

Chemicals and Materials

Cytotoxic Drugs - Control Measures

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What are cytotoxic drugs?

Cytotoxic drugs are commonly used to treat cancer cells by preventing rapid cell growth and division. This document covers measures to minimize worker exposure to cytotoxic drugs in a health or community care setting. For more information about cytotoxic drugs and their health effects, please see [Cytotoxic Drugs—Overview](#).

What are some ways to reduce exposure to cytotoxic drugs?

After identifying areas and tasks with the risk of exposure to cytotoxic drugs, follow the [hierarchy of controls](#) to determine how to address these risks.

Because of their specific medical properties, it is often not possible to eliminate or substitute cytotoxic drugs with less hazardous alternatives. For this reason, most protective measures involve some form of physical barrier between the worker and the drug, safe work procedures, relevant training, and personal protective equipment (PPE). The safety precautions below can help protect workers from exposure to cytotoxic drugs.

- Establish and maintain safe work procedures for working with cytotoxic drugs and provide pre-job and on-the-job training to everyone who may be exposed to them.
- Record the toxicity, solubility, stability, exposure treatment procedures, and general descriptions of the appearance of all cytotoxic drugs used in the facility and make this information available to all staff who may be exposed to them. Establish and maintain a medical surveillance program.
- Establish a [protective reassignment program](#) to protect workers who are attempting to become pregnant, or are pregnant or breastfeeding.
- Make sure the drug containers are appropriately labelled.
- Do not allow eating, drinking, smoking, chewing gum, or storing food in areas where there might be cytotoxic drugs.

How important is cleaning cytotoxic drug-handling areas?

Everyone who works with cytotoxic drugs or in cytotoxic drug-handling areas should know how to clean contaminated surfaces. Due to their chemical stability, traces of cytotoxic drugs can remain in drug-handling areas and be spread far from their point of origin. Always assume that drug containers, drug handling surfaces, and waste containers that have come into contact with cytotoxic drugs are contaminated. Residue can also collect on items not directly used for handling cytotoxic drugs, such as pens, computer mouse, keyboard, door handles, and elevator buttons. To protect everyone, it is important to clean all surfaces and objects in areas where cytotoxic drugs are handled.

Good practice is to clean work surfaces before and after all tasks that involve handling cytotoxic drugs, as well as at the end of each shift.

How to clean cytotoxic drug-handling areas?

The cleaning procedure for cytotoxic drugs differs from disinfection, which removes biological agents such as bacteria. To remove cytotoxic drug residue, a chemical decontamination procedure must be used. Decontamination involves either chemically inactivating the residue on the surface being cleaned or physically transferring chemical residue to a disposable absorbent material (e.g., a wipe) moistened with a decontaminating agent. The physical transfer method is preferred for cytotoxic drugs because there is currently no non-toxic product that can inactivate all cytotoxic drugs. After the physical transfer is complete, the absorbent material should be contained and disposed of as cytotoxic waste.

When choosing decontaminating agents, consider their compatibility and effectiveness against the specific cytotoxic drug being handled or stored. Prepare and store any diluted solutions according to the manufacturer's directions, keeping dilutions in clean, labelled containers.

Other cleaning precautions for cytotoxic drugs include:

- Avoid spraying decontamination solution directly onto the work surface. Spraying the solution can disperse particulates and spread cytotoxic drug residue.
- When cleaning inside biological safety (biosafety) cabinets in the drug preparation areas, work from the cleanest to the dirtiest area to minimize the spread of drug contamination.
- If mopping, use a wet mop instead of a dry mop to reduce spreading drug residues into the air.
- Use disposable cleaning equipment made of non-shedding material where possible.
- Train all individuals assigned this task on your facility's decontamination procedures.

What precautions should be taken before the cytotoxic drug is administered?

Precautions when receiving and unpacking cytotoxic drugs include:

- Ensure the storage area has sufficient ventilation to dilute and remove airborne contaminants.
- Quarantine damaged packages immediately and contact the supplier.
- Dispose of damaged containers of cytotoxic drugs as toxic waste instead of returning them to the supplier to prevent further contamination.

Precautions when preparing cytotoxic drugs for administration include:

- Clean room: Dedicate a clean room for the preparation of cytotoxic drugs to physically separate this area from the rest of the pharmacy.
 - Limit access to this clean room to only authorized personnel who work with cytotoxic drugs.
 - Set up the negative pressure and air exchange rates of this room according to up-to-date standards and guidance.
- Sterile preparation: Centralize the mixing, preparation, and priming of sterile drug formulations, such as injections, to a Class II Type B biosafety cabinet specifically designated for cytotoxic drugs. This cabinet should:
 - Exhaust to the outdoors and prevent recirculation into any work areas,
 - Prevent contaminants from escaping the cabinet through its exhaust and ventilation system, and
 - Have a continuous monitoring device to make sure there is adequate airflow to ensure protection.
- Nonsterile preparation: Designated fume hoods can be used to prepare some nonsterile drug formulations, such as tablets and capsules, if the exhausted air is HEPA filtered and exhausted to the outdoors.
- Do not use laminar flow devices that direct airflow toward the operator for preparing cytotoxic drugs.
- Use injection devices with built-in safety mechanisms, such as closed-system drug transfer devices and needleless systems, to prevent puncture wounds.
- Only use reusable equipment that is dedicated to cytotoxic drugs, and ensure they are clearly labelled “for cytotoxic drugs only”.
- Avoid using automated counting or packaging machines to prevent generating dust.

Precautions when transporting prepared cytotoxic drugs within the facility include:

- Do not use pneumatic tubes to transport cytotoxic drugs.
- Dedicate transport boxes solely for cytotoxic drugs to prevent cross-contamination.
- Label the outside of packages to indicate that the contents are cytotoxic, including information on who to inform in case of a spill or other incident.
- When transporting large quantities of cytotoxic drugs, keep the products in their original packaging. Wrap the outer boxes in protective plastic and fasten packages to the transport cart using belts.
- When transporting smaller quantities of cytotoxic drugs, use unbreakable and leak-tight boxes. Sponge or foam can be used to secure the prepared drugs in place and absorb any shock.

- Deliver cytotoxic drugs directly from the preparation area to the administration area. Detours risk spreading contamination to other [areas](#).
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What precautions should be taken when administering cytotoxic drugs?

Precautions when administering cytotoxic drugs include:

- Place a disposable absorbent plastic-backed pad under connections and ports when attaching tubing, bag, or syringe to catch any leaks of cytotoxic drugs.
 - Place a similar pad under injection or insertion sites where possible.
 - Pads can also be used to catch any droplets when the protective caps from syringes are removed.
 - Only prepare cytotoxic drugs, prime IV tubing, and spike IV bags in the designated cytotoxic preparation area, not in the administration area.
 - Avoid purging air from needles to prevent droplet contamination.
 - Check the integrity of the cytotoxic drug container at the beginning and throughout the administration process to monitor for leaks.
 - Use injection devices with built-in safety mechanisms, such as closed-system drug transfer devices and needleless systems, to prevent puncture wounds.
 - Discard the IV bag and attach tubing as a single unit to reduce the risk of leakage.
 - When disposing of syringes, don't remove the needle. Discard both as a single unit in a cytotoxic sharps waste container.
 - Keep topical drugs in a sealed container or bag labelled with "cytotoxic" between applications.
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What precautions should be taken during patient care and housekeeping?

Precautions when caring for patients who are receiving cytotoxic drugs include:

- Avoid shaking used bed linens to minimize the release of contaminants.
- Roll or fold heavily soiled bedding with the most soiled areas inside the bundle.
- Use disposable linen if available.
- Use disposable moistened towelettes to wash patients who need to be washed in their beds.

- If possible, encourage patients to use the toilet instead of bedpans to reduce aerosols.
- Close the lid of the toilet before flushing to reduce aerosols.
- If bedpans are used, use disposable ones where available.
- Place soiled disposable diapers in the cytotoxic waste container.

Precautions when performing housekeeping and waste disposal in areas where cytotoxic drugs are handled include:

- There should be clearly labelled cytotoxic waste containers, including sharps containers where appropriate, in all areas where cytotoxic drugs are received, stored, prepared, and administered.
- Follow your local legal requirements for labelling cytotoxic waste containers.
- Waste bins with foot pedal-controlled lids are recommended to minimize exposure.
- Make sure lids are closed when the waste bins are not in use.
- Treat all disposal items that may have contacted cytotoxic drugs as cytotoxic waste.
- When disposing of cytotoxic waste, avoid touching the outside surface of the waste container to prevent contamination.
- Place items gently into the cytotoxic waste container to prevent splashing.
- Avoid filling waste containers beyond 75% capacity to prevent spills.
- Avoid travelling through care units, public areas, and food or linen storage areas when transporting cytotoxic waste.

What should be done when there is a cytotoxic drug spill?

Precautions when cleaning up spills of cytotoxic drugs can include:

- Ensure a [spill response](#) procedure is in place at your facility and train designated workers on how to safely respond and clean up a spill.
- Ensure your facility has designated kits for handling cytotoxic spills.

The International Society of Oncology Pharmacy Practitioners (ISOPP) Standard for the Safe Handling of Cytotoxics recommends including the following items in the cytotoxic spill kit:

- Written instructions for use of the spill kit.
- Warning signs to alert other staff to the hazard and isolate the area of the spill.
- Personal protective equipment (PPE) (e.g., single-use chemoprotectant gown, boots or overshoes, head cover, goggles or face shields, respirator mask).

- Two pairs (at minimum) of gloves manufactured specifically for handling cytotoxics (with proven resistance).
- Small scoop to clean up any broken glass.
- Spill mat (alginate impregnated) to absorb small volumes of spilled liquid.
- Spill pillow to absorb large volumes of liquid (this item may be part of the spill kit or may be supplied separately).
- Large quantities of swabs.
- Concentrated alkaline detergent solution.
- Bottled water in the correct quantity for the dilution of detergent.
- Two plastic bags are clearly identified for cytotoxic waste.
- Clearly labelled cytotoxic waste container.
- Spill report or incident form.

When there is a spill of cytotoxic drugs:

- Alert staff in the area and limit access by placing warning signs.
- Do not leave the area unattended.
- Only attempt to clean up the spill if you are trained on cytotoxic spill cleanup and have the correct equipment. If you are not trained, follow your facility's procedures to call for help.
- Wear the required PPE. This equipment typically includes a respirator, eye and face protection, a head cover, two pairs of gloves, a long-sleeved gown, and shoe covers.
- For liquid spills, wait a few seconds for aerosols to settle, then place liquid-absorbing material from the spill kit over the liquid.
- Wet solid spills to prevent dust generation, then place liquid-absorbing materials over the wetted spill.
- Work from the edges of the spill inward.
- Discard the used absorbing material into a labelled waste bag.
- Follow the spill kit instructions for decontaminating and cleaning the spill area.

What personal protective equipment (PPE) may be required when working with cytotoxic drugs?

Note that personal protective equipment and clothing (PPE) are the least effective form of protection against exposure. They should be used together with other forms of prevention. If PPE is used, the workplace should implement [an effective PPE program](#).

A risk assessment determines the specific PPE required for each task in the workplace. Workers should refer to the safe work procedures at their workplace to determine what types of PPE they are required to wear when handling cytotoxic drugs.

Disposable PPE should be discarded as hazardous waste. Reusable PPE, including goggles, face shields, and reusable respirators, should be decontaminated using a decontaminating agent daily after use.

PPE that can help protect against exposure to cytotoxic drugs includes gloves, gowns, respirators, eye and face protection, and shoe covers.

Gloves

Gloves are used for every task that may expose the worker to cytotoxic drugs or materials containing cytotoxic drugs, such as drug containers or bodily waste. Double gloving may be required for activities that could result in direct exposure to cytotoxic drugs, such as drug preparation, topical drug administration, and spill clean-up.

Select gloves specifically designed for handling cytotoxic drugs. For example, choose gloves that have been tested following the criteria in the American Society for Testing and Materials (ASTM) International Standard D6978 (Standard Practice for Assessment of Resistance of Medical Gloves to Permeation by Chemotherapy Gloves).

Follow the manufacturer's instructions for how often to change the gloves. Gloves should be immediately changed if there is a tear, puncture, or known or suspected contamination.

Gowns

Gowns are typically worn during activities that may result in direct exposure to cytotoxic drugs to prevent skin contact. It is recommended to use a non-linting, impermeable, moisture-resistant disposable gown. This gown should also have long sleeves and fitted cuffs, be closed at the neck, and have a back closure (no open front), with a tie around the waist.

Follow the manufacturer's instructions for how often to change gowns. If your gown is damaged or contaminated, change it earlier.

Respirators

Wear a respirator when there is a risk of exposure to airborne particulates, aerosols, or vapours of cytotoxic drugs. These situations include preparing cytotoxic drugs outside of an appropriate biosafety cabinet, cleaning up a cytotoxic drug spill, decontaminating a biosafety cabinet designated for cytotoxic drugs, and unpacking shipments of cytotoxic drugs that are suspected of being damaged.

Medical masks are not enough to protect against cytotoxic drugs. A fit-tested respirator with the appropriate cartridge must be used. The type of respirator and cartridge depends on the potential exposure to airborne particulates, aerosols, or vapours from cytotoxic substances for each task in the workplace. Fit tests must also be carried out before a respirator is issued to a worker, and the worker must perform a seal check before each use.

Eye and face protection

Use eye protection whenever there is a risk of splashing, including cleaning up spills and cleaning the designated biosafety cabinet. When more protection from splashes and sprays is needed, use face shields in addition to eye protection.

Avoid safety glasses and directly ventilated goggles because they do not provide enough protection against splashing. Instead, use non-ventilated or indirectly ventilated goggles. Indirect ventilation is preferred because non-ventilated goggles tend to fog up.

Shoe covers

Shoe covers prevent the spread of drug residue outside areas designated for cytotoxic drug handling. Covers are usually part of the sterile drug preparation procedure, but wearing them can also help prevent contamination spread when cleaning up drug spills.

Follow the manufacturer's instructions for how often to change shoe covers. If there is damage or contamination, change your shoe covers earlier.

Are there specific PPE techniques to prevent exposure to cytotoxic drugs?

Proper technique while putting on and taking off PPE is crucial. Improper use of PPE not only increases your risk of being exposed to cytotoxic drugs but can also lead to workplace contamination.

- Wash your hands with soap and water before and after wearing PPE. You can use an alcohol-based sanitizer before wearing PPE, but [sanitizers should not be used after removing PPE because they do not adequately remove chemical contaminants](#).
- Visually inspect the PPE for defects before putting it on.
- Exercise caution when removing PPE. Try not to touch the outside of PPE to prevent self-contamination.
- If the PPE is reusable, clean and decontaminate it after each use following the manufacturer's instructions.
- Remove all PPE before leaving areas designated for handling cytotoxic drugs, including areas for drug preparation or administration.

- When removing the face shield, try to only touch the parts that go around your head or ears. Avoid touching the front and sides of the face shield, as they are more likely to be contaminated.
- When wearing one pair of gloves with a gown, tuck the cuffs under the gloves.
- When wearing two pairs of gloves with a gown, put on the first pair, then put on the gown with cuffs over the gloves, followed by the second pair of gloves, covering the gown cuffs.

Put on PPE in the following order:

1. Respirator
2. Eye protection
3. Face shield
4. First pair of gloves
5. Gown
6. Shoe covers
7. Second pair of gloves

Remove PPE in the following order

1. Outer gloves
2. Shoe covers
3. Gown
4. Face shield
5. Eye protection
6. Respirator
7. Inner gloves

What should be done in case of exposure to cytotoxic drugs?

Skin exposure:

- Immediately wash the affected skin with soap and water, and if the affected area is large, take a full shower.
- Seek professional medical advice as soon as possible.

Contaminated clothing:

- Immediately remove the contaminated clothing.
- Wash clothing with minimal contamination separately from other laundry and rinse well.
- Dispose of heavily contaminated clothing as cytotoxic waste.
- Avoid taking contaminated clothing home.

Eye exposure:

- Flush your eyes with water for at least 15 minutes using an eye wash station or a portable eye rinse system.
- Remove any contact lenses before flushing.
- Seek professional medical advice as soon as possible.

Needlestick or sharps injury:

- Allow the wound to bleed freely to limit the absorption of drugs.
- Avoid pinching the wound because it can cause suction and restrict blood flow, increasing the risk of drug absorption.
- After bleeding freely, gently and thoroughly wash the area with soap under running water.
- Seek professional medical advice as soon as possible.

Exposure-reporting:

- Ensure your organization has an exposure-reporting procedure.
- Encourage everyone to report all incidents of exposure to cytotoxic.

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