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What Goes Down the Drain May End Up On Your Plate — Your Right to Know

Photo Courtesy of Sewage Sludge Action Network

Sewage Sludge Action Network persuaded the Snow Camp, North Carolina City Council to stop Synagro Company from spreading toxic sewage sludge on this field located across the street from the Sylvan Elementary School.

National Equal Justice Association (NEJA) representatives met environmental activist Darlene Schanfeld, Ph.D., at the 2018 International Soil Not Oil Conference, where she led a workshop on the problem of sewage waste. Schanfeld has been an environmental activist for over three decades, fighting to change government policy on sewage waste since 2000. She is a member of Sierra Club Wastewater Residuals National Grassroots Team. She is also founder and lead organizer of the Club's Sewage Sludge Free WA (North Olympia Chapter) and serves as a consultant on this issue with other environmental organizations. Sewage Sludge Free WA is fighting to protect soil, rivers, oceans and human health by increasing environmental regulations to stop municipal use of toxic and pathogen-laden sewage sludge and effluents (processed sewage water) as compost, fertilizer, agricultural irrigation ingredients, and even in households, which causes major health and environmental problems locally, regionally, nationally and internationally.

By Darlene Schanfeld, Ph.D.

Beer served with sewage effluent. Fish and shellfish served with plastics, PCBs and flame retardants. Soybeans with medications and antimicrobial chemicals, and maybe a bit of Prozac. Vegetables with pharmaceuticals. Commercial compost with sewage solids.

From Prozac to caffeine to cholesterol medicine, from ibuprofen to bug spray, researchers have found an alphabet soup of drugs and personalcare products in sewage-processed wastewater.[1] After any level of processing, the sewage solids and effluent residuals end up in the soils of farms and forests, in food and beverages, and in the habitat and tissues of marine life. Hike through some forests and you might observe forest soils covered with the sludge flowing into nearby creeks.

How?!!

Thousands of municipal wastewater treatment plants (WWTPs) line shores throughout the U.S., and more if we count those facilities of Canada that share water bodies with the U.S. Anything that goes down the drain from households, businesses, medical facil-

ities, and industry ends up in these plants. Added to this can be septage full of pharmaceutical and personal care products (PPCP) and toilet, dishwashing and clothes washing machine dirty waters.

Over 80,000 chemicals and a list of pathogens create sewage processing plants' toxic brews. Additionally, when a pollutant is dissolved, the remaining chemicals can be more toxic than the pollutant.. These are unknown, as they are chemical combinations synergistically created while in the brews.

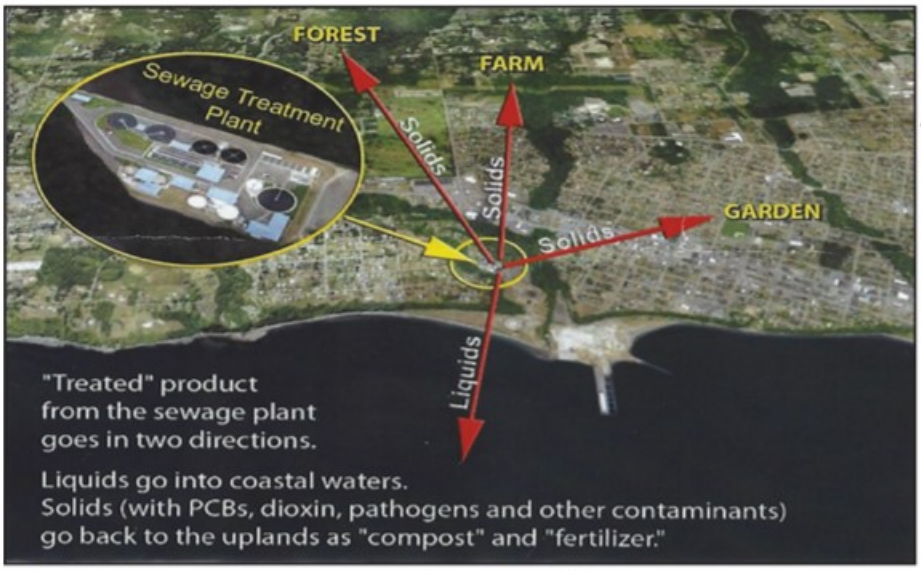

Photo Courtesy of Darlene Schanfeld

Municipal Wastewater Treatment Plants (MWTPs) generate sewage sludge, the solid, semisolid or liquid residue created during sewage treatment, which often contains toxins and plastics and yet is used as fertilizer or compost or discharged into rivers, streams and oceans.

Some municipalities dump all their sewage into water bodies without any level of treatment. All dump their "treated effluent" into water bodies. There are primary, secondary and tertiary levels of treatment, the latter treating the effluent to a higher standard to lessen effluent pathogens to the U.S. Environmental Protection Agency (EPA) approved levels. However, this is based on trust, as once a tertiary plant's periodic permit is approved, there is no oversight, and there have been instances of not meeting the "approved level." Further, cleaner effluent results in more heavily-toxic solids. Land-applied sewage sludge may not stay put. Wind and fog carry sewage particles elsewhere. Rain means storm water runoff. These solids move to unintended properties and to anyone downwind to breathe the toxic particles, and into marine ecosystems.

Biosolids

Sewage sludge is defined as the solid, semisolid or liquid residue generated during the treatment of domestic sewage. When sludge materials go through additional processing steps and treatment to meet EPA standards for land application, they are referred to as "biosolids" (a term created by the EPA and a public relations firm to whitewash that it is sewage). Treatment is used to reduce the concentration of disease-causing pathogens. If the resulting product meets regulatory standards, the product can be used for agriculture (farms and forests) and residential soil fertilization. These products can be accessed in large loads from treatment plants or commercially bagged from garden shops selling compost. Labeling is only required for nine heavy metals, phosphorus, and nitrogen. Nothing more.

Recorded usage of sewage sludge through 2016 from major facilities - those that treat one million or more gallons of sewage per day - are as follows: 47% are land applied, 15% incinerated, 6% landfilled, and 32% either injected into wells, used for cement kiln energy, gas production, or landfill cover. Unaccounted for are the wastes from communities that generate smaller daily loads but recycle in some of the same ways. EPA's Office of Inspector General (OIG) reports that one state it interviewed tracks where the sewage sludge is applied; in other states, the applier or generator tracks. EPA, however, only records where the material is generated.[2]

Scientists find that:

• Between 107,000-730,000 tons of microplastics, particles smaller than five millimeters, are annually spread over Europe and North American farmlands. A major source is from treated sewage.

• In 2017, Australia produced 327,000 tons of dry biosolids containing microplastics.

• 75% was used in agriculture.[3] Even without accounting for runoff into water bodies where these are found, and in the deepest ocean and oceans worldwide, this problem escalates significantly because these wastes are spread in forests and parks and are sold to home gardeners.

Recently, PFOA (perfluorooctanoic acid), a compound used for products that resist: sticking, heat, water, stains, paints, and grease (e.g., Teflon and Scotchgard) have become newsworthy. PFAS is a family of nearly 5,000 synthetic chemicals (including PFOA) that are extremely persistent in the environment and in our bodies and food. These are found in human blood samples and water bodies, and can lead to kidney cancer and chronic liver disease, and to diseases in the liver, thyroid, and immune system. These have been recently found in Maine's farm soils fertilized with sewage sludge.[4a] The U.S. Food and Drug Administration confirmed that PFOA chemicals have made their way into the US food supply.[4b]

Photo Courtesy of Turtle Valley Sludge Free

Internationally, residents are protesting the spread of biosolid sludge onto agricultural and ranchlands.

As to the cleanliness of the effluent (processed sewage water), which also contains many if not most of the same pollutants as the processed sludge, it is important to note that "cleaner" does not mean clean. Many states allow the effluent to be spread on crop and grazing lands. Effluent is also used to "enhance" aquifer levels, spread on recreational lands, emitted into wetlands, and in many communities, allowed as potable water, including for production of beer.

How has this come to be, you might ask?

The Clean Water Act §405(d) sets the framework for sewage sludge regulations. In 1993, management of sewage sludge, including limits for pollutants in landapplied sludge, was brought under the 40 CFR Part 503 rule, Standards for the Use or Disposal of Sewage Sludge (Biosolids Rule) and the National Pollutant Discharge Elimination System (NPDES) permit program.[5]

This rule established standards consisting of general requirements, pollutant limits, management practices, and operational standards for the final use or disposal of sludge generated during domestic sewage treatment, for the purpose of protecting public health and the environment from certain pollutants and any reasonably anticipated adverse effect. Unlike other waste materials, sludge applied to land in accordance with the Biosolids Rule is a federally permitted release under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The rule applies to any person or entity who prepares sewage sludge, applies sewage sludge to the land, fires sewage sludge in a sewage sludge incinerator, owns/operates a surface disposal site, or emits exit gas from a sewage sludge incinerator stack. It establishes a ceiling concentration for the regulated pollutants and limits for cumulative and annual pollutant loading rates - the maximum amount of regulated pollutants that can be applied to an area of land.

Since the initiation of the rule, the U.S. EPA, was to add pollutants to this list every two years. EPA has not. As of today, the list of pollutants remains as it was over two decades ago - nine heavy metals, phosphorus, and nitrogen.

On November 15, 2018, the Office of Inspector General, after conducting an audit, criticized EPA's handling of its sewage recycling mandate. [6]

• The Clean Water Act requires EPA to review its sewage sludge regulations at least every two years and identify additional toxic pollutants and promulgate regulations for these, and be transparent about their risks.

• Controls over the land application of sewage sludge, including laws, regulations, guidance, policies or activities, were incomplete or had weaknesses and may not fully protect human health and the environment.

• EPA's website, public documents, and sewage sludge labels do not explain the full spectrum of pollutants and the uncertainty regarding their safety.

• EPA lacked the data or risk assessments from 1989 through 2015. Sixty-one of 352 pollutants the EPA identified during that stretch of time were designated as acutely hazardous, hazardous or priority pollutants in other programs.

Instead, EPA reduced staff and resources for this program, creating barriers to addressing control weaknesses. Without the data, the agency has an incomplete risk assessment and cannot determine whether biosolid pollutants are safe.

EPA has not conducted regular training of regional and state staff and wastewater treatment operations, and its inspection goals are different than what the agency recommends for authorized states.

Consequently, the program is at risk of not achieving its goal to protect public health and the environment. As troubling is the fact that EPA staff is allowed to meet its compliance monitoring goals by conducting desk audits (file reviews), rather than on-site inspections. This is problematic for at least two reasons. An on-site inspection may turn up unreported issues. A reported issue may not come to EPA's attention until months later when it receives a report.

Effluent: Toilet to Tap and Elsewhere…

Water reuse is the practice of using treated wastewater for what may be considered a beneficial use. The terms reclaimed water, reused water, and recycled water are used interchangeably. As examples, the water can be processed sewage wastewater, or industrially used water such as from food processing plants that contain pesticides or other chemicals.

It is estimated that more than 300 km3 (cubic kilometers) of municipal wastewater and more than 600 km3 of industrial wastewater, are annually generated world-wide. Only 8% of domestic and industrial wastewater is treated in developing countries; 70% in highincome countries. 13% of California wastewater is reclaimed; 39% is used for crop irrigation.[7]

Forty plus states in the U.S. allow treated effluent to be reused.[8] This number will grow along with water shortages. Purple pipes seem in vogue to capture this water directly from WWTPs and divert it for other uses.[9] It is a positive step to refrain from pouring this waste into surface water bodies. Still, it cannot be proven safe for human use and the environment. With all additional treatment methods - filters, ultraviolet, chlorine, reverse osmosis, and others, single or in combination, the question remains, what in this toxic brew is being tested? It is impossible to know all the waste pollutants. It is impossible, financially, to test for all.

The U.S. Geological Survey (USGS) 2015 Report says that reclaimed wastewater was used for irrigation in 10 states: California, Florida, Arizona, Texas, Utah, Nevada, New Mexico, Colorado, Kansas and Illinois. [10]

According to the EPA, California has the longest history of regulating reclaimed wastewater for agricultural use on produce crops.[11] *California also allows "reclaimed water" for potable use*. In 2018, the California State Water Resources Control Board allowed treated recycled water to be added to reservoirs, *the source of California municipal drinking water*.[12]

Oregon allows treated "reclaimed water" usage for irrigation, or other "beneficial uses." The reclaimed water may be retained in a pond or lagoon without a reservoir permit prior to reuse. Per ORS 537.132, registration of municipal reclaimed water provides an exemption from the permitting requirements that would otherwise be required.[13a,b]

Florida has allowed agricultural use of reclaimed water on food crops that are skinned, cooked, or thermally processed before consumption.[14]

In February 2018, Washington State adopted its rule for reuse of sewage effluent, allowing use for crop irrigation, landscaping, flushing toilets, wetlands for stream flows, recharging groundwater, and other uses like cleaning streets, dust control, and fighting fires. On a case-by-case basis, reclaimed water may be allowed for potable water.[15]

Delaware, Hawaii, Ohio, Oklahoma and Texas adopted reuse regulations. Virginia, New Mexico and Arizona recycle effluent for drinking water. Countries like Singapore, Australia and Namibia do as well.[16]

Each municipality may further treat its reused water differently to further reduce pollutants and pathogen levels. Engineering companies continually develop methods to better remove sewage waste from treated water. Universities also continually research safer methods for treating sewage. However, at this time, there are no standards that set "safe" levels of exposure for trace chemicals

and these are showing up in food and water, sometimes abundantly. Further, processed water may be colorless and odorless but still be unsafe.

Wastewater processing can remove and inactivate harmful bacteria, viruses, and other pathogens. However, pathogens have been found to be dormant, rather than dead, and revitalized when applied to soil. The issue remains, after "treatment," what are municipalities testing for when they claim the water is safe for whatever purpose?

Washington State Department of Ecology admits that trace amounts of toxic compounds have been detected in surface water, groundwater, wastewater, reclaimed water, and sediments throughout Washington.[17]

According to the Washington State Department of Health:

"Though we can detect minute amounts of many organic and chemical compounds in wastewater and reclaimed water, we don't yet know of any human health effects from them. Typical wastewater treatment isn't designed to remove these microscopic particles, so they may exist in the source water from reclaimed water treatment plants. According to recent testing, reclamation treatment does reduce or remove a number of compounds. The EPA hasn't yet determined 'safe' levels of exposure for these trace chemicals. There are many studies in progress looking at advanced treatment and removal techniques, and whether anything is harmful to us."[18]

There is documentation of antibiotic resistant bacteria and genes in the three byproducts of wastewater processing plants: 1) biosolids/sewage sludge often used as a fertilizer and compost; 2) recycled water for irrigating leafy green crops consumed raw, as well as grass in public parks and other playing fields and for potable water; and 3) effluent that is discharged to lakes, rivers, and oceans.[19]

In Washington State, wastewater influent, secondary effluent, tertiary effluent, and biosolids were sampled for 172 organic compounds (PPCPs, hormones, steroids, semi-volatile organics) from five WWTPs. Four of the five WWTPs discharged within the Puget Sound watershed. Two provided secondary treatment, and three tertiary treatment including for nitrogen and phosphorus removal. Two produced tertiary-treated reclaimed water. Yet three pharmaceuticals (carbamazepine - seizure control, fluoxetine, and thiabendazole) were relatively untreated by the WWTP technologies. PPCPs were found in all samples. Roughly 20% of the 172 analytes (mainly polycyclic aromatic hydrocarbons) were found only in the sewage sludge.[20]

Elsewhere, the Washington State Department of Ecology analyzed 24 water samples from a WWTP - the effluent, surface water, and groundwater. 17 PPCPs were detected in the effluent, four in the surface water, and three in the groundwater.[21]

The Washington Toxics Coalition tested household dust and laundry wash water from 20 homes in Longview and Vancouver, Washington. They also took samples of incoming and outgoing water from two WWTPs that discharge into the Columbia River. They detected flame retardants in all of those tests. Their study concluded that flame retardants are sloughing off of household products, such as couches and TVs, and are collecting on clothing, washing out in the laundry and passing through processing plants into local waterways.[22]

Nineteen commonly occurring PPCPs were measured in eight vegetables irrigated with tertiary treated wastewater. Sixty-four percent contained traces of contaminants of emerging concern (CEC), including DEET (a repellent) and triclosan (an antibacterial), caffeine, meprobamate, primidone, carbamazepine, dilantin, and naproxen.[23]

WWTPs do not always filter or trap microplastics. Worse, the microplastics can absorb toxic chemicals from the sewage. In the nanometers' range they can penetrate the organs of humans and animals. In the United Kingdom, these microplastics were found in one-third of fish caught in streams, lakes and oceans.[24] This is also not uncommon in fin and shellfish caught in North America, given the ubiquitousness of these plastics.[25]

And beer. There are now about 5,300 "craft brewers" in the U.S. It has been reported that some small brewers in California, Texas, Oregon, Arizona, Colorado, New York, and elsewhere use or have used processed effluent, each selecting their own additional treatments. These servings are typically limited to special events. Still, some end up with microplastics in the beer.[26] This is the case in Sweden, as well. [27]

In 2014, the U.S. EPA Office of Inspector General (OIG) determined that management controls put in place by the EPA to regulate and control hazardous chemical discharges from sewage treatment plants to water resources have limited effectiveness. The reg-

ulations are not effective in controlling the discharge of hundreds of hazardous chemicals to surface waters such as lakes and streams. [28] These chemicals then travel up the sea life food chain and humans and wildlife then feed on them.

In sum, you can find sewage in commercial compost and sewage contaminants in your food and drink. The government is really leaving it to us, as consumers, to investigate what our dollars are buying. The microplastics and the other contaminants and pathogens from sewage are covering soils and sediments. It is the "new sentinel for human health risks."[29]

People and farm animals have become ill and even died from exposure to sewage wastes. Leonardo Trasande, in his recently released book, Sicker, Fatter, Poorer, writes, "invisible pollutants are the tipping point for endocrine disruption, including sexual development and hormonal changes." I would add: and for many other disorders. Sewage contaminants are invisible. Illnesses from these wastes do not show up immediately and without knowledge of direct contact with toxic sewage, will not likely be considered when someone takes sick.

Several major environmental organizations such as the Sierra Club, the Natural Resources Defense Council and the Center for Food Safety, along with smaller NGOs, oppose the recycling of sewage for food production. In addition, there are U.S. and foreign markets, food processors and distributors that refuse food produced with sewage wastes.

Certified organic farmers cannot use sewage wastes to grow their food. Eat certified organic food, or food from non-certified organic farmers you know do not raise food in sewage wastes or other pollutants. This supports these farmers and invests in your health rather than the medical industry.

For sewage solids reuse, there are multiple options. Europe has invested in methods such as pyrolysis and plasma arc. Sewage sludge is very hot. Placed in internal chambers they contain sufficient heat to operate the systems while breaking the bonds of the contaminants. The end results are minuscule levels of ash, but sufficient energy left to sell to the grid. Some pyrolysis firms are, instead, using the charred waste for compost, roads, building blocks, etc. The U.S. does have options.

WWTPs around the country have aged. It is necessary that municipalities upgrade their plants. Rather than invest in current treatment techniques, they should look for alternative treatment systems. Instead of asking their legislators to help fund old technologies, legislators could offer some financing for municipalities to investigate nonpolluting technologies. They exist and are ecologically and economically cost-effective.

Endnotes:

1.Technically these are referred to as wastewater treatment plants. I have substituted the word "processed" for treatment, since these plants were designed to treat very little and not for the thousands of influents they receive.
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7. https://cen.acs.org/articles/95/i47/Tappingsewage-source-useful-materials.html.
8. https://www.gao.gov/assets/670/663343. pdf . Since this 2014 report, additional states have approved the reuse of sewage effluent.
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