What goes down the drain, from ibuprofen to soaps, gets turned out to pasture via toxic sludge, researchers warn

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What goes down the drain -- detergents, personal-care products and discarded and excreted medications -- may be out of sight and out of mind, but they are not, unfortunately, out of this world.

Significant amounts of toxic chemicals from households persist in the environment because they end up in sewage sludge. Though pathogens are removed in wastewater treatment plants, no treatment is required to address some of the most abundant chemical contaminants that originate in the home. So sludge and sludge-rich composts, often containing toxic chemicals, are commonly applied to farmland, parks, forests and yards.

Take ibuprofen (its many trade names include Advil and Motrin), for example, the third most consumed drug in the world. Wastewater treatment plants remove 60 to 90 percent of it, but that's not enough, warns a Cornell researcher.

"Given the volume that is consumed, a lot still goes out to the environment," says Anthony G. Hay, Cornell associate professor of microbiology and director of Cornell's Institute for Comparative and Environmental Toxicology. He studies how ibuprofen and other chemicals present in sewage sludge are degraded by microorganisms.

"Even low concentrations of ibuprofen have been found to affect the way fish spawn, so we don't want it accumulating in the environment,"

says Hay. "Understanding the biological fate is very important for being able to predict the potential for toxicity of compounds. In the case of ibuprofen, we were able to show that it can be degraded to nontoxic intermediates."

Since legislation prohibits dumping sewage sludge in the ocean, most of it in this country is applied to soil for its nutrients and to improve the physical properties of the soil, which is often cheaper than landfill or incineration.

"However, there are no requirements in the U.S. to test for or remediate organic pollutants in sewage sludges, and sludges contain a wide variety of these contaminants that conventional treatment does not eliminate," adds Ellen Z. Harrison, who served as director of Cornell's Waste Management Institute for many years until her recently announced retirement.

Gardeners may unknowingly use sludge-based products, such as free compost, because labeling is not mandated. Some products even use the term "organic" on their labels, says Harrison.

To make matters even more complex, Hay adds, "Most wastewater treatment plants were designed to target industrial pollutants. There are no requirements for monitoring chemicals from personal-care products, pharmaceutical compounds or antibiotics. We are interested in knowing what compounds are out there and if biodegradation is making these things less toxic or more toxic."

While looking at sludge, Hay's research team found high levels of compounds commonly used in detergents such as alkylphenol ethoxylates that "get more toxic as they degrade, becoming persistent compounds that mimic estrogen," says Hay. "The concentrations being reported in the environment are below levels of concern for most

humans but are high enough to affect fish populations by changing sex ratios, resulting in fewer males. The question is, what is the long-term effect on populations? We don't really know."

Working with graduate student Abbie Wise Porter, Hay found alkylphenol in sludges from Syracuse, Cortland, Ithaca and Cayuga Heights at levels that were five times higher than most other places that had been studied. This suggested that the sludges had about 15-40 times more estrogen activity than dairy cow manure, which is considered to have high estrogen levels due to lactating cows, says Hay.

In addition, Porter found triclosan, a widely used biocide (used to kill bacteria), in all of the sludges at quite high concentrations. "Triclosan is coming from the antibacterial hand soaps, deodorants, toothpastes and many other personal-care products," says Hay. "There are more and more reports of triclosan in environmental samples ... in fish, and in high concentrations in breast milk. Triclosan is not all that effective in these products, but it is still being marketed to the public to quell their fears about microbes. Unfortunately, triclosan inhibits our ability to eliminate other pollutants from our body so it may be doing more harm than good."

So what are consumers to do?

"Not buying anti-bacterial hands soaps would be a good first step since regular soaps are just as effective," says Hay. "With respect to the other pollutants we detected, people can select fragrance-free products when possible and look for products that are labeled as biodegradable."

Harrison adds that, at the legislative level, banning the use of certain toxic chemicals such as the most toxic brominated flame retardant -- which is banned in California -- would be appropriate.

Also, people should find out where the sludge from their local treatment plants goes, and make sure it is not used at schools or parks, says Harrison. "When they obtain compost or soil amendments for their yards, they should find out whether they contain sewage sludge. And of course, they should try to use products that don't contain toxic chemicals and should not flush unwanted chemicals or pharmaceuticals down the drain."

More suggestions about environmentally friendly products can be found at www.fingerlakesbuygreen.org/ .

Source: Cornell University