

Conventional Septic Systems Effectively Remove Chemicals from Waste Water

What's in our waste water? And is it removed by conventional waste water treatment?

Those were two questions addressed in a comprehensive study at Colorado School of Mines by researchers in the school's Small Flows Program. Dr. Robert Siegrist presented the study at a recent meeting of the Montana and Wyoming environmental health associations.

In the past, Siegrist said, waste water treatment systems were mostly focused on the treatment of organic matter, suspended solids, nutrients and pathogens. But today systems may have to treat contaminants of emerging concern, including endocrine-disrupting compounds, pharmaceutically-active compounds and antimicrobial agents.

Because of the adverse health effects of even trace amounts of these compounds, keeping them out of our ground water is a major concern. The sources of these trace organic compounds are pharmaceuticals and personal care products (PPCPs), foods and consumer products, and human biogenic compounds. They can and do enter our water resources through incomplete removal and discharge from waste water treatment systems.

According to Siegrist, trace organic compounds (TOrcs) are present in municipal wastewaters and are capable of persisting through centralized treatment plants. Endocrine disruption has been observed in aquatic organisms downstream of such treatment plants in many towns in the U.S.

But little is known about the occurrence and fate of TOrcs in common onsite waste water treatment systems. Since 25 million septic systems already exist in the U.S., with thousands more being installed daily, research into their efficacy at treating these compounds is sorely needed.

Field Monitoring of Waste Water

The research began by monitoring waste water quality at 30 existing onsite systems in Colorado. Monitoring was done at residential, commercial, and institutional sites to determine TOrcs occurrence as a function of source type.

Twenty two different TOrcs were detected in the wastewater going into the septic tank (influent). Four compounds were present in 100 percent of the samples: caffeine, coprostanol, cholesterol and EDTA. A variety of compounds derived from sources such as disinfectants, antimicrobial agents, surfactant metabolites and metal chelating agents were found in more than two-thirds of the samples.

The study found that anaerobic treatment within the septic tank removes about 20 percent of the TOrcs, but that the majority of the compounds pass through the tank into the drain field for further treatment.

Field Research at Drain Filed Test Site

Researchers analyzed effluent from an 8-unit apartment building using a system installed in 1998 in which raw waste water passes through two 1,250 gallon tanks in series before going into a sewer line. Effluent was taken from the second tank to a holding basin.

From the holding basin, the effluent took two different paths to a specially constructed, divided drain field in a sandy loam soil: Half of the liquid went straight into one part of the drain field via a distribution box, and the other half went through a textile biofilter before entering the second part of the drain field.

Probes were set up under each side of the drain field to monitor effluent at 2 feet, 4 feet and 8 feet below the drain field. Percent removals were calculated under a variety of variables.

A summary of the results shows that more than 90 percent of the target compounds from septic tank effluent were removed through 8 feet of soil, with many of the compounds completely removed through 2 feet of soil. A notable exception was nonylphenol, a surfactant metabolite, which actually increased in the shallow soil layers and had negligible removal overall.

The almost complete removal of target compounds was similar for both effluent types and at different concentration levels.

The Bottom Line

This initial study of effluent treatment in conventional drain fields suggests, according to Siegrist, that conventional, onsite waste water treatment systems provide comparable, and in some cases, better treatment than centralized waste water treatment plants.

That's comforting news for folks in Ravalli County, where we have more than 17,000 septic systems. But it doesn't change the fact that individual septic systems need to be installed correctly and maintained and monitored in order to continue to work properly.

What Can We Do to Help Keep Our Water Safe?

Prevention is still the best strategy for reducing contamination. Minimize the use overuse and misuse of drugs and return unused medications to pharmacies, rather than dumping them down the drain or flushing them down a toilet.

Here in the Bitterroot, three pharmacies – Bitterroot Drug in Hamilton, Family Pharmacy in Stevensville and Florence Pharmacy in Florence – accept unused pharmaceuticals. The drugs are taken to Marcus Daly Memorial Hospital, where they are safely and properly disposed of.

Lotions, sunscreen, shampoo and perfume all wash off easily when we shower and bathe. Such chemicals also end up in our water supply, and little is known about what effect they may have.

We encourage people to make conscientious choices to buy products that contain only biodegradable or natural ingredients. We also suggest people avoid purchasing products labeled "antibacterial" to lessen the likelihood of resistant microorganisms increasing in the environment.

Other strategies include installing NSF-certified home water treatment systems which can provide additional protection against common contaminants found in drinking water, including arsenic, cysts and pesticides, as well as reduce chemicals such as chlorine. While not specifically certified to reduce pharmaceuticals at this time, these products may be helpful in reducing many impurities.

Personal Responsibility

We also encourage every person to take an informed and active role in assessing and protecting their family's drinking water.

Knowing the source of your drinking water is a good place to start. Is your well at least 100 feet from your septic system? How deep is it? Are there any likely contaminants, like pesticides or other chemicals that might be getting into your groundwater? If you're not sure, or if your water tastes bad, you probably should have your drinking water tested.

The most common tests are for nitrates and/or bacteria, but more extensive (and expensive!) tests may be done for specific chemicals. The RCEH Department has sampling kits from local and regional labs available for the public.

It's also important to know the location and function of your septic system. We can't stress enough the need for regular septic pumping, evaluation and maintenance. As Siegrist's study indicates, properly installed and maintained wastewater treatment systems do a good job of treating human waste.

For more information regarding Siegrist's study – Occurrence and Fate of Endocrine Disrupting Compounds and Trace Organic Chemicals in Onsite Wastewater Systems – go to the Small Flows Program Web site -- <http://smallflows.mines.edu/>.

In order to help citizens understand more clearly many of the environmental health issues in Ravalli County and the role of the Environmental Health Department in addressing these issues, our department runs a series newspaper articles titled "Environmental Health Talk."

In this ongoing series we hope to help raise the community's awareness of issues such as air and water quality and give readers useful tips on topics like recycling, collecting and disposing of hazardous materials and maintaining septic systems, just to name a few. To this end, we welcome public comment. If there's an environmental health issue you'd like us to address, write call or email the department: RCEH, c/o "EnviroHealth Talk," 215 South 4th St, Suite D, Hamilton MT 59840. Phone: 375-6571. Email: rdaniel@ravallicounty.mt.gov