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# Types of Pharmaceutical Waste and How to Dispose of Them





## Types of Pharmaceutical Waste and How to Dispose of Them

If your facility produces or works with pharmaceuticals, it likely produces pharmaceutical waste. In that case, you'll need to have safe, effective and compliant disposal practices in place to keep that waste from polluting the environment or adversely affecting human health.

It's important to know the types of waste in the pharmaceutical industry so you can ensure safe handling and disposal. It's also essential to have a dependable disposal plan that will keep your facility compliant with the law. This guide describes the different pharmaceutical waste classifications, provides examples of pharmaceutical waste and offers some pharmaceutical waste disposal methods.

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# Who Produces Pharmaceutical Waste?

What is pharmaceutical waste? This waste includes discarded pharmaceutical products like prescription and over-the-counter medications, as well as the chemical sludges and wastewaters produced during pharmaceuticals manufacturing. It also includes waste medical items, like used gloves and sharps, that contact pharmaceuticals. Because of the health hazards and ecological risks this waste poses, it requires specialized disposal processes that ensure safety.

Pharmaceutical waste may come from various sources, from manufacturing plants to facilities that provide medical or veterinary services. Below are a few commercial and industrial sources of pharmaceutical waste:

## 1. Pharmaceutical Manufacturing Plants

Pharmaceutical manufacturing plants are common sources of pharmaceutical waste. The plants that manufacture drugs must have a way to dispose of the chemical residues left over from the manufacturing processes.

Some of the waste generated at pharmaceutical manufacturing plants is physical waste. It might be unused products, spent chemical containers with residues inside or the rags and mop heads used to clean equipment and wipe up spills.

Pharmaceutical plants cannot send this refuse to the landfill, where the chemicals could seep into the soil and groundwater, potentially harming the environment and contaminating the local water supply.

Plants also cannot merely flush unused pharmaceuticals and chemicals down the drain. Doing so could interfere with surface water treatment, contaminate local bodies of water and harm wildlife. The plant must dispose of this waste according to strict regulations to avoid compromising human health, destroying the environment and incurring stiff regulatory penalties.

As manufacturing plants process drugs, some chemical residues also remain on the equipment surfaces. When manufacturing plants clean their contaminated surfaces or drain and clean holding tanks, the water they use for these processes gets contaminated with pharmaceutical residues. The contaminated water becomes wastewater that facilities must also dispose of responsibly to avoid health and environmental harms.

## 2. Health Care Institutions and Facilities

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Health care and extended care facilities use numerous pharmaceutical products every day. Some of those products inevitably turn into waste — for instance, expired drugs, used syringes, empty medicine bottles and other refuse contaminated with pharmaceutical chemicals. Many of

empty medicine bottles and other refuse contaminated with pharmaceutical chemicals. Many of these products could cause environmental contamination or adverse health effects if the facility disposed of them improperly.

At extended care and health care facilities, controlled substances present a particular concern. These facilities often deploy morphine and other opioid painkillers after surgery or in palliative care. These substances could cause addiction if improper disposal released them into the community.

As with pharmaceutical manufacturing plants, health care and extended care facilities cannot merely throw these products into the trash or pour them down the drain without risking serious health and environmental harm. They need trusted, practical waste disposal services to ensure health and safety while also ridding their buildings of products they no longer need.

### 3. Personal Care Product Manufacturers

Like pharmaceutical manufacturers, manufacturers of personal care products like cosmetics, perfumes, creams and lotions generate waste that requires specialized disposal.

Manufacturing personal care products leaves contaminants behind. Spent chemical containers and unused products require careful disposal. The chemical residues left on the manufacturing equipment also produce contaminated wastewater during cleaning and necessitate specialized wastewater disposal.

### 4. Veterinary Offices

A veterinary clinic may produce a more extensive range of pharmaceutical waste than an average doctor's office as well.



Like health care facilities for humans, veterinary offices use a wide range of pharmaceutical products. The average veterinary office produces more pharmaceutical waste than an average doctor's office — it's rare, for instance, that a human patient could go to the same doctor for a respiratory illness, an amputation and end-of-life care. So a veterinary clinic may produce a more extensive range of pharmaceutical waste than an average doctor's office as well.

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Veterinary offices, like human health care facilities, must dispose of their pharmaceutical waste responsibly to protect human and ecological health.

# Who Regulates Disposal of Pharmaceutical Waste?

The U.S. Environmental Protection Agency (EPA) is the main governing body that regulates the disposal of pharmaceutical waste. Additional regulatory bodies include the following:

- Drug Enforcement Agency (DEA)
- Department of Transportation (DOT)
- Joint Commission (JC)
- Occupational Health and Safety Administration (OSHA)
- Fish and Wildlife Services (FWS)

The EPA's Resource Conservation and Recovery Act (RCRA) gives the EPA the authority to [regulate hazardous waste](#), including some pharmaceutical waste, from the cradle to the grave. Under the RCRA, businesses are responsible for that waste from the moment they create it through its storage, treatment, transport and ultimate disposal. Failing to store and dispose of hazardous pharmaceutical waste safely can result in significant fines.

# What Are Examples of Pharmaceutical Waste?

Let's discuss some specific examples of pharmaceutical waste. Pharmaceutical waste breaks down into two main categories: solid waste and liquid waste.

## Solid Pharmaceutical Waste

Solid pharmaceutical waste generally encompasses used items containing pharmaceutical residues:

- Sharps, including scalpels, needles and syringes
- Contaminated items like gloves, masks, bandages and IV bags and tubing
- Drugs containing hazardous or non-hazardous chemicals
- Empty receptacles like pill bottles, blister packs, liquid medicine containers and ointment

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- Empty receptacles like pill bottles, blister packs, liquid medicine containers and ointment tubes
- Medicine distribution devices like autoinjectors, inhalers and nebulizers

## Liquid Pharmaceutical Waste

Liquid pharmaceutical wastes accrue as pharmaceutical manufacturing facilities perform certain processing operations. Examples of these wastes include sludge from chemical processing and contaminated solvents from tank cleaning.

Unused liquid medicines are sometimes classified as pharmaceutical waste, though in some areas, such as Michigan, they are [liquid industrial byproducts](#) and subject to different regulations.

# Types of Hazardous Waste in the Pharmaceutical Industry

The pharmaceutical industry generates several different types of hazardous waste, and the RCRA regulates all of them.

The RCRA breaks some hazardous wastes down into defined lists of chemicals. It also breaks hazardous wastes down into categories based on their distinctive characteristics. Let's discuss some of those below.

## Listed Hazardous Pharmaceutical Waste

Many pharmaceutical wastes appear on specific RCRA lists of hazardous wastes. On these lists, different letters of the alphabet serve as categories for various wastes. The RCRA's [F and K lists](#), for instance, contain a few types of hazardous pharmaceutical waste.

The F list lays out hazardous wastes from certain industrial and manufacturing processes. Instead of being specific to particular industries, these wastes fall into the following categories:

- Wastes from the production of chlorinated aliphatic hydrocarbons
- Wastes containing dioxins
- Wastes from electroplating and other metal finishing
- Leachate from multiple sources
- Wastewater treatment sludges from petroleum refineries
- Spent solvents

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- Spent wood preservers

In a pharmaceutical context, F-listed wastes most often come from solvent procedures performed in diagnostic laboratories. Examples of relevant hazardous chemicals on the F list include spent non-halogenated solvents like these:

- Xylene
- Acetone
- Ethyl acetate
- N-butyl alcohol
- Cyclohexanone
- Methanol
- Toluene
- Isobutanol
- Benzene

The K list, on the other hand, lays out hazardous wastes from specific manufacturing and industrial sectors, including organic chemicals manufacturing and veterinary pharmaceuticals manufacturing. Unlike the wastes on the F list, these wastes are source-specific. Examples of hazardous chemicals on the K list include the following:

- Wastewater treatment sludges from the production of veterinary pharmaceuticals containing arsenic or organoarsenic compounds
- Distillation tar residues from the manufacture of veterinary pharmaceuticals from arsenic or organoarsenic compounds
- Residues from using activated carbon in the manufacture of veterinary pharmaceuticals from arsenic or organoarsenic compounds

## Characteristic Hazardous Waste



The RCRA also classifies hazardous wastes according to specific characteristics they have. The list of [characteristic wastes](#) is also known as the D list. The wastes break down according to the following four attributes:

- **Ignitability:** Ignitable wastes are generally liquids with flash points below 60 degrees Celsius, non-liquids that can cause fires, and compressed gases and oxidizers that can ignite. Pharmaceutical products exhibiting ignitability often contain more than 24% alcohol or have gel bases.
- **Corrosivity:** Corrosive wastes generally have extreme pH. Liquids with a pH lower than 2 or higher than 12.5 are typically corrosive, as are any others that can damage steel. Corrosive pharmaceuticals are usually strong acids and bases used as compounding chemicals.
- **Reactivity:** Reactive wastes may react with water, be unstable under standard conditions, give off toxic gases or detonate when subjected to heat.
- **Toxicity:** Toxic wastes cause harm when living beings bodies. Many hazardous pharmaceutical wastes are toxic wastes. Toxic pharmaceuticals typically contain mercury, chloroform, arsenic, cadmium, chromium, selenium, barium, lindane, mercury, m-cresol or silver.

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# Acute Hazardous Pharmaceutical Waste

Additionally, many types of pharmaceutical waste are classified as acute hazardous pharmaceutical waste. Acute hazardous waste is toxic even in very small quantities.

Acute hazardous pharmaceutical wastes contain chemicals that appear on the EPA's P list. The **P and U lists** lay out commercial and pure formulations of unused chemicals. The P list includes acute hazardous wastes from commercial chemical products, and the U list includes non-acute hazardous wastes from commercial chemical products. The chemicals in these wastes must be either 100% pure or the sole active ingredient in a given product.

Examples of hazardous pharmaceuticals on the P list include the following:

- Arsenic trioxide
- Epinephrine
- Nicotine
- Phentermine
- Physostigmine
- Physostigmine salicylate
- Warfarin, at concentrations of more than 0.3%

Examples of hazardous pharmaceuticals on the U list include diethylstilbestrol (DES), which can cause severe birth defects, and chemotherapy drugs like these:

- Cyclophosphamide
- Daunomycin
- Melphalan
- Streptozotocin

## Examples of “Non-Hazardous” Pharmaceutical Waste

Though we've discussed hazardous pharmaceutical waste, many pharmaceutical wastes receive a non-hazardous classification. It's common for health care facilities to generate only **5% to 15% hazardous waste**. What is non-hazardous waste, then, and why does it deserve special consideration?

The term “non-hazardous” as it relates to pharmaceutical waste is something of a misnomer. It

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refers to waste not governed under the RCRA, not necessarily to waste that is 100% harmless if it enters the environment. “Non-hazardous” waste could potentially still have detrimental health and environmental effects. For this reason, even if it is technically non-hazardous, pharmaceutical waste still requires careful handling and safe, specific disposal procedures.

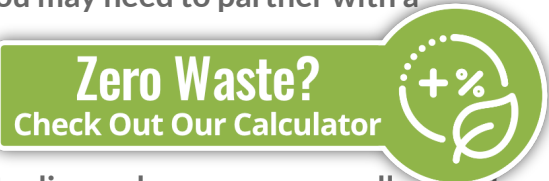
Some examples of non-hazardous pharmaceutical waste include the following:

- Over-the-counter medications
- Over-the-counter nicotine replacement therapies, in [certain states](#)
- Antibiotics
- Hormones
- Contraceptives
- Endocrine-disrupting compounds
- P- and U-listed wastes in which the listed chemicals are not the sole active ingredient
- Drugs OSHA lists as toxic even though the RCRA does not

# How to Dispose of Pharmaceutical Waste Properly

Now that you have more information about pharmaceutical waste, how can you apply that knowledge to your waste streams? You’ll want to create a comprehensive waste management plan for your facility so you can ensure safety and compliance with the law. Below are some tips for disposing of pharmaceutical waste responsibly:

- Disposing of prescription drug waste: As you dispose of prescription drug waste, don’t toss the medicines into the trash or flush them down the toilet. You’ll likely want to contract with a reliable waste management company for safe disposal instead.
- Disposing of pharmaceutical wastewater: Many pharmaceutical manufacturing facilities generate pharmaceutical wastewater as they clean tanks and other manufacturing equipment. This water cannot go down the drain – you may need to partner with a professional waste disposal facility that can handle it.
- Disposing of contaminated products: Your facility may have contaminated products like gloves and masks. A waste disposal company can collect and dispose of them to keep your facility compliant with the law.



# HOW VLS Can Help

When you need a reliable partner in pharmaceutical waste disposal, VLS is here to assist you. We follow initiatives from the EPA and other regulatory bodies, and we are happy to consult with your facility about the types of pharmaceutical waste you deal with. We also provide numerous direct services to help your organization with its pharmaceutical waste treatment and disposal:

- Containerized waste disposal: Containerized waste is waste stored in hazardous container bins like [waste drums and totes](#). We collect and dispose of this waste sustainably to ensure environmental safety, regulatory compliance and overall peace of mind for your business.
- Waste-to-energy services: [Waste-to-energy services](#) allow us to capture the energy given off during this process. VLS can work with your facility to dispose of your waste and generate usable energy simultaneously.
- Tank cleaning: A pharmaceutical plant needs a way to clean its tanks thoroughly and dispose of the used water. VLS can provide [tank cleaning services](#) and dispose of the

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contaminated wastewater safely and responsibly. Using this service helps protect human health and the environment and keeps your company compliant with the law.

- **Secure destruction:** You may need to destroy proprietary information, manufactured chemicals and material components to keep trade information secure. VLS can provide confidential destruction so your processes remain private.

# Contact VLS for Responsible and Sustainable Pharmaceutical Waste Management

To dispose of your facility's pharmaceutical waste with sustainable, environmentally responsible methods, work with VLS Environmental Solutions. We have extensive experience in cradle-to-grave management of pharmaceutical waste, and we can work with just about any organization, from pharmaceutical processing plants to health care centers.

[Contact us](#) today to schedule pharmaceutical waste disposal services or learn more.

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