Chemotherapy Hood Decommissioning for Disposal or Recycling

Fact Sheet

Sponsored by the AIHA® Healthcare Working Group Hazardous Drugs Project Team

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Question

The AIHA Healthcare Working Group recently received the following question: "I have a chemotherapy hood that is being removed from the pharmacy. I understand how to legally bag and dispose of the high-efficiency particulate air (HEPA) filters, but how do I get rid of the hood? Is it possible to clean the hood to the point where it is no longer considered a hazard and give it to a school, or do I have to dispose of it in the same waste stream I use to dispose of the filter? If I can clean it, at what point is it considered clean? Are there any guidelines on this?"

Answer

Whether a hood is reused, recycled, or discarded, the following elements should be considered as part of the decommissioning plan: a risk assessment, removal of the HEPA filter, decontamination, and surface wipe sampling. This information will assist in developing the final endpoint for the hood (i.e., reuse, recycle, or discard).

This fact sheet does not address hoods used to compound biological agents. Per the National Sanitation Foundation (NSF) Standard 49–2014,[1] the decommissioning process for a biological safety cabinet (BSC) used in a laboratory with biological agents includes gas decontamination and other steps to address the biological hazard. The decommissioning and decontamination needs of a chemotherapy hood, however, are different due to the nature of the hazard, which is, for the most part chemical, not biological.

Risk Assessment

Prior to cleaning and decontamination of the BSC and/or compounding aseptic containment isolator (CACI), an initial risk assessment should be conducted that includes a review of maintenance and compounding history to determine the types of drugs compounded, frequency of hood use, past cleaning protocols used, etc. This risk assessment will help determine the appropriate deactivating agent to be used, particularly if there are any known adverse reactions with specific agents. If there are multiple hazardous drugs present, a universal deactivating agent may not be available that will deactivate the variety of hazardous drugs used in the hood.

HEPA Filter

The standard practice for BSCs and/or CACI used for hazardous drug compounding is to have the HEPA filters removed, bagged, and disposed of by incineration as regulated medical waste (trace chemo "yellow") or disposed of as hazardous waste via a Resource Conservation Recovery Act (RCRA) disposal contractor. The HEPA filter is removed by a trained hood certification technician wearing appropriate personal protective equipment (PPE), such as double nitrile gloves that have been tested in accordance with ASTM International for chemotherapy drugs,[2] eye and face protection, protective gown, and respiratory protection as determined by the initial risk assessment. An HEPA vacuum is also used.

Decontamination

Once the HEPA filters have been removed, all accessible surfaces should be decontaminated. As mentioned earlier, there does not appear to be a universal agent to decontaminate all types of hazardous drugs. However, per the resources listed below, the common theme is to deactivate the hazardous drug with an appropriate agent such as bleach, followed with sodium thiosulfate to prevent corrosion of the stainless steel hoods, and concluding with decontamination/disinfection.

The U.S. Pharmacopeial Convention (USP) General Chapter 800,[3] Table 5, has a summary of cleaning steps to include deactivation of hazardous drugs, with a detailed explanation in paragraph 15.1. A summary of USP guidelines is as follows:

- Deactivation (render compound inert or inactive): "As listed in the hazardous drug labeling or if no specific information available, sodium hypochlorite or other Environmental Protection Agency-registered oxidizer"
- Decontamination (remove inactivated residue): "Sterile alcohol, sterile water, peroxide, or sodium hypochlorite"

- Cleaning (remove organic and inorganic material): "Germicidal detergent and sterile water"
- Disinfection (destroy microorganisms): "Sterile alcohol or other EPA-registered disinfectant appropriate for use"

The Controlled Environment Testing Association (CETA) also has a document, *Servicing Hazardous Drug Compounding Primary Engineering Controls*,[4] which provides guidance for the decommissioning and disposal of a chemotherapy hood.

Another useful reference for decommissioning equipment potentially contaminated with pharmaceuticals is the *Good Practice Guide: Good Engineering Practice*,[5] published by ISPE, the International Society for Pharmaceutical Engineering.

The 2013 Pan American Health Organization guideline, *Safe Handling of Hazardous Chemotherapy Drugs in Limited-Resource Setting*,[6] recommends the following:

> A 2% sodium hypochlorite solution with detergent may be wiped onto contaminated surfaces, allowed to dwell in accordance with the manufacturer's specifications, and then rinsed; this is followed by a neutralizing solution of 1% sodium thiosulfate, wiped on and off, followed by a rinse solution of water, then alcohol.

The sodium thiosulfate neutralizes the bleach or ammonium chloride to prevent pitting the stainless steel. A wipedown with isopropyl alcohol (IPA) or a mild soap solution, following cleaning with any bleach-containing surfactant, is suggested to further prevent pitting of the hood.

Commercially available products can be purchased that use these same active ingredients in a convenient two-step wipe system. However, in most all situations, despite decontamination efforts, contamination may still be present on the hard-to- reach surfaces such as the internal mechanisms of the hood, plenum, and ductwork. Best practice dictates that service personnel should presume that all internal components are contaminated.[6]

In addition, company identifiers should also be removed. As a best practice, some health care facilities remove the fan motor to further prevent repurposing. The pressure gauge, lighting system, and circuit boards should also be removed and disposed of as universal waste, due to potential mercury contamination.

Wipe Sampling

Once the HEPA filters have been removed and all accessible areas decontaminated, surface wipe sampling should be conducted to determine the amount of residual hazardous drugs. Published regulations and guidelines on this topic are sparse.

Although there are no established acceptable surface limits or federal standards for testing to demonstrate that an object is clean enough for disposal, in general, all accessible surfaces should be decontaminated to as low as reasonably achievable (ALARA).

From a liability perspective, documentation is necessary verifying that proper decontamination has been performed. The article "Surface Wipe Sampling for Antineoplastic (Chemotherapy) and Other Hazardous Drug Residue in Healthcare Settings: Methodology and Recommendations"[7] (*Journal of Environmental and Occupational Hygiene*) provides an overview of how to conduct surface wipe sampling.

Reuse, Recycle (Salvage) or Discard?

After decontamination activities are completed, the hood is labeled as "clean" or "decontaminated." Prior to reusing, recycling, or discarding the hood, consider the end-user. For example, donation of a chemotherapy hood (even though decontaminated) to a school may not be a suitable option for young children due to the perceived or actual risk of residual contamination. However, reuse at a research facility, graduate school, or another department within your company that is familiar with hazardous drugs may be acceptable.

If the hood can no longer be used, salvaging the decontaminated hood and associated ductwork for scrap metal is an acceptable practice. In addition to decontamination, the metal should

be cleaned using detergent solution, paying special attention to corners and seams that the workers would not ordinarily contact. The recycling facility may require verification of decontamination via surface testing (i.e., wipe samples). When in doubt, discard the hood as RCRA hazardous waste.

References

1. **National Sanitation Foundation (NSF):** *Biosafety Cabinetry: Design, Construction, Performance, and Field Certification* (International Standard/American National Standard 49-2014). Ann Arbor, Mich.: NSF, 2014.
2. **ASTM International:** *Standard Practice for Assessment of Resistance of Medical Gloves to Permeation by Chemotherapy Drugs.* (D6978-05). West Conshohocken, Pa.: ASTM International, 2005.
3. **U.S. Pharmacopeial Convention (USP):** General Chapter 800, First Supplement to USP 39–NF 34. Rockville, Md.: USP, 2016.
4. **Controlled Environment Testing Association (CETA):** *Servicing Hazardous Drug Compounding Primary Engineering Controls* (Publication CAG–005–2007). Raleigh, N.C.: CETA, 2007.
5. **ISPE, the International Society for Pharmaceutical Engineering:** *Good Practice Guide: Good Engineering Practice.* Bethesda, Md.: ISPE, 2008.
6. **Connor, T.H., S.F. Eckel, M.A. McDiarmid, M. Polovich, and A.L. Power:** *Safe Handling of Hazardous Chemotherapy Drugs in Limited-Resource Settings.* Washington, D.C.: Pan American Health Organization, 2013. See Section 2.7.
7. **Connor, T.H., M.D. Zock, and A.H. Snow:** Surface Wipe Sampling for Antineoplastic (Chemotherapy) and Other Hazardous Drug Residue in Healthcare Settings: Methodology and Recommendations. *Journal of Occupational & Environmental Hygiene. 13(6)* (2016).

Additional Resources

American Society of Health-System Pharmacists: *ASHP Guidelines on Handling Hazardous Drugs*. Bethesda, Md.: ASHP, 2006.

ANSI/AIHA Standard Z9.11–2008 – *Laboratory Decommissioning*. Available at www.aiha.org/market. Identifies the minimum acceptable criteria for completing the decommissioning process, performing risk assessments, and documenting the necessary information for regulatory and historical purposes.

Boston University: *Policy on Laboratory Decontamination and Decommissioning*. Available at http://www.bu.edu/ehs/plans/management-plans/laboratory-safety/laboratory-decontamination-and-decomissioning.

Boston University: *Servicing and Disposing of Laboratory Equipment.* This handout guides contractors and facilities workers in performing work on or disposing of laboratory equipment. Available at http://www.bu.edu/ehs/files/2011/05/Equipment-decontamination.pdf.

Controlling Occupational Exposure to Hazardous Drugs. Chapter 21 in *OSHA Technical Manual* (OSHA Instruction CPL 2-2.20B CH-4). Washington, D.C.: Occupational Safety and Health Administration, Directorate of Technical Support, 1995.

NIOSH: *Preventing Occupational Exposures to Antineoplastic and Other Hazardous Drugs in the Healthcare Setting* (NIOSH Alert), 2004. Contains information on decontamination. Available at http://www.cdc.gov/niosh/docs/2004-165.

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