OBJECTIVES

- Identify Hazardous Exposure Risks in Handling of Hazardous Drugs and identify appropriate process for containment of hazardous residue
- Recognize how to complete the Assessment of Risk (AoR) of NIOSH listed drugs
- Identify the proper handling of Hazardous consumables: receiving, storage, dispensing, delivery, and waste; recognize the proper use of personal protective equipment
- Summarize cleaning, deactivation, decontamination, containment and personnel safety in handling hazardous drugs
- Identify appropriate cleaning process including: deactivation, decontamination, containment and personnel safety in handling hazardous drugs.

United States Pharmacopeia (USP)

United States Pharmacopeia (USP)

A scientific nonprofit organization that sets standards for the identity, strength, quality, and purity of medicines, food ingredients, and dietary supplements manufactured, distributed and consumed worldwide. USP's drug standards are enforceable in the United States by the Food and Drug Administration, and these standards are used in more than 140 countries.

Chapters < 1000 are requirements and legally enforceable
Chapters > 1000 are recommendations

USP <800>:

Hazardous Drugs—Handling in Healthcare Settings


Enforceable Agencies

Inspectors from CMS, the state boards of pharmacy, and accreditation surveyors (e.g., The Joint Commission,) as well as federal agencies (e.g., OSHA) will be heavily involved in surveying for <800> compliance.

- The Joint Commission (TJC)
- Centers for Medicare and Medicaid Services (CMS)
- State boards of pharmacy.
- State agencies: Office of Statewide Health Planning and Development
- United States Department of Labor. Occupational Safety and Health Administration (OSHA)

UTAH Pharmacy Law

Utah Code, Pharmacy Practice Act, Chapter 17b, Part 6, Section 618: Compliance with state and federal laws.

http://le.utah.gov/xcode/Title58/Chapter17b/58-17b.html
**OSHA**

- Employer programs should attend to several critical elements, including the infrastructure program and management requirements outlined in the U.S. Pharmacopeial Convention General Chapters 797 and 800. The Oncology Nursing Society guidelines, now available free of charge, and staff work assignments and management to reduce/remove hazards to conception, pregnancy, and breastfeeding arising from exposures to hazardous drugs.

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**Overview of USP <800>, cont.**

- Applies to all healthcare personnel who handle HD preparations, and entities which store, prepare, transport, or administer HDs: pharmacies, hospitals, other healthcare institutions, patient treatment clinics, physicians' practice facilities, veterinarians' offices.
- Personnel who may potentially be exposed to HDs include, but are not limited to: pharmacists, pharmacy technicians, nurses, home healthcare workers, physicians, physician assistants, veterinarians, and veterinary technicians.
- Entities that handle HDs must incorporate these standards into their occupational safety plan. At a minimum, include:
  - Engineering controls
  - Competent personnel
  - Safe work practices
  - Proper use of appropriate Personal Protective Equipment (PPE)
  - Policies for HD waste segregation and disposal

---

**Possible Exposure Activities**

- Receiving and unpacking HD consumables
- Compounding CSP
- Counting, cutting, crushing capsules/tablets
- Expelling air from syringes filled with HDs
- Administering HDs
- Contacting residue on drug container exterior, work surfaces, floors and final drug preparations
- Contacting or inhaling HD residue or aerosolization from another patient's medication
- Surgical procedures on patient receiving HDs
- Handling body fluids, contaminated clothing, dressings, linens
- Handling HD waste, including containers
- Deactivating, decontaminating, cleaning and disinfecting areas containing HDs or where HDs have been
- Maintenance activities for HD equipment and devices
- Spills – generation, management, and disposal

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**Sources for Potential Contamination**

- Receiving
- Compounding
- Storage
- Transport
- Compounding
- Leakage, poor technique, failure to decontaminate final CSP
- Breaks in packages; contamination of other packages
- Administration
- Line manipulation; infusions bags leaks/breaks
- Waste
- Improper disposal

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**Overview of USP <800>, cont.**

- Effective federally December 1st 2019
  - (exception – state can make effective immediately: example CA)
- Applies to all healthcare personnel that handle and / or work around HDs
- Applies to all entities: hospital, retail, doctor offices
- Includes all drugs listed by NIOSH
Surface Areas for HD Contamination

- C-PECs, BSCs, CACIs
- Floors/counters inside and outside of drug preparation areas
- IV bags / syringes
- Vials
- Consumable containers (tablets or capsules bottles/vials)
- Transport containers – for delivery personnel
- Chairs
- Waste containers
- Elevator buttons
- Door handles
- Pencils / pens
- Keyboards
- Touch screen on computer

Types of Exposure

- Routes of unintentional entry of HDs into the body include:
  - Dermal and mucosal adsorption
  - Inhalation
  - Injection
  - Ingestion either of contaminated foodstuffs or mouth contact with contaminated hands
- Clinical and Non-clinical personnel maybe exposed:
  - Aerosols or generated dust
  - Spills
  - Touching a contaminated surface – receiving, administration, cleaning or disposal

Dermal Exposure / Ingestion

Dermal Exposure:
- Touching contaminated surfaces
- Improper donned PPE
- Improperly doffing and disposal of PPE
- Touching vials/bottles without PPE
  - vial/bottle surfaces are contaminated with HD residue
- Wearing non-tested gloves may be permeable to HDs
  - Wear only ASTM Standard 6978-05 tested gloves

Ingestion:
- Outside surfaces contaminated with HD residue
- Do not eat or drink where HDs are prepared or stored.

WHO is at risk of exposure

- Pharmacists
- RX Technicians
- Receiving area workers
- Inventory – stocking, control
- Housekeeping / Environmental Services
- Trash collectors
- Administration
- Patients
- Visitors
- Family members at home for all of the above
- General public
- Laundry service staff
- Unit Secretary
- Nursing
- Physicians
- Maintenance
- Maintenance

Do you see the possible contaminated points / objects?

Exposure Control / Safe Handling
Exposure Control

- Good Policy and Procedure
- Signage
- Identifying Hazardous Containers
- Areas to Consider:
  - Receiving
  - Pharmacy
    - Storage (shelves)
    - Dispensing area (counting trays, counter tops)
  - Transport / Delivery
  - Housekeeping / Laundry
  - Waste management

Safe Handling Practices

- Wash hands for at least 20-30 seconds with warm water and soap prior to handling, preparing, administering, transporting, disposing of, or managing spills of hazardous drug or waste.
- Wash hands before and after working in any area where hazardous drugs are handled, prepared, administered, or disposed.
- Do NOT eat, drink, chew gum, apply cosmetics or store food in areas where hazardous drugs are stored, handled, prepared, administered or disposed.

Mind the “dust!”

Dosage forms of drugs defined as hazardous may not pose a significant risk of direct occupational exposure because of their dosage formulations.

Solid Tablets or Capsules

- Mind the “dust!”

- Consider alternative containment strategies / work practices
  - Including Personal Protective Equipment

Personal Protective Equipment

- Compounding sterile and nonsterile antineoplastic HDs
- Administering antineoplastic HDs:
  - Two pairs of chemotherapy gloves are required,
  - Two pairs of chemotherapy gloves are required when administering injectable antineoplastic HDs.

For all other activities, the entity’s SOP must describe the appropriate PPE to be worn based on its occupational safety plan and assessment of risk (if used). The entity must develop SOPs for PPE based on the risk of exposure (see Types of Exposure) and activities performed.

Appropriate PPE must be worn when handling HDs including during:
- Receipt
- Storage
- Transport
- Compounding (sterile and non-sterile)
- Packaging / Counting
- Administration
- Deactivation / decontamination, cleaning, and disinfecting
- Spill control
- Waste disposal

Personal Protective Equipment (PPE)

PPE – HD GLOVES

USP <800>:
- Chemotherapy gloves should be worn for handling all HDs including non-antineoplastics and for reproductive risk only HDs.
- Chemotherapy gloves must be powder-free because powder can contaminate the work area and can adsorb and retain HDs.
- Gloves must be inspected for physical defects before use.
- Do not use gloves with pin holes or weak spots.
- When used for sterile compounding, the outer glove must be sterile.
# PPE – HD GLOVES

- ASTM gloves required for:
  - Unpacking
  - Compounding / Cutting / Crushing
  - Cleaning and disinfecting the HD exposed area
  - Decontaminating hazardous exposed areas
  - Transport/delivery
  - Spills
  - Disposal of HD products

- **SHOULD CONSIDER FOR:**
  - Counting and Repackaging
  - ASTM gloves required for:
    - Unpacking
    - Compounding / Cutting / Crushing
    - Cleaning and disinfecting the HD exposed area
    - Decontaminating hazardous exposed areas
    - Transport/delivery
    - Spills
    - Disposal of HD products

# PPE – Gowns

- Non-permeable, polyethylene coated polypropylene or laminated material
- Do NOT wear outside compounding/packaging area.
- May NOT be re-used.

# PPE – Bonnet, Booties, Head Covers.

- **HEAD, BEARD, SHOE COVERS:**
  - **NOT required for SOLID HD handling but if worn:**
    - head, beard, shoe covers changed after removal or if contaminated
    - Shoe covers should be worn to contain HD residue to specific area
    - Shoe covers recommended to be coated
    - Do NOT wear shoe covers outside HD area.
  - If packaging in a non-classified ‘cleanroom’ should be donned.

- **EYE and FACE PROTECTION:**
  - Optional for compounding / cutting /crushing depending on HD drug
  - Required for
    - Cleaning
    - Spills
    - Unpacking damaged HD items

# PPE – Respiratory Protection - MASKS

- All Hazardous Masks must be fit-tested:
  - N95 or N100 (NIOSH approved):
    - Compounding – cutting, crushing
    - Receipt of, unpacking and decontamination of HD intact items not in impervious plastic
  - Half Mask with Multi-gas Cartridge and P100-filter:
    - receipt of, unpacking and decontamination of HD materials not contained in plastic.
  - Full-face piece, chemical cartridge respirator with a pre-filter + shield or eye protection
  - If splash Risk during compounding / preparation
  - Spill management
  - Cleaning a Contained Vented Enclosure (CVE) or Containment Primary Engineering Control (C-PEC)
  - Known or suspected airborne exposure to powders, vapors or gases.
Garbing of cleaning and disinfecting personnel

- Cleaning and disinfecting personnel must comply with the pharmacy’s PPE garbing procedures for hazardous areas and performing housekeeping duties.

- Housekeeping personnel is responsible to clean Hazardous Exposed Area (CVE, C-SCA) they must don ASTM International-approved gloves before starting work.

HD PPE DOFFING ORDER

Doffing of HD PPE is very IMPORTANT, proper doffing will mitigate exposure risk to employee and possible spread of HD residue.

HANDLING CONSUMABLES

- Must be received in a “neutral” or “negative” pressure area relative to adjacent spaces.

RECEIVING Hazardous Consumables

- Must have appropriate/adequate personal protective equipment available:
  - Gloves
  - Gowns
  - Respirator
  - Eye Protection
  - Spill Kit

- All HD containers MUST be decontaminated upon receiving
  - Mitigates HD residue movement within the pharmacy
    - Wiper saturated with B20
    - Wiper saturated with a Deactivating agent for antineoplastic HD

Non-antineoplastic HDs are not likely to arrive in separate packaging.

- Each facility must evaluate and determine how to handle:

  **Received Intact**

  Received Intact

  Non-antineoplastic HDs are not likely to arrive in separate packaging.

  - Each facility must evaluate and determine how to handle:

  **Receiving and Handling Damaged HD Containers**

  - If damaged container must be opened:
    - Don 2 pairs ASTM approved gloves and gown
    - Don chemical cartridge respirator mask
    - Place in imperious container
    - Transport to C-SEC, first wiping down the outside with a decontaminate and sIPA
    - Follow cleanroom gowning procedure
    - Place absorbent pad inside the C-PEC
    - Wipe down the container with sterile 70% IPA and place inside C-PEC
    - Carefully remove usable items; decontaminating each item with a separate wipe
    - Seal impecious container with damaged item(s) and dispose of in Hazardous Waste

  - Report and manage Damaged Containers as a Spill
**Counting or Repackaging of Hazardous Drugs**

- PPE determined by Assessment of Risk – or follows USP <800> for all drugs.
  - Entity’s SOP must describe the appropriate PPE to be worn based on its occupational safety plan and assessment of risk (if used). The entity must develop SOPs for PPE based on the risk of exposure (see Types of Exposure) and activities performed.
  - Tablets and capsules of antineoplastic HDs must not be placed in automated counting or packaging machines - creates powdered contaminants.
  - Consider dedicated equipment: counting trays, spatulas, funnels, etc.
  - Consider Cross-contamination when packaging NIOSH Table 2 and 3 drugs.

**Solid Manipulation and Compounding**

- Equipment for compounding:
  - **PPE to protect against occupational exposure**
    - Double gloves required
    - FULL PPE when cleaning areas and equipment.
  - **Plastic backed preparation mat in C-PEC or CVE**
    - Equipment, mortars, pestles, spatulas, must be dedicated for HD
    - Prepare liquids, cut or crush tablets, open capsules in a CVE or C-PEC to protect against occupational exposure.

- Deactivation/decontamination, cleaning and disinfecting – routinely
  - Area, Room, C-PEC /CVE Equipment

**Containment-Segregate Compounding Area:**

- **Solid Manipulation and Compounding**
  - USP <800>: manipulation of HD Table 1 anti-neoplastic solid form, tablet, capsule and Table 2 and 3 dependent on Assessment of Risk.
    - within negative pressure non-sterile C-PEC,
      - Unidirectional air not required
      - No ISO classification needed
      - Preferred external vented, can be redundant HEPA filtered
    - BSC class I or II, CACI, CVE (containment ventilated enclosure)
  - C-PEC within negative pressure C-SCA
    - Area has fixed walls,
    - Negative pressure between 0.01 and 0.03 inches of water column relative to all adjacent areas.
    - Has minimum of 12 ACH.
    - Must be externally vented.
    - LOD for doffing of HD PPE must be outlined at exit door.

  *If prepared in sterile compounding C-PEC, the C-PEC MUST be decontaminated and cleaned before using for sterile preparation*

**Transport of Hazardous Drugs**

- PPE determined by Assessment of Risk – or follows USP <800> for all drugs.
  - Entity’s SOP must describe the appropriate PPE to be worn based on its occupational safety plan and assessment of risk (if used). The entity must develop SOPs for PPE based on the risk of exposure (see Types of Exposure) and activities performed.
  - Use packaging containers and materials that maintain physical integrity, stability, and sterility (if needed) of the HDs during transport.
    - Packaging materials must protect the HD from damage, leakage, contamination, and degradation, while protecting healthcare workers who transport HDs.
    - Written SOPs to describe appropriate shipping containers and insulating materials, based on information from product specifications, vendors, and mode of transport.
  - HDs that need to be transported must be labeled, stored, and handled in accordance with applicable federal, state, and local regulations.

**Transporting of Hazardous Drugs, cont.**

- Pneumatic tubes must not be used to transport any liquid HDs or any antineoplastic HDs because of the potential for breakage and contamination.

- When shipping HDs to locations outside the entity, the entity must consult the Transport Information on the SDS.
  - Labels for the HDs include storage instructions, disposal instructions, and HD category information in a format that is consistent with the carrier’s policies.
CLEANING UP

Selecting Agents

• No single agent can deactivate all HDs
• Specific chemicals deactivate some HDs – check SDS
• Most HDs are water soluble, using a cleaning agent that has surfactant allows the HD to transfer from the inanimate surface to the wet wiper

Cleaning and Disposal

• Policies and procedures for cleaning and disinfecting tasks must be developed.
  - Cleaning and disinfecting personnel must be trained and assessed on correct application of these policies and procedures.
• Only trained and qualified cleaning and disinfecting personnel may be allowed to clean the hazardous exposed area.
• To avoid cross-contamination and to protect cleaning and disinfecting personnel:
  - Separate designated equipment for Hazardous cleanup
  - Should be disposable
• Equipment (mop heads, towels, etc.) should be disposable and disposed in trace hazardous waste

Deactivation, Decontamination, Cleaning, Sanitization

Use disposable wipers

Deactivation is not always possible; but decontamination is.

Agents for Deactivation/Decontamination

• Solution considered effective with HDs:
  - EPA-registered oxidizing agents (Environmental Protection Agency)
    - Should have documented effectiveness in decontaminating surfaces
    - Check expiration dates of product
    - Products not registered as EPA disinfectant should NOT be:
      - used as a decontamination, cleaning or sporidical agent
  - 2% sodium hypochlorite (Bleach diluted)
    - Mind the surface cleaning, and clothes exposed to solution.
    - Mix daily
    - This is stronger concentration than when used as sporidical
  - Products containing 80% 10mM Sodium Lauryl Sulfate and 20% Isopropyl alcohol
  - PEROXYACETIC ACID and HYDROGEN PEROXIDE
  - Hydrogen Peroxide at a variety of concentrations

Disposal of Hazardous Drugs

• All personnel who perform routine custodial waste removal and cleaning activities in HD handling areas must be trained in appropriate procedures to protect themselves and the environment to prevent HD contamination.
• Disposal of all HD waste must comply with all applicable federal, state, and local regulations. Items include, but not limited to:
  - unused HDs, expired etc.
  - trace contaminated PPE
  - other materials – empty HD bottles, wipers
Hazardous Drug Disposal Bins

- Hazardous waste must be stored in containers that comply with the RCRA (Resource Conservation and Recovery Act) rules.
- PPE, Cleaning wipers, empty consumable bottles and/or drugs must be disposed of in the appropriate hazardous drug disposal bin.
- Trace Waste: Yellow Bin
- RCRA Waste: Black Bin

Empty hazardous consumable bottles should be disposed into hazardous trace waste or RCRA if P-list drug.

U-Listed

- U-listed wastes are “toxic”; they are still regarded as hazardous, but some of the more stringent regulations that apply to the P-list do not apply to U-listed wastes.

Hazardous Waste Disposal Bin

- BLACK RCRA DISPOSAL BINS
- The EPA has identified several drugs as hazardous waste due to their toxicity. They require disposal in a separate bin (BLACK).

Example Hazardous drugs that require disposal in the black RCRA bins: Chlorambucil, Cyclophosphamide (Cytoxan), Chloral hydrate, Dioctylsulfosuccinate, Reserpine, Warfarin

From https://www.epa.gov

P-listed

- P-listed wastes are “acutely toxic”, meaning that they can cause death or irreversible illness at low doses.

Common P-Listed Pharmaceuticals:

<table>
<thead>
<tr>
<th>Name</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic trioxide</td>
<td>P012</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>P042</td>
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<tr>
<td>Nicotine</td>
<td>P075</td>
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<tr>
<td>Nitroglycerin</td>
<td>P081</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>P204</td>
</tr>
<tr>
<td>Phosgestone sulfamate</td>
<td>P169</td>
</tr>
<tr>
<td>Warfarin = 0.5%</td>
<td>P003</td>
</tr>
</tbody>
</table>

Unused smoking cessation aids (e.g., patches and gum) that contain nicotine as the only ingredient are classified as listed hazardous waste P075.

Hazardous Drug Disposal Bins

- Trace Waste Bin:
  - PPE
  - Wipers, used to decontaminate
  - Protective work space mats
  - Empty bottles non-P-listed drugs
  - Empty P-listed drug bottles tripled rinsed and/or deactivated / decontaminated inside and outside

Hazardous Waste Disposal Bin

- Does my empty bottle of P-listed Pharmaceutical go in RCRA

"A container or inner liner removed from a container that has held an acute hazardous waste listed in (261.31 or 261.33) is empty if:"

(i) The container or inner liner has been triple rinsed using a solvent capable of removing the commercial chemical product or manufacturing chemical intermediate;

(ii) The container or inner liner has been cleaned by another method that has been documented to address equivalent removal, or had the inner liner removed, the container is not considered “RCRA empty,” even though the pharmaceutical may be fully dispensed. If the container is not “RCRA empty,” the residues may be regulated as acute hazardous waste.

From https://www.epa.gov
Exposure to Hazardous Drugs

Skin Exposure:
• Remove contaminated clothes and immediately wash skin with mild soap and cool water for at least 30 seconds
• Do NOT use alcohol containing products (ex: Purell)

Eye Exposure:
• Immediately flush the eyes with water for at least 15 minutes.
• If Plumbed Eyewash Station not available use personal eyewash bottles – flushing for 15 minutes

Seek emergency treatment as indicated
Document ALL actual and near miss exposures

Hazardous Drug Medical Surveillance

• Healthcare workers who handle HDs as a regular part of their job assignment should be enrolled in a medical surveillance program.
• Elements:
  – Development of an organized approach to identify potential exposure
  – Protect confidentiality of employee’s personal medical history in accordance with OSHA
  – Initial base line assessment
    o Records of HD handling, with quantities and dosage forms
    o Estimated number of HD per week or month
    o Estimated hours exposed handling weekly or monthly
    o Physical and laboratory studies
  – Surveillance is performed annually.
  – Have a follow up plan for workers who have shown health changes suggesting toxicity or have experienced acute exposure.

Plumbed Eyewash Station

Some Symptoms Associated with Acute Exposure to Hazardous Drugs

• Lightheaded
• Nausea and vomiting
• Dizzy
• Local skin or mucous membrane reaction
• Abdominal pain
• Headache
• Metallic taste in mouth
• Burning/watery eyes
• Scratchy throat
• Hair loss

Spill Kit

• Have a spill kit available at all times
• Know what is in your Spill Kit
  – Have additional items/equipment needed for Spill clean-up with Spill Kit.
• If a spill happens:
  – Alert everyone in the immediate area to avoid contact with the spill
  – Use the Chemotherapy Drug Spill Kit and appropriate PPE for containment of any hazardous drug
  – Wear Double Gloves
• Document ALL spills

Quality Assurance Program

The quality assurance program for solid HD handling:
Surface sampling area(s) of exposure:
• Receiving
• Storage
• Dispensing
• Sale counter
• Delivery area

The quality assurance program for sterile compounding:
1. Verification of equipment, including the PEG:
   o Certification
   o Pressure and airflow sampling
   o Contaminate Surface sampling
   o Documentation
2. Verification of hazardous controlled areas:
   o Air sampling
   o Surface sampling
   o Monitoring environment and documenting
Drugs on the NIOSH list that MUST follow USP <800> requirements:

- Antineoplastic: Active Pharmaceutical Ingredient (API)
- Antineoplastic requiring manipulation

- For NIOSH Table 2 and 3 drugs to not require following USP <800> containment requirements you MUST perform an assessment of risk to determine alternative containment strategies and work practices

Hazardous drugs can be classified as anti-neoplastic, cytotoxic, biologic, antiviral, immunosuppressive, antibiotic and/or hormone.

They are hazardous regardless of whether they are administered intravenously, orally, or topically.

NIOSH Table Classification

- Antineoplastic (Table 1) (High Risk)
  - Antineoplastic drugs that may also pose a reproductive risk for susceptible populations.
- Non-antineoplastic hazardous (Table 2)
  - Non-Antineoplastic (anticancer) drugs that meet one or more of the NIOSH criteria of a hazardous drug and may also pose a reproductive risk for susceptible populations.
- Reproductive Risk Only (Table 3)
  - Non-antineoplastic drugs that primarily have adverse reproductive effects. Are a risk to men and women who are actively trying to conceive and women who are pregnant or breast feeding.
  - Any other drug with similar toxicity structure as that of an R3 classified product
### 2016 NIOSH Table 2 ORAL Formulations
Non-Antineoplastic

- Abacavir
- Azathioprine
- Carbamazepine
- Cyclophosphamide
- Dexamethasone
- Divalproex
- Estronex
- Estradiol
- Estradiol progestrone combo
- Estradiol conjugated
- Estrone, estradiol, and estriol
- Estrogen, estradiol
- Estrogen, conjugated
- Estrogen/progesterone combo
- Estradiol
- Entecavir
- Divalproex
- Deferiprone
- Cyclosporine
- Carbamazepine
- Azathioprine
- Lamotrigine
- Lenalidomide
- Leflunomide
- Ganciclovir
- Fluoxetine
- Fingolimod
- Estropipate
- Estrogen, estradiol
- Estrogen, conjugated
- Estrogen/progesterone combo
- Estradiol
- Entecavir
- Divalproex
- Deferiprone
- Cyclosporine
- Carbamazepine
- Azathioprine

### 2016 NIOSH Table 3 ORAL Formulations
Reproductive /non-Antineoplastic

- Acitretin
- Allretinon
- Ambrisentan
- Bosentan
- Cabergoline
- Clomiphene
- Clonazepam
- Colchicine
- Dronedarone
- Dutasteride
- Ergonomine / methylxynogenine
- Estrogen
- Estradiol
- Methylergonovine
- Methytestosterone
- Milipristone
- Misoprostol
- Paroxetine
- Ribavirin
- Rivastigmine
- Tamoxifen
- Testosterone
- Topiramate
- Tretinoin
- Ulipristal
- Valproate/valproic acid
- Vinblastine
- Voriconazole
- Warfarin
- Ziprasidone
- Zonisamide

### 2018 Proposed Oral Additions

<table>
<thead>
<tr>
<th>Drug</th>
<th>Table</th>
<th>Classification</th>
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<tr>
<td>Certitin</td>
<td>1</td>
<td>antineoplastic</td>
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<tr>
<td>Clobazam</td>
<td>3</td>
<td>antiepileptic</td>
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<tr>
<td>Cobimetinib</td>
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<td>Isoretinoin</td>
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<td>Ixabradine</td>
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<tr>
<td>Ilovanibib</td>
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<td>Milnefoxine</td>
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<td>Ozolinib</td>
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<td>Sondegib</td>
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<td>Trizolam</td>
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### 2018 Proposed Injectable Additions

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<tr>
<td>Bevacizumab</td>
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<td>Bimatoprost</td>
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<td>Botulinum toxins</td>
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<tr>
<td>Darbepoetin alfa</td>
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<td>Dihydroergotamine</td>
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<tr>
<td>Urofollitropin</td>
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</table>

### Reading NIOSH List

**Risk Elements**

Not all hazardous defined drugs pose a significant direct occupational exposure risk because of their dosage form:

- Medications in final dispensing form: tablets and capsules

These products may pose a risk if the dosage form requires alteration.

- Cutting
- Crushing
- Dissolving
- Filling or opening
- Compounding

- Counting/repackaging
- Mind the “dust!”
Assessment of Risk Elements

- Drug
- Dosage form
- Risk of exposure
- Situational risk
- Packaging
- Manipulation / compounding

Documentation of alternative containment strategies & work practices

Review, at minimum, annually (document annual review)

Have a process to review and add new drugs

6. Assess Risk of each eligible drug, in each dosage form.

5. Divide the list into the two categories:

3. Developing AoR:

2. Determine your approach:
- Manipulation / compounding
- Packaging
- Situational risk
- Risk of exposure
- Dosage form
- Drug

4. After September 2018 download 2018 NIOSH list.

1. Compare the NIOSH list with your formulary, including non-formulary items, and even drugs purchased only as Unit Dose or Unit of Use.

5. Divide the list into the two categories:
- Medications ineligible for an AoR (Table 1 manipulation, and others?)
- Medications considered for AoR (Table 1 final form, Table 2 and 3)

6. Assess Risk of each eligible drug, in each dosage form.

Assessment MUST Include

- Receiving:
  - Can you identify HDs from outside of the container?
  - What PPE will be used
- Storing:
  - Other than antineoplastics requiring manipulation and any API
    - How will you store other agents?
    - How will personnel be protected?
- Compounding:
  - Agents other than the antineoplastics and API, if compounding
    - What controls are needed?
    - Other policy and procedures will be used for which product?
    - PPE – what will be required, what is optional

Assessment MUST Include, cont.

- Transporting:
  - How do you protect preparation?
  - How do you protect personnel?
- Administering:
  - CSTD are required for antineoplastics when dosage form allows.
    - Will you use CSTD for other agents?
    - PPE for other agents?
- Disposal:
  - EPA, State, municipal and organizational policy?
  - How are spills handled?
  - Will agents on table 2 and 3 differ from table 1?
  - Housekeeping disposal protection?
  - PPE – spills, trash removal?

Assessing RISK

Consider containment strategies and work practices to protect from:

- Ingestion
- Inhalation
- Contact exposure
- Vapors in environment
- Residue movement

Assessment of Risk Steps

7. Create a master spreadsheet for all NIOSH listed drugs.

8. Create a complete AoR for each eligible drug dosage form.

Assessment of Risk Steps, cont.
Two Categories - Storage

Ineligible for AoR

Antineoplastic drugs requiring manipulation other than counting and hazardous API must:
- Follow USP <800> handling
- Storage:
  - Separately from non-HD
  - Negative pressure room, externally vented
  - 12 Air Changes per Hour (ACPH)

May be Considered for an AoR

Hazardous drugs that may be stored with other inventory:
- Non-antineoplastic
- Reproductive risk only
- Final dosage forms of any HD antineoplastic

Sterile and non-sterile HDs may be stored together outside of buffer area of cleanroom, but ONLY sterile HDs should be stored in a buffer room under negative pressure.

Alternative Containment Strategies

- Alternative containment strategies
  - Only purchase as UD or UU – no manipulation required
- Alternative work practices
  - Gloves meeting ASTM D6978 standard
  - Use dedicated equipment for counting
  - Transport
- Use PPE based on activity: Guide in NIOSH Table 5
- Labeling / identification

Master Spreadsheet Example, RISK only

| Drug | Category | Risk | Eligibility | Buffer Area | Cleanroom | Buffer Room | Negative Pressure Room | Airmaster AC Unit
|------|----------|------|-------------|-------------|-----------|-------------|------------------------|------------------|
| ABC  | Antineoplastic | N/A | Eligible | Required | Yes | Yes | Yes | Yes
| DEF  | Hazardous | N/A | Eligible | Required | Yes | Yes | Yes | Yes

Sample Individual Drug AoR

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Qualifiers</th>
<th>Assessor Notes</th>
</tr>
</thead>
</table>

Master Spreadsheet Example

Master spreadsheet: 2 sections, Eligibility and Risk Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Risk</th>
<th>Eligibility</th>
<th>Buffer Area</th>
<th>Cleanroom</th>
<th>Buffer Room</th>
<th>Negative Pressure Room</th>
<th>Airmaster AC Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antineoplastic</td>
<td>N/A</td>
<td>Required</td>
<td>Required</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hazardous</td>
<td>N/A</td>
<td>Eligible</td>
<td>Required</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Sample Individual Drug AoR

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Qualifiers</th>
<th>Assessor Notes</th>
</tr>
</thead>
</table>
**Available Drug Toxicity Information**

- DrugBank: [http://www.drugbank.ca/](http://www.drugbank.ca/)
- Medical Safety Data Sheets (MSDS)
- Product labeling approved by FDA (DPI)
- Manufacturer warnings
- FDA
- Literature
- Case studies
- Healthcare professional journals
- ONS, Safe Handling for Hazardous Drugs, [www.ons.org](http://www.ons.org)
- Recommendations from other facilities – online web search

**Safety Data Sheet (MSDS)**

- Chemical Product and Company Info
- Ingredient information
- Hazardous information
- First aid measures
- Fire fighting measures
- Accidental release measures
- Handling and storage – section 7
- Exposure control/ personal protection
- Physical / chemical properties
- Stability and reactivity
- Toxicology information
- Ecological information
- Disposal considerations
- Transportation information
- Regulatory information
- Other information

**DAILYMED and DRUG DATA**

**NIOSH Guidance on Environmental and PPE**

- NIOSH Table 5 is Guidance only
- Tables 2 and 3 drugs AoR to determine Environmental Controls and Personal Protective Equipment

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Activity Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intact capsules</td>
<td>Cutting</td>
</tr>
<tr>
<td>Tablets</td>
<td>Crushing</td>
</tr>
<tr>
<td>Oral Liquids</td>
<td>Withdrawal from vial/ampule</td>
</tr>
<tr>
<td>Topical</td>
<td>Compounding</td>
</tr>
<tr>
<td>Vial/ampule</td>
<td>Administration</td>
</tr>
<tr>
<td>SC/IM/IT</td>
<td>Transporting</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Storage / retrieval</td>
</tr>
<tr>
<td>Bulk Powder</td>
<td>“Dusty” counting/packaging</td>
</tr>
<tr>
<td>Inhalation</td>
<td></td>
</tr>
</tbody>
</table>

**NIOSH Table 5**

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Activity</th>
<th>Double (oro) (top)</th>
<th>Protective gear</th>
<th>Eye/face protection</th>
<th>Respirator protection</th>
<th>Ventilated engineering control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intact tablet</td>
<td>Administration from unsealed package</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Tablet or capsule</td>
<td>Cutting, crushing</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

Administrative - not single glove, no potential for spill, do not drain into a control device

Administrative - not single glove, no potential for spill, do not drain into a control device
Summary: Assessment of RISK

- Each entity must have a specific list of HDs (to the dosage form level) and adequate practices to protect its personnel.
- The list must be reviewed and revised regularly, at least every 12 months and that review documented.
- There must also be mechanisms to review drugs that are new to the institution and a determination made about whether or not they are hazardous.
- Additional information is available in the text of USP <800> and in resources such as those available at www.hazmedsafety.com.

**Clearly defensible position on how you handle products/practices for that product/dosage form.**

Summary, cont.

- Developing and following guidelines and procedures when handling HD drugs will protect you and your staff from unwanted exposure.
- The appropriate PPE required for the safe handling of hazardous drugs must be made available to all employees
  - Receiving
  - Dispensing
  - Stacking
  - Delivery
  - Cashier
  - Housekeeping
- Emergency Hazardous Spill Kit must be available and spills should be managed by employees trained to use the spill kit.

Question 1

USP <800> requires specific consideration on handling hazardous drugs in which of the following areas?

A. Receiving  
B. Storage  
C. Dispensing  
D. Disposal  
E. All of the above
Answer 1

USP <800> requires specific consideration on handling hazardous drugs in which of the following areas?

A. Receiving
B. Storage
C. Dispensing
D. Disposal
E. All of the above

Question 2

The appropriate PPE required for the safe handling of hazardous drugs must be made available to which of the job functions listed below?

A. Receiving and stocking
B. Dispensing and cashier
C. Delivery
D. Housekeeping
E. Bookkeeper

Answer 2

The appropriate PPE required for the safe handling of hazardous drugs must be made available to which of the job functions listed below?

A. Receiving and stocking
B. Dispensing and cashier
C. Delivery
D. Housekeeping
E. Bookkeeper

Question 3

Which is the correct order for removal of hazardous residue?

A. Clean, decontaminate, deactivate
B. Decontaminate, deactivate, clean
C. Deactivate, decontaminate, clean

Answer 3

Which is the correct order for removal of hazardous residue?

A. Clean, decontaminate, deactivate
B. Decontaminate, deactivate, clean
C. Deactivate, decontaminate, clean

Question 4

USP <800> applies to:

A. Only Hospital Personnel involved with hazardous drugs
B. Only Pharmacy personnel involved with compounding hazardous drugs.
C. All healthcare personnel who handle hazardous preparations, store, prepare, transport or administer hazardous drugs.
D. Only to personnel involved in the administration of hazardous drugs.
E. None of the above.
USP <800> applies to:

A. Only Hospital Personnel involved with hazardous drugs
B. Only Pharmacy personnel involved with compounding hazardous drugs.
C. All healthcare personnel who handle hazardous preparations, store, prepare, transport or administer hazardous drugs.
D. Only to personnel involved in the administration of hazardous drugs.
E. None of the above.

Which of the following NIOSH listings do not have to follow all of the containment requirements of USP <800>, if an assessment of risk is performed and implemented?

A. NIOSH table 1 antineoplastic conventionally manufactured products, that do not require any further manipulation other than counting or repackaging (unless specified by the manufacturer)
B. NIOSH table 2 drugs
C. NIOSH table 3 drugs
D. All NIOSH listed drugs must follow USP <800> containment requirements.
E. A, B and C

REFERENCES

- Environmental Protection Agency EPA: https://www.epa.gov/hazardous-waste-management-pharmaceutical-hazardous-waste
- DrugBank: http://www.drugbank.ca/
- Manufacturer warnings
- FDA website: https://www.fda.gov/
- OSHA. Safe Handling for Hazardous Drugs: www.osha.org
- The Chapter <800> Answer Book
- The Joint Commission: https://www.jointcommission.org
- Hazzards Environmental Resource Center, Utah, Pharmaceuticals – Hazardous Waste
- The Chapter <800> Answer Book
- Hazardous Substances Chapter 6, Utah Code, Part 1, Solid and Hazardous Waste Act
- Manufacturer warnings
- Manufacturer warnings

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