



Compounding Committee: USP <800> Hazardous Drugs—Handling in Healthcare Settings

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Be Aware and Take Care: Talk to your Pharmacist!



Compounding Committee

- ▶ This presentation has been modified to ensure compliance with ADA provisions



United States Pharmacopeia (USP)

2015-2020 Resolutions

- ▶ Resolution VII - Quality Standards for Compounded Medicines:
 - ▶ USP will continue working with stakeholders to develop and maintain practice and quality standards for sterile and non-sterile compounding.
 - ▶ USP will increase the availability of its compounding standards, expand stakeholder engagement and education, and promote adoption of these standards by compounding professionals and regulatory authorities.



United States Pharmacopeia (USP)

- ▶ General Chapter <795> Pharmaceutical Compounding—Nonsterile Preparations
- ▶ General Chapter <797> Pharmaceutical Compounding – Sterile Preparations
- ▶ General Chapter <800> Hazardous Drugs—Handling in Healthcare Settings
- ▶ General Chapter <825> Radiopharmaceuticals— Preparation, Compounding, Dispensing, and Repackaging



Milestones for revisions

- ▶ Public comment period March 30, 2018 through July 31, 2018
- ▶ Open microphone session April 20, 2018
- ▶ Intended publication date June 1, 2019
- ▶ Intended official date of December 1, 2019



NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings

- ▶ The National Institute for Occupational Safety and Health (NIOSH) is a division of Center for Disease Control and Prevention (CDC)
- ▶ NIOSH List Antineoplastic and Other Hazardous Drugs in Healthcare Settings:
 - ▶ 2004, 2010, 2012, 2014, 2016



The National Institute for Occupational Safety and Health (NIOSH)

- ▶ Hazardous Drugs include those that exhibit one or more of the following six characteristics in humans or animals: (Criteria)
 - ▶ Carcinogenicity
 - ▶ Teratogenicity or fertility impairment
 - ▶ Reproductive toxicity
 - ▶ Organ toxicity
 - ▶ Genotoxicity
 - ▶ Structure and toxicity profiles of new drugs that mimic existing drugs determined hazardous



The National Institute for Occupational Safety and Health (NIOSH): Types of hazardous drug

Table 1. Group 1: Antineoplastic drugs

- ▶ one or more of the NIOSH criteria for a hazardous drug.
- ▶ Many of these drugs are cytotoxic
- ▶ Represent an occupational hazard to healthcare workers and should *always* be handled with use of recommended engineering controls and personal protective equipment (PPE), regardless of their formulation.



The National Institute for Occupational Safety and Health (NIOSH) : Types of hazardous drug

Table 2. Group 2: Non-antineoplastic drugs that meet one or more of the NIOSH criteria for a hazardous drug

- ▶ Some of these drugs may represent an occupational hazard to males or females who are actively trying to conceive, women who are pregnant or may become pregnant, and women who are breast feeding, because they may be present in breast milk
- ▶ Unopened, intact tablets and capsules may not pose the same degree of occupational exposure risk as injectable drugs, which usually require extensive preparation.



The National Institute for Occupational Safety and Health (NIOSH) : Types of hazardous drug

Table 3. Group 3: Non-antineoplastic drugs that primarily have adverse reproductive effects

- ▶ NIOSH criteria for reproductive hazards.
- ▶ Represent a potential occupational hazard to males or females who are actively trying to conceive, women who are pregnant or may become pregnant, and women who are breast feeding, as they may be present in breast milk.
- ▶ Unopened, intact tablets and capsules may not pose the same degree of occupational risk as injectable drugs that usually require extensive preparation.



The National Institute for Occupational Safety and Health (NIOSH) : Types of hazardous drug

- ▶ **Table 4:** drugs that were deleted from the 2014 NIOSH hazardous drug list for the 2016 update; however, there are no deletions to report
- ▶ **Table 5:** provides general guidance for some of the possible scenarios that may be encountered in healthcare settings where hazardous drugs are handled.



USP General Chapter <800> Hazardous Drugs—Handling in Healthcare Settings

- ▶ NIOSH defines criteria and identifies hazardous drugs (HD)
- ▶ USP develops the standards for handling these HDs to minimize the risk to public health.
- ▶ The goals of the USP standards are to help increase awareness, provide uniform guidance to reduce the risk of managing HD, and help reduce the risk posed to patients and the healthcare workforce.



USP General Chapter <800> Hazardous Drugs—Handling in Healthcare Settings

- ▶ Dec. 1, 2014, to May 31, 2015: Second public comment period
 - ▶ over 1,300 comments from ~150 stakeholders
- ▶ Feb. 1, 2016: the Compounding Expert Committee's responses to the public comments posted
 - ▶ https://www.uspnf.com/sites/default/files/usp_pdf/EN/USPNF/usp-nf-commentary/gc_800_commentary_final.pdf
- ▶ December 1, 2019: enforcement date.



USP General Chapter <800> Hazardous Drugs—Handling in Healthcare Settings

- ▶ USP Frequently asked questions:
 - ▶ General
 - ▶ Assessment of Risk (AOR)
 - ▶ Personnel
 - ▶ Facilities and Engineering Controls
 - ▶ Environmental Quality and Control
 - ▶ Personal Protective Equipment (PPE)
 - ▶ Compounding
 - ▶ Receiving
 - ▶ Labeling, Packaging, Transport and Disposal
 - ▶ Medical Surveillance



USP General Chapter <800> Hazardous Drugs: Sections

1. Introduction and Scope
2. List of Hazardous Drugs
3. Types of Exposure
4. Responsibilities of Personnel Handling Hazardous Drugs
5. Facilities and Engineering Controls
6. Environmental Quality and Control
7. Personal Protective Equipment
8. Hazard Communication Program
9. Personnel Training
10. Receiving
11. Labeling, Packaging, Transport, and Disposal
12. Dispensing Final Dosage Forms
13. Compounding
14. Administering
15. Deactivating, Decontaminating, Cleaning, and Disinfecting
16. Spill Control
17. Documentation and Standard Operating Procedures
18. Medical Surveillance



2. List of Hazardous Drugs

- ▶ NIOSH maintains a list of antineoplastic and other HDs used in healthcare.
- ▶ Entity must maintain a list of HDs, which must include any items on the current NIOSH list that the entity handles.
 - ▶ must be reviewed at least every 12 months and whenever a new agent or dosage form is used.



2. List of Hazardous Drugs

Box 1: Containment Requirements

- ▶ Drugs on the NIOSH list that must follow the requirements in this chapter include:
 - ▶ Any HD API
 - ▶ Any antineoplastic requiring HD manipulation
- ▶ Drugs on the NIOSH list that do not have to follow all the containment of this chapter if an assessment of risk is performed and implemented include:
 - ▶ Final dosage forms and compounded HD preparations and conventionally manufactured HD products, including antineoplastic dosage forms that do not require any further manipulation other than counting or repackaging (unless required by the manufacturer)
- ▶ For dosage of other HDs on the NIOSH list, the entity may perform an assessment of risk to determine alternative containment strategies and/work practices

Active pharmaceutical ingredient (API): Any substance or mixture of substances intended to be used in the compounding of a drug preparation, thereby becoming the active ingredient in that preparation and furnishing pharmacological activity or other direct effect in the diagnosis, cure, mitigation, treatment, or prevention of disease in humans and animals or affecting the structure and function of the body.



2. List of Hazardous Drugs

- ▶ An assessment of risk (AOR) may be performed for dosage forms to determine alternative containment strategies and/or work practices.
 - ▶ Must document what alternative containment strategies and/or work practices are being employed for specific dosage forms to minimize occupational exposure
 - ▶ Must be reviewed at least every 12 months and the review documented.
- ▶ AOR must, at a minimum, consider the following:
 - ▶ Type of HD (e.g., antineoplastic, non-antineoplastic, reproductive risk only)
 - ▶ Dosage form
 - ▶ Risk of exposure
 - ▶ Packaging
 - ▶ Manipulation



3. TYPES OF EXPOSURE

- ▶ Table 1 provides examples of potential opportunities of exposure based on activity



4. RESPONSIBILITIES OF PERSONNEL HANDLING HAZARDOUS DRUGS

- ▶ Designated person:
 - ▶ Is qualified and trained to be responsible for developing and implementing appropriate procedures;
 - ▶ Oversees compliance with this chapter and other applicable laws, regulations, and standards;
 - ▶ Ensures competency of personnel;
 - ▶ Ensures environmental control of the storage and compounding areas.
 - ▶ Thoroughly understands:
 - ▶ rationale for risk-prevention policies,
 - ▶ risks to themselves and others,
 - ▶ risks of noncompliance that may compromise safety,
 - ▶ the responsibility to report potentially hazardous situations to the management team.
 - ▶ Responsible for the oversight of monitoring the facility and maintaining reports of testing/sampling performed in facilities, and acting on the results.



5. FACILITIES AND ENGINEERING CONTROLS

- ▶ HDs must be handled under conditions that promote patient safety, worker safety, and environmental protection.
- ▶ Signs designating the hazard must be prominently displayed before the entrance to the HD handling areas.
- ▶ Access to areas where HDs are handled must be restricted to authorized personnel to protect persons not involved in HD handling.
 - ▶ HD handling areas must be located away from breakrooms and refreshment areas for personnel, patients, or visitors to reduce risk of exposure.
- ▶ Designated areas must be available for:
 - ▶ Receipt and unpacking
 - ▶ Storage of HDs
 - ▶ Nonsterile HD compounding
 - ▶ Sterile HD compounding



5. FACILITIES AND ENGINEERING CONTROLS

- ▶ Designated areas :
 - ▶ Receipt and unpacking: (Antineoplastic HDs and all HD APIs)
 - ▶ neutral/normal or negative pressure relative to the surrounding areas.
 - ▶ Storage of HDs:
 - ▶ Not on floor
 - ▶ Antineoplastic HDs (requiring manipulation) and all HD APIs:
 - ▶ stored separately from non-HDs
 - ▶ stored in an externally ventilated, negative-pressure room with at least 12 air changes per hour (ACPH).
 - ▶ Non-antineoplastic, reproductive risk only, and final dosage forms of antineoplastic HDs:
 - ▶ may be stored with other inventory if permitted by entity policy.
 - ▶ Refrigerated antineoplastic HDs must be stored in a dedicated refrigerator in a negative pressure area with at least 12 ACPH.



5.3 Compounding Engineering controls:

- ▶ **Containment primary engineering control (C-PEC)** a ventilated device to minimize worker and environmental HD exposure
 - ▶ must operate continuously if it supplies some or all of the negative pressure in the C-SEC or if it is used for sterile compounding.
- ▶ **Containment secondary engineering control (C-SEC)** room in which the C-PEC is placed and must:
 - ▶ externally vented
 - ▶ physically separated (a different room from other areas)
 - ▶ Have an appropriate air exchange (ACPH)
 - ▶ Have a negative pressure **between** 0.01 and 0.03 inches of water column relative to all adjacent areas.



5.3 Compounding Engineering controls:

- ▶ **Supplemental engineering controls:** (closed-system drug-transfer device (CSTD)) are adjunct controls to offer additional levels of protection.
- ▶ **Other Engineering controls:**
 - ▶ Sink must be available for hand washing.
 - ▶ Water sources and drains must be located at least 1 meter away from the C-PEC.

Nonsterile and sterile HDs:

- ▶ C-PECs must be placed in separate rooms, unless C-PEC used for nonsterile compounding are sufficiently effective that the room can continuously maintain ISO 7 classification throughout the nonsterile compounding activity.
- ▶ If in the same room they must be placed at least 1 meter apart and particle-generating activity must not be performed when sterile compounding is in process.



5.3.1 NONSTERILE COMPOUNDING

- ▶ Nonsterile HD compounding must be performed in a C-PEC within a C-SEC
- ▶ C-SEC surfaces of ceilings, walls, floors, fixtures, shelving, counters, and cabinets in the nonsterile compounding area must be smooth, impervious, free from cracks and crevices, and non-shedding.

Table 2. Engineering Controls for Nonsterile HD Compounding

C-PEC	C-SEC Requirements
<ul style="list-style-type: none">• Externally vented (preferred) or redundant-HEPA filtered in series• Examples: CVE, Class I or II BSC, CACI	<ul style="list-style-type: none">• Externally vented• 12 ACPH• Negative pressure between 0.01 and 0.03 inches of water column relative to adjacent areas



5.3.2 STERILE COMPOUNDING

- ▶ C-PECs (Class II or III BSC or CACI) must be:
 - ▶ externally vented
 - ▶ provide an ISO Class 5 or better air quality
 - ▶ must not be used for the preparation of a non-HD unless:
 - ▶ non-HD is placed into a protective outer wrapper during removal from the C-PEC and is labeled to require PPE handling precautions.
 - ▶ must be located in a C-SEC
- ▶ C-SEC:
 - ▶ ISO Class 7 buffer room with ISO Class 7 ante-room (preferred)
 - ▶ Unclassified containment segregated compounding area (C-SCA)

Biological safety cabinet (BSC): A ventilated cabinet often used for preparation of hazardous drugs. Divided into three general classes (Class I, Class II, and Class III).

Compounding aseptic containment isolator (CACI): A specific type of CAI that is designed for the compounding of sterile HDs. The CACI is designed to provide worker protection from exposure to undesirable levels of airborne drugs throughout the compounding and material transfer processes and to provide an aseptic environment with unidirectional airflow for compounding sterile preparations.



5.3.2 STERILE COMPOUNDING

HD cleanroom suite:

- ▶ C-SEC: (Clean/Buffer room)
 - ▶ Fixed walls,
 - ▶ Minimum of 30 ACPH of HEPA-filtered supply air,
 - ▶ air quality of ISO Class 7 or better
 - ▶ Negative pressure **between** 0.01 and 0.03 inches of water column relative to all adjacent areas
- ▶ C-SEC (Anteroom)
 - ▶ Fixed walls,
 - ▶ Minimum of 30 ACPH of HEPA-filtered supply air
 - ▶ Positive pressure of at **least** 0.02 inches of water column relative to all adjacent unclassified areas
 - ▶ Air quality of ISO Class 7 or better
 - ▶ Hand-washing sink **must** be placed in the ante-room at least 1 meter from the entrance to the HD buffer room



5.3.2 STERILE COMPOUNDING

- ▶ IF HD buffer room entered through the positive-pressure non-HD buffer room, the following is also required: **(Not a recommended facility design)**
 - ▶ Line of demarcation must be defined within the negative-pressure buffer room for donning and doffing PPE
 - ▶ Method to transport HDs, HD CSPs, and HD waste into and out of the negative pressure buffer room to minimize the spread of HD contamination.
 - ▶ If using a pass-through chamber (buffer area and adjacent space).
 - ▶ must be included in the facility's certification (particles and pressure)
 - ▶ Refrigerator pass-through must not be used.



5.3.2 STERILE COMPOUNDING

Containment segregated compounding area (C-SCA):

- ▶ Must have:
 - ▶ Fixed walls,
 - ▶ Negative pressure **between** 0.01 and 0.03 inches of water column relative to all adjacent areas,
 - ▶ 12 ACPH
 - ▶ Externally vented
 - ▶ hand-washing sink must be placed at least 1 meter from C-PEC
 - ▶ either inside the C-SCA or directly outside the C-SCA.
 - ▶ Only low-and medium-risk HD CSPs may be prepared in a C-SCA.



5.3.2 STERILE COMPOUNDING

Table 3. Engineering Controls for Sterile HD Compounding

Configuration	C-PEC	C-SEC	Maximum BUD
ISO Class 7 buffer room with an ISO Class 7 ante-room	<ul style="list-style-type: none"> Externally vented Examples: Class II BSC or CACI 	<ul style="list-style-type: none"> Externally vented 30 ACPH Negative pressure between 0.01 and 0.03 inches of water column relative to adjacent areas 	As described in <797>
Unclassified C-SCA	<ul style="list-style-type: none"> Externally vented Examples: Class II BSC or CACI 	<ul style="list-style-type: none"> Externally vented 12 ACPH Negative pressure between 0.01 and 0.03 inches of water column relative to adjacent areas 	As described in <797> for CSPs prepared in a segregated compounding area



5.4 Containment Supplemental Engineering Controls

- ▶ Closed-system drug-transfer device (CSTD):
 - ▶ May limit the potential of generating aerosols during compounding.
 - ▶ Must not be used as a substitute for a C-PEC when compounding.
 - ▶ should be used when compounding HDs when the dosage form allows.
 - ▶ Must be used when administering antineoplastic HDs when the dosage form allows.



6. ENVIRONMENTAL QUALITY AND CONTROL

Environmental wipe sampling for HD surface residue should be performed routinely.

- ▶ Surface wipe sampling should include:
 - ▶ Interior of the C-PEC and equipment contained in it
 - ▶ Pass-through chambers
 - ▶ Surfaces in staging or work areas near C-PEC
 - ▶ Areas adjacent to C-PECs (floors, staging, and dispensing area)
 - ▶ Areas immediately outside the HD buffer room or the C-SCA
 - ▶ Patient administration areas
- ▶ Common marker HDs that can be assayed include cyclophosphamide, ifosfamide, methotrexate, fluorouracil, and platinum-containing drugs.
 - ▶ Example of measurable contamination: cyclophosphamide levels >1.00 ng/cm²,
 - ▶ If any measurable contamination is found, the designated person **must** identify, document, and contain the cause of contamination.



7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

▶ **Gloves:**

- ▶ Must meet American Society for Testing and Materials (ASTM) standard D6978
- ▶ worn for handling all HDs
- ▶ must be powder-free
- ▶ must be inspected for physical defects before use.
- ▶ for sterile compounding: two pairs required
 - ▶ the outer chemotherapy gloves must be sterile
 - ▶ changed every 30 minutes
 - ▶ must be changed when torn, punctured, or contaminated

▶ **Gowns:**

- ▶ must be disposable and shown to resist permeability by HDs
- ▶ must be selected based on the HDs handled
- ▶ must close in the back (i.e., no open front), be long sleeved, and have closed cuffs that are elastic or knit
- ▶ must not have seams or closures
- ▶ must be changed per the manufacturer's information for permeation of the gown. If none every 2–3 hours
- ▶ must not be worn to other areas



7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

▶ **Head, Hair, Shoe, and Sleeve Covers**

- ▶ When compounding HDs, a second pair of shoe covers must be donned before entering the C-SEC and doffed when exiting the C-SEC.
- ▶ Shoe covers worn in HD handling areas must not be worn to other areas

▶ **Eye and Face Protection**

- ▶ must be worn when there is a risk for spills or splashes of HDs or HD waste materials when working outside of a C-PEC
- ▶ Goggles must be used when eye protection is needed.



7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

▶ **Respiratory Protection**

- ▶ Surgical masks must not be used when respiratory protection is required.
- ▶ For most activities, a fit-tested NIOSH-certified N95 or more is sufficient to protect against airborne particles.
 - ▶ no protection against gases and vapors and little protection against direct liquid splashes
- ▶ Appropriate full-facepiece, chemical cartridge-type respirator or powered air-purifying respirator (PAPR) should be worn when there is a risk of respiratory exposure to HDs, including when:
 - ▶ *Attending to HD spills larger than what can be contained with a spill kit*
 - ▶ *Deactivating, decontaminating, and cleaning underneath the work surface of a C-PEC*
 - ▶ There is a known or suspected airborne exposure to powders or vapors



7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

▶ **Disposal of Used Personal Protective Equipment**

- ▶ All PPE worn when handling HDs to be contaminated with, at minimum, trace quantities of HDs.
- ▶ All PPE worn be disposed of in the proper waste container before leaving the C-SEC.
- ▶ Chemotherapy gloves and sleeve covers worn during compounding must be carefully removed and discarded immediately into a waste container approved for trace contaminated waste inside the C-PEC or contained in a sealable bag for discarding outside the C-PEC.



8. HAZARD COMMUNICATION PROGRAM

- ▶ Required to establish P&Ps that ensure worker safety during all aspects of HD handling.
- ▶ Must develop SOPs to ensure effective training regarding proper labeling, transport, storage, and disposal of the HDs and use of Safety Data Sheets (SDS), based on the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).
- ▶ Elements of the hazard communication program plan must include:
 - ▶ Written plan that describes how the standard will be implemented
 - ▶ All containers of hazardous chemicals must be labeled, tagged, or marked with the identity of the material and appropriate hazard warnings
 - ▶ must have an SDS for each hazardous chemical they use (29 CFR 1910.1200)
 - ▶ must ensure that the SDSs for each hazardous chemical used are readily accessible to personnel during each work shift and when they are in their work areas
 - ▶ Personnel who may be exposed to hazardous chemicals when working must be provided information and training before the initial assignment to work with a hazardous chemical, and also whenever the hazard changes
 - ▶ Personnel of reproductive capability must confirm in writing that they understand the risks of handling HDs



9. PERSONNEL TRAINING

- ▶ must be trained based on their job functions.
- ▶ must occur before the employee independently handles HDs.
- ▶ The effectiveness of training must be demonstrated by each employee.
- ▶ competency must be reassessed at least every 12 months.
- ▶ must be trained prior to the introduction of a new HD or new equipment and prior to a new or significant change in process or SOP.
- ▶ All training and competency assessment must be documented.
- ▶ The training must include at least the following:
 - ▶ Overview of entity's list of HDs and their risks
 - ▶ Review of the entity's SOPs related to handling of HDs
 - ▶ Proper use of PPE
 - ▶ Proper use of equipment and devices (e.g., engineering controls)
 - ▶ Response to known or suspected HD exposure
 - ▶ Spill management
 - ▶ Proper disposal of HDs and trace-contaminated materials



10. RECEIVING

- ▶ should be received from the supplier in impervious plastic to segregate them from other drugs
- ▶ must be delivered to the HD storage area immediately after unpacking.
- ▶ PPE, including chemotherapy gloves, must be worn when unpacking HDs.
- ▶ A spill kit must be accessible in the receiving area.
- ▶ The entity must enforce policies that include a tiered approach, starting with visual examination of the shipping container for signs of damage or breakage (e.g., visible stains from leakage, sounds of broken glass).
- ▶ Damaged shipping containers: transported to a C-PEC designated for nonsterile compounding.
 - ▶ considered spills and must be reported to the designated person and managed.



10. RECEIVING

Table 4. Summary of Requirements for Receiving and Handling Damaged HD Shipping Containers

If the shipping container appears damaged

- Seal container without opening and contact the supplier
- If the unopened package is to be returned to the supplier, enclose the package in an impervious container and label the outer container “Hazardous”
- If the supplier declines return, dispose of as hazardous waste

If a damaged shipping container must be opened

- Seal the container in plastic or an impervious container
- Transport it to a C-PEC and place on a plastic-backed preparation mat
- Open the package and remove undamaged items
- Wipe the outside of the undamaged items with a disposable wipe
- Enclose the damaged item(s) in an impervious container and label the outer container “Hazardous”
- If the supplier declines return, dispose of as hazardous waste
- Deactivate, decontaminate, and clean the C-PEC (see Deactivating, Decontaminating, Cleaning, and Disinfecting) and discard the mat and cleaning disposables as hazardous waste



11. LABELING, PACKAGING, TRANSPORT AND DISPOSAL

▶ **Labeling**

- ▶ HDs identified must be clearly labeled at all times during their transport.
- ▶ Personnel must ensure that the labeling processes for compounded preparations do not introduce contamination into the non-HD handling areas.

▶ **Packaging**

- ▶ must select and use packaging containers and materials that will maintain physical integrity, stability, and sterility (if needed) of the HDs during transport.
- ▶ must protect the HD from damage, leakage, contamination, and degradation, while protecting healthcare workers who transport HDs.
- ▶ must have written SOPs to describe appropriate shipping containers and insulating materials

▶ **Transport**

- ▶ must be labeled, stored, and handled in accordance with applicable federal, state, and local regulations.
- ▶ must be in containers that minimize the risk of breakage or leakage.
- ▶ must ensure that labels and accessory labeling for the HDs include storage instructions, disposal instructions, and HD category information in a format that is consistent with the carrier's policies

▶ **Disposal**

- ▶ All personnel performing custodial waste removal and cleaning activities must be trained in appropriate procedures
- ▶ Disposal of all HD waste, including, but not limited to, unused HDs and trace-contaminated PPE and other materials, must comply with all applicable federal, state, and local regulations.



12. DISPENSING FINAL DOSAGE FORMS

DISPENSING FINAL DOSAGE FORMS

- ▶ HDs that do not require any further manipulation, other than counting or repackaging of final dosage forms, may be prepared for dispensing without any further requirements for containment unless required by the manufacturer or if visual indicators of HD exposure hazards are present (e.g., HD dust or leakage).
- ▶ Clean equipment should be dedicated for use with HDs and should be decontaminated after every use.
- ▶ Tablet and capsule forms of antineoplastic HDs must not be placed in automated counting or packaging machines.



13. COMPOUNDING

- ▶ must be compliant with the appropriate USP standards for compounding including <795> and <797>.
- ▶ must be done in proper engineering controls
- ▶ When compounding HD preparations in a C-PEC, a plastic-backed preparation mat should be placed on the work surface of the C-PEC.
 - ▶ The mat should be changed immediately if a spill occurs and regularly during use, and should be discarded at the end of the daily compounding activity.
 - ▶ equipment for compounding (such as mortars and pestles, and spatulas) must be dedicated for use with HDs.
- ▶ Bulk containers of liquid and API HD must be handled carefully to avoid spills.
- ▶ APIs or other powdered HDs must be handled in a C-PEC to protect against occupational exposure, especially during particle-generating activities



14. ADMINISTERING

- ▶ must be administered safely using protective medical devices and techniques.
 - ▶ protective medical devices: needleless and closed systems.
 - ▶ protective techniques: spiking or priming of IV tubing with a non- HD solution in a C-PEC and crushing tablets in a plastic pouch.
- ▶ Appropriate PPE must be worn when administering HDs.
- ▶ PPE must be removed and disposed of in a waste container approved for trace contaminated HD waste at the site of drug administration.
- ▶ Equipment (such as tubing and needles) and packaging materials must be disposed of properly, such as in HD waste containers, after administration.
- ▶ CSTDs must be used for administration of antineoplastic HDs when the dosage form allows. Techniques and ancillary devices that minimize the risk posed by open systems must be used when administering HDs through certain routes.
- ▶ If HD dosage forms do require manipulation such as crushing tablet(s) or opening capsule(s) for a single dose, personnel **must** don appropriate PPE and use a plastic pouch to contain any dust or particles generated.



15. DEACTIVATING, DECONTAMINATING, CLEANING, AND DISINFECTING

- ▶ All areas where HDs are handled and all reusable equipment and devices must be deactivated, decontaminated, and cleaned.
 - ▶ sterile compounding areas and devices must be subsequently disinfected.
- ▶ P&Ps for cleaning must include procedures, agents used, dilutions (if used), frequency, and documentation requirements.
- ▶ appropriate PPE:
 - ▶ resistant to the cleaning agents used,
 - ▶ two pairs of chemotherapy gloves
 - ▶ impermeable disposable gowns
 - ▶ eye protection and face shields must if splashing is likely
 - ▶ respiratory protection must be used, if warranted
- ▶ Agents used for deactivation, decontamination, and cleaning should be applied through the use of wipes wetted with appropriate solution
- ▶ All disposable materials must be discarded to meet EPA regulations and the entity's policies.
- ▶ Perform cleaning in areas that are sufficiently ventilated.



15. DEACTIVATING, DECONTAMINATING, CLEANING, AND DISINFECTING

Table 5. Cleaning Steps

Cleaning Step	Purpose	Example Agents
Deactivation	Render compound inert or inactive	As listed in the HD labeling or other agents which may incorporate Environmental Protection Agency (EPA)-registered oxidizers (e.g., peroxide formulations, sodium hypochlorite, etc.
Decontamination	Remove HD residue	Materials that have been validated to be effective for HD decontamination, or through other materials proven to be effective through testing, which may include alcohol, water, peroxide, or sodium hypochlorite
Cleaning	Remove organic and inorganic material	Germicidal detergent
Disinfection (for sterile manipulations)	Destroy microorganisms	EPA-registered disinfectant and/or sterile alcohol as appropriate for use



15. DEACTIVATING, DECONTAMINATING, CLEANING, AND DISINFECTING

▶ **Deactivation**

- ▶ renders a compound inert or inactive.
- ▶ Residue must be removed by decontaminating the surface.
- ▶ There is no one proven method for deactivating all compounds. (EPA-registered oxidizing agents that are appropriate for the intended use)

▶ **Decontamination**

- ▶ inactivating, neutralizing, or physically removing HD residue and transferring it to absorbent, disposable materials (e.g., wipes, pads, or towels) appropriate to the area being cleaned.
- ▶ The work surface of the C-PEC must be decontaminated between compounding of different HDs.
- ▶ The C-PEC must be decontaminated at least daily, any time a spill occurs, before and after certification, any time voluntary interruption occurs, and if the ventilation tool is moved.
 - ▶ areas under the work tray must be deactivated, decontaminated, and cleaned at least monthly

▶ **Cleaning**

- ▶ a process that results in the removal of contaminants (e.g., soil, microbial contamination, HD residue) from objects and surfaces using water, detergents, surfactants, solvents, and/or other chemicals.
- ▶ Cleaning agents used on compounding equipment should not introduce microbial contamination.

▶ **Disinfection**

- ▶ a process of inhibiting or destroying microorganisms.
- ▶ must be done for areas intended to be sterile, including the sterile compounding areas.



16. SPILL CONTROL

SPILL CONTROL

- ▶ personnel must receive proper training in spill management and the use of PPE and NIOSH-certified respirators
- ▶ Spills must be contained and cleaned immediately by qualified personnel with appropriate PPE.
- ▶ Qualified personnel must be available at all times while HDs are being handled.
- ▶ Signs must be available for restricting access to the spill area.
- ▶ Spill kits must be readily available in all areas where HDs are handled.
- ▶ All spill materials must be disposed of as hazardous waste.
- ▶ The circumstances and management of spills must be documented.
- ▶ Personnel potentially exposed during the spill or spill clean up or who have direct skin or eye contact with HDs require immediate evaluation.
- ▶ Non-employees exposed to an HD spill should follow entity policy, which may include reporting to the designated emergency service for initial evaluation and completion of an incident report or exposure form.
- ▶ SOPs must:
 - ▶ be developed to prevent spills and to direct the clean up of HD spills.
 - ▶ address the size and scope of the spill and specify who is responsible for spill management and the type of PPE required.
 - ▶ address the location of spill kits and clean-up materials as well as the capacity of the spill kit.



17. DOCUMENTATION AND STANDARD OPERATING PROCEDURES

- ▶ SOPs must be reviewed (and documented) at least every 12 months
- ▶ SOPs should include:
 - ▶ Hazard communication program
 - ▶ Occupational safety program
 - ▶ Designation of HD areas
 - ▶ Receipt
 - ▶ Storage
 - ▶ Compounding
 - ▶ Use and maintenance of proper engineering controls
 - ▶ Hand hygiene and use of PPE based on activity
 - ▶ Deactivation, decontamination, cleaning, and disinfection
 - ▶ Dispensing
 - ▶ Transport
 - ▶ Administering
 - ▶ Environmental monitoring
 - ▶ Disposal
 - ▶ Spill control
 - ▶ Medical surveillance
- ▶ Personnel who transport, compound, or administer HDs must document their training according to OSHA standards (OSHA Standard 1910.120) and other applicable laws and regulations



18. MEDICAL SURVEILLANCE

- ▶ Medical surveillance is part of a comprehensive exposure control program complementing engineering controls, safe work processes, and use of PPE. Healthcare workers who handle HDs as a regular part of their job assignment should be enrolled in a medical surveillance program.



Questions