SURFACE CONTAMINATION IN A TEACHING HOSPITAL: A 6-YEAR PERSPECTIVE

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BACKGROUND

- Many cross-sectional studies have been published about surface contamination with hazardous drugs in healthcare settings.
- Since 2010, our group has performed 6 multicenter studies of environmental contamination with antineoplastics in Quebec and Canada hospitals.
- These studies included cyclophosphamide, methotrexate and ifosfamide => provide a cross-sectional portrait of surface contamination
- We explored the longitudinal profile of a single hospital to better understand the strategies implemented to minimize surface contamination.

PURPOSE

- Describe the surface contamination of three hazardous drugs within a teaching hospital.
- Comment the different strategies that were put in place over the years in the context of multicenter studies.

MATERIAL AND METHODS

- Descriptive retrospective and longitudinal study conducted in a 500-bed mother-child teaching hospital (38 beds of hematology-oncology)
- From 2010 to 2016 : 12 standardized sampling sites collected every year => 6 in pharmacy areas and 6 in outpatient patient care areas
- In May 2016 : 12 additional points of measure identified for two inpatient care wards
- For each sample : 600 cm² was sampled with one wipe and analyzed by UPLC-MS-MS
- Closed system transfer device are not used.

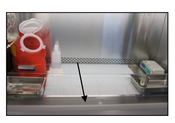
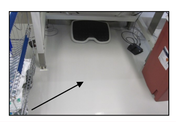
	Limits of detection (pg/cm²)	Limits of quantification (pg/cm²)
Cyclophosphamide (CP)	0.36	1.21
Ifosfamide (IF)	0.95	3.17
Methotrexate (MTX)	0.97	3.25

RESULTS

72 **samples obtained beetween 2010 and 2016**

- A total of 36 samples in the pharmacy and 36 in outpatient care areas
- Proportion of positive samples : 50% (36/72) for cyclophosphamide, 32% (23/72) for ifosfamide and 19% (14/72) for methotrexate
- Similar proportion of positive results in the pharmacy (35% (38/108)) than in the outpatient care areas (32% (35/108)

Six sampling sites in pharmacy areas

Reception counter	Storage shelf or bin	Front grille inside the hood	Floor in front of the hood	Service hatch	Tray for drug delivery
					

Six sampling sites in patient care areas

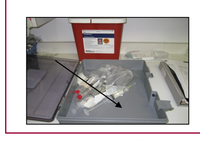
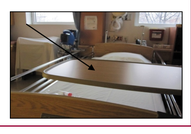
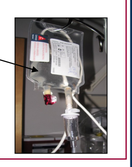
Storage shelf or bin	Counter for priming	Arm rest	Patient room counter	Outpatient clinic counter	Outer surface of drug
					

Table 1 : Standardized sampling sites

Table 2 : Profile of surface contamination of cyclophosphamide, ifosfamide and methotrexate per year extracted from the multicenter studies

Years	Shipment reception counter	Storage shelf or bin	Front grille inside the hood	Floor In front of the hood	Service hatch or counter for post-preparation validation	Tray used for drug delivery	Storage Shelf or bin	Counter used for priming or validation	Arm rest	Patient room counter	Outpatient clinic counter	Exterior surface of antineoplastic drug container	Local ratio of positive samples n/n	Local ratio of samples above 75th percentile of the multicenter study n/n	**LOD** from multicenter study pg/cm²	**LOQ** from multicenter study pg/cm²	Global **75th percentile** of multicenter study pg/cm²
Cyclophosphamide (pg/cm²)																	
2008-2010	44	19	56	16	< LOD	< LOD	16	5.8	89	< LOD	400	7	9/12	NA	1.5	5.0	NA
2012	3	330	75	110	< LOD	< LOD	3	3	3	160	3	< LOD	9/12	4/12	1.8	6.0	9
2013	< LOD	84	210	280	< LOD	< LOD	< LOD	< LOD	< LOD	3	< LOD	26	5/12	4/12	1.8	6.0	8.4
2014	< LOD	1.9	4.9	23.1	< LOD	< LOD	< LOD	5.3	< LOD	< LOD	< LOD	< LOD	4/12	1/12	0.36	1.21	11.25
2015	< LOD	< LOD	< LOD	8.2	< LOD	< LOD	< LOD	< LOD	< LOD	150	< LOD	< LOD	2/12	2/12	0.36	1.21	6.7
2016	< LOD	< LOD	4.4	7.5	< LOD	< LOD	< LOD	5.9	2	1.7	6.6	240	7/12	2/12	0.36	1.21	6.8
Ifosfamide (pg/cm²)																	
2008-2010	< LOD	< LOD	63	< LOD	< LOD	2.9	2	< LOD	< LOD	< LOD	< LOD	< LOD	3/12	NA	1.2	4.0	NA
2012	3.5	150	830	400	< LOD	3.5	7.2	< LOD	< LOD	63.0	3.5	21.0	9/12	9/12	2.2	7.0	< LOD
2013	< LOD	54	< LOD	290	< LOD	< LOD	< LOD	< LOD	< LOD	7	< LOD	< LOD	3/12	3/12	2.2	7.0	< LOD
2014	< LOD	< LOD	< LOD	88.1	< LOD	< LOD	< LOD	< LOD	< LOD	9.2	< LOD	< LOD	2/12	2/12	0.95	3.17	1.59
2015	< LOD	< LOD	17	67	9.9	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	3/12	3/12	0.95	3.17	< LOD
2016	< LOD	< LOD	< LOD	22	< LOD	< LOD	< LOD	< LOD	3	30	< LOD	< LOD	3/12	3/12	0.95	3.17	< LOD
Methotrexate (pg/cm²)																	
2008-2010	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	0/12	NA	6.0	20	NA
2012	< LOD	< LOD	15	< LOD	< LOD	< LOD	< LOD	42	< LOD	< LOD	< LOD	< LOD	2/12	2/12	8.0	30	< LOD
2013	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	0/12	0/12	7.5	30	< LOD
2014	9.7	< LOD	54.7	1.6	< LOD	< LOD	< LOD	5.9	< LOD	< LOD	< LOD	< LOD	4/12	4/12	0.97	3.25	< LOD
2015	93	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	4	< LOD	16	< LOD	3/12	3/12	0.97	3.25	< LOD
2016	660	5	< LOD	< LOD	< LOD	< LOD	< LOD	5.5	12	< LOD	10	< LOD	5/12	5/12	0.97	3.25	< LOD

24 **samples obtained in May 2016 in two patient care wards => no positive samples identified to same three drugs**

DISCUSSION/CONCLUSION

- Different strategies to reduce contamination were implemented: centralized IV tube priming (2011), training sessions (2014), water cleaning of final compounded bag/syringe (2014), urinary surveillance pilot study (2015)
- This study shows a longitudinal perspective of the surface contamination of hazardous drugs in a teaching mother-child hospital.
- Every hospital should review its annual scorecard of contamination with a longitudinal perspective to minimize drug contamination.
- It is possible to contain surface contamination with hazardous drugs with different strategies.

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Contact : jf.bussieres@ssss.gouv.qc.ca - Conflict of interests : None - Funding : None.