

Minimizing hazardous drug surface contamination in the clinical setting using standardized workflow and a closed system transfer device; a method validation

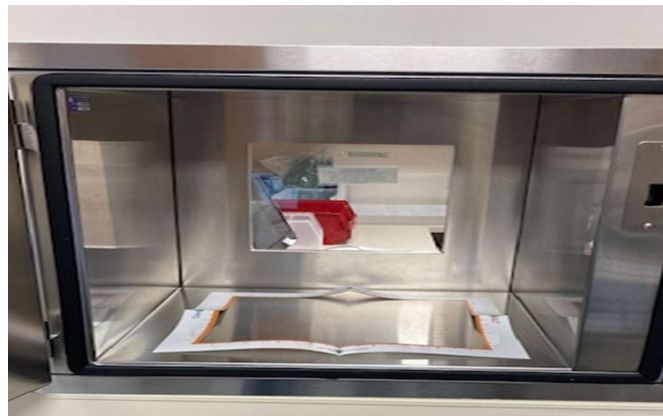
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Background

- Occupational exposure to hazardous drugs (HD) occurs during compounding and administration in pharmacy and nursing areas ¹⁻⁴.
- Exposure to HD may lead to serious adverse reactions ⁵.
- Implementation of guidelines, safe handling precautions, and environmental and engineering controls have occurred, but levels of HD surface contamination continue to be reported in health care settings.
- Closed System Transfer Devices (CSTD) may offer additional containment to minimize HD surface contamination.

Purpose

- Demonstrate the effectiveness of the ChemoLock (ICU Medical, San Clemente, CA) CSTD, with standard work practices, to minimize HD surface contamination.
- Offer a method for the routine evaluation of surfaces to verify areas are free of HD surface contamination or justify updated cleaning or facility controls.



Sampling Area inside Pharmacy Pass Through

Results

Table 1. Surface Contamination Wipe Analysis Results (ND=Non-Detectable)

Wipe Study Date	Number of Locations	Paclitaxel Concentration ng/ft2 (ng/cm2)	5-FU Concentration ng/ft2 (ng/cm2)	Cyclophosphamide Concentration ng/ft2 (ng/cm2)	Methotrexate Concentration ng/ft2 (ng/cm2)	Doxorubicin Concentration ng/ft2 (ng/cm2)
October 1, 2020	6*	ND	ND	ND	ND	ND
April 8, 2021	6*	ND	ND	ND	ND	ND
January 14, 2021	6*	ND	ND	ND	ND	ND

* Pharmacy Hood; Pharmacy Pass Thru; Nursing Staging Area; Main Pharmacy Pass Thru; Counter in Mixing Room; Chemo Bin Nursing

Conclusions

- ChemoLock CSTD is effective in mechanically minimizing the environmental exposure of healthcare workers to HD surface contamination, demonstrated by non-detectable results for all samples.
- Surface wipe evaluation remains the established technique for detection of HD surface contamination.
- Routine monitoring of HD surface contamination may offer justification for the updating of engineering controls (such as a CSTD), or enhanced workflow and disinfectant procedures to reduce or eliminate surface contamination.



Closed System Transfer Device in Use in the Biological Safety Cabinet

Directions for further study

- Determining the source of HD contamination (HD vials) may present opportunities to further eliminate surface contamination.
- Compliance in standard work practices and adherence to the approved uses of engineering controls may decrease or eliminate HD surface contamination opportunities.
- Real-time or continuous monitoring may detect or decrease factors involved in detection errors such as removing drug stability or sampling inconsistencies.

Key Takeaways

- Standardization of workplace practices, including the use of primary and secondary engineering controls (closed system transfer devices) are a key element in the minimization of exposure to hazardous drugs in the compounding and administration areas.
- Regular and uniform evaluation of surfaces in the compounding and administration areas may offer identification of practices that may require updating.
- This study offers a method to verify the institutional practices and controls adopted adequately address hazardous drug surface contamination.

References

- Cannor, T. H.; Anderson, R. W.; Sessink, P. J.; Broadfield, L.; Power, L. A. (1999). Surface contamination with antineoplastic agents in six cancer treatment centers in Canada and the United States. In *American journal of health-system pharmacy*. AJHP, official journal of the American Society of Health-System Pharmacists 56 (14), pp. 1427–1432.
- Bussi eres, Jean-Fran ois; Tanguay, Cynthia; Touzin, Karine; Langlois, Eric; Lefebvre, Michel (2012). Environmental contamination with hazardous drugs in quebec hospitals. In *The Canadian journal of hospital pharmacy* 65 (6), pp. 428–435.
- Palamini, Marie; Gagn e, S ebastien; Caron, Nicolas; Bussi eres, Jean-Fran ois (2020). Cross-sectional evaluation of surface contamination with 9 antineoplastic drugs in 93 Canadian healthcare centers: 2019 results. In *Journal of oncology pharmacy practice: official publication of the International Society of Oncology Pharmacy Practitioners* 26 (8), pp. 1921–1930.
- Ramphal, Raveena; Bains, Tejinder; Vaillancourt, R egis; Osmond, Martin H.; Barrowman, Nicholas (2014). Occupational exposure to cyclophosphamide in nurses at a single center. In *Journal of occupational and environmental medicine* 56 (3), pp. 304–312.
- NIOSH ALERT — Preventing Occupational Exposures to Antineoplastic and Other Hazardous Drugs in Health Care Settings.