# Bulletin de veille n° 74

***1er septembre 2025 – 31 octobre 2025***

## *Surveillance biologique de l'exposition professionnelle aux médicaments cytotoxiques. Etude de terrain.*

Objectif : *Disposer d'une connaissance actualisée du sujet en accompagnement des demandes d'assistance qui découlent de la valorisation de l'étude sur la surveillance biologique de l'exposition aux médicaments cytotoxiques en milieu hospitalier.*

*La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS. Les éléments issus de cette veille sont founis sans garantie d'exhaustivité.*

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- ***Articles de périodique (PREPRINT)***

Li C., Wang S., Wang M., Jing L., Pang C., Ma N. and Dong W.
**The surface contamination of hazardous drugs in different working places of healthcare facilities in shaanxi, China.**
Journal of Oncology Pharmacy Practice, 15 septembre 2025

Résumé: *Introduction : Surface contamination from chemotherapy drugs poses occupational risks to healthcare workers, yet data from China are limited. This study assessed such contamination in healthcare facilities in Shaanxi Province. Methods : A cross-sectional study was conducted in 16 institutions. Surface wipe samples were collected from Pharmacy Intravenous Admixture Services (PIVAS) and drug preparation rooms in wards (DPRWs) over three days, before and after cleaning. Concentrations of cyclophosphamide (CP) and gemcitabine (Gem) were measured using HPLC-MS/MS. Statistical analyses evaluated contamination differences across environments and cleaning effects. Results : A total of 659 samples were analyzed. In PIVAS, median Gem and CP levels ranged from 0.00-1.44 ng/cm² and 0.0011-1.10 ng/cm², respectively. In DPRWs, levels ranged from 0.01-3.53 ng/cm² (Gem) and 0.47-36.61 ng/cm² (CP), with CP consistently higher. Contamination concentrated on biological safety cabinet (BSC) surfaces in PIVAS and cabinet windows or preparation tables in DPRWs. Cleaning significantly reduced contamination, which correlated with drug preparation volume. While DPRWs had higher median contamination, the overall difference with PIVAS was not significant. However, DPRWs equipped with BSC had notably lower contamination. Conclusions : Hazardous drug contamination remains a concern, especially in DPRWs without BSC. Enhanced cleaning protocols and stricter safety regulations are needed to protect healthcare workers in Chinese medical settings.*

https://doi.org/10.1177/10781552251376292

Ziya O., Reçber T., Nemutlu E. and Güdül Bacanlı M.
**Quantitative analysis of vial surface and cross-contamination of widely used antineoplastic drugs in Türkiye: A critical assessment for manufacturing and occupational safety.**
Journal of Oncology Pharmacy Practice, 24 septembre 2025

Résumé: *Introduction : The global rise in cancer incidence has led to an increased demand for antineoplastic agents, intensifying occupational risks associated with drug handling. Methods : This study aimed to quantitatively assess both surface contamination and cross-contamination on the vials of six frequently used cytotoxic drugs in Türkiye, 5-fluorouracil (5-FU), doxorubicin, etoposide, gemcitabine, ifosfamide, and cyclophosphamide, using a standardized wipe sampling method followed by LC-MS/MS analysis. This study quantitatively assess both surface contamination on 65 vials of six frequently used cytotoxic drugs and cross-contamination on an extended set of 75 vials (including oxaliplatin), using a standardized wipe sampling method followed by LC-MS/MS analysis. Results : Out of 65 vials, 63.08% were contaminated with the active pharmaceutical ingredient (API), while 49.33% of 75 vials exhibited cross-contamination with other APIs. Notably, contamination was present in 100% of 5-FU and gemcitabine samples, with the highest recorded level reaching 2276.920 ng/cm(2) (133199.848 ng/vial). Conclusions : We explicitly state that this is the first study in Türkiye to assess both surface and cross-contamination on cytotoxic drug vials at a national level. These findings underscore significant disparities in manufacturing hygiene practices and highlight an urgent need for regulatory oversight to mitigate healthcare worker exposure risks. The study advocates mandatory contamination reporting, stricter decontamination protocols, and enhanced batch control measures in drug production facilities.*

https://doi.org/10.1177/10781552251381167

Verscheure E., Vandervoort D., Deruyck E., Poels K., Ghosh M., Vanoirbeek J. and Godderis L.
**Method validation for quantification of five antineoplastic agents in urine using UPLC-ESI-MS/MS.**
Archives of Toxicology, 16 octobre 2025

Résumé: *Antineoplastic agents are hazardous compounds frequently used in cancer treatment. It is already known that the hospital environment poses a risk of occupational exposure to these agents. However, recent years, the rise of outpatient treatment and at-home treatment has introduced an additional risk including also cohabitants of patients. We identified a clear need for highly sensitive monitoring methods to assess exposure to high-risk compounds in a home setting. This study presents two validated methods for quantifying five high-risk antineoplastic agents in urine: one for cyclophosphamide, etoposide, mitomycin C and imatinib, and one for alpha-fluoro-beta-alanine. Liquid-liquid extraction with ethyl acetate was used for extraction of cyclophosphamide, etoposide, mitomycin C and imatinib from urine. Alpha-fluoro-beta-alanine was extracted using solid-phase extraction with Oasis HLB cartridges. All samples were analysed using ultra-performance liquid chromatography coupled to tandem mass spectrometry. During method validation, selectivity, extraction efficiency, matrix effect, process efficiency, linearity, sensitivity, precision and accuracy were established. The lower limits of quantification were determined to be 0.1 ng/mL (cyclophosphamide and mitomycin C), 0.7 ng/mL (etoposide), 1 ng/mL (alpha-fluoro-beta-alanine) and 10 ng/mL (imatinib). The methods were fully validated and are now ready for application in the field.*

https://doi.org/10.1007/s00204-025-04220-y

Shirkosh S., Mahmoodi-Shan G. and Jouybari L.
**Caring Under Challenges: Exploring the Experiences of Oncology Nurses in a Tertiary Hospital in Northern Iran.**
Seminars in Oncology Nursing, 18 octobre 2025

Résumé: *OBJECTIVES: Oncology nursing, as one of the most challenging areas of healthcare, requires special attention to nurses' caregiving experiences. This study was conducted to explore the care challenges of oncology nurses in northern Iran. METHODS: This qualitative descriptive study, with a conventional content analysis approach, was conducted with the participation of 12 nurses working in oncology wards in northern Iran from August to December 2024. Data were collected through in-depth semi-structured interviews and analyzed using Graneheim and Lundman's (2004) method. Sampling was purposive and continued until data saturation was reached. RESULTS: Data analysis revealed four main themes with twelve subthemes of oncology nurses' care challenges: Supportive Care Paradox (conflict between the therapeutic communication standard and reality: mismatch between patient expectations and system capabilities, and patients' informational conflicts), Educational Paradox in the Healthcare System (inadequate specialized training, lack of clinical skills, and educational system limitations), Multilayered Occupational Burnout (adverse effects of cytotoxic exposure, emotional-cultural burnout, and ethical-systemic burnout), and Organizational Incongruence in the Healthcare System (imbalanced resource distribution, imbalanced responsibility distribution, and insufficient systemic support). These findings show deep-rooted systemic and cultural barriers affecting care quality. CONCLUSION: This study reveals systemic and emotional challenges of oncology nurses that impede the provision of sustainable care. The pressure to compensate for shortcomings exacerbates nurses' burnout. The health system must strengthen the sustainable care and professional health of nurses through specialized training, human resource optimization, psychological support, and equitable allocation of resources. IMPLICATIONS FOR PRACTICE: Implementing targeted educational programs and systemic reforms can enhance care*

*quality and nurses' well-being, providing implications for policy and practice in similar resource-limited settings.*

https://doi.org/10.1016/j.soncn.2025.152044

Smith E.A.S. and Alon A.
**A novel approach for evaluating the containment of a closed intravenous administration system for hazardous drugs.**
Journal of Occupational and Environmental Hygiene, 27 octobre 2025

Résumé: *Oncology nurses are routinely exposed to antineoplastic agents through skin absorption or inhalation of airborne agents when administering drugs intravenously. Although safe infusion devices aimed at preventing the hazardous disconnection of empty bags were developed, none of them are completely closed systems per National Institute for Occupational Safety and Health (NIOSH) guidelines. The authors evaluated a closed system administration device developed to prevent exposure of healthcare professionals to cytotoxic drugs during their administration. System components were assembled in various scenarios mimicking intravenous drug administration and then tested in a sealed chamber connected to a gas analyzer. The concentration of 70% isopropanol vapors (as a drug surrogate) was measured continuously in the chamber. The analysis showed no detectable increase in isopropanol vapor concentration in the sealed chamber compared to baseline levels over the course of the tasks, indicating that no leaks of 70% isopropanol occurred when the closed system administration devices were used. Furthermore, the results remained the same regardless of the number of connection cycles the products had undergone, or whether they were newly manufactured or at the simulated end of their shelf-life. This study showed that the use of a closed administration system can minimize the risk of exposure of healthcare professionals to hazardous drugs and potentially reduce environmental contamination.*

https://doi.org/10.1080/15459624.2025.2563550

- ***Articles de périodique***

Ursini C.L., Omodeo-Salè E., Di Gennaro G., Buresti G., Fresegna A.M., Ciervo A., Gentile M., Maiello R., Beltramini S., Gaggero D., Rigamonti N., Maccari E., Zorzetto G., Maiolino P., Di Filippo P., Bilancio M.C., Baldo P., Martinello V., Di Mattia A., Esposito C., Nardulli P., Laforgia M. and Cavallo D. (Préprint dans Bulletin n° 72)
**Buccal micronucleus cytome assay to evaluate cyto-genotoxic effects of occupational exposure to antineoplastic drugs: application on a large sample size of workers furnished by an Italian network of oncological hospitals.**
Archives of Toxicology, Volume 99, Numéro 8, août 2025, page 3429-3441.

Résumé: *Many antineoplastic drugs (ADs) used to treat cancer are characterized by the non-selective effect representing a possible cause of health effects in exposed workers. We established an Italian Network of seven Oncological Hospitals with the aim to evaluate, on a large size sample of workers, cyto-genotoxic effects by a sensitive and non-invasive biomarker also detecting workplace and personal contamination. We performed Buccal Micronucleus Cytome (BMCyt) assay on 200 workers handling ADs and 150 controls. AD contamination was detected performing workplace and personal monitoring of Gemcitabine, Ifosfamide, Cyclofosfamide and 5-Fluorouracil, using UHPLC MS/MS. We found in all the exposed group higher mean values of cells with micronucleus (MN‰), higher percentage of positivity to*

*MN (subjects with micronucleated cells frequency exceeding a fixed cut-off value (1.5‰)), higher frequency of binucleated cells, broken eggs and total anomalies than in the controls. Taking into account the tasks (preparation, administration in Day Hospital and wards, administration in room operator and disposal), only preparators and administrators showed higher MN‰ frequency than in controls, whereas each task group showed a similar higher percentage of MN positives than in controls. We found low levels, but still detectable, of contamination in all the monitored workplaces. This study demonstrated induction of genotoxicity and of cytokinesis defect/arrest in buccal cells of workers handling antineoplastic drugs. The BMCyt assay was demonstrated to be a suitable biomarker of effect for biomonitoring of workers handling AD due to its high sensitivity and non-invasivity.*

https://doi.org/10.1007/s00204-025-04073-5

Ahmad M.B. and Shamoun S.
**Knowledge and Attitudes of Safe Handling of Chemotherapy Drugs among Oncology Nurses at Teaching Hospital.**
Asian Pacific Journal of Cancer Prevention, Volume 26, Numéro 9, septembre 2025, page 3331-3337

Résumé: *OBJECTIVE: This study aims to assess the knowledge and attitudes of oncology nurses at Jordan University Hospital in Jordan concerning the safe handling of chemotherapy drugs. METHODS: A descriptive study was conducted utilizing a structured questionnaire, which was distributed to 106 nurses at Jordan University Hospital selected through stratified random sampling. The inclusion criteria focused on registered nurses with experience in handling chemotherapy drugs, including those involved in their administration, or disposal within the hospital. Nurses working in non-oncology departments, those with less than one year of experience, and those undergoing orientation programs were excluded from the study. RESULT: The results showed the oncology nurses possess inadequate knowledge about chemotherapy exposure and use of PPES, where knowledge about chemotherapy exposure scored mean 4.8 and SD 1.01 within possible score 1-12, while knowledge about use of PPEs scored mean 10.3 and SD 2.21 within possible score 7-24. Additionally, the analysis showed negative attitude of handling chemotherapy drugs among the oncology nurses, the scored mean was 21 out of a range of 15-50, with SD 2.8. CONCLUSION: The oncology nurses demonstrate insufficient knowledge and exhibit a negative attitude toward the safe handling of chemotherapy drugs. Consequently, there is a critical need to update national guidelines on safe handling practices and implement initiatives such as seminars, workshops, and training programs is essential to improve knowledge, foster positive attitudes, and promote safer handling practices among oncology nurses.*

https://doi.org/10.31557/apjcp.2025.26.9.3331

Swierczynski G., Guyon J., Molimard M., Garrigou A., Baldi I., Verdun-Esquer C., Villa A. and Canal-Raffin M.
**Experimental protocols and models for assessing the permeation of antineoplastic drugs through gloves: From a scoping review to a guidelines proposition for future studies.**
Journal of Hazardous Materials, Volume 495, 5 septembre 2025, article 138933

Résumé: *This work aimed to analyze published experimental protocols investigating glove resistance to antineoplastic drugs (ADs) permeation to propose guidelines for future research. A scoping review was performed using three databases and studying 32 experimental parameters. Twenty-four articles were included, testing 35 ADs and 12 glove materials. While some parameters, such as glove thickness, drug concentration, trade name and instrumentation were well documented, others were often missing such as temperature (reported in only 58.3 % of articles), tested glove area (29 %), glove thickness at the tested*

*area (16.6 %) and methods sensitivity (50 %) used to detect the drugs that passed through the glove. A great heterogeneity in experimental conditions (7 temperatures tested; 17 contact times) was observed and in instrumentation used to perform the permeation tests (13 different experimental devices). To approximate real-life exposure and glove-wearing conditions, 83.3 % of articles tested ADs commercial forms, concentrations were those of clinical practice and some protocols added mechanical and/or chemical stresses to gloves. However, none examined potential synergistic effects between drugs and excipients despite known influences, such as polysorbate 80 affecting permeation process through nitrile gloves. Additionally, an overview of all the ADs permeation results from the studies was presented for a contact time of 30 min, whatever the other experimental conditions. These findings highlighted how heterogeneous experimental conditions and missing data complicate cross-study comparisons. To address these issues, guidelines were proposed to improve protocols and harmonize published data in future, which would enhance the comparability of glove permeation results across studies.*

https://10.1016/j.jhazmat.2025.138933

Clark C.
**Reducing the risks to nurses of working with hazardous cancer drugs.**
British Journal of Nursing, Volume 34, Numéro 17, 18 septembre 2025, page S10-S16

Résumé: *Freelance medical writer Christine Clark (cmclark@dermpharmacy.com) reports on the sixth annual online meeting held to discuss solutions to the risks encountered by nurses working with cancer drugs.*

https://doi.org/10.12968/bjon.2025.0373

Saito M., Cartwright F., Olsen M. and Walton A.L.
**Reducing Antineoplastic Drug Surface Contamination in an Outpatient Oncology Clinic: A Quality Improvement Project.**
Clinical Journal of Oncology Nursing, Volume 29, Numéro 5, octobre 2025, page 378-383

Résumé: *Occupational exposure to antineoplastic drugs (ADs) via dermal absorption from contaminated work surfaces is a serious concern in healthcare environments where people handle ADs. Exposure to ADs increases healthcare workers.*

https://doi.org/10.1188/25.Cjon.378-383

Reis A., Silva V., Joaquim J.J., Valadares L., Matos C., Valeiro C., Mateos-Campos R. and Moreira F.
**Health Effects of Ergonomics and Personal Protective Equipment on Chemotherapy Professionals.**
Current Oncology, Volume 32, Numéro 10, octobre 2025, article 563

Résumé: *(1) Background: With the increasing incidence of cancer, the need for handling cytotoxic drugs has also grown. However, manipulating these drugs exposes healthcare professionals to significant risks, including occupational exposure to hazardous chemicals. Therefore, it is important to adopt protective measures, including personal protective equipment (PPE) and correct ergonomic practices, to ensure safe drug preparation and minimize health risks for the operators. However, while chemical exposure and PPE have been extensively addressed in the literature, the combined impact of ergonomic practices and protective measures remains insufficiently emphasized, representing a critical gap this review aims to address. Accordingly, the objective of this literature review was to analyze the ergonomic and*

*individual protection practices during the handling of cytostatic drugs and all the implications that bad ergonomic practices and/or poor individual protection have on the operator's health; (2) Methods: In order to perform this integrative review, a structured literature search was conducted using online databases (Web of Science(®), Google Scholar(®), and PubMed(®)) from January 2005 to June 2025. (3) Results: A total of 19 articles were analyzed, with 17 focusing on PPE and 17 on ergonomics. The findings emphasize that PPE, such as gloves, masks, gowns, sleeves and safety glasses, plays a critical role in the safe handling of cytotoxic drugs, particularly when combined with other safety measures. Additionally, maintaining correct ergonomic posture is important in preventing musculoskeletal disorders; (4) Conclusions: This review emphasizes the significance of integrating appropriate PPE use with sound ergonomic procedures. Although PPE is still the secondary line of defense against occupational exposure, ergonomic issues must also be addressed to avoid chronic musculoskeletal problems. Continuous training, rigorous attention to safety procedures, and ergonomic enhancements should be prioritized by healthcare facilities as a key element of occupational safety programs to reduce the short-term and long-term health hazards for personnel handling dangerous drugs.*

https://doi.org/10.3390/curroncol32100563

Bouchfaa M., Vasseur M., Courtin J., Pinturaud M., Beauval N., Allorge D., Odou P., Simon N. . (Préprint dans Bulletin n° 68)
**Assessment of chemical contamination by cancer drugs during use of the RIVA(TM) compounding robot: A pilot study.**
Journal of Oncology Pharmacy Practice, Volume 31, Numéro 7, octobre 2025, page 1061-1070

Résumé : *INTRODUCTION: Many hospitals are now investing in robotic compounding system for the preparation of cytotoxic agents. The objective of the present study was to describe contamination by cytotoxics inside and outside the RIVA(TM) robot (ARxIUM, Winnipeg, Canada). MATERIAL & METHODS: We applied a risk analysis to determine which locations inside and outside the compounding robot should be monitored. Samples were collected by swabbing with a wet swab (using 0.1 mL of sterile water) before the robots was cleaned. Ten cytotoxics compounded with the robot were screened for using LC-MS/MS. We determined the percentage contamination rates inside (CR(in)) and outside (CR(out)) the robot and the amounts of each contaminant (in ng/cm²). If a sample was found to be positive, a corrective action was implemented. RESULTS: Our risk analysis highlighted 10 locations inside the robot and 7 outside. Ten sampling campaigns (10 samples per campaign) were performed. The mean CR(in) (40%) was significantly higher than the mean CR(out) (2%; p < 10(-4)). Gemcitabine and cyclophosphamide were the main contaminants. After the implementation of corrective measures (such as daily cleaning with SDS/isopropyl alcohol), the CR(in) fell from 60% to 10%. DISCUSSION/CONCLUSION: The frequency of contamination was lower for robotic compounding than for manual compounding in an isolator. However, robotic compounding tended to generated larger mean amounts of contaminant; this was related to incidents such as splashing when syringes were disposed of after the compounding. The implementation of corrective actions effectively reduced the CRs. Further longer-term studies are required to confirm these results.*

https://doi.org/10.1177/10781552241276530

van den Berg R.B., Korczowska E., Santos M.S.F., Portilha-Cunha M.F., Ribeiro A.R.L., Bláhová L., Bláha L., Eyser C.V., Tuerk J., van Rossen R., Wilms E.B. and Crul M.
**Surface Wipe Sampling of Hazardous Medicinal Products: A European Interlaboratory Comparison Study.**

Drug Testing and Analysis, Volume 17, Numéro 10, octobre 2025, page 1955-1964

Résumé: *Workplace monitoring of hazardous medicinal products (HMPs) using surface wipe sampling is becoming common practice in many European hospitals and pharmacies. However, no independent quality control is available to validate wiping procedures and analytical methods. This study aimed to conduct a Europe-wide interlaboratory comparison (ILC) program to independently and blindly assess laboratory performance and variability in HMP detection. Four European laboratories participated in the study. Six HMPs-cyclophosphamide, etoposide, gemcitabine, ifosfamide, methotrexate, and paclitaxel-were prepared at four concentrations (5000, 2000, 200, and 20 ng/mL) and applied to a 400-cm(2) stainless-steel surface, then wiped by the coordinating body according to each laboratory's protocol. Wipe samples were distributed to individual laboratories, where blind analyses were conducted. Target criteria for accuracy and recovery were set at 70%-130% and 50%-130%, respectively. Of the 80 samples, 69 (86%) met accuracy targets, and 70 (88%) met recovery targets. Accuracy was often overestimated for the lowest concentrations of cyclophosphamide, etoposide, methotrexate, and paclitaxel by Laboratory A. Laboratory D showed low accuracy for paclitaxel at three lower concentrations. Among the 10 samples that did not meet recovery targets, all were below 50% and involved etoposide and paclitaxel. This ILC program demonstrates a viable method for evaluating laboratory performance in HMP detection, offering an external validation mechanism for surface wipe sampling methods. A future goal is to establish a global ILC program with a designated coordinating body for managing it effectively.*

https://doi.org/10.1002/dta.3902

Floeder A., Huang J., Bergsrud K., Lilly R., Borgatti A., Arnold S. and Balbo S.
**Investigating antineoplastic drug surface contamination in veterinary settings and on canine patients.**
Annals of Work Exposures and Health, Volume 69, Numéro 8, octobre 2025, page 843-854

Résumé: *Antineoplastic drugs can persist on surfaces in human and veterinary oncology clinics where they are administered, resulting in potentially hazardous exposures for healthcare workers and cancer patient caregivers. To assess potential surface contamination in occupational settings, a new liquid chromatography-selected reaction monitoring-mass spectrometry (LC-SRM-MS/MS) method was developed to simultaneously detect six commonly used antineoplastic drugs. A surface wipe and desorption method was optimized for cyclophosphamide, doxorubicin, methotrexate, etoposide, paclitaxel, and 5-fluorouracil with drug desorption recoveries ranging from 49% to 79%. The limit of detection (LOD) and limit of quantitation (LOQ) ranged from 0.01 to 0.12 ng/ml and 0.01 to 1.33 ng/ml, respectively. This method was used to quantify cyclophosphamide and doxorubicin surface contamination from wipe samples collected at a veterinary clinic following drug administration to canine-patients. Specific areas in the oncology treatment room identified as frequently contacted were sampled to determine the antineoplastic drug surface contamination that could lead to worker exposure through dermal contact, with cyclophosphamide and doxorubicin levels ranging from 6.68 to 17.4 pg cm-2 and 13.5 to 40.3 pg cm-2. Additionally, cyclophosphamide and doxorubicin wipe samples (n = 50) were obtained from two kennel surfaces and 10 canine-patients after chemotherapy. Samples were collected from the patients' coats before leaving the clinic and day after in the home environment to investigate the potential for dogs to be a source of household contamination. Cyclophosphamide was identified in samples collected at home in 4/5 canine-patients at levels ranging from 2.61 to 368 ng/sample, while doxorubicin was identified on kennel surfaces wiped post-treatment at levels ranging from 3.53 to 1655 pg cm-2. These findings support the ability of this method to detect contamination of these drugs in both occupational clinics and homes. The results set the stage for investigating contamination levels in various settings, such as human and veterinary clinics and home environments, as well as evaluating the*

*effectiveness of decontamination products and protocols toward reducing workplace and environmental exposures.*

https://doi.org/10.1093/annweh/wxaf058

Burke E., Harkins P., Fenn S., Khan F., McCormack O., Mulsow J. and Shields C. (Préprint dans Bulletin n° 73)
**Pressurised intraperitoneal aerosolised chemotherapy (PIPAC) for peritoneal malignancy, a systematic review of its occupational safety.**
European Journal of Surgical Oncology, Volume 51, Numéro 10, octobre 2025, article 110312

Résumé: *Pressurised intraperitoneal aerosolised chemotherapy (PIPAC) is an emerging technique for treating peritoneal malignancies, in which chemotherapeutic agents are delivered as an aerosol during laparoscopy. This method may provide more uniform distribution and deeper tissue penetration compared to hyperthermic intraperitoneal chemotherapy (HIPEC). However, the aerosolization of cytotoxic agents raises potential occupational health concerns for surgical and perioperative staff. This systematic review aimed to evaluate the occupational safety of the PIPAC procedure. A comprehensive search of PubMed, EMBASE, and Web of Science identified 854 studies, of which 9 met the inclusion criteria. These prospective studies, conducted across European centres between 2013 and 2021, collectively assessed 24 PIPAC procedures. Exposure was evaluated through environmental air sampling, surface wipe analysis, and biological monitoring (urine or plasma samples). Across the included studies, air contamination was consistently undetectable or below established safety thresholds. Biological monitoring also revealed no measurable systemic exposure in healthcare workers. While some surface contamination was identified, primarily on gloves and equipment, detected levels were below those commonly reported in HIPEC procedures. These findings suggest that, when appropriate safety measures are in place, PIPAC poses minimal occupational risk to healthcare staff.*

https://doi.org/10.1016/j.ejso.2025.110312