

FAQs About PPCPs: Montana Focus

FAQs:

What are PPCPs?

Pharmaceuticals and Personal Care Products (PPCPs) comprise a broad, diverse collection of thousands of chemical substances found in everyday products, such as prescriptions, veterinary supplies, over-the-counter (OTC) medications, cosmetics, fragrances, lotions, and household and industrial chemicals. Since its introduction in 1999, the acronym PPCPs has become the most frequently adopted term for describing these chemicals in both the technical and popular literature, and is a useful keyword for performing literature searches.

What is the overall scientific concern?

A number of studies conducted over the past several years have shown that trace amounts of pharmaceuticals and personal care products are present in environmental water supplies, including lakes, rivers, streams, and ground water. The impacts to aquatic organisms and drinking water sources are of special concern.

What are major sources of PPCPs in the environment?

Human activities! Because water is continuously 'recycled', any time it comes in contact with PPCP substances there is a high probability that they will mix. These instances include:

- Any activity where man-made products come into contact with water, such as: bathing (shampoos, soaps, conditioners), shaving, detergent use in washing machines, sunscreens from swimming, etc.
- Human use of medications, illicit drugs, and OTC products; what isn't used by your body goes into the water.
- Disposal of unused/expired medications, OTC products, and cleaning products down the drain or in landfills.
- Veterinary drug use, especially antibiotics and steroids.
- Agribusiness, especially where large quantities of waste are produced in concert with animal medications and supplements.
- Residues from pharmaceutical manufacturing (regulated and controlled).
- Residues from hospitals and other care facilities.

PPCPs enter the environment by many routes, but even actions as simple as wearing lotion or taking medication can affect the environment in which you live. Importantly, most water treatment systems (municipal or individual septic systems) are not designed to treat PPCPs.

Should we be worried about human health?

These chemicals have been detected at extremely low concentrations; as detection technology becomes more sophisticated it is likely that more PPCPs will be detected. To date, research throughout the world has not demonstrated an impact on human health at the

trace levels at which these chemicals have been found. Researchers do not yet know the extent to which risks might exist from decades of persistent exposure to minuscule levels of bioactive chemical substances in potable water.

The majority of testing conducted is research oriented. While researchers continue to study the issue, there is no information that suggests that people should have concerns regarding the benefits of drinking water, which far outweighs any potential risks associated with consuming extremely low levels of PPCPs.

What are the major issues with respect to effects?

Studies in aquatic environments with a significant percentage of wastewater have shown impacts that can likely be attributed to PPCPs, such as fishes with both male and female reproductive organs and changes in ratios of male and female fish populations.

Why aren't PPCP being removed from water and wastewater?

Some PPCPs are removed through treatment processes, but this is an emerging issue and historically has not been a concern.

Further research is needed in the wastewater industry to explore treatment technologies. These technologies could be utilized to remove PPCPs from waste streams entering the waterways across the nation.

The drinking water industry also continues to study treatment options for removing these substances from source water. No single treatment option is likely to address all contaminants present, so any final movement towards new treatment technologies will likely be complex. This once again points to the most desired action, pursuing programs aimed at preventing PPCPs from entering source water.

Where are PPCPs found in the environment?

PPCPs are found where people use and dispose of personal care products. Because water is continuously 'recycled,' PPCPs can be found in water bodies influenced by raw or treated sewage, including rivers, streams, ground water, coastal marine environments, and many drinking water sources. PPCPs dissolve easily, don't evaporate at normal temperature and pressures, and can also attach to solid substances such as soils and rocks. Practices like the use of sewage sludge ("biosolids") and reclaimed water for irrigation brings PPCPs into contact with the soil. Across the nation, PPCPs have been identified in most places sampled.

What has been found in Montana?

A University of Montana study detected PPCPs in shallow ground water at Frenchtown and Missoula. Separate studies in the Helena Valley, focusing on domestic wells and later Prickly Pear Creek, identified the presence of PPCPs. A study targeting agricultural sources in the Gallatin Valley is underway, and, as yet, has not detected PPCPs in surface waters or

streambed sediments. The only statewide study thus far is being led by the Montana Bureau of Mines and Geology to look for veterinary pharmaceuticals in ground water.

Are there regulatory standards for PPCPs?

- **No.** At this time, regulatory standards have not been promulgated for most, if any PPCPs. The issue of PPCPs in water is an emerging concern, and actions may be taken to develop regulatory standards in the future.
- Below is a link to DEQ's Circular DEQ-7 Montana Numeric Water Quality Standards, which includes a table of established water quality standards:

<http://deq.mt.gov/wqinfo/Standards/CompiledDEQ-7.pdf>

How is the disposal of unused pharmaceuticals regulated?

Residential disposal of unused pharmaceuticals is not regulated. Other entities, including pharmacies, hospitals, and industry, are regulated by the Resource Conservation and Recovery Act (RCRA). RCRA regulates the management and disposal of hazardous pharmaceutical wastes. Under RCRA, a waste is considered hazardous if it is a "Listed" hazardous waste, or if it displays one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity.

How do I properly dispose of unwanted pharmaceuticals?

Don't flush unwanted or expired drugs down the drain! For a long time, many of us have been told to flush drugs down the sink or toilet to prevent unintentional ingestion by children or pets; however, PPCPs are showing up in our water supplies. A recent study in the Helena Valley (Miller and Meek, 2005) found PPCPs in 32 of the 35 water wells tested.

Although not an ideal solution, disposal of PPCPs in a landfill (most of which are lined and regulated) is a more environmentally friendly means of disposal than flushing. *Please evaluate whether the following options will work for you:*

- Remove the drugs from their container and mix them in a plastic bag or other resealable container with an undesirable substance (kitty litter, coffee grounds, dirt, etc), and throw it into the trash.
- Keep drugs in their original container, scratch out personal information, add some water and undesirable substance to the container, close the container, wrap it in duct tape, and throw it into the trash.
- Check to see if your pharmacy has a drug "take back" program.
- As a rule, try to only purchase the quantity of drugs or products that you will use. Also, make sure to take your full course of drugs, which is especially true for antibiotics. It is better not to have to dispose of the drugs at all.
- Follow any specific disposal instructions associated with your prescription.

What can I do to prevent PPCPs from contaminating water?

- Take all medications.
- Don't buy more medications or products than you need.
- Don't dispose of expired/unwanted medications down the drain (*see above*).
- Reconsider using "antimicrobial" soaps and other products that contain antibiotics or metals. Most of the additives take time to act on microbes, and are likely running down the drain before they have any effectiveness. Soaps and detergents have inherent anti bacterial properties.
- If you're looking for cleaning products that kill bacteria, opt for products that include alcohol, bleach, hydrogen peroxide, or ammonia rather than antibiotics.
- Consider purchasing personal care products that are entirely plant-based, unscented, dye free, and phosphate free. The more "natural" a product is, the more likely it will degrade in the environment.
- Consider purchasing organic or "free range" meat, eggs, and dairy products, which are less likely to contribute veterinary waste to the environment than conventional products.
- Women on birth control pills may be interested to know that synthetic estrogens are one of the more common PPCPs found in water. If this concerns you, you may want to discuss other birth control alternatives with your care provider.

In what quantities are PPCPs used or introduced to the environment? What does "parts per trillion" mean?

The Environmental Protection Agency (EPA) states: *"As a whole, PPCPs are produced and used in large quantities. Personal care products tend to be made in extremely large quantities – thousands of tons per year. But quantities of production or consumption do not correspond with the quantities of PPCPs introduced to the environment. PPCPs manufactured in large quantities may not be found in the environment if they are easily broken down and processed by the human body or degrade quickly. PPCPs made in small quantities could be overrepresented in the environment if they are not easily broken down and processed by the human body and make their way into domestic sewers."*

Although PPCPs are used in large quantities, the concentrations of PPCPs currently being found in water supplies are very small. The laboratory tests for these compounds typically report PPCP concentrations in "**parts per trillion**" (which is the same as "nanograms per liter"). One part per trillion is equivalent to 1 drop in 20 Olympic pools that are 2 meters deep, or 1 second in 31,700 years.

It is important to keep in mind that although the PPCPs are showing up in very small concentrations, scientists and regulators do not yet understand whether or not these compounds might have adverse human health effects, either singly or in a mix. Remember, many PPCPs are products that have been approved for use in or on our bodies in much higher concentrations than are being found in the environment; however, common sense tells us it's better to not have PPCPs in our water, and we should be doing all we can to prevent PPCP contamination.

Where can I find more information on PPCPs?

- Montana-specific information:

- Montana Water News, Special Issue: '[Pharmaceuticals In Montana's Water](#),' March 2008. This includes information on recent PPCP studies in the state.
- DEQ and DPHHS web links.
- Federal Information Sources:
 - EPA's PPCPs '[Related Links](#)' site. This contains information on pharmaceutical databases, veterinary medicine, PPCP monitoring programs, government regulatory bodies, and much more.
 - U.S. Geological Survey's (USGS) '[Toxic Substances Hydrology Program](#).' This site provides information on their PPCP research to evaluate the potential threat to environmental and human health.
 - Office of National Drug Control Policy, [Proper Disposal of Prescription Drugs](#). This is the official guidance in effect when local programs are not in place.
- Other:
 - [Teleosis Institute](#), a nonprofit dedicated to reducing the environmental impacts of health care. This site has information on the Green Pharmacy Program, a local drug take back program initiated in the San Francisco area.

Can I get my water tested for PPCPs? How are PPCPs tested?

- Very few laboratories in the world analyze for PPCPs, and the cost for analyzing one sample can be as high as approximately **\$1,000**.
- Before you decide to test your water for PPCPs, please consider the following:
 - PPCP analyses can detect chemicals in the parts per trillion range. Therefore, extreme care must be taken during sample collection and handling to prevent potential contamination.
 - DEQ recommends hiring a qualified environmental professional to collect any PPCP samples, because of the cost of the sample and special handling and sample preservation requirements.
 - Proper water sampling can require purging of your water supply system and cleaning of the fixture from which the sample is collected.
 - How will you evaluate the sample results? Currently, there are no regulatory standards for most PPCPs. Therefore, if an analysis finds PPCPs in your water, there are probably no water quality standards to compare against.

- Link to USGS protocol for PPCP sampling:

http://water.usgs.gov/owq/FieldManual/chapter5/5.6.1.F_v-1.1_4-03.pdf

FOR MORE INFO ABOUT SPECIFIC LABS...

- Columbia Analytical Services, Washington:

<http://www.caslab.com/ppcp.php>

- Axys Analytica, Wisconsin:

<http://www.axysanalytical.com>

- Montana State University Agricultural Experimental Analytical Laboratory:

<http://ag.montana.edu/analyticalab/>

What about home treatment systems to remove PPCPs from my water? Is bottled water more likely to be free of PPCPs?

A number of home water treatment options are available that may remove some PPCPs from water. It is important to realize that not all treatment methods are likely to be effective at removing all PPCPs. Proper maintenance of any system is critical to maintain effectiveness!

- Carbon filters (in-flow or counter-top): Carbon filters likely remove some PPCPs. Change filters regularly to maintain effectiveness and prevent bacterial growth.
- Reverse osmosis (RO): Probably the best at removing PPCPs from water. Also helps remove salts, metals, and other hard-water concerns. Brine from the RO system is generally disposed down a drain, so although you won't be drinking the PPCPs they are still circulating in the environment.
- Water softeners: Not thought to have an effect on PPCPs.
- Bottled water: Unless the bottled water is distilled or treated with reverse osmosis, it is not necessarily free of PPCPs. Bottled water companies are not required to test for PPCPs.

You must evaluate the cost-benefit regarding water treatment.

Who can I contact for more information?

Joe Meek
Source Water Protection Program
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
Ph: (406) 444-4806 Fax: (406) 444-6836
jmeek@mt.gov

Laura Alvey
Ground Water Remediation Program
Montana Department of Environmental Quality
PO Box 200901, Helena MT 59620
Ph: (406) 841-5062 Fax: (406) 841-5050
lalvey@mt.gov

Jon Dilliard
Public Water Supply and Subdivision Bureau

Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
Ph: (406) 444-2409 Fax: (406) 444-1374
jdilliard@mt.gov

Mary Simmons
Environmental Health Section Supervisor
Laboratory Services Bureau
P.O. Box 6489
Helena, MT 59604
Ph: (406) 444-9777 Fax: (406) 444-1802
msimmons@mt.gov