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Hazardous Pharmaceuticals (Including Cytotoxic Drugs): Guidelines for Handling and Disposal (1997)

Canadian Society of Hospital Pharmacists
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Hazardous Pharmaceuticals (Including Cytotoxic Drugs): Guidelines for Handling and Disposal

INTRODUCTION

This is the 1997 edition of the Canadian Society of Hospital Pharmacists (CSHP) Hazardous Pharmaceuticals (Including Cytotoxic Drugs): Guidelines for Handling and Disposal. It is one of a series of documents establishing criteria for the practice of pharmacy in hospitals and other health care settings.

These Guidelines were developed for the protection of the pharmacist, other health care professionals, the patient, the product, and the environment.

These guidelines were approved under the title of Handling and Disposal of Hazardous Pharmaceuticals Guidelines (including Cytotoxic Drugs); the title was fine-tuned in 2009.

1. SCOPE

1.1

These guidelines set forth general safety procedures for handling and disposing of pharmaceuticals, including cytotoxic drugs, biologicals and chemicals used in health care facilities and pharmacies, but not including radiopharmaceuticals.

1.2

When developing a program for the disposal of hazardous pharmaceuticals, in addition to complying with federal regulations, each health care facility should ensure compliance with:

a) provincial government legislation governing the handling and disposal of hazardous wastes; and,
b) municipal government regulations governing disposal of hazardous wastes.

2. GLOSSARY OF TERMS, ABBREVIATIONS, AND SYMBOLS

The following definitions apply for terms used in these guidelines. They may have different meanings in other contexts.

Aseptic technique	Procedures conducted under controlled conditions to minimize the chance of contamination.
Biologicals	Pharmaceuticals developed from micro organisms or animal cells (e.g., vaccines).
Class II biological containment cabinet	A ventilated cabinet having: a) an open front with inward airflow for personnel protection; b) HEPA-filtered downward airflow for product protection; and, c) HEPA-filtered exhaust air for environmental protection.
Cleaning	The freeing of an object of dirt or impurities.
Cytotoxic drug	A drug that has a deleterious effect on living cells; usually refers to antineo-plastics or drugs used in the treatment of cancer.
Decontamination	The freeing of an object, or a person, of some contaminating substance.
Disinfection	The destruction of pathogenic microorganisms.
Handling	Manipulations in which a person can become exposed to the product (e.g., storage, compounding, preparation, reconstitution, administration, disposal).
Hazardous chemicals	Chemicals that are dangerous to humans and/or other living organisms as a result of being either: a) cytotoxic; b) corrosive (acids of pH < 2.0 and bases of pH > 12.0); c) flammable; d) reactive (explosive, water reactive, shock sensitive); e) genotoxic (mutagenic); f) carcinogenic; or, g) teratogenic.
Hazardous pharmaceuticals	Pharmaceuticals in which the concentration, toxicity, environmental persistence, degradation characteristics, flammability, corrosiveness, or reactivity, represents a risk to the health of humans and/or other living organisms.
Large or small amounts	Due to varying opinions as to what constitutes a large or small amount, and the differing disposal aspects of pharmaceuticals, appropriate disposal authorities (including provincial and municipal) should be consulted on an individual case basis.
Pharmaceutical waste	Pharmaceutical products that have become outdated or contaminated, have been stored improperly, or are no longer required.
Secure chemical landfills	Specialized landfills in which leaching by ground water will not contaminate water supplies.

3. RESPONSIBILITY

Handling and disposal procedures related to pharmaceuticals shall be the responsibility of the director of pharmacy or a designate.

4. BASIC SAFETY PRINCIPLES

4.1 Policies and Procedures

4.1.1

Written policies and procedures shall be developed to address the following issues as they pertain to hazardous pharmaceuticals:

a) storage;
b) preparation;
c) labelling of products removed from original containers;
d) use of safety equipment;
e) emergency procedures for treating accidental contact and spills; and
f) disposal.

4.1.2

Written policies and procedures shall be developed in consultation with other facility departments, appropriate committees, and provincial and local authorities.

4.1.3

Policies and procedures shall be reviewed annually, dated accordingly, and revised as necessary to reflect current approved practices and legislation.

4.1.4

Information regarding handling and disposal, including information needed in responding to accidental contact or spills, shall be readily available (e.g., in a safety manual, on index cards, in computerized files).

4.1.5

There shall be a quality assurance program to ensure adherence to the policies and procedures.

4.2 Training

4.2.1

Training regarding policies and procedures shall be provided to all appropriate pharmacy staff and other facility staff (e.g., nursing, housekeeping, maintenance, laundry).

4.2.2

The level of training shall be determined by the level of involvement with the products.

4.2.3

The training program shall be continually reviewed and revised.

4.3 Security

Areas where hazardous pharmaceuticals are stored shall be locked when unattended and have restricted access at all other times.

5 BASIC WASTE DISPOSAL GUIDELINES

5.1 Minimizing Waste Production

5.1.1

Provision for disposal of waste shall be considered before a material is purchased or produced within the pharmacy.

5.1.2

The amount of pharmaceutical waste generated shall be minimized through preplanning.

5.1.3

Quantities of materials purchased shall reflect needs.

5.1.4

Quantities of materials with special disposal requirements (e.g., chemicals, cytotoxics, biologicals) should be purchased in quantities to match immediate needs.

5.1.5

Nonhazardous materials should be substituted for hazardous ones when possible.

5.1.6

Hazardous materials should be recovered for re-use when appropriate.

5.2 Packaging Waste for Disposal

5.2.1

Pharmaceutical waste shall be packaged appropriately for disposal and either visibly identified or labelled as to the type of waste contained within.

5.2.2

Pharmaceutical waste shall be segregated into appropriate containers and/or plastic bags with the appropriate color coding and labelling.[1]

5.2.3

The following color coding and/or additional labelling should be used[1]:

a) regular pharmaceutical waste: black, dark green or facility recognized coding;
b) cytotoxic pharmaceutical waste: no specific color coding, but shall be labelled with a cytotoxic hazard symbol (see Appendix A);
c) waste biologicals: yellow; and
d) patient-associated waste: no specific color coding, but shall be labelled with a cytotoxic hazard symbol if contaminated with cytotoxics.

5.2.4

Reusable waste containers for hazardous pharmaceuticals and chemicals shall be[1]:

a) fabricated of metal or rigid plastic;
b) resistant to burning, impact, and corrosion;
c) suitable for the waste they are to contain; and
d) color-coded or identified according to the type of waste for which they are intended.

5.2.5

A sharps container shall[1]:

a) be sturdy enough to resist puncture under usage conditions and to the point of disposal;
b) be clearly identified as containing sharps by the use of the word “sharps” or a symbol recognized by the facility;
c) have lid(s) capable of being tightly secured; and

d) have the cytotoxic hazard symbol displayed clearly and visibly, if used for containing cytotoxic wastes.

5.2.6

A waste-holding plastic bag shall[1]:

a) be color-coded or identified according to the type of waste for which it is intended and have the cytotoxic hazard symbol displayed clearly and visibly, if used for containing cytotoxic wastes; and
b) be sturdy enough to resist leaking and breaking under individual usage conditions, and to the point of disposal.

Provincial, municipal, or facility regulations may mandate bags of a specific thickness.

5.3 Return to Distributing Agent

5.3.1

After obtaining permission from the distributing agent, intact pharmaceutical products or chemicals (e.g., unreconstituted or unopened vials, ampoules, or bottles) should be returned to the distributing agent (e.g., pharmaceutical manufacturer, laboratory in which they were prepared, National Cancer Institute).

5.4 Transportation

5.4.1

Appropriate precautions in packaging pharmaceuticals or chemicals for transport shall be taken to help prevent handlers from accidental exposure due to breakage.[2]

5.4.2

Transportation methods used shall reflect the hazards involved.

5.4.3

Hazardous chemicals shall not be transported by Canada Post.[2,3]

5.5 Separation of Wastes

5.5.1

Separation of wastes shall be performed considering the following:

a) method of disposal (e.g., incineration, sewer, municipal landfill, collection for special disposal by local or provincial disposal authorities, e.g., commercial disposal);
b) wastes requiring chemical deactivation prior to disposal (e.g., chemicals, cytotoxics (if incineration is not available), associated contaminated materials);
c) wastes requiring autoclaving prior to disposal (e.g., some biologicals);
d) wastes requiring the supervision of disposal (e.g., narcotics, and controlled drugs);
e) wastes containing hazardous packaging or preparation materials (e.g., broken glass, needles, other sharps); and
f) method of storage of waste prior to disposal (e.g., location, type of container, labelling).

5.6 Waste Storage in Health Care Facilities

5.6.1

There shall be a separate area in the health care facility designated for the storage of waste materials prior to their proper disposal.

6. DISPOSAL METHODS

6.1 Incineration

6.1.1

Incineration shall be the preferred method of disposal as it results in the destruction of organic compounds which include the majority of pharmaceuticals.

6.1.2

The following limitations apply to incineration:

a) certain wastes, such as aerosol containers and flammable substances, are not suitable for incineration;
b) some incinerator operators do not allow non-combustible materials to be incinerated (e.g., large glass containers, metals); and
c) temperatures of greater than 1000 °C are required for the complete destruction of cytotoxics.

6.1.3

If the health care facility does not have on-site incinerators, access should be arranged to use a local incinerator (e.g., municipal, university, another health care facility, or commercial).

6.1.4

Appropriate packaging, labelling, and precautions shall be taken during the transportation to the incinerator to prevent accidental exposure of waste handlers.

6.2 Disposal into the Sewer System

6.2.1

The disposal of small amounts of unused pharmaceuticals or urine or feces containing excreted pharmaceuticals and their metabolites into the sewer system should not present a hazard.[4]

6.2.2

The sewer system shall not be excessively or indiscriminately used, as it may result in contamination of the water supply and disruption of the sewer processes.[4]

6.3 Disposal into Municipal Landfills

6.3.1

Secure chemical landfills may be used to dispose of pharmaceuticals although it is the least desirable method of disposal.

7. DISPOSAL OF NON-CYTOTOXIC[5] PHARMACEUTICALS

7.1 Rendering Pharmaceuticals Unusable

7.1.1

Pharmaceuticals shall be disposed of in such a manner that they cannot be used.

7.1.2

If the pharmaceuticals will not be destroyed under the supervision of the director of pharmacy or a designate, the pharmaceutical waste (other than

cytotoxic) shall be rendered unusable prior to being removed from the pharmacy for disposal.

7.1.3

Solid dosage forms should be placed into a plastic container and water added thereby dissolving them into an unusable mixture.

7.1.4

Ointments, creams, jellies, powders, etc., should be made unfit for use by removal from their containers or by other means.

7.2 Disposal by Patients

7.2.1

Unused medications shall be returned to the pharmacy for proper disposal, if possible.

7.2.2

If the return of unused medication is not possible, patients shall be instructed on the proper disposal of pharmaceuticals, especially with respect to special handling and disposal techniques required for some pharmaceuticals (e.g., biologicals, cytotoxics).

7.3 Disposal of Organic Pharmaceuticals

7.3.1

Organic pharmaceuticals should be destroyed through incineration.

7.3.2

Pharmaceuticals with persistent or bioaccumulation properties shall not be discarded into sewer systems or landfills.

7.4 Disposal of Inorganic Pharmaceuticals

7.4.1

Inorganic pharmaceuticals shall be recycled, chemically deactivated, or buried by appropriate authorities in a manner that will prevent them from being leached out by ground water, as they cannot be completely destroyed through incineration.

7.5 Disposal of Antibiotics and Antiseptics

7.5.1

Antibiotics and antiseptics shall be incinerated when possible, as it avoids upsetting bacterial flora used in sewage treatment or the composting process.

7.5.2

If incineration is not available, local disposal authorities shall be consulted for the disposal of large amounts of these products.

7.6 Disposal of Narcotics and Controlled Drugs

7.6.1 Legislation

Narcotics and controlled drugs shall be disposed of in accordance with federal legislation and the directives of the Bureau of Dangerous Drugs, Health Protection Branch.[6]

7.6.2 Disposal of Partial Doses

Unusable injectable narcotics or controlled drugs in quantities that represent a partial dose from an ampoule or vial shall be destroyed by a facility employee, who is a health professional, in

accordance with narcotic regulations and the health care facility's policies.

7.6.3 Disposal of Large Quantities of Narcotics and Controlled Drugs

7.6.3.1
Large quantities of narcotics and controlled drugs (e.g., outdated, damaged, partially filled containers, etc.) shall be destroyed after obtaining prior written permission from the Regional Office of the Bureau of Dangerous Drugs in the region in which the health care facility is located.

7.6.3.2
Destruction shall be conducted by the pharmacist (or facility employee in charge of the facility pharmacy or main drug room) in the presence of a Bureau official or another health care professional (as defined by the Bureau) and in accordance with narcotic regulations and facility policies.

7.6.3.3
The destruction process shall ensure that there is no opportunity for diversion of the drug into illegal channels.

7.7 Disposal of Biologicals

7.7.1

Biologicals, in particular live attenuated vaccines, shall be handled with caution to avoid exposure of the handler to the vaccine.

7.7.2

Biologicals shall be incinerated when possible.

7.7.3

Biologicals shall be disposed of in yellow containers or bags, preferably labelled with a biohazard label.

8. HANDLING AND DISPOSAL OF CYTOTOXIC DRUGS

8.1 Policies and Procedures

8.1.1

Written policies and procedures shall be developed and shall be readily available to all personnel involved in handling cytotoxic drugs.[7-14]

8.1.2

References providing detailed handling procedures and provincial guidelines shall be consulted when preparing departmental policies and procedures.

8.2 Personnel

8.2.1

Preparation, reconstitution, administration, and disposal of cytotoxic drugs shall be performed by specially trained personnel, to protect the handlers, the drug, and the environment.

8.2.2

Patients or health care professionals handling cytotoxics in the home or office setting shall receive training and shall follow the principles and procedures necessary for safe handling of cytotoxics.

8.2.3

There shall be no eating, drinking, smoking, chewing of gum or tobacco, applying of cosmetics or storing of food in the cytotoxic preparation room.

8.2.4

Personnel shall wash their hands thoroughly after removing gloves used while preparing,

administering, or disposing of cytotoxic drugs or cytotoxic-contaminated materials.

8.3 Protective Equipment and Clothing

8.3.1

Protective equipment and clothing shall be worn to prevent exposure of the skin or eyes to the drug and to prevent inhalation of powders or aerosols.

8.3.2

Recommended protective clothing includes:

a) a long sleeve, back closure, water repellent, disposable protective garment with solid front and tight fitting cuffs and neck;
b) disposable, powder-free, surgical latex gloves, changed at least hourly, or when contaminated or punctured; if powderfree gloves are not available, powder shall be swabbed off the gloves before use;
c) eye protection (e.g., safety glasses or goggles, face visors); and
d) respiratory protection (e.g., disposable dust and mist respirator mask [not a surgical mask]).

Note: *Contact lenses should not be worn, even with eye protection, as they may absorb aerosolized material.*

Note: *(c) and (d) are not required when working with a biological containment cabinet.*

8.3.3

There shall be an eye wash station in the cytotoxic work area and a safety shower readily accessible.

8.4 Preferred Work Area

8.4.1 Biological Containment Cabinet

Note: *Provincial regulations may require the use of a biological containment cabinet for the preparation of cytotoxic drugs.*

8.4.1.1
Whenever possible, cytotoxic drugs shall be prepared in a Biological Containment Cabinet, Class II, that meets current NSF Standard 49.[15]

8.4.1.2
External venting is preferred and may be required by provincial regulations.

8.4.1.3
The Biological Containment Cabinet (BCC) should be cleaned and disinfected regularly (i.e., before and after each preparation session) to ensure a proper environment for preparation of sterile products. For routine cleanups of surfaces between decontaminations, use water for injection or irrigation, with or without a small amount of cleaner. If the contamination is soluble only in alcohol, then 70% isopropyl or ethyl alcohol may be used in addition to the cleaner. In general, alcohol is not a good cleaner, only a disinfectant, and its use in a BCC should be limited. The BCC should be disinfected with 70% alcohol before any aseptic manipulation is begun.

8.4.1.4
The Biological Containment Cabinet should be operated continuously with the blower turned on 24 hours a day, seven days a week. If the cabinet must be turned off, all parts of the cabinet that can be reached should be decontaminated. Once the cabinet is clean, the blower may be turned off. The work access opening of the cabinet and the HEPA exhaust area should be sealed with tape to prevent contamination from escaping from the cabinet.

8.4.1.5
The Biological Containment Cabinet should be decontaminated on a regular (at least weekly) basis and whenever there is a spill. If the BCC is only used for chemical (drug) products, decontamination using a stainless steel cleaning agent should be done. Refer to manufacturer of the BCC for guidelines, or to the ASHP technical assistance bulletin on handling cytotoxic and hazardous drugs (reference 9).

8.4.1.6
A horizontal laminar air flow cabinet shall not be used because of the risk of carrying aerosolized drug particles being propelled out of the cabinet onto personnel and into the room.

8.4.2 Certification of a Biological Containment Cabinet

8.4.2.1
The biological containment cabinet shall be certified by a qualified technician when installed, at least annually thereafter, or any time the cabinet is physically moved.[16]

8.4.3 Filter Replacement

8.4.3.1
Care shall be taken when replacing and disposing of the high efficiency particulate air (HEPA) and charcoal filters in cabinets that have been used in the preparation of cytotoxic drugs.

8.4.3.2
Only trained biosafety personnel shall replace cabinet filters.

8.4.3.3
Used filters shall be treated as cytotoxic contaminated waste and incinerated.

8.4.4 Location of a Biological Containment Cabinet

8.4.4.1
The biological containment cabinet should be located in an area of the workroom with a minimum air turbulence, removed from doorways, traffic corridors and air conditioning and heating vents.

8.5 Alternative Work Area

8.5.1

If a biological containment cabinet is not available or legislated by provincial regulations, the work area used should:

a) permit effective cleaning of all surfaces;
b) have a sink nearby; and,
c) not have air conditioning or ventilation facilities that draw up particles and aerosols and redistribute them to other areas.

8.6 Parenteral Preparation Techniques

8.6.1 Aseptic Technique

8.6.1.1
Aseptic technique shall be followed when preparing parenteral cytotoxic drugs within or outside a biological containment cabinet.

8.6.2 Preparation

8.6.2.1
Preparation work should be performed on a disposable, plastic-backed absorbent cloth or liner so that it can be removed and disposed of as cytotoxic contaminated waste.

8.6.2.2
The cloth shall be changed after a preparation is completed, after a shift, and after a spill.

8.6.2.3
Problems inherent with the use of a liner include:

a) introduction of particles into the work area;
b) uneven work surface may cause spills;
c) increased difficulty of spill detection; and,
d) creation of additional contaminated material for disposal.

8.6.3 Pressure Differentials

8.6.3.1
Production of pressure differentials and aerosols shall be avoided at all times to avoid undue exposure of the handler or the environment.

8.6.3.1.1
Hydrophobic 0.22 micron air venting filter devices may be used, especially when working outside a biological containment cabinet.

8.6.3.1.2
Negative pressure techniques shall be used when working with vials.

8.6.4 General Techniques

8.6.4.1
Injury and exposure when breaking open an ampoule shall be avoided by using the following techniques:

a) gently tap all fluids or powders down from the top and neck of the ampoule;
b) wrap the disinfected ampoule neck in a sterile gauze pad or alcohol pad prior to breaking; and,
c) use an ampoule breaker, if available.

8.6.4.2
When reconstituting powders in glass ampoules or vials, the diluent shall be added slowly down the wall of the container to thoroughly wet the powder before agitating.

8.6.4.3
Luer-lock disposable syringes and fittings shall be used in both the preparation and administration of cytotoxic drugs to help prevent leakage and accidental separation of needles from syringes.

8.6.4.4
Appropriate sizes of syringes shall be used so that each is not more than 3/4 full when containing the final dose.

8.6.4.5
The volume of cytotoxic solution shall be adjusted while the needle is in the vial; no excess drug shall be drawn up.

8.6.4.6
If excess drug is drawn up, the excess liquid shall be returned to its vial, or in the case of ampoules, a sealed vial.

8.6.4.7
After completing the preparation, the external surfaces of syringes and intravenous bags or bottles, especially the access ports, shall be wiped clean of any drug contaminates.

8.7 Nonsterile Cytotoxic Drugs

8.7.1 General Principles

8.7.1.1
Gloves shall be worn when handling oral and other nonsterile cytotoxic dosage forms such as topical preparations.

8.7.1.2
Preparation of nonsterile cytotoxic dosage forms should be performed in a biological containment cabinet observing precautions and procedures for handling cytotoxics.

8.7.1.3
Equipment (counting tray, pill cutter) shall be kept exclusively for dispensing nonsterile cytotoxic drugs. This equipment shall be cleaned with an alcohol swab immediately after use.

8.7.2 Weighing Cytotoxic Drug Products

8.7.2.1
Procedures requiring the weighing of ingredients shall not be performed in a biological containment cabinet because the air currents will affect the balance.

8.7.2.2
When weighing cytotoxic products, full protective clothing and equipment, including eye and respiratory protection, shall be used.

8.7.3 Prepackaging Cytotoxic Drug Products

8.7.3.1
Unit dose and other mechanical packaging equipment shall not be used to prepackage cytotoxic drug products due to the increased chance of tablet or capsule breakage and the difficulty of clean-up.

8.8 Administration of Cytotoxic Drugs

8.8.1 Safety Precautions

8.8.1.1
Special safety precautions shall be followed during the administration of all cytotoxic drugs to prevent undue exposure of the handler and the patient.

8.8.2 Protective Clothing

8.8.2.1
Protective clothing (gowns, gloves, eye protection) should be worn during administration to offer the handler protection from leakage or drug splash.

8.8.3 Leakage

8.8.3.1
Luer-lock syringes and infusion pump fittings shall be used to minimize leakage and separation of the fittings.

8.8.3.2
During administration, a plastic-backed absorbent pad shall be placed under the administration set to absorb any leakage.

8.8.4 Avoiding the Production of Aerosols

8.8.4.1
Production of aerosols shall be avoided.

8.8.4.2
Administration sets should be attached and primed prior to the cytotoxic drug being added to the IV fluid.

8.8.4.3
If the cytotoxic drug has been added prior to the set being primed, then the set shall be primed, releasing only the first drop into a sterile gauze pad and the gauze pad discarded as cytotoxic waste.

8.8.5 Use of Glass IV Containers

8.8.5.1
Glass IV containers with venting tubes should be avoided.

8.8.5.2
If such containers are used, a sterile gauze pad shall be secured over the tube when it is inverted in order to catch any solution trapped in the tube.

8.8.6 Disposal of Needles

8.8.6.1
To avoid accidental skin punctures, needles shall not be recapped or clipped after use, but shall be

discarded directly into the designated cytotoxic sharps containers.

8.9 Transportation within the Health Care Facility

8.9.1

Special precautions shall be followed to prevent breakage and to help minimize exposure and contain spills when transporting cytotoxic drugs within the health care facility.

8.9.2

Syringes, bottles, or bags, containing cytotoxic drug products shall be placed into sealable plastic bags and transported via a tray or cart that will minimize the possibility of drug products falling during delivery.

8.9.3

Luer-lock syringe caps shall be used when transporting syringes containing cytotoxics solutions.

8.9.4

Mechanical transportation systems that produce stress on their contents (e.g., pneumatic tubes) shall not be used to transport cytotoxics.

8.9.5

All individuals involved in the transportation of cytotoxics shall be trained in methods to handle cytotoxic spills.

8.10 Transportation Outside the Health Care Facility

8.10.1

Cytotoxic drugs in liquid or unreconstituted parenteral dosage forms should be placed in sealable plastic bags prior to transporting.

8.10.2

Appropriate packaging materials shall be used to provide cushioning.

8.10.3

Packaged cytotoxic drugs shall be labelled appropriately for transportation in order to alert the handler to the hazards of the package's contents.

Note: *Compliance with various provincial dangerous goods transportation acts or regulations is required. The manufacturers of the drugs can be contacted for this information.*

8.11 Segregation of All Forms of Cytotoxic Pharmaceutical Waste (Sterile and Nonsterile)

8.11.1

All items which come in contact with cytotoxic drugs during preparation or administration shall be treated as cytotoxic waste and disposed of properly.

8.11.2

Cytotoxic pharmaceutical waste and associated contaminated materials (e.g., syringes, tubing, containers, disposable gowns, disposable gloves, preparation and administration materials) shall be separated from general waste and discarded into designated leak-proof waste containers that clearly and visibly display the cytotoxic hazard symbol.

8.11.3

Sharp objects (e.g., needles, broken glass) contaminated with cytotoxics shall be placed into designated leak-proof, punctureproof sharps containers that clearly and visibly display the cytotoxic hazard symbol.

8.11.4

Contaminated needles, syringes, sets, and tubing shall be disposed of intact.

8.11.5

To prevent penetration and leakage:

a) excess cytotoxic fluids shall be placed in sealed containers; the original vial is acceptable; and,
b) an absorbent material should be placed at the bottom of the cytotoxic waste container to absorb excess fluids.

8.12 Disposal of Cytotoxic Pharmaceutical Waste

8.12.1 Incineration

8.12.1.1
Cytotoxic pharmaceutical wastes shall be incinerated unless incineration is unavailable.

8.12.1.2
Incineration temperatures of 1000° C or greater are required for complete destruction.

Note: *Some cytotoxics decompose on incineration to release toxic gases such as fluorides, hydrogen chloride, bromine, sulfur dioxide, nitric oxide, nitrogen dioxide, and phosphorus oxide.*

8.12.2 Alternative Disposal Methods

8.12.2.1 Chemical Deactivation
8.12.2.1.1
If incineration is not available, chemical deactivation may be used for some cytotoxic pharmaceuticals. Currently, no one method can be recommended for all cytotoxic drugs as a general procedure.[17, 21]

8.12.2.1.2
Deactivation should be performed in a biological containment cabinet or fume hood, using appropriate clothing and double gloving.

8.12.2.1.3
If deactivation procedures are performed outside a biological containment cabinet or fume hood, protective eye and respiratory equipment shall be worn, in addition to protective clothing and double gloving.

8.12.2.2 Landfill Sites
8.12.2.2.1
Disposal of small amounts of cytotoxics into landfill sites or the sewer may be permissible in some regions.

8.12.2.2.2
Local disposal authorities should be consulted if either of these methods are to be used.

8.13 Patient Excreta

8.13.1

When handling excreta, vomitus (after oral doses), and other body fluids from patients receiving cytotoxic pharmaceuticals within the previous 48 hours, latex gloves shall be worn.

8.13.2

Urine collected after cytotoxic bladder instillations, or other large quantities of cytotoxic contaminated

body fluids, can be disposed of in a urine collection container containing “Cellite” to solidify the waste to prevent liquid spillage during transportation.

8.13.3

The container shall be clearly and visibly marked with the cytotoxic hazard symbol.

8.13.4

Regular cytotoxic contaminated patient waste may be disposed of in the sewage system.

8.13.5

Disposable pads or disposable linen shall be used for the incontinent patient.

8.13.6

Cytotoxic contaminated garments and linen shall be treated as isolation linen and washed separately.

8.13.7

Cyclophosphamide is found in sweat and saliva, therefore precautions shall be followed for 72 hours after a dose when bathing a patient or performing oral treatment or care procedures.[18]

8.14 Accidental Exposure

8.14.1

If spillage of the cytotoxic drug occurs into the eyes or onto unprotected skin, the drug shall immediately be washed away with copious amounts of water.

8.14.2

When skin is accidentally exposed to cytotoxic drugs, the affected area shall also be washed with soap and water.

8.14.3

All people accidentally exposed to cytotoxics shall be examined by the occupational health service staff in accordance with facility policies and appropriate documentation shall be completed.

8.14.4

Contaminated disposable clothing shall be discarded as cytotoxic waste.

8.14.5

Non-disposable clothing shall be handled with gloves, prewashed separately, and then further washed.

8.14.6

Skin punctures or needle stick injuries shall be washed with running water and the puncture area may be squeezed to encourage bleeding to flush out any drug that may have been injected accidentally.

8.15 Spills

8.15.1

Spills shall be cleaned up immediately by properly trained personnel following established policies and procedures.

8.15.2

Personnel cleaning up cytotoxic spills shall use full protective equipment and clothing (e.g., gowns, double gloves, eye and respiratory protection).

8.15.3

Spill kits, containing all materials and equipment necessary to clean a spill, shall be available and readily accessible at the work site.

8.15.4

The spill shall be contained and wiped up using absorbent powders or papers, or both.

8.15.5

The area shall be washed with a detergent followed by 70% isopropyl alcohol (aseptic areas) or water (non-aseptic areas), then dried.

8.15.6

All contaminated materials shall be immediately discarded into designated cytotoxic waste containers.

8.16 Employee Monitoring

8.16.1

Complete blood counts may be done to provide a baseline for future examinations.[19]

8.16.2

A registry of the extent to which personnel handle cytotoxics (e.g., number of doses prepared) and accidental exposure should be maintained.

8.17 Reproductive Precautions

8.17.1

Policies shall address female employees who are pregnant or breast feeding and employees who are attempting to conceive.

8.17.2

Employees shall be provided with information to enable them to make an individual decision regarding the hazards of continuing to handle cytotoxics.

8.17.3

If requested, every attempt should be made to transfer an employee to comparable duties that do not involve handling cytotoxics.

8.17.4

If a suitable transfer cannot be made, leave of absence without pay should be considered.

9. HANDLING AND DISPOSAL OF CHEMICALS

9.1 Purchasing and Storing Chemicals

9.1.1

Minimum inventories of hazardous chemicals shall be maintained.

9.1.2

An inventory of all chemicals shall be made periodically to determine if there are excessive quantities or if there are outdated chemicals.

9.1.3

Chemicals shall be stored under proper conditions of temperature, light, moisture, sanitation, ventilation, segregation, and security.

9.1.4

If no expiry date is indicated on a chemical label, the container shall be labelled with the date it was received and also the date it was opened.

9.1.5

Chemicals with a limited safe shelf life shall be given an appropriate expiry date.

9.1.6

Chemicals that may become an explosive hazard if allowed to dehydrate shall be disposed of after a designated time period.

9.1.7

Improperly stored chemicals shall be disposed of immediately.

9.1.8

Chemicals shall be stored in their original containers with labels clearly indicating the contents and any special hazards associated with them.

Note: *The Workplace Hazardous Materials Act should be consulted to ensure compliance with the labelling and employee education requirements of this legislation.*

9.1.9

If chemicals are stored in other containers or repackaged, the new containers shall have all old labels removed and shall be clearly labelled as to the contents, associated hazards, date of receipt of the chemical, and the repackaging date.

9.1.10

The new container shall be appropriate for its chemical contents (i.e., glass vs. plastic, light sensitive, etc.).

9.1.11

Flammable or explosive chemicals shall be kept in the smallest quantities necessary and in manufacturer-approved containers and shall be stored away from sources of ignition.

9.1.12

Bulk flammable liquids shall be stored in properly designed flammable storage rooms or in locked facilities exterior to the building.

9.1.13

Acids and corrosives shall be stored as close to the floor as possible to reduce the area involved if they fall and release their contents.

9.1.14

Incompatible chemicals shall be stored in separate sections to help prevent accidental mixing if spills or breakage occur.

9.2 Handling Precautions

9.2.1

Fume hoods, properly installed and with adequate ventilation should be used.

9.2.2

A safety shower and eyewash fountain should be located in or near the pharmacy department.

9.2.3

Protective equipment and clothing (gowns, gloves, eye and respiratory protection) shall be worn to prevent accidental contact or inhalation, when appropriate. Refer to the applicable Material Safety Data Sheet for specific information.

9.2.4

Labels shall be read prior to use of the chemical to note any warnings and precautions.

9.2.5

All glass containers and equipment shall be checked prior to use for cracks or breaks.

9.2.6

Damaged glassware shall not be used because of the risk of contact due to leakage or breakage.

9.3 Disposal of Chemicals

9.3.1 Hazardous Organic Chemicals

9.3.1.1
Disposal procedures shall be dependent upon the type and amount of chemical to be discarded.[20]

9.3.1.2
The following chemical properties shall be considered when determining the method of disposal:

a) toxicity;
b) flammability;
c) corrosiveness;
d) bioaccumulation;
e) environmental persistence;
f) carcinogenicity;
g) reactivity with water and other chemicals;
h) corrosiveness to drain pipes; and,
i) adverse effects on sewage disposal systems.

9.3.1.3
Small amounts of some chemicals can be discarded into the sewer system and flushed with copious amounts of water. References must be checked prior to discarding any type of chemical.

9.3.1.4
Local authorities (municipal and provincial) shall be contacted for local disposal regulations and suggestions regarding types and amounts of chemical waste that can be discarded into the sewer system or landfill.

9.3.1.5
Chemical wastes to be disposed of by means other than the sewer system shall be separated into suitable containers and labelled as to the type of contents, method of disposal, and appropriate cautionary labels.

9.3.1.6
Personnel shall be knowledgeable about which chemicals can be mixed and which are incompatible.

9.3.1.7
Flammable wastes shall be stored in approved safety containers.

9.3.1.8
Contaminated sharps (e.g., broken glassware) shall be separately placed into puncture resistant containers and appropriately labelled.

9.3.2 Hazardous Inorganic Chemicals

9.3.2.1 General Principles
9.3.2.1.1
Toxic inorganic chemicals and their salts (e.g., mercury) shall not be discarded into the sewer, but shall be collected for recycling or disposal by local disposal authorities.

9.3.2.1.2
Spills, depending on their size and nature, should be followed by chemical treatment of microscopic droplets, especially those droplets that may have penetrated into pores on benches, floors, etc. Refer to the applicable Material Safety Data Sheet for specific information.

9.3.2.2 Mercury Spill
9.3.2.2.1
While wearing gloves, as much spilled mercury as possible should be collected by physical means, (i.e.,

scooped up, aspirated or vacuumed into a collection bottle).

9.3.2.2.2
Collected mercury shall be stored in a tightly stoppered container for disposal by authorities.

10. LITERATURE CITED

These Guidelines refer to the following publications; the dates shown indicate the latest issues available at the time of printing:

1. Handling of Waste Materials within Health Care Facilities. Canadian Standards Association Standard Z317.10-M. 1988

2. Transportation of Dangerous Goods Act and Regulations, S.C., 1980, Chapter 36.

3. The Canada Postal Guide, Part 1, Section 34.11.

4. Duel WC. Environmental impact of drugs in hospital sewage disposal system (Q & A) *JAMA* 1977;238(11):1188.

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7. Knowles RS and Virden JE. Handling of Injectable antineoplastic agents. *B Med J* 1980;281:589-591.

8. American Society of Hospital Pharmacists. Safe handling of cytotoxic drugs. *Am J Hosp Pharm* 1984;41:81-7.

9. American Society of Hospital Pharmacists. ASHP technical assistance bulletin on handling cytotoxic drugs. *Am J Hosp Pharm* 1990;47:1033-1049.

10. National Study Commission on Cytotoxic Exposure. Consensus Responses to Unresolved Questions Concerning Cytotoxic Agents, Second Edition. L.P. Jeffrey, Chairman, Rhode Island Hospital, Providence, Rhode Island. 1986.

11. National Study Commission on Cytotoxic Exposure. Position Statement: The Handling of Cytotoxic Agents by Women who are Pregnant, Attempting to Conceive, or Breast Feeding. L.P. Jeffrey, Chairman, Rhode Island Hospital, Providence, Rhode Island. 1987.

12. Occupational Safety and Health Administration (OSHA). OSHA work-practice guidelines for personnel dealing with cytotoxic (antineoplastic) drugs. Am J Hosp Pharm 1986; 43:1193-1204.

13. Health Care Occupational Health and Safety Association (Ontario). A Guide to the Safe Handling of Antineoplastic Agents. 1986.

14. Workers' Compensation Board of British Columbia. Requirements for the Safe Handling of Antineoplastic Agents in Health Care Facilities. 1986.

15. National Sanitation Foundation. Ann Arbor, Michigan, Standard No. 49.

16. Canadian Standards Association. Biological Containment Cabinets: Installation and Field Testing. CAN/CSA-Z316.3-M87.

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18. Harris J and Dodds LJ. Handling waste from patients receiving cytotoxic drugs. *Pharmaceutical Journal* 1985;7(Sept. 7):289-91.

19. Tuffnell PG, Gannon MT, Dong A, et al. Limitations of urinary mutagen assays for monitoring occupational exposure to antineoplastic drugs. *Am J Hosp Pharm* 1986;43:344-8.

20. Armour MA. Hazardous Laboratory Chemicals Disposal Guide. CRC Press, 1990.

21. Castegnaro M, Adams J, Armour MA, et al., eds. Laboratory decontamination and destruction of carcinogens in laboratory wastes; some antineoplastic agents. International Agency for Research on Cancer Scientific Publication No. 73. Oxford University Press, Fair Lawn, New Jersey, 1985.

APPENDIX A

Figure 1
Cytotoxic Hazard Symbol
Handling of Waste Materials Within Health Care Facilities
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