# Nonsterile Hazardous Drug Compounding: How to keep workers safe!

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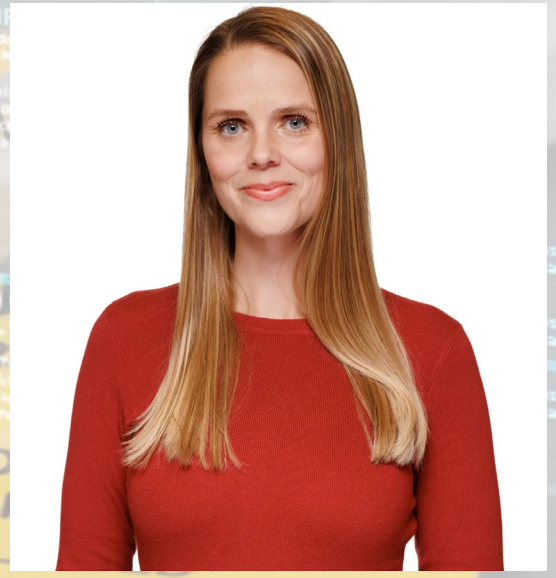

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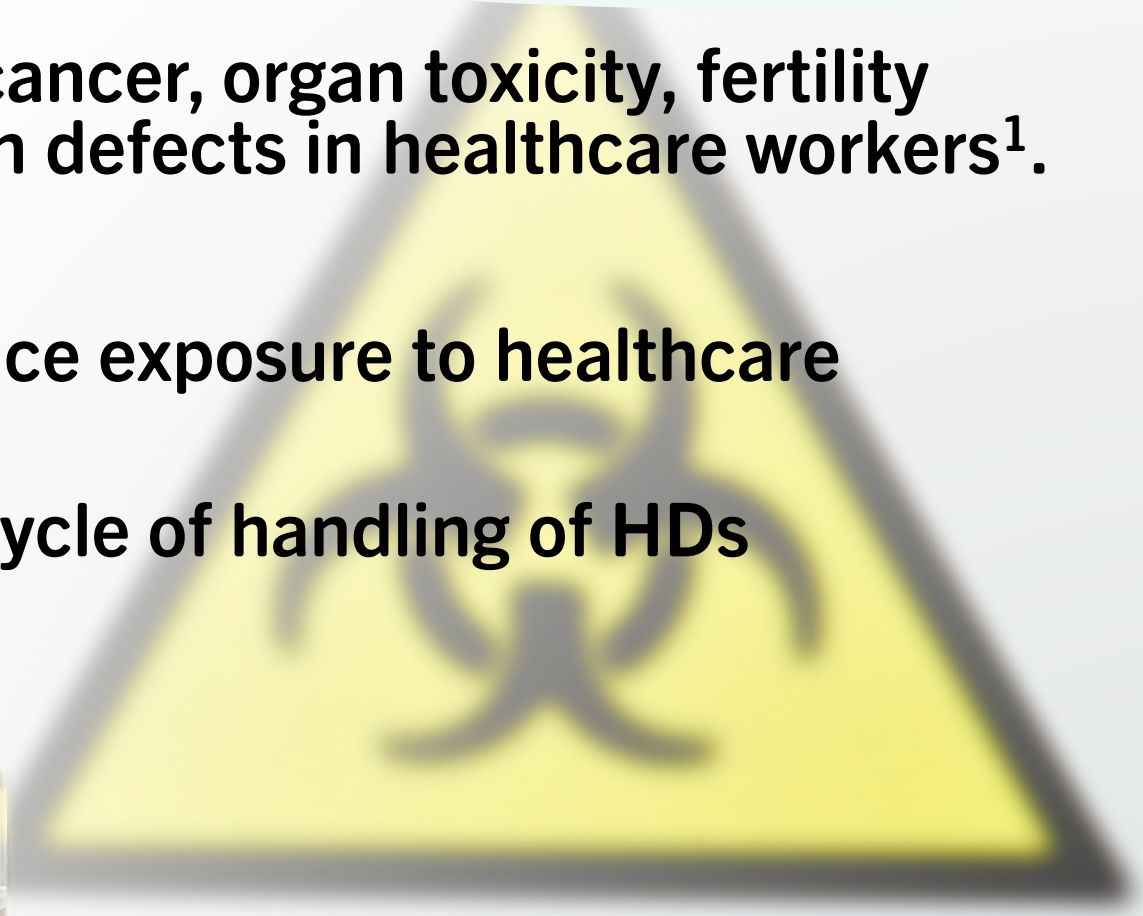
# Learning and Performance Objectives

At the conclusion of this lecture, you will be able to:

1. Discuss the NAPRA Model Standards as it relates to non-sterile hazardous drug compounding.
2. Describe the facility requirements and guidance for Level C compounding areas.
3. Identify the different ways of providing protection to workers compounding non-sterile preparations.
4. Determine key strategies for repackaging, splitting, and compounding non-sterile HDs.

# Let's Start with Why…

- **Hazardous Drugs (HDs) can cause cancer, organ toxicity, fertility problems, genetic damage, and birth defects in healthcare workers[1].**
- **Known this for over 30 years…**
- **Procedures in place in order to reduce exposure to healthcare workers.**
- **This is important for the entire life cycle of handling of HDs including:**
  - **Receiving**
  - **Transport**
  - **Compounding (sterile and non-sterile)**
  - **Administration**




1. Hazardous Drugs: The Silent Stalker of Healthcare Workers? Training, Education Are Key to Preventing Exposures.
by Mark A. Lucas and Thomas H. Connor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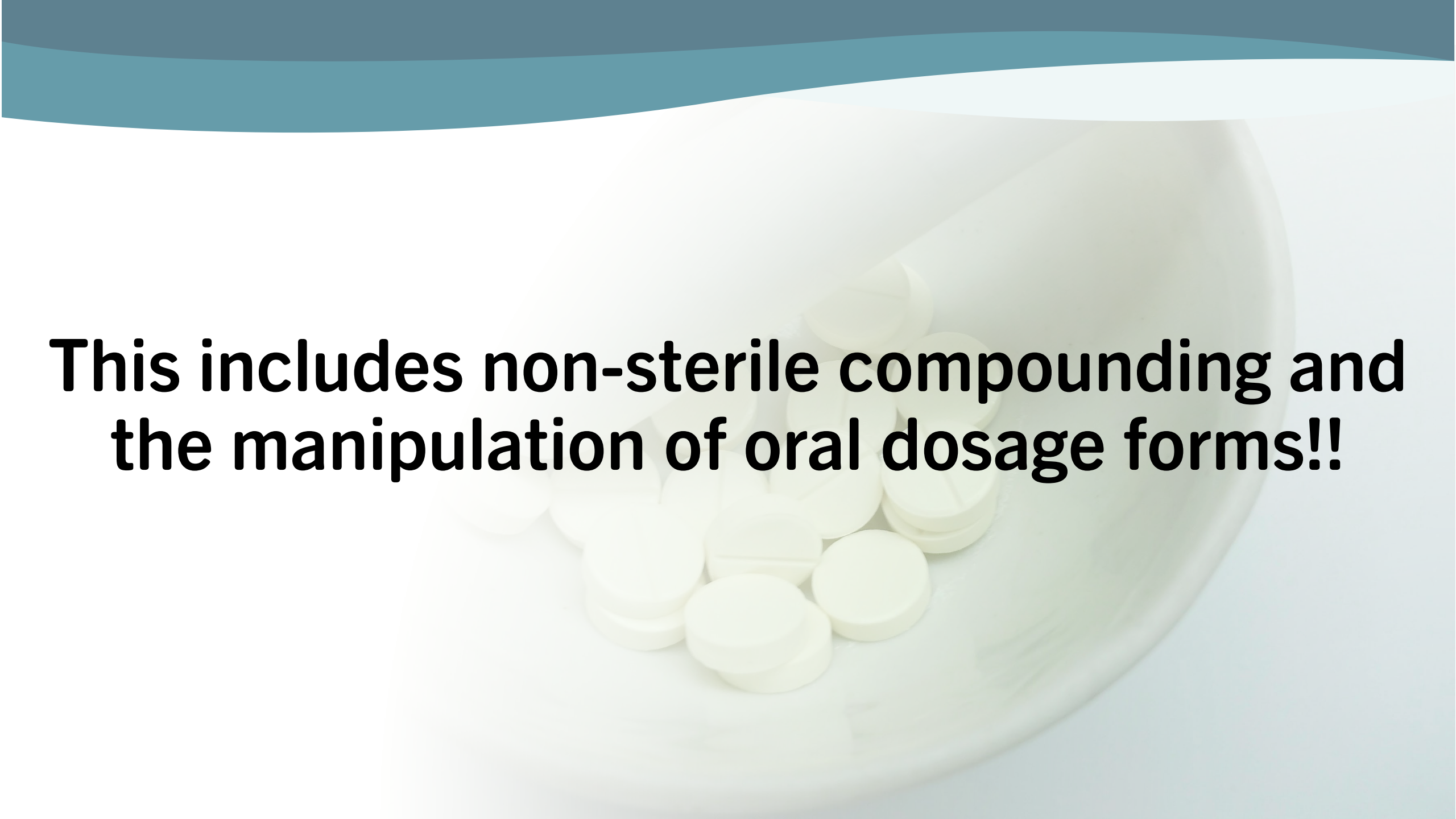
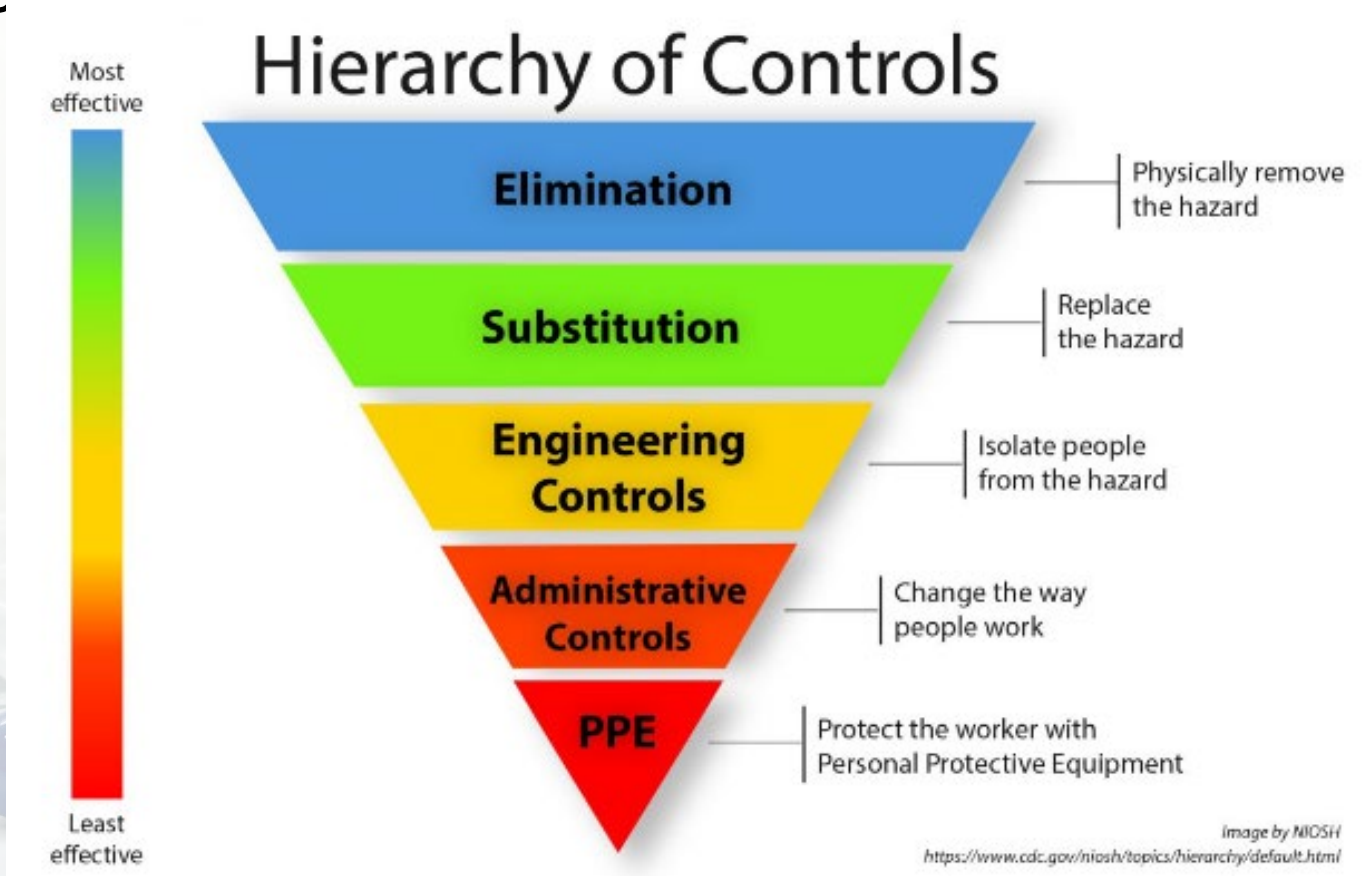


This includes non-sterile compounding and the manipulation of oral dosage forms!!

# NIOSH Hierarchy

- For non-sterile compounding the following controls are used to reduce exposure:
  - Engineering controls such as a containment ventilated exposures (CVE)
  - Administrative controls such as workflows (decontamination strategies, dedicated equipment, etc.)
  - Personnel protective equipment (PPE)



# NAPRA Model Standards – Non-sterile Compounding

- NAPRA has 2 documents:
  - NAPRA Model Standards for Non-sterile Compounding
  - NAPRA Guidance Document for Non-sterile Compounding
- The guidance document has more detailed information regarding HD non-sterile compounding.
- Focus on Level C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# Level C Compounding – HDs Defined

- What are defined as HDs per NAPRA Model Standards:
  - HDs on Table 1 of the NIOSH HD List
  - Hazardous materials classified by WHIMIS
  - NIOSH Table 2s and 3s compounded in large quantities

- HDs found on Table 2 and 3 of the NIOSH HD list still pose a risk for staff.
- Still waiting on the 2020 list to be released…
- Very hard to quantify “large quantities” so it’s best to build the proper area to compound hazardous drugs and materials or outsource the RX.
- Assessment of risk is vital to assess the levels of exposure dependent on the drug, type of manipulation, and environment it is prepared.

# Level C Compounding – Room Design

## Requirement

- Physically separate room
- Well-ventilated room with external venting through HEPA filtration
- Negative pressure
- Appropriate ACPH
- Construction to minimize the risk of exposure
- Eyewash
- Smooth and impervious
- Heating/AC prevent contamination
- Windows cant lead directly outside
- C-PEC available

## Guidance

- Min 12 ACPH
- Negative -2.5 Pa to surrounding areas
- Sink with hot and cold water
- 20 degrees
- Uninterrupted power supply
- Water sources 1 meter away from C-PECs

## Best Practice

- C-PEC should include containment ventilated enclosures best known as powder hoods
- HD storage area can double as a non-sterile compounding area since they have the same requirements and guidance's.
- If your pharmacy can't accommodate this design, then avoid preparing HD compounds and outsource to another pharmacy.

# Storage of Hazardous Products

- NAPRA MS: hazardous products must be stored in a well-ventilated area and clearly identified with signage.
- NAPRA Guidance Doc:
  - Dedicated room
  - Separate from receiving area
    - **CCR recommends receiving of HDs happen inside the negative space in case of potential spill or damage**
  - Negative pressure -2.5 Pa to surrounding areas
  - 12 ACPHs, air exhausted to the exterieur
  - Shelving with lips
  - Signage
  - Sufficient ventilations

Guidance document allows for storage and compounding to occur in the same room.

# Engineering Controls

- Put in place to offer protection to the worker and the environment.
- No need to offer an ISO class 5 environment as this is for non-sterile compounding but cleanliness is still very important.
- Requires certification every 6 months, during installation or being moved.
- Placed inside the negative pressure, separate room.
- Cleaning procedures put in place to reduce cross contamination between preparations and ingredients.

# C-PEC for Non-Sterile Compounding

## Requirement

- C-PEC installed and maintained
- Deactivated, decontaminated, cleaned
- Don appropriate PPE

## Guidance

- C-PEC externally vented or redundant HEPA filters in series
- Class I BSC, CVE, Class II BSC, CACI
- Allowance for occasional use of sterile BSC for non-sterile compounding*

## Best Practice

- USP 795 (2023) offers 3 options CVE, BSC, or containment glove bag.
- Preference to not share BSC for sterile and non-sterile compounding as occasional is hard to define

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# Garbing of Personnel

- Goal is to protect staff from exposure to HD residues and vapors.
- This is non-negotiable
- PPE must be available to staff to offer protection from HD residues.
- Non-compliance tends to be in retail/community pharmacies that compound a lot of hormones.

## Requirement

- Chemo gloves
- Disposable, impermeable gown
- Head, hair, shoe and sleeve covers
- Respiratory protection
- Eye and face protection

## Guidance

- 2 pairs of chemotherapy gloves (ASTM D6978)
- Gowns demonstrate resistance to permeability of HDs. Coated and closed in the front.
- 2 shoe covers and doff outer pair before exiting
- Sleeve covers (polyethylene coated)
- Respiratory protection, airborne particles N95 or N100 (NIOSH-approved) vapors or gases NIOSH-approved full-face respirator.
- Goggles and face shield for specific duties

## Best Practice

- Gowns ASTM F3267-22 rating
- Outer shoe covers water-resistant and seamless
- Installation of doffing line before exiting the HD storage room/compounding room, not just for shoe covers.
- Different levels of PPE dependant on the activity performed.
- Consider hair cover in the compounding area.

# ASTM Rating for HD Gowns

- ASTM released F3267-22 on December 20th , 2022.
- Standard Specification for Protective Clothing for Use Against Liquid Chemotherapy and Other Liquid Hazardous Drugs.
- This specification establishes design, performance, documentation, and labeling requirements and provides test methods for protective clothing used in preventing exposure to liquid chemotherapy and other liquid hazardous drugs.

# Types of HD PPE

- Don PPE depending on the activity of the HD
- Consider:
  - Exposure to the HD
  - Type of manipulation (pill splitting, repackaging tablets, reconstitution, compounding a suspension, etc.)
  - Environment (in a C-PEC, negative pressure room, etc.)
- Risk assessment is performed before making the decision and updating the PnPs.

# Doffing of HD PPE

- Even though it's a non-sterile environment, anytime HDs are handled a doffing line and procedure should be established.
- This reduces the amount of HD residues being tracked out of the compounding/storage environment.
- Update PnP to include doffing procedures.
- Educate staff on the procedures.

# Doffing


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# Decontamination, Cleaning and Disinfecting

- Even though this is non-sterile compounding we still need to think about thorough cleaning and disinfection procedures.
- Added decontamination steps is necessary due to the handling/compounding of HDs.
- Choose the right cleaning and disinfection agent in order to be effective and efficient.
- Using a proven decontamination agent ensures HD residues are removed from the surfaces.

## Requirement

- Meticulously clean equipment
- Eliminate chemical contamination
- Cleaning personnel comply with HH and G
- Work surface of C-PEC decon and clean

## Guidance

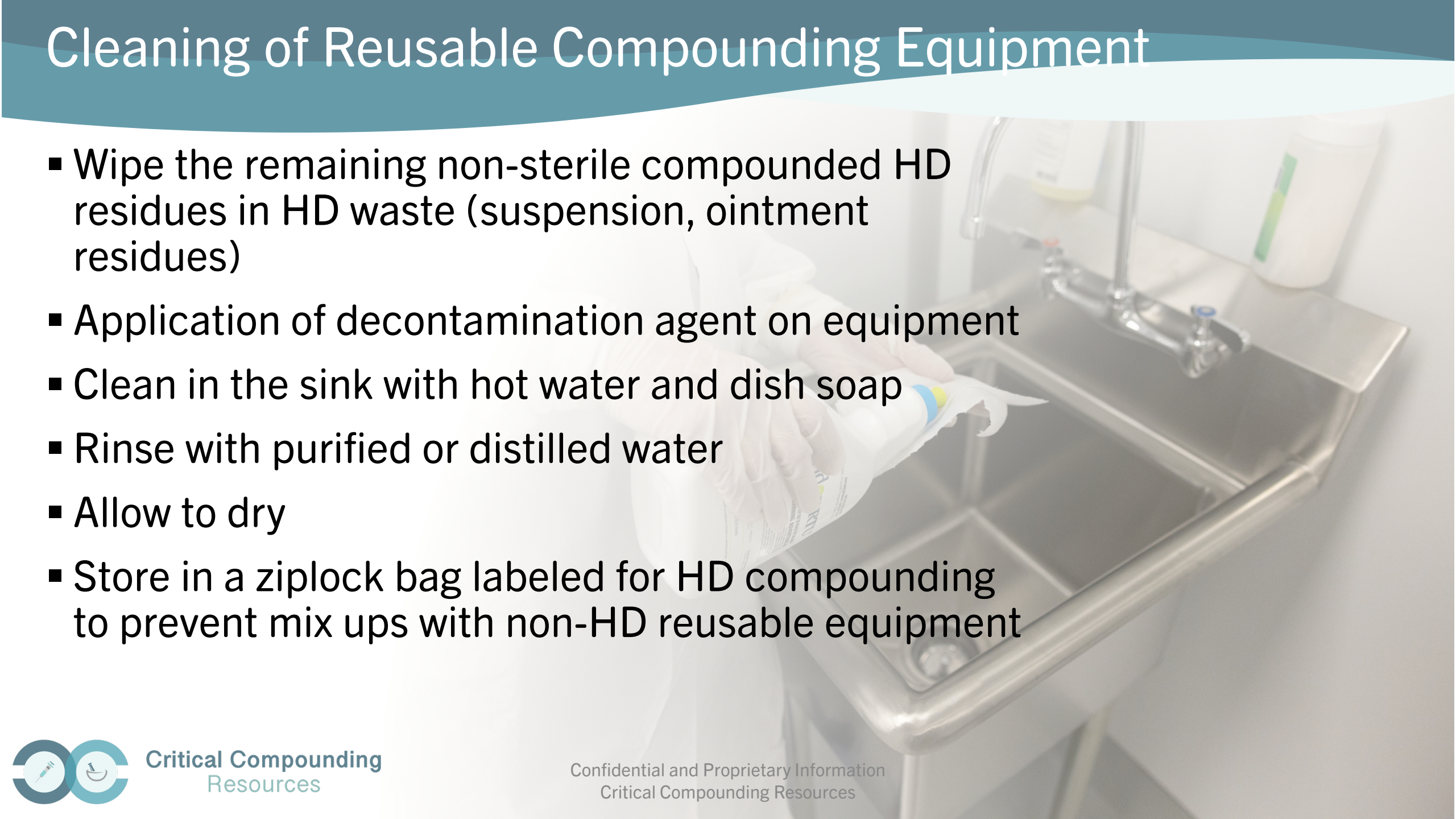
- Defines deactivation and decontamination
- Defines cleaning
- Work surface of C-PEC decon and clean pre-compounding and in between preps
- Clean underneath the tray (when applies)
- Resp protection when opening the C-PEC for decon and cleaning
- Document
- Wipe sampling recommendation

## Best Practice

- Decon and clean the compounding room on a schedule
- All surfaces C-PEC decon and cleaned before the start of compounding
- Work surface in between preps
- Decon is achievable versus deactivation
- PnPs
- Wipe sampling and trending of results

# Cleaning of Reusable Compounding Equipment

- Wipe the remaining non-sterile compounded HD residues in HD waste (suspension, ointment residues)
- Application of decontamination agent on equipment
- Clean in the sink with hot water and dish soap
- Rinse with purified or distilled water
- Allow to dry
- Store in a ziplock bag labeled for HD compounding to prevent mix ups with non-HD reusable equipment



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# Compounding Procedures

- **Dependant on the dosage form the procedures and tools used differ.**
- **Establish compounding procedures for each type of compounded non-sterile preparation and equipment used.**
- **Important**
  - **Be precise in measurements**
  - **Require a 2nd check of calculations and measurements before the combining of ingredients when possible.**
  - **Clear and concise documentation (master formulas) prevent potential mix-ups.**
  - **Ensure compounders initials appear on the documentation, along with the 2nd checkers and final verifier.**

# Repackaging Oral Dosage Forms – Health Systems

- Unit-dose for liquids in oral syringes for nursing ready to administer
- Tablets repackaged in unit-dose packaging properly labeled to highlight the cytotoxic nature of the medication
- Splitting tablets
  - Pill splitter then packaged unit-dose

# Repackaging Oral Dosage Forms – Retail

- Dispense the bottle
  - Hopefully include oral syringes so patients can accurately measure the dose with a dispense cap
- Tablets dispensed in secure vials labeled as HD
- Splitting tablets
  - Pill splitter given to patient or if a dosette/dispill patient then pharmacy can do it for them.

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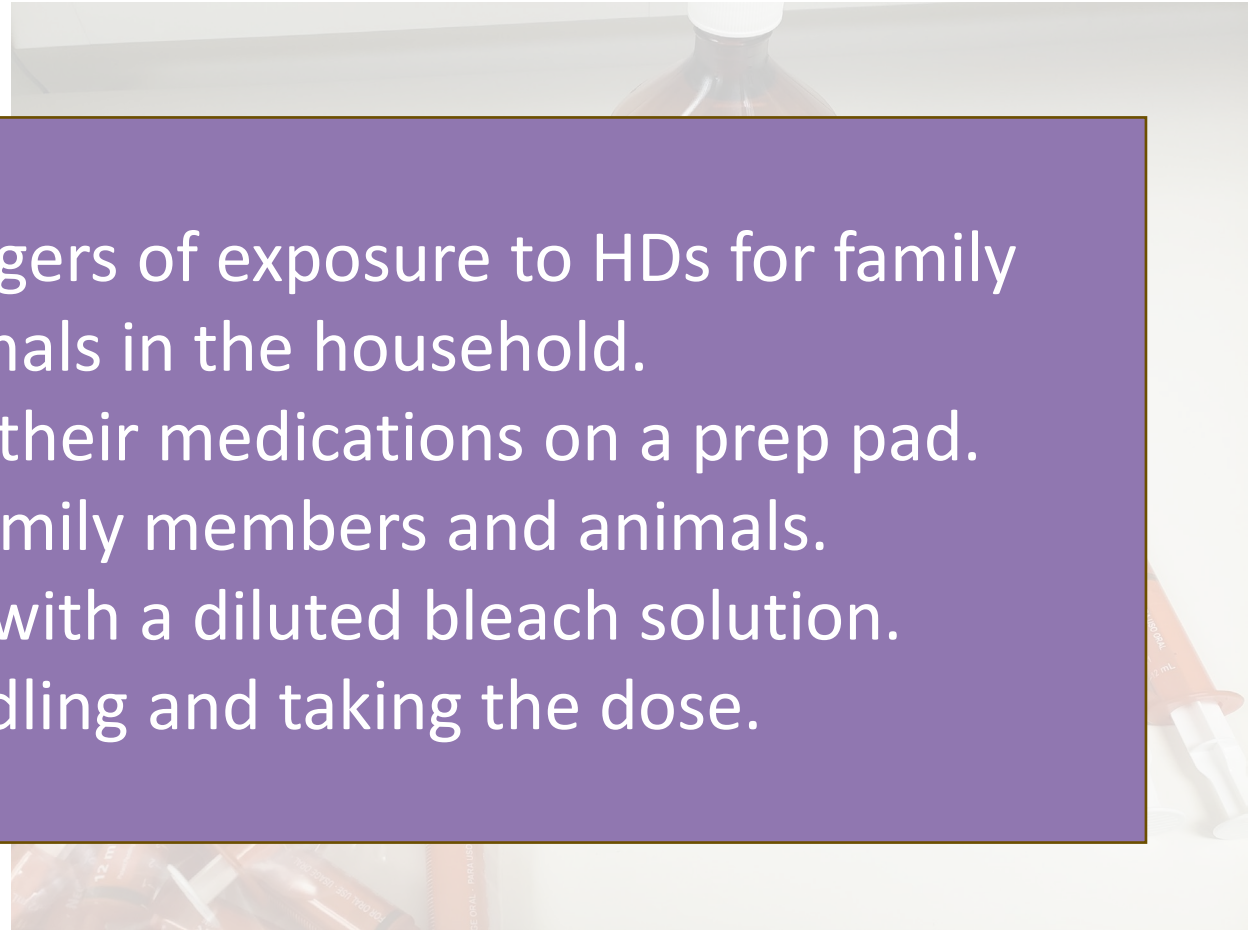
# Repackaging Oral Dosage Forms – Retail

- Dispense the bottle



- Explain to the patients the dangers of exposure to HDs for family members and animals in the household.
- Teach patients to manipulate their medications on a prep pad.
- Keep away from other family members and animals.
- Thoroughly clean the area with a diluted bleach solution.
- Wash hands after handling and taking the dose.

do it for them

# Powder Generating Activities- HDs

- Crushing tablets, opening capsules, splitting tablets, reconstituting oral liquid HDs…
- Those activities require staff to be fully protected when manipulating the HDs.
- Full containment strategies are recommended EVEN for retail pharmacies. If these can’t be met then outsource the RX to a Level C pharmacy

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# Transport of HD Compounded Preparations

| Requirement | Guidance | Best Practice |
| --- | --- | --- |
| • Nothing | • Nothing | • Use the **sterile** HD NAPRA Model Standards as guidance |

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# Transport of HDs CSPs

- PnPs should be developed and implemented for the transport of hazardous compounded preparations to:
  - Patient care units
  - Other pharmacies
  - Patients
- PnP for return of expired or unused hazardous compounded sterile preparations from:
  - Patient's home
  - Hopsital unit

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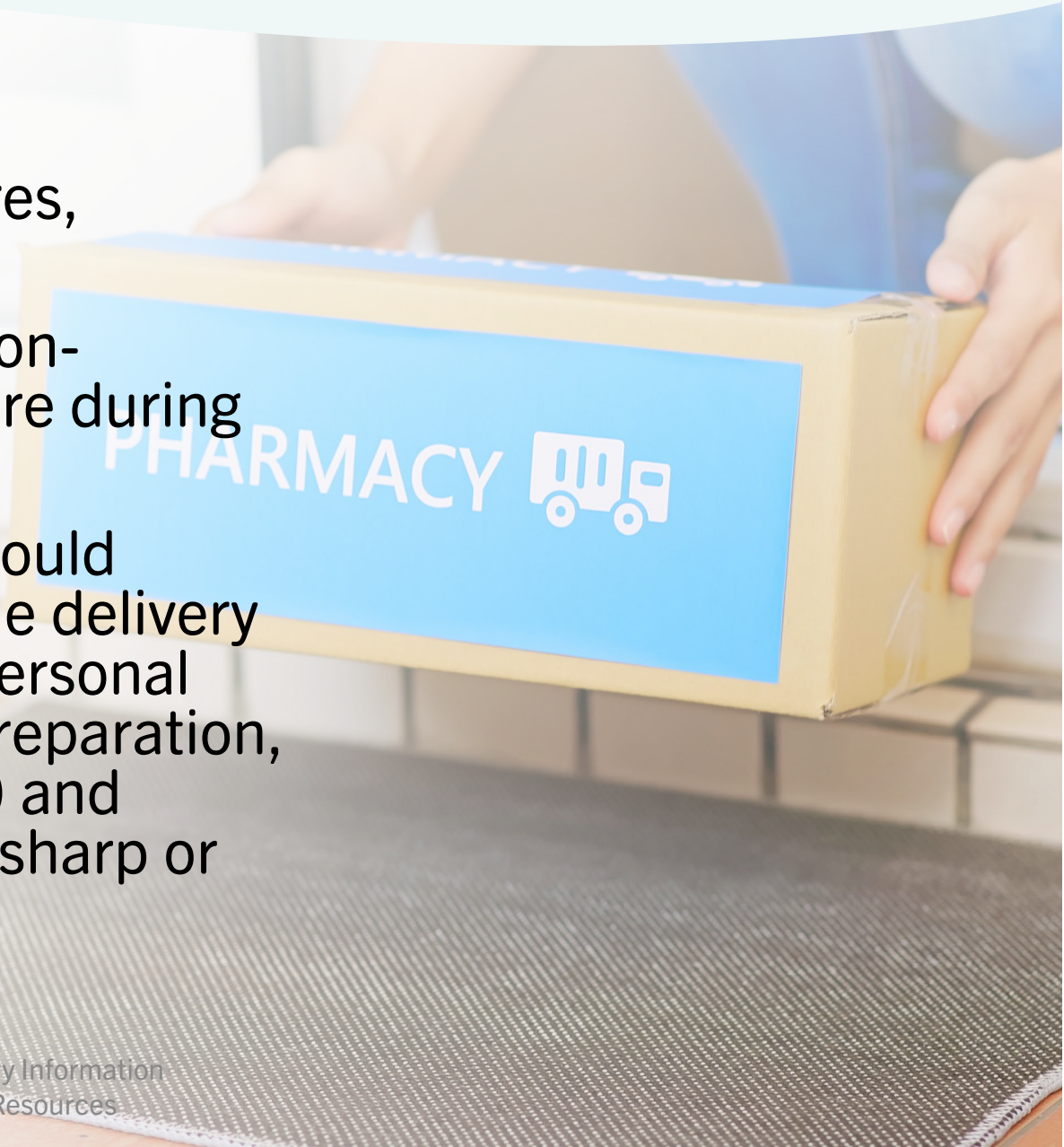
# The Transport and Delivery Procedures

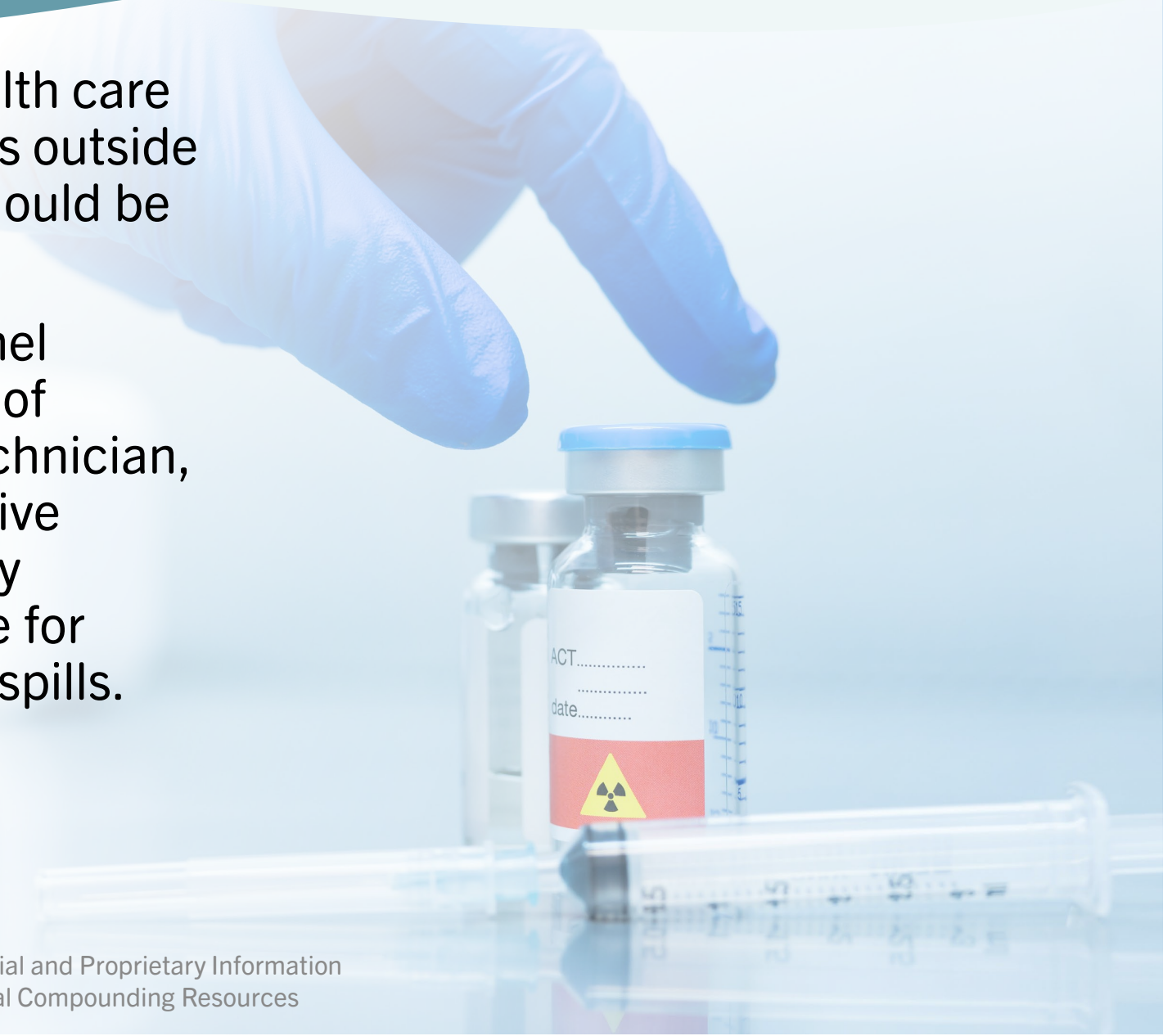
Should include:

- Identify the delivery person and procedures, temperature monitoring (if needed).
- The steps to be followed in the event of non-maintenance of target storage temperature during transport.
- The transport and delivery procedures should include any precautions to be taken by the delivery person, especially during delivery (e.g., personal delivery of the hazardous compounded preparation, rather than delegation to another person) and during return of medications, waste, and sharp or pointed items.



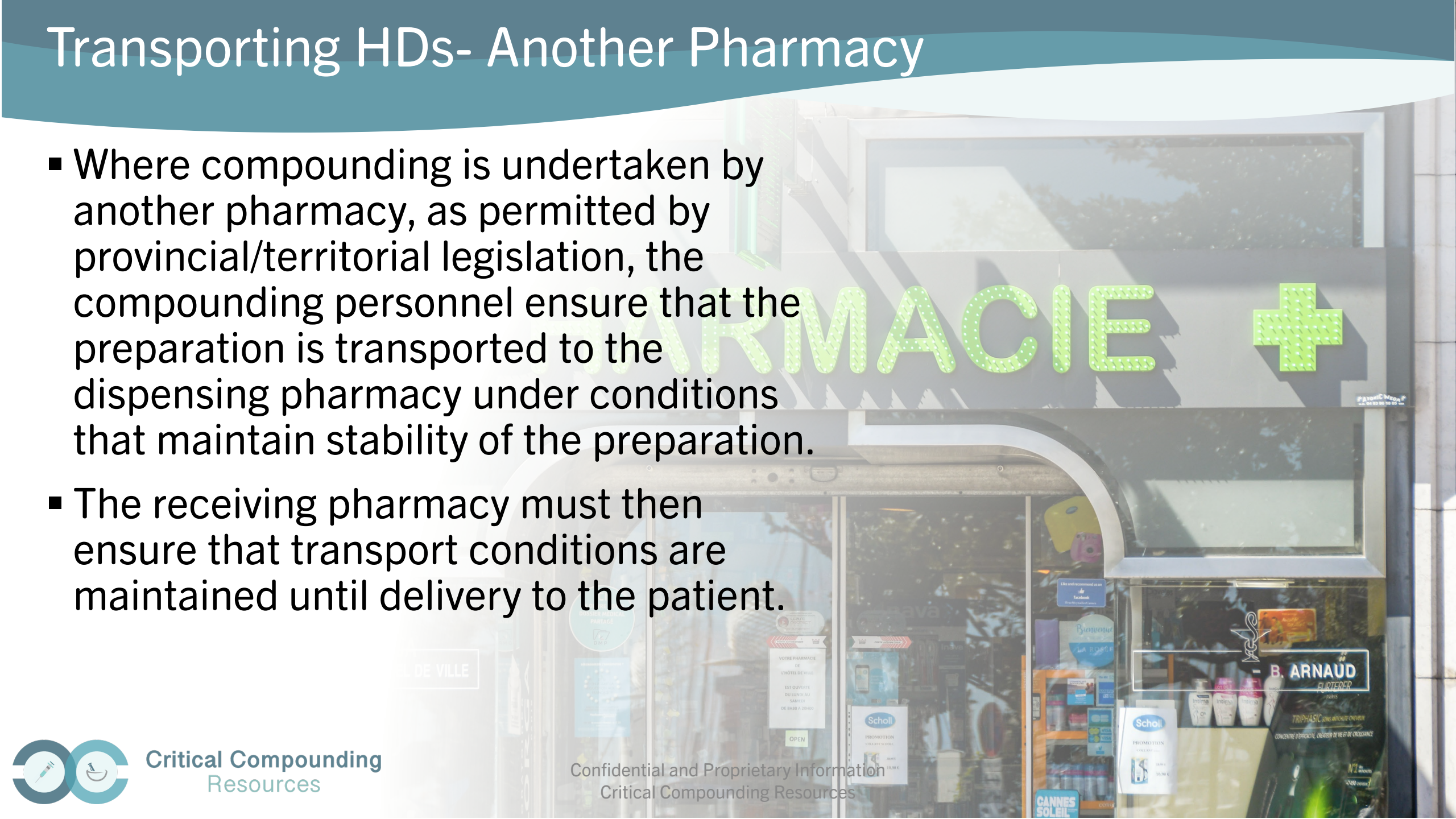
# The Transport and Delivery Procedures (continued)

- For community pharmacies and health care facility pharmacies making deliveries outside the facility, the delivery container should be lockable or sealed.
- The supervisor ensures that personnel involved in preparation and delivery of products (pharmacist, pharmacy technician, pharmacy assistant and driver) receive training on the transport and delivery procedures, including the procedure for dealing with accidental exposure or spills.



# Transporting HDs- Another Pharmacy

- Where compounding is undertaken by another pharmacy, as permitted by provincial/territorial legislation, the compounding personnel ensure that the preparation is transported to the dispensing pharmacy under conditions that maintain stability of the preparation.
- The receiving pharmacy must then ensure that transport conditions are maintained until delivery to the patient.



# Hazardous Waste Management

## Requirement

- Procedures in place following environmental protection legislation
- Training
- PPE

## Guidance

- Procedures following WM regulations
- PnPs (see following slides)

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# Hazardous Waste Management

All personnel receive appropriate training on destruction procedures to ensure their own protection and prevent contamination of the premises


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# Waste Management (continued)

- All equipment, products and vials used in the compounding of hazardous preparations should be discarded in hazardous waste container.
- Labeled hazardous waste - cytotoxic
- Outer gloves should be removed in the C-PEC
- All PPE should be discarded into HD waste
- Comply with local, provincial, and federal laws.


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# Waste Management

- Hazardous waste containers must be identified with a self-adhesive label marked “Hazardous waste – cytotoxic”.
- Containers should be filled to only three-quarters of their capacity.
- Once a bin is threequarters full, it should be sealed.
- Personnel should never attempt to compress the contents of a hazardous waste bin.

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# Summary

- There is no safe amount of HD exposure.
- Handling, receiving, compounding, packaging and transporting HDs require vigilance and to be compliant with NAPRA Model Standards.
- NAPRA Model Standards are very limited on information.
- CCR recommends pharmacy follow the Guidance Document in order to supplement the details needed to provide adequate protection for staff.
- And best practice recommendations are always useful in order to increase the quality of the preparations for the patients and increase safety for the staff handling HDs.


Questions?

# References


- Hazardous Drugs: The Silent Stalker of Healthcare Workers? Training, Education Are Key to Preventing Exposures. by Mark A. Lucas and Thomas H. Connor
- Model Standards For Pharmacy Compounding Of Non-Sterile Preparations, National Association of Pharmacy Regulatory Authorities, March 2018 and revised January 2022.
- Guidance Document For Pharmacy Compounding Of Non-Sterile Preparations, National Association of Pharmacy Regulatory Authorities, March 2018, revised June 2018 and revised January 2022.