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DEPARTMENT OF THE ARMY
Fort Detrick
Frederick, Maryland

11-233

(Following is the translation of a letter written by Dr. W. Schiff, 355 Marburg/Lahn, which was written on July 25, 1968. Translation performed by Constance L. Lust.)

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Subject: Investigations with the U.S. Slit-Sampler
Refer: Letter of American Embassy in Bad Godesberg of July 15, 1968

The Slit Sampler and All-Glass-Impinger which reached me in mid-August 1967, I sent to Dr. Glassman in Fort Detrick via a Marburg moving company (as ship freight) on July 22, 1968.

In order to completely report the experimental experiences obtained in my laboratory, which as far as I know also reached the U.S. services at Fort Detrick, I send the following results about comparative tests. We obtained these data with an original and a copy instrument of the slit sampler according to Decker and Wilson.

Method:

In order to perform the trials the air inlet openings of both instruments were adapted with a metal cone. To keep a regular, equal distribution of uniform air samples, both cones were connected with sterilized rubber tubing to a "Y"-shaped pipe in comparative experiments with equal flow through velocity of air. In all tests the two instruments stood separated by 50 cm. Other methodological procedures are presented in table 1. The counting of the resulting bacterial colonies was done after 48-hour incubation of agar plates at 37° (Nutrient agar Difco).

Results:

In table 1 are compared the average number of bacteria in air for 8 different experiment days in a 100m^3 room with a slit sampler original

and copy. Number of trials was 60. In presenting averages of 5 results the distribution pattern is less varied for the individual tests. The conditions in an aerosol chamber are predictable, but the natural count in an average room or in free-air are unknown and can be subjected to severe fluctuations during short term trials. These variations in count number for these runs of 10 minutes duration each were (in cell count) 1-36 per plate or 20-720 cells per m^3 air. Beyound this the inhomogenous, natural suspension of aerosolized bacteria in air effect a chance distribution (despite the Y connecting piece) on one or the other instruments. For example: in this way for two extreme comparisons (with uniform air flow of 5 l/min) the original instrument counted 2-32 and the copy 14-2 bacteria per plate.

Since Decker and Wilson reported an optimal flow of 1 cft. (28.3 l) per minute in aerosol chamber trials, but we had found 2x the yield in cell counts of room air with only 5 l/min., we tested both instruments at these two air flow velocities (uniform and variable). Slit width (0.15 mm) and slit/agar-distance (3 mm) was not altered.

In the table it can be seen that with uniform air flow of 1 cft. (28 l)/min, in 20 trials, with the original and copy instrument, an average of 75 cells/m^3 air was counted (cell yield relation 1:1). When 5 l/min was used the results compared favorably in 20 trials; original 174, copy 184 cells/m^3 air (1:1.06). Therefore no difference existed in the efficiency of the original or copy version.

This war further corraborated in 2x 20 tests when the air flow was variable for both apparatuses. Original -28 l/m gave 132 cells; copy -5 l/m 272 cells/m^3 (relation 1:2.06). In the reverse case original -5 l/m 129 cells; copy 28 l/m 64 cells/m^3 (2.02:1). In both instruments it became apparent that a lowering of the air flow from 28 to 5 l/m resulted in a 2x greater relative cell yield. (We had the same experience in the Cascade-Impactor of Anderson.)

Table 1 should also make clear the extraordinary degree of variation in the efficiency of various samplers (agar - impactor; for this compare figures 2,3,4. The agar- drum ventilators we developed) with uniform flow or the same sampler with variable air flow. This was tested with common room-air or free air. It can hardly be doubted that in corresponding trials with "artificial" aerosols of bacteria a "Nivellierung" of such findings would result.

In connection with the 3 experimental reports from Fort Detrick, of 2/2/68, I would like to comment further (5/3/68) - contrary to the views of several authors - that the ability (capacity) of air samplers for room or free air cannot be determined or compared by employing aerosol-chamber-experiments.

Table 1: 80 comparative cell determinations for common room air, using an original-and a copy instrument of the Slit Sampler according to Decker and Wilson. Air flow variable from 28 l (1 cu.ft.) and 5 l/min.

Slit/agar distance	uniformly 3 min.
Slit width	" 0.15 min.
Time	" 10 min.
medium	nutrient agar (Difco)
Lab room	lab (100 m^3)

Legend for table:

Durchschnittliche Keimzahl pro = average counts per

Luftdurchfluss = air flow

Anzahl der Vergleichs Versuche = number of comparing experiments

(Table on following page)

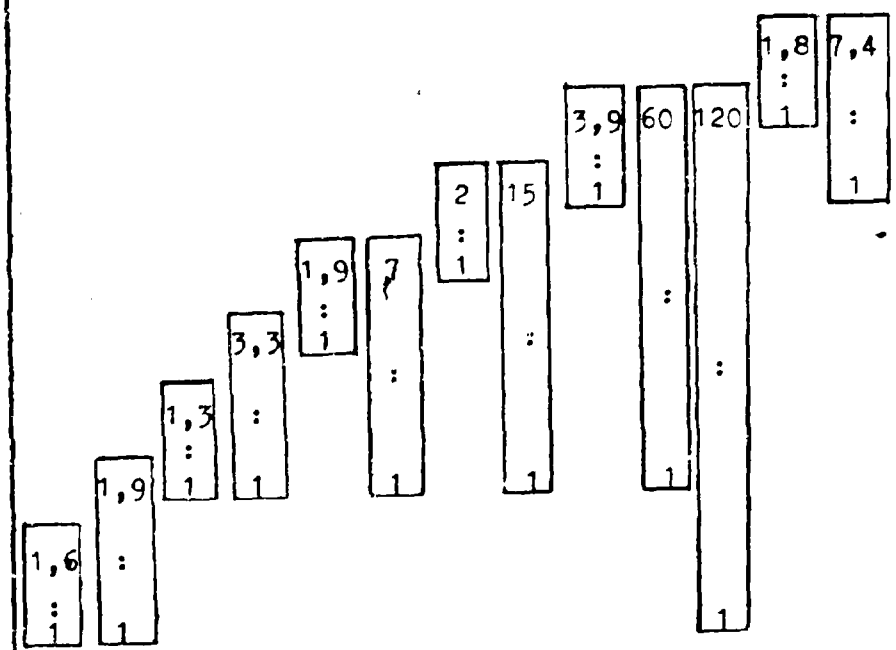
Table 1

	Slit-S.-Original				Slit-S.-Kopie			
	Durchschnittliche Keimzahl pro							
	Platte		m^3 Luft		Platte		m^3 Luft	
Luftdurchfluß/min.	28 L				28 L			
Anzahl der Vergleichs-Versuche 5	17,4	21,4	61	75	19,0	21,5	67	75
5	23,4		82		26,2		92	
5	30,1		105		23,6		83	
5	13,8		48		17,0		60	
	Relation			1 : 1				
Luftdurchfluß/min.	5 L				5 L			
Anzahl der Vergleichs-Versuche 5	11,6	8,7	232	174	11,6	9,2	232	184
5	11,4		228		15,2		304	
5	6,0		120		3,4		68	
5	5,8		116		6,6		132	
	Relation			1 : 1,06				
Luftdurchfluß/min.	28 L				5 L			
Anzahl der Vergleichs-Versuche 5	73,6	37,4	258	132	20,4	13,6	408	272
5	42,4		148		22,8		456	
5	20,8		73		5,4		108	
5	12,8		45		5,8		116	
	Relation			1 : 2,06				
Luftdurchfluß/min.	5 L				28 L			
Anzahl der Vergleichs-Versuche 5	5,2	6,5	104	129	18,6	18,4	65	64
5	6,4		128		17,8		62	
5	9,2		184		19,8		69	
5	5,0		100		17,4		61	
	Relation			2,02 : 1				

Figure 1: Comparison of Slit Sampler (DECKER and WILSON), Cascade Impactor (ANDERSEN) and 3 modifications of Agar Drum Ventilator (ADV) for collection of airborne bacteria in room air at different air flow.

Sampling Time: Uniformly 10 min
Agar Medium: Nutrient Agar (DIFCO)

Type of Sampler	Air Flow/min	Mean Ratio of bacterial content of air as simultanously measured by 2 methods	Total Ratio of Efficiency
ADV-67	0,5 L		200
"	1 "		120
"	5 "		27
ADV-Vaulted Lid	5 "		13,3
ADV-Flat Lid	5 "		6,5
Andersen-Casc.Imp.	5 "		2,5
Slit-S. (D. and W.)	5 "		1,9
Andersen-Casc.Imp.	28,3 "		1,6
Slit-S. (D. and W.)	28,3 "		1
No. of comparative trials		20 40 20 130 60 60 20 12 14 15 12 8 12	



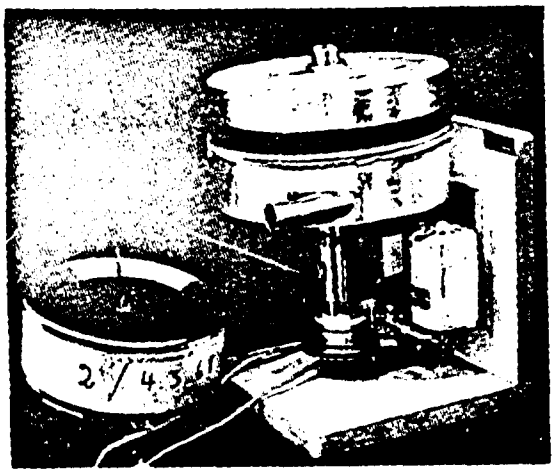


Fig. 2: ADV with flat lid

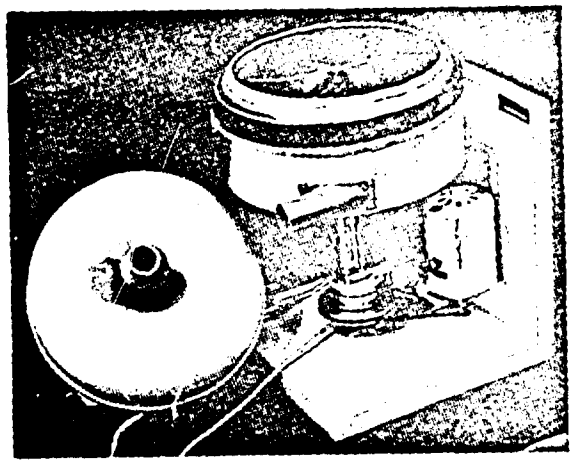


Fig. 3: ADV with vaulted lid

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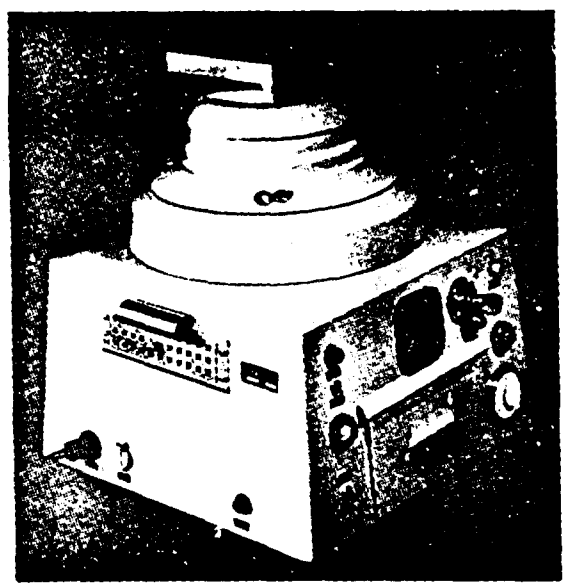
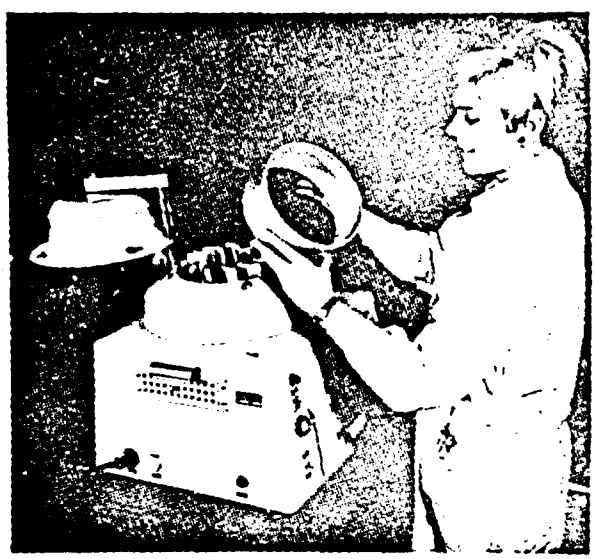


a)



b)

Fig. 4: ADV - 67