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Environmental *Aspergillus* spp. contamination during the move of an onco-haematological paediatric unit in a temporary ward: efficacy of protective measures

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Background: Fungal infections have increased in recent years and represent a major concern for hospitals, especially in wards receiving immunocompromised patients. Due to the delay to move in a new ward, the onco-hematological pediatric (OHPU) unit was relocated in a ward of 12 beds with an anteroom and a ventilation system including high-efficiency particulate air (HEPA) filters but without positive pressure to maintain the air pressure at a higher level than the surroundings and with a very low air changes rate (2 per hour).

Material/methods: To evaluate the performances of the air handling system and therefore the feasibility of the moving of the OHPU in the temporary ward, particulate air counts and microbiological (bacterium, yeasts, moulds) air and surfaces samplings (Samplair, AES, Biom erieux, France using trypticase soy and chloramphenicol sabouraud agar Petri dishes; 25 cm² trypticase soy agar Petri dishes for bacteriological samples and 10 cm² surface swabbed areas cultured on Sabouraud dextrose agar containing chloramphenicol for moulds samples respectively) were performed in the

ward at baseline without care activity (period 1 in 2011), after installation of mobile air decontamination systems Plasmair and Immunair (AirInSpace, Montigny-le-Bretonneux, France) in the rooms and the corridors of the ward without care activity (period 2 in 2012) and after the moving of the OHPU with use of the mobile air decontamination systems (period 3 from 2012 to 2015). The comparison of the environmental contamination according to these 3 periods was performed using SPSS 20.0 (Chicago, IL, USA).

Results: The fungal air and surfaces contamination of the rooms and the corridors of the ward was significantly lower in period 2 compared to period 1 ($P < 0.05$ for the number of positive samples, $P < 0.0001$ for the fungal load respectively) allowing the moving of the OHPU. In period 3, the rate of the environmental contamination remained stable (Table). No invasive aspergillosis was documented during the follow-up.

Variable	Period 1				Period 2				Period 3			
	Rooms		Corridors		Rooms		Corridors		Rooms		Corridors	
	N= 111 Air (CFU/m ³)	N= 695 Surface (CFU/10m ²)	N= 23 Air (CFU/m ³)	N= 84 Surface (CFU/10m ²)	N= 66 Air (CFU/m ³)	N= 377 Surface (CFU/10m ²)	N= 27 Air (CFU/m ³)	N= 59 Surface (CFU/10m ²)	N= 386 Air (CFU/m ³)	N= 1860 Surface (CFU/10m ²)	N= 182 Air (CFU/m ³)	N= 548 Surface (CFU/10m ²)
Fungal contamination (CFU/m ³)												
Proportion of positive samples (%)	60%	54%	100%	60%	6%	8%	52%	8.5%	26%	10%	38%	13%
Mean (min-max)	168.9 (0-916)	862.2 (2-9102)	26.1 (0-148)	28.2 (0-223)	1.67 (0-10)	9.9 (0-24)	0.89 (0-4)	1.00 (0-3)	26.9 (0-4)	32.1 (0-304)	3.92 (0-24)	5.35 (0-300)
Fungal contamination with <i>A. fumigatus</i>												
Proportion of positive samples (%)	9%	2.5%	9%	7%	0%	1%	0%	2%	1%	0.1%	2%	0%
Mean (min-max)	2.8 (0-12)	2.71 (0-13)	0.54 (0-4)	1.1 (0-9)	0 (0-0)	1.66 (0-11)	0 (0-0)	0.25 (0-2)	0.13 (0-4)	0.1 (0-6)	0.18 (0-8)	0 (0-0)
Fungal contamination with <i>Aspergillus</i> spp.												
Proportion of positive samples (%)	1%	0.7%	0%	0%	0%	0.3%	0%	0%	0.5%	0.1%	1%	0.2%
Mean (min-max)	0.2 (0-2)	0.5 (0-3)	0 (0-0)	0 (0-0)	0 (0-0)	0.11 (0-1)	0 (0-0)	0 (0-0)	0 (0-4)	0.06 (0-3)	0.2 (0-2)	0.01 (0-1)
	<i>A. niger</i> (1)	<i>A. niger</i> (1)	-	-	-	<i>A. niger</i> (1)	-	-	<i>A. flavus</i> (1) <i>A. glaucus</i> (2)	<i>A. flavus</i> (1)	<i>fusarium</i> sp. (1)	
		<i>A. flavus</i> (1)							<i>A. glaucus</i> (1) <i>A. oryzae</i> (1)	<i>Rhizopus</i> sp. (1)		
										<i>A. niger</i> (1)		

Conclusions: The existing air handling system in the temporary ward did not allow the moving of the OHPU because of the high rate of environmental fungal contamination. The use of mobile air decontamination system significantly reduced this environmental contamination and the performances were maintained during care activity. Such systems may represent an efficient help in units receiving immunocompromised patients to improve the performances of the air handling system if not adequate.