



## ENVIRONMENTAL HEALTH AND SAFETY

# Handling Antineoplastics and Other Hazardous Drugs

Drugs used to treat cancer along with other antineoplastic drugs, antivirals, antibiotics, and bioengineered drugs are designed to interfere with cell growth or DNA synthesis; these drugs may be referred to as hazardous drugs (HD). In therapeutic prescriptions with the correct dosage and route of administration, HDs may result in positive health outcomes for patients. However, due to the nonselective actions of these drugs, they can disrupt the growth and function of healthy and diseased cells, with potential toxic side effects including carcinogenicity, teratogenicity/developmental toxicity, reproductive toxicity, organ toxicity, and/or genotoxicity.

Similarly, HDs can cause adverse effects in healthcare workers or lab personnel who are inadvertently exposed to or mishandle these materials. Researchers working on protocols with **any drug** should read its safety data sheet (SDS) to review potential hazards and ensure they are using appropriate controls, including engineering controls (i.e., fume hood) and personal protective equipment (PPE). Environmental Health and Safety (EHS) has reviewed the National Institute for Occupational Safety and Health (NIOSH) Hazardous Drug list and updated the university's chemical inventory system, EHSA, with a notation (yellow dot) for those drugs that are on the NIOSH list:

Item(s) marked with a ● are NIOSH Hazardous Drugs

Some common examples of HDs on the NIOSH list that are used on campus include: chloramphenicol, cisplatin, and doxorubicin. The HDs included on the NIOSH list are drugs that have been approved for use in humans by the Food and Drug Administration (FDA), not regulated by the U.S. Nuclear Regulatory Commission, and either have a package insert from the manufacturer regarding the manufacturer's special handling information (MSHI) or are identified as having a carcinogenic hazard, developmental hazard, reproductive hazard, genotoxic hazard, or other health hazard. The NIOSH list may not be all-inclusive, so researchers should review drug-specific information for each product used in their laboratory.

The 2024 NIOSH list contains Table 1 and Table 2 of HDs; all drugs from both Table 1 and Table 2 have been included as an HD in the chemical inventory system (EHSA). While the 2024 list does not contain controls to be used, the 2016 NIOSH list did contain a table with controls and that table is included here to give general parameters of controls to be considered for work with HDs. If the chemical inventory for your lab includes chemicals on the NIOSH list, please ensure that you know how to safely handle the material and contact EHS (303-724-0242) with any questions.

Additionally, if your lab is using HDs in research and there are materials contaminated with HDs that will be disposed of as waste, please refer to the Biosafety division guidance on [biohazardous waste disposal](#). Any raw material or unused product that will be disposed of as waste should be collected in accordance with hazardous waste regulations and be picked up by the [Hazardous Materials division](#).

### References/Resources:

NIOSH List of Hazardous Drugs in Healthcare Settings, 2024

NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings, 2016

Table 1

Formulation	Activity	Double chemotherapy gloves	Protective gown	Eye/face protection	Respiratory protection	Ventilated engineering control
All types of hazardous drugs	Receiving, unpacking, and placing in storage	no (single glove can be used, unless spills occur)	yes, when spills and leaks occur	no	yes, when spills and leaks occur	no
Intact tablet or capsule	Administration from unit-dose package	no (single glove can be used)	no	no	no	N/A
Tablets or capsules	Cutting, crushing, or manipulating tablets or capsules; handling uncoated tablets	yes	yes	no	yes, if not done in a control device	yes+
Tablets or capsules	Administration	no (single glove can be used)	no	yes, if vomit or potential to spit up*	no	N/A
Oral liquid drug or feeding tube	Compounding	yes	yes	yes, if not done in a control device	yes, if not done in a control device	yes+
Oral liquid drug or feeding tube	Administration	yes	yes	yes, if vomit or potential to spit up*	no	N/A
Topical drug	Compounding	yes	yes	yes, if not done in a control device	yes, if not done in a control device	yes+, BSC or CACI
Topical drug	Administration	yes	yes	yes, if liquid that could splash*	yes, if inhalation potential	N/A
Subcutaneous/intra-muscular injection from a vial	Preparation (withdrawing from vial)	yes	yes	yes, if not done in a control device	yes, if not done in a control device	yes, BSC or CACI
Subcutaneous/intra-muscular injection from a vial	Administration from prepared syringe	yes	yes	yes, if liquid that could splash*	no	N/A
Withdrawing and/or mixing intravenous or intramuscular solution from a vial or ampoule	Compounding	yes	yes	no	no	yes, BSC or CACI; use of CSTD recommended
Withdrawing and/or mixing intravenous or intramuscular solution from a vial or ampoule	Administration of a prepared solution	yes	yes	yes, if liquid that could splash*	no	N/A, CSTD required per USP 800 if the dosage form allows
Solution for irrigation	Compounding	yes	yes	yes, if not done in a control device	yes, if not done in a control device	yes, BSC or CACI; use of CSTD recommended
Solution for irrigation	Administration (bladder, HIPEC, limb perfusion, etc.)	yes	yes	yes	yes	N/A
Powder/solution for inhalation/aerosol treatment	Compounding	yes	yes	yes, if not done in a control device	yes, if not done in a control device	yes, BSC or CACI
Powder/solution for inhalation/aerosol treatment	Aerosol administration	yes	yes	yes	yes	yes, when applicable
Powder/solution for inhalation/aerosol treatment	Administration	yes	yes	yes, if liquid that could splash*	yes, if inhalation potential	N/A
Drugs and metabolites in body fluids	Disposal and cleaning	yes	yes	yes, if liquid that could splash	yes, if inhalation potential	N/A
Drug-contaminated waste	Disposal and cleaning	yes	yes	yes, if liquid that could splash	yes, if inhalation potential	N/A
Spills	Cleaning	yes	yes	yes	yes	N/A

Table Abbreviations and Footnotes

BSC	Class II Biological Safety Cabinet
CACI	Compounding aseptic containment isolator
CSTD	Closed system drug-transfer device
HIPEC	Hyperthermic intraperitoneal chemotherapy
	For nonsterile preparations, a ventilated engineering control such as a fume hood or Class I BSC or a HEPA-filtered enclosure (such as a powder hood) is sufficient if the control device exhaust is HEPA filtered or appropriately exhausted to the outside of the building. It is recommended that these activities be carried out in a control device, but it is recognized that under some circumstances, it is not possible. If the activity is performed in a ventilated engineering control that is used for sterile intravenous preparations, a thorough cleaning is required following the activity.
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*	Required if subject may resist