APPLIED AND ENVIRONMENTAL MICROBIOLOGY, Aug. 1982, p. 512–513
0099-2240/82/080512-02$02.00/0

Vol. 44, No. 2

Comparison of Bacterial Recovery by Reuter Centrifugal Air Sampler and Slit-to-Agar Sampler

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Received 7 December 1981/Accepted 26 April 1982

Bacterial recovery by a portable Reuter centrifugal air sampler and a standard Mattson-Garvin slit-to-agar air sampler was compared in a series of experiments. Microbial air quality was monitored in seven typical laboratory locations. Tests showed that the Reuter centrifugal air sampler yielded significantly higher recoveries than did the slit-to-agar unit.

Microbial contamination of air in various facilities has been well documented (2, 6, 7, 10, 12). The environment was monitored to determine the degree and source of microbial contamination and to ensure reliable results. Numerous reports (1, 4, 7, 8, 10, 11) of air sampling devices and techniques for monitoring the environment have presented data on the efficacy of these procedures in the laboratory and on the cost of the devices. Portable air samplers would be useful for obtaining estimates of microbial contamination in pharmaceutical plants (3) where federal regulations require the monitoring of air. This study compared the efficiency of the portable Reuter centrifugal air sampler (RCS) with that of the slit-to-agar sampler (STA) in a normal laboratory environment.

The RCS (Folex-Biotest; Schlussner, Inc., Moonachie, N.J.), a portable air sampler weighing 2.5 lb (ca. 1.14 kg), collects bacteria in a medium-coated plastic strip which lines the sampler drum. The plastic strip is subdivided into 34 rectangular sections with an agar surface of 34 cm^2. Bacteria are collected by air centrifugation and agar impaction. The maximum air sampling capacity of the device is 11.3 ft^3 (320 liters)/8 min. The STA (Model 200; Mattson-Garvin Co., Maitland, Fla.), a slit-orifice sampler, collects bacteria on a revolving 150-mm-diameter agar plate. Its maximum air sampling capacity is 60 ft^3 (1,700 liters)/h. The RCS was calibrated according to the manufacturer's instructions by determining the proper revolutions per minute with a tachometer and the proper blade pitch. The STA was calibrated by determining the air flow volume with a wet-test gas meter; the proper slit width and distance from the agar were determined according to the manufacturer's instructions. Media strips and petri dishes were prepared by placing 11 ml of Trypticase soy agar (BBL Microbiology Systems) in the strip and 70 ml in the dish; 70% ethanol was used to disinfect the samplers.

Air samples were taken simultaneously from seven locations, five samples per location, by placing both devices 36 in. (ca. 90 cm) apart. The STA was set for 11.3 min (11.3 ft^3 of air); the RCS was set for 8 min (11.3 ft^3 of air). Plates and strips were incubated for 48 h at 35°C, and the total bacteria count was determined.

An analysis of variance (9) was performed on the total bacterial count data from the two air samplers. The counts were transformed to $\log_{10}$ counts to assure homogeneity of variance. Differences among means were examined by Duncan's test (5).

An analysis of variance (Table 1) on the counts per 11.3 ft^3 of air tested the null hypothesis that the recovery for samplers was equal and that the contamination was equal among locations. The tests were performed at the $\alpha = 0.05$ significance level. The RCS gave significantly higher counts ($\alpha = 0.05$ level) than did the STA. The total counts observed at the seven locations also differed (Table 2). The arithmetic means per 11.3 ft^3 of air computed by Duncan's test did not differ at the $\alpha = 0.05$ level. For example, the virology laboratory had a count significantly

TABLE 1. Two-way analysis of variance for location and air sampling devices

Source	Sum of squares	Degrees of freedom	Mean squares	*F* ratio
A (samplers)	1.37154	1	1.37154	76.79[a]
B (locations)	1.95958	6	0.32660	18.29[a]
AB (sampler-location interaction)	0.08458	6	0.01410	0.79
Error	1.00026	56	0.01786	

[a] Significant at $\alpha = 0.05$ level.

TABLE 2. Summary of means and standard deviation for two air samplers (total bacterial count in 11.3 ft^3 of air)

Location no.	Site	Mean count ± SD for:		Mean count[a]
		STA	RCS	
1	Microbiology lab C	18.6 ± 4.9	35.8 ± 8.9	27.2
2	Microbiology media room	19.8 ± 8.1	39.6 ± 13.0	29.7
3	Microbiology lab B	17.2 ± 2.2	45.0 ± 10.3	31.1
4	Microbiology washroom	28.6 ± 5.7	43.8 ± 10.9	36.2
5	Virology lab	10.4 ± 4.3	20.0 ± 7.7	15.2
6	Basement	20.6 ± 6.2	32.6 ± 5.9	26.6
7	Second-floor hall	40.0 ± 8.5	70.8 ± 9.4	55.5
	Overall mean	22.2	41.1	

[a] Duncan's tests on location: means not significantly different at $\alpha = 0.05$.

lower than any of the other laboratories. The interaction term was not significant (Table 1), and the STA was consistently lower than the RCS at all locations. The arithmetic means and standard deviations are presented for each location, and a plot of these means is shown in Fig. 1. The RCS had a significantly higher mean for all seven locations.

Both the STA and the RCS are simple to operate. The STA has a total sampling capacity of 60 ft^3/h compared with 11.3 ft^3/8 min for the RCS. However, this study showed a significantly higher recovery of bacteria by the RCS than by the STA. The portable RCS is easily disinfected and is therefore practical to transport and use. In addition, the RCS is less noisy than the STA and uses 11 ml of agar per sample compared with the 70 ml used by the STA. Need, ease of operation, and cost of the instrument, however, should be considered in selecting an air sampler.

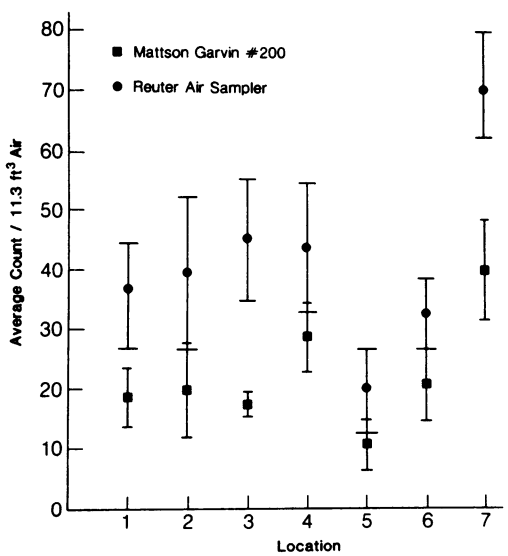

FIG. 1. Means and standard deviations for two air samplers.

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