

Emerging Pollutants of Concern

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There is a new group of chemicals that operators should be aware that have the potential to be included in future NPDES permit conditions. These chemicals are generally referred to as “contaminants of emerging concern” (CECs). You may have heard of them as pharmaceuticals and personal care products (PPCPs), steroids and hormones. These contaminants have been measured in receiving streams and WWTF effluents. Research has suggested that some of these contaminants may cause ecological harm. The EPA website indicates that to date, no evidence has been found of human health effects from PPCPs in the environment.

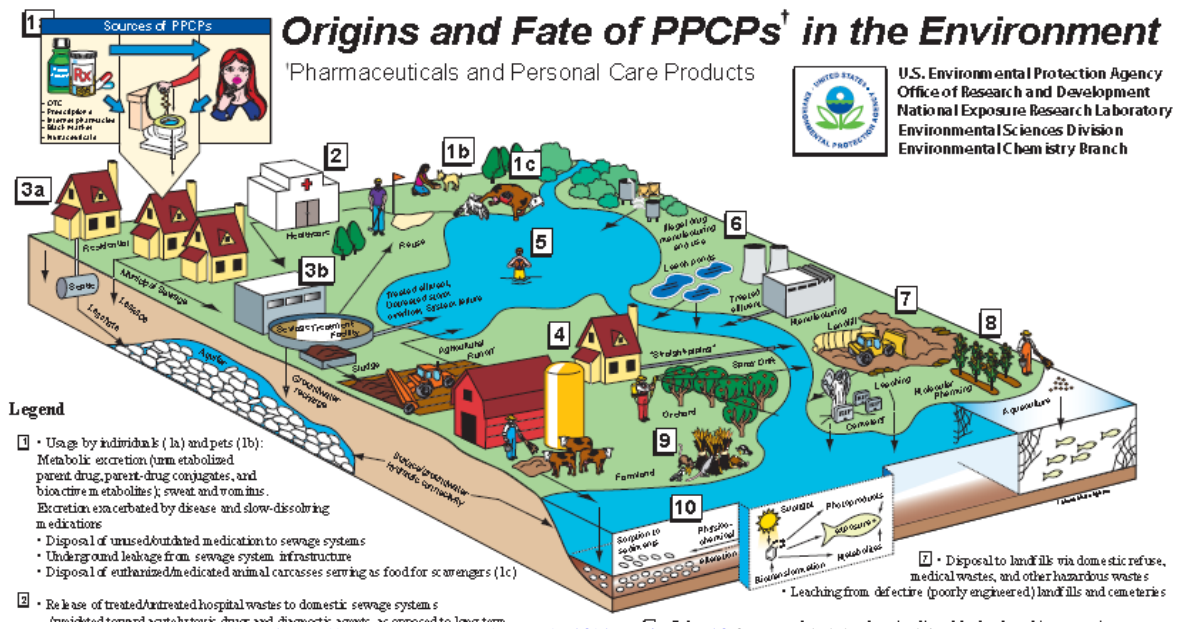
These pollutants, among others, are being investigated by EPA* in an orderly manner:

1. Strengthening scientific knowledge
2. Improving public understanding
3. Building partnerships for stewardship
4. Taking regulatory action when appropriate

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

Where do these pollutants come from? EPA has listed several sources:

- Human activity (washing, primping, and playing)
- Illicit drugs
- Veterinary drug use, especially antibiotics and steroids
- Commercial agriculture
- Residues from pharmaceutical manufacturing
- Residues from hospitals



See <http://www.epa.gov/ppcp/pdf/drawing.pdf> for readable graphic

As has been the case in the past, EPA generally has approached new limits such as these with a progressive escalation of enforcement. First a wastewater facility may be required to monitor or “report” these pollutants in their permit. Then when there is enough test information to make an informed decision, EPA can act on whether your effluent has reasonable potential to cause water quality violations.

Testing methods

The EPA has developed two new state-of-the-art analytical methods to identify and measure certain contaminants of emerging concern, specifically; pharmaceuticals and, steroids and hormones in sewage influent, effluent and sludge.

1694 Pharmaceuticals and Personal Care Products in Water, Soil, Sediment, and Biosolids by HPLC/MS/MS

1698 Steroids and Hormones in Water, Soil, Sediment, and Biosolids by HRGC/HRMS

These methods currently cover over 100 chemicals, (74 pharmaceuticals and personal care products and 27 steroids-hormones) for your influent, effluent and sludge samples.

It may not be necessary to test for all 74 PCPP’s and 27 steroids/hormones. In fact, a subset of 10 to 15 is suggested by EPA as being more representative for wastewater effluents for screening purposes.

These tests are new and most laboratories are not set up to run them yet, so there is a limited amount of information available. The cost is approximately \$1,200 to \$1,400 per sample per method. Certainly this would be a big impact to your budget since it may be an unplanned expense.

The following Tables 1 and 2 describe the method, the type of container, preservation and holding times. The practical quantitation limit is also shown for both methods.

Table 1 - Methods, Containers, Preservation, and Holding Times

Method: Parameter	Matrix	Container	Preservation	Holding Time
1694: PPCPs	Aqueous	1 liter amber glass, Teflon lid	Cool to 4°C	2-7 days
1698: Steroids/Hormones	Aqueous	1 liter amber glass, Teflon lid	Cool to 4°C	2-7 days
1694: PPCPs	Biosolid	8 oz. glass, Teflon lid	Freeze	2-7 days
1698: Steroids/Hormones	Biosolid	8 oz. glass, Teflon lid	Freeze	2-7 days

Table 2 - Analytical Methods and Practical Quantitation Limits

Method: Parameter	Matrix	Practical Quantitation Limits
1694: PPCPs	Aqueous	2-10 ng/L (PPT)
1698: Steroids/Hormones	Aqueous	2-10 ng/L (PPT)
1694: PPCPs	Biosolid	0.1-100 µg/Kg (PPB)
1698: Steroids/Hormones	Biosolid	0.1-100 µg/Kg (PPB)

The good news is that EPA has performed a literature review of the capability of existing wastewater treatment unit processes to remove some of these types of pollutants. Activated sludge has some success in removing some of the pollutants, with a typical range of 20 to 80% removal rate taken from the database of information available. Table 3 shows the list of CEC's with the highest average removal rates using activated sludge as the unit process.

Table 3 - Top 10 CEC Removal Rate Estimates using Activated Sludge

Contaminant of Emerging Concern	Activated Sludge Removal Average (%)
Cephalexin	100
Estriol	99
Fenoprofen	99
Nalidixic Acid	98
Cefaclor	97
Sulfadiazine	97
Thymol	98
Amoxicillin	94
Ofloxacin	85
Celestolide	80
Monensin	80
Traseolide	80
Estrogenic Activity	82

This subject will be of concern as WWTF's are upgraded for the next twenty year period and into the future. You can find more on this subject on the EPA web site for CEC's at:

<http://water.epa.gov/scitech/swguidance/ppcp/results.cfm>.