

Tool Development for Assessing Antineoplastic Drugs Surface Contamination in Healthcare Services and Other Workplaces

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Abstract : Introduction: Healthcare workers' exposure to antineoplastic drugs (AD) is a burning issue for occupational medicine practitioners. Biological monitoring of occupational exposure (BMOE) is an essential tool for assessing AD contamination of healthcare workers. In addition to BMOE, surface sampling is a useful tool in order to understand how workers get contaminated, to identify sources of environmental contamination, to verify the effectiveness of surface decontamination way and to ensure monitoring of these surfaces. The objective of this work was to develop a complete tool including a kit for surface sampling and a quantification analytical method for AD traces detection. The development was realized with the three following criteria: the kit capacity to sample in every professional environment (healthcare services, veterinaries, etc.), the detection of very low AD traces with a validated analytical method and the easiness of the sampling kit use regardless of the person in charge of sampling. Material and method: AD mostly used in term of quantity and frequency have been identified by an analysis of the literature and consumptions of different hospitals, veterinary services, and home care settings. The kind of adsorbent device, surface moistening solution and mix of solvents for the extraction of AD from the adsorbent device have been tested for a maximal yield. The AD quantification was achieved by an ultra high-performance liquid chromatography method coupled with tandem mass spectrometry (UHPLC-MS/MS). Results: With their high frequencies of use and their good reflect of the diverse activities through healthcare, 15 AD (cyclophosphamide, ifosfamide, doxorubicin, daunorubicin, epirubicin, 5-FU, dacarbazine, etoposide, pemetrexed, vincristine, cytarabine, methotrexate, paclitaxel, gemcitabine, mitomycin C) were selected. The analytical method was optimized and adapted to obtain high sensitivity with very low limits of quantification (25 to 5000ng/mL), equivalent or lowest that those previously published (for 13/15 AD). The sampling kit is easy to use, provided with a didactic support (online video and protocol paper). It showed its effectiveness without inter-individual variation (n=5/person; n= 5 persons; p=0,85; ANOVA) regardless of the person in charge of sampling. Conclusion: This validated tool (sampling kit + analytical method) is very sensitive, easy to use and very didactic in order to control the chemical risk brought by AD. Moreover, BMOE permits a focal prevention. Used in routine, this tool is available for every intervention of occupational health.

Keywords : surface contamination, sampling kit, analytical method, sensitivity

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