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COMPARATIVE CHARACTERISTIC OF SOME OF THE DEVICES USED TO DETERMINE THE MICROBIAL CONTAMINATION OF THE AIR

by

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COMPARATIVE CHARACTERISTIC OF SOME OF THE DEVICES USED TO DETERMINE THE MICROBIAL CONTAMINATION OF THE AIR

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To study microbial contamination of the air, several special devices – bacteria traps – are recommended. However, they do not fully satisfy the requirements of practicing laboratories.

We directed our attention to the fact that when air is seeded with Krotov apparatus the indices of microbial contamination are considerably lower than those from other methods and devices. This prompted us to carry out a comparative study of the results obtained with Krotov and P. P. D'yakonov apparatus and the Koch plate culture method.

Working with the D'yakonov apparatus, we were unable to obtain results which would satisfy us. For this reason only results of microbial contamination of air obtained with Krotov apparatus and the Koch plate culture are compared.

For the plate method test we used metal cans 10 cm in diameter and 20 cm in height and plates 9 cm in diameter. Glucose agar is poured into the latter. The volume of air in the can over the surface of the medium equalled to 1.5 liters.

We tested 3-5 cans at a time, i.e., we tested the microbe content of 4.5-7.5 liters of air.

Cans with the sterile air were opened in the room where air was to be sampled. The covered plates containing medium were placed in the cans on special supports. With several up-down movements the sterile air in the can was replaced with the air to be tested. The plate, containing medium, was uncovered and left at the bottom of the can. The can was closed and placed into an incubator for 48 hours. The bacteria in the column of air over the plate settled on the surface of the agar, grew and formed colonies, which we counted. Then we calculated the bacterial content in 1 m^3 of air.

In the same room and simultaneously with the collection of samples in cans we inoculated the air on the same medium with the Krotov apparatus.

The testing of the air was carried out in classrooms of schools and universities. The test results are presented in Table 1.

Table 1. Comparative data on the number of bacteria in 1 m^3 of air in a school.

Classroom numbers	Air sampling			
	with Krotov apparatus		plate method	
	before classes	after classes	before classes	after classes
1	—	2400	5000	15000
2	1933	4400	9000	19000
3	2266	4600	7000	28000
4	2100	8467	21000	46000
5	1167	7100	17000	133000
6	1900	5467	6600	13000
7	1922	2930	5730	19100
8	2233	10700	13000	55000
9	3500	6967	18600	36600

As is evident from the table, in the seeding of air with Krotov apparatus, a considerable number of bacteria are not caught. The average index of the number of bacteria in the air of the school during the testing with Krotov apparatus before classes is 5.3 times lower, and that after classes is 7 times lower, than that obtained with plate method.

Evidently, the air is not brought into total contact with the surface of the nutrient medium in the plate during its flow through the slit in the Krotov apparatus. As a result many bacteria, bypassing the medium, are ejected along with the outgoing air. To check this assumption, we placed opened plates containing agar in the path of the outgoing air and then counted the number of colonies. Subsequently by conversion we calculated the number of bacteria remaining in 1 m^3 of air.

These data are presented in Table 2. Also, in this table the data are compared with the number of bacteria in 1 m^3 according to the readings of Krotov apparatus with corrections from the plate culture method.

Table 2. Computation of the quantity of microorganisms in 1 m^3 of air with different methods of air seeding.

Sample number	Plate culture method	Krotov apparatus		
		Base plate count	Count in outgoing air	Total
1	21000	2100	18000	20100
2	7000	4600	4000	8600
3	30230	2100	31460	33560
4	31020	2000	28900	30000
5	19700	1900	20000	21900

The presented data attest to the fact that Krotov apparatus does not trap a very large quantity of microorganisms.

In order to determine the effect of the rate of air flow through the apparatus on the test results, we carried out analogous studies with air flow at different rates (30, 20, and 10 liters per minute). The obtained results are presented in Table 3.

The data indicate that a reduced rate of air flow through the Krotov apparatus lowers the number of microorganisms settling on the nutrient medium even more.

Table 3. Computation of the quantity of microorganisms in 1 m^3 of air with the Krotov apparatus with different rates of air flow.

Test number	Rate of air flow in liters per minute	Base plate count	Count in outgoing air	Total
1	30	4880	10660	15540
2	20	3500	6000	9500
3	10	10900	32000	42900
4	30	7400	2600	10000
5	20	5880	6000	11880
6	10	6000	8000	1400
7	30	2100	10000	12100
8	20	1800	21000	22800
9	10	2900	90000	93900

It is obvious that the use of Krotov apparatus for seeding the air does not give satisfactory results. It is necessary to use the can-plate culture method, which gives better results.

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13. ABSTRACT

This article deals with a comparative study between Krotov apparatus and plate culture methods of determining microbial contamination of air. The air tested was that of schools and universities before and after classes. The results have been tabulated and comparison made.

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