LETTERS TO THE EDITOR

Microbial Air Monitoring as a Useful Tool When Commissioning Bone Marrow Transplant Units

To the Editor—Bone marrow transplant patients are highly susceptible to airborne infections, which are mainly due to opportunistic microorganisms.[1-3] Guidelines for the proper design of hospital rooms and heating, ventilation, and air-conditioning (HVAC) systems have been published.[3,4] Their aim is to control the concentration of airborne particles and their deposition onto surfaces, minimizing their introduction, production, and retention inside the rooms, thus protecting patients from environmental infections.

We report our experience of microbial air monitoring carried out at a newly opened bone marrow transplant unit (BMTU), just before patient admission began. The study was carried out at the University Hospital in Parma, Italy. The BMTU consisted of 3 rooms and was equipped with an HVAC system, which had been certified by the installer as compliant with the required standards.[4] Air sampling was performed in the 3 patient rooms (ambient air and air coming out of the HVAC diffusers); ambient air in the corridor was also sampled. Air samples were collected using both active and passive sampling methods.[5] Active samples were collected using a DUOSAS 360 (Pbi), with a flow rate of 180 L/min and a suction volume of 1,000 L.

To sample the air coming out of the HVAC system, the sampler was placed at a distance of about 30 cm from the air outlet. Results were expressed as colony-forming units (CFU) per cubic meter. Petri dishes with a diameter of 9 cm were used for passive sampling to determine the index of microbial air contamination (IMA).[6] The IMA was expressed as CFU per square meter per hour. Tryptic soy agar was used for bacteria isolation, with incubation at 36°C ± 1°C for 48 hours, while Sabouraud dextrose agar with chloramphenicol was used for fungi isolation, with incubation at 22°C ± 1°C for 120 hours.

Microbial air samples collected in patient rooms before the opening of the BMTU showed high bacterial and fungal contamination values, both in ambient air (mean ± standard deviation; bacterial: 12 ± 10.6 CFU/m^3, 0 ± 0 CFU/m^2/h; fungal: 120 ± 33.6 CFU/m^3, 33 ± 58 CFU/m^2/h) and in the air supplied by the HVAC system (bacterial: 6.67 ± 3.05 CFU/m^3; fungal: 32 ± 34.65 CFU/m^3). Fungi were isolated in 100% of active samples and 75% of passive samples collected from ambient air and in 77% of air samples collected from the HVAC system.

Four more samplings were performed, each one preceded by an accurate cleaning and disinfection, but there was no improvement in air quality. Bacterial and fungal air contamination values for the first 5 samplings are shown in Table 1. A closer inspection of the HVAC system was carried out, revealing an incorrect setup of the ventilation system's parameters (pressure and number of air changes).

After the problem was corrected, bacterial counts decreased dramatically, both for ambient air and for air outlets. No fungal contamination was detected (Table 1, sixth sampling).

This experience demonstrates that microbiological air control may prove to be a useful tool in identifying hazardous situations and assessing the efficacy of corrective actions.

We support what Eickhoff[7] suggested in 1994, namely, that environmental sampling should be considered in ultra-high-risk units such as BMTUs and other settings in which patients temporarily have no functioning host defense mechanisms and any opportunistic microorganism that comes along may cause a fatal infection. The use of an active sampler capable of collecting large volumes of air in short periods of time is recommended to evaluate the concentration of viable particles and to detect small numbers of fungal spores in highly filtered areas.[3]

Settle plates, which are available in every hospital, can be used to specifically measure how air biocontamination contributes to the biocontamination of critical surfaces.[5] Plates can also be used to generally measure microbial air quality and to highlight critical situations.[3] Settle plates are less sensitive than active sampling methods in collecting fungi and buoyant respirable particles, since they rely on gravity and tend to select for larger particles. However, in our study they helped reveal an anomalous situation. Long sampling periods may increase their sensitivity, as indicated in the European Union guidelines to good manufacturing practice.[8] In this document, threshold values for active (CFU/m^3) and passive (settle plates 9 cm in diameter exposed for 4 hours) samplings are listed.

Doubts remain about the potential usefulness of particulate sampling in detecting contamination problems. The Centers for Disease Control and Prevention 2003 guidelines include particulate sampling among the areas of future research, particularly to determine whether it could replace microbiological sampling for measuring the air quality of clean environments (operating rooms, hematopoietic stem cell transplantation units, etc.).[3] However, particle counters are not available in every hospital. Furthermore, a study by Landrin et al[9] showed that no correlation exists between microbial counts and particle counts in empty ventilated operating rooms equipped with high-efficiency particulate air (HEPA) filters. In fact, in many cases high particle counts were not associated with an increase in air microbiological counts, indicating that such particles were not ascribable to microbial contamination.

As a final thought, whatever approach is adopted, all environmental control activities should be purposeful and well

TABLE 1. Bacterial and Fungal Air Contamination Values in the Monitored Environments before (First 5 Samplings) and after (Sixth Sampling) the Corrective Action

		Active sampling						Passive sampling					
		Bacteria			Fungi			Bacteria			Fungi		
Sampling points	*N*	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
Before corrective action													
Rooms (ambient air)	15	32.5	60.3	16	20.4	27.7	14	52	48	63	398	161	440
Rooms (HVAC)	15	19.3	16.7	16	12	18	8	...	...	...	...	...	...
Corridor (ambient air)	5	135	103.2	148	2.8	1.1	2	818	1,046	472	0	0	0
After corrective action													
Rooms (ambient air)	3	2.7	3.1	2	0	0	0	0	0	0	0	0	0
Rooms (HVAC)	3	1.3	2.3	0	0	0	0	...	...	...	...	...	...
Corridor (ambient air)	1	10[a]	...	...	0[a]	...	...	0[a]	...	...	0[a]	...	...

NOTE. Active samplings are expressed as colony-forming units per cubic meter; passive samplings are expressed as the index of microbial air contamination, in colony-forming units per square meter per hour. HVAC, heating, ventilation, and air-conditioning.
[a] This figure refers to 1 sample.

planned and should be carried out by skilled personnel using adequate methods. Results should be properly analyzed and effectively communicated, and, most importantly, action should be taken in case of anomalies. We also advocate a closer cooperation between infection control teams and hospital engineering departments.

ACKNOWLEDGMENTS

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article. All authors submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and the conflicts that the editors consider relevant to this article are disclosed here.

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Infect Control Hosp Epidemiol 2012;33(1):101-102
 0899-823X/2012/3301-0021$15.00. DOI: 10.1086/663646

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The Value of Universal versus Targeted Screening for Methicillin-Resistant *Staphylococcus aureus* among Admission Patients

To the Editor—We read with interest the evaluation by Leonhardt et al[1] of universal versus targeted screening for methicillin-resistant *Staphylococcus aureus* (MRSA) on admission to the hospital, in particular the finding that there was no impact on MRSA transmission rates. Leonhardt and colleagues used polymerase chain reaction (PCR) for detection in 2 hospitals, and their admission prevalence rates were less than 5%—that is, 1.76% and 3.24%—during the control