disrupting chemicals ... have been shown to have adverse effects in wildlife species, as well as in laboratory animals at low levels.”



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## *Why Are We Concerned About PPCPs?*

*Large quantities of PPCPs can enter the environment after use by individuals or domestic animals via numerous small discharges.*

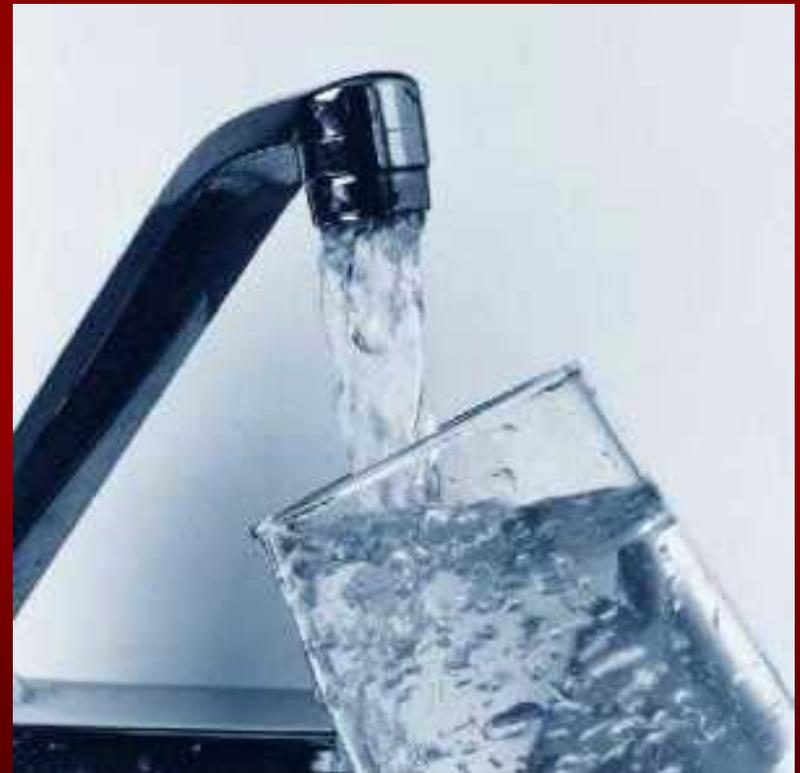
*The risks posed to aquatic organisms and to humans are unknown, largely because the concentrations are so low.*

*While the major concerns have been pathogen resistance to antibiotics and disruption of aquatic endocrine systems by natural and synthetic sex steroids, many other PPCPs have unknown consequences.*

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## Why Are We Concerned About PPCPs?

A 2004 study by USGS and the CDC reported that while concentrations were generally low, organic wastewater-related contaminants such as pharmaceuticals and their metabolites, fragrances and cosmetics can remain in potable water after conventional water treatment processes.



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## Why Are We Concerned About PPCPs?

Effects on aquatic life are a major concern. Exposure risks for aquatic organisms are much larger than those for humans. Aquatic organisms have:

- continual exposures
- bio-accumulation
- multi-generational exposures
- exposure to higher concentrations of PPCPs in untreated water
- possible low dose effects



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## Why Are We Concerned About PPCPs?

Endocrine disruptors such as synthetic estrogen used in oral contraceptives may impact reproduction of aquatic organisms at low concentrations.

Several studies have been conducted that indicate that exposure of fish to synthetic estrogen causes reproductive effects such as changes in sperm density, gonad size, reduced viability of eggs, and male gender reversal.



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## *Why Are We Concerned About PPCPs?*

*There are no confirmed human health effects from such low-level exposures in drinking water, but special scenarios (one example being fetal exposure to low levels of medications that a mother would ordinarily be avoiding) may require more investigation.*

*The number of PPCPs are growing. In addition to antibiotics and steroids, over 100 individual PPCPs have been identified (as of 2007) in environmental samples and drinking water.*

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## *Why Are We Concerned About PPCPs?*

*Research is currently being conducted by various regulatory agencies and academic institutions to evaluate the effect that these compounds have on aquatic organisms, and wildlife that may prey on aquatic organisms.*

*Since complex mixtures of PPCPs may be present in surface waters and sediment, there are currently limited data on direct effects to aquatic organisms from exposure to these mixtures compared to individual components.*

*We simply do not know how damaging these compounds may be, individually or in combination.*

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## Summary

We are in the early exploratory stages in understanding PPCP's.

Testing and interpretation are expensive.

Well designed, installed and maintained septic systems are an essential public health tool, but they can not treat PPCPs any more than a wastewater treatment plant is able to do so.

Improper use and disposal of chemicals can overwhelm a system's ability to treat normal sanitary waste.

The cumulative impact of chemical use may result in effects we can't yet understand or predict.

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## Summary

Consider the Cuyahoga River in Ohio. We knew our rivers were polluted in the 1960s, but it wasn't until this river actually caught fire in 1969 that the nation's attention was focused on river water quality. This event galvanized the movement which led to the Clean Water Act in 1972.

Are we willing to wait for the PPCP version of a burning river before we take action?



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## Links

<http://www.epa.gov/ppcp/>

[http://www.whitehousedrugpolicy.gov/publications/pdf/prescrip\\_disposal.pdf](http://www.whitehousedrugpolicy.gov/publications/pdf/prescrip_disposal.pdf)

<http://www.neiwpsc.org/ppcp/ppcp-concern.asp>

<http://www.mass.gov/dep/toxics/stypes/ppcpedc.htm>

## Bibliography

*Responses to Pharmaceuticals Discharge Question to ACWA, FSTRAC, AND WQSMA,*  
Scott J. Stoner, NYSDEC December 22, 2011

*Contaminants of Emerging Concern from Onsite Septic Systems,*  
Barnstable County Department of Health and Environment, April 2012

*Pharmaceuticals and Personal Care Products In the Environment,*  
The National Association of Clean Water Agencies, November 2005

# Non-traditional Contaminants And Septic Systems

[www.mainepublichealth.gov/septic-systems](http://www.mainepublichealth.gov/septic-systems)

The screenshot shows a web browser window with the address bar displaying [www.maine.gov/dhhs/mecdc/environmental-health/plumb/index.htm](http://www.maine.gov/dhhs/mecdc/environmental-health/plumb/index.htm). The page title is "Subsurface Wastewater Unit, Division of Environmental Health, Maine CDC - Mozilla Firefox". The main content area features the "Maine Subsurface Wastewater Unit" header, a navigation menu, and a search bar. The page includes a sidebar with "Maine Subsurface Wastewater Unit" and "Social Services Help" sections. The main content area contains introductory text about the unit's role in regulating septic systems, a "What's New at the Subsurface Wastewater Unit" section, and a list of links under "On this page:". The footer of the browser window shows the Windows taskbar with the date "Tues 3 Jan 2012" and time "8:21 AM".

**Maine Subsurface Wastewater Unit**

Maine is a predominantly rural state, and relies heavily on decentralized sewage disposal facilities for disposal of human waste, i.e., septic systems. The State of Maine has regulated septic systems since 1926, to varying degrees. Over the years, the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules (Rules) in their various versions have been administered by the Maine Center for Disease Control and Prevention (MeCDC) and its predecessors.

The MeCDC has been and continues to be responsible for the Rules because they have historically been viewed as a public health code, rather than an environmental regulation.

The Subsurface Wastewater Unit, within the MeCDC's Division of Environmental Health, promulgates and administers the Rules. Our mission is to minimize health and safety hazards associated with improperly installed subsurface waste water disposal systems.

**What's New at the Subsurface Wastewater Unit**

**On this page:**

- [Family Burying Grounds](#)
- [Health Inspection Program Holding Tank Policy](#)
- [Fillable Online HHE-200 Page One Available](#)
- [Recently Approved Products](#)
- [Elimination of Permit Labels](#)

**Featured Links**

- [Online Rules](#)
- [Variances](#)
- [Site Evaluator Licensing](#)
- [Frequently Asked Questions](#)
- [Ten Tips for Systems](#)
- [Cemeteries and Crematoria](#)
- [Certifications](#)
- [Public Swimming Pools](#)
- [2001 DHS & DEP Programs Review](#)

**Online Services**

- [Publications Order Form](#)
- [Record Search Form](#)
- [Water Records](#)

# *Non-traditional Contaminants And Septic Systems*

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