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Effectiveness of a room air decontamination using Airsteril® Multiflex Air Purifier on aerosolized germs in the room air

Expert opinion

In November 2020, tests were carried out on devices from MedicPartner GmbH to determine the effectiveness of room air decontamination using the Airsteril® Multiflex Air Purifier device in the test laboratory HygCen Germany GmbH (test report SN 30794 from 2020-11-23).

The effectiveness was tested against bacteriophages (as a surrogate for virus effectiveness). The following test setup was used for this:

In a test room with a volume of 75m³, the coliphage phi X174 (Microviridae, single-stranded DNAA, 27 nanometer capsid diameter, uncoated) was first nebulized using an ultrasonic nebulizer type RAX. 1000ml germ suspension were applied within 30 minutes.

For coliphage phi X174, the germ concentration in the to be nebulized germ solution was determined to be 7.00log/ml. Mathematically, the theoretical load of the air in the test room is 8.13lg/m³. In fact, in the reference test in which the Airsteril® Multiflex Air Purifier was not operated, 7.23lg/m³ coliphage phi X174 could be re-isolated from the air.

The development of the germ concentration in the air was examined by means of the impinger method at different times after the end of the nebulization of the corresponding test germ. For this purpose, air samples of the room air were passed through impingers with an air volume flow of 125 l per 10 minutes for a sampling period of 10 minutes. The liquid contained in the impingers was then examined quantitatively for the presence of the test germ.

After the end of the nebulization of the germ aerosol, samples were taken immediately afterwards (T0) after 10, 20, 30, 60 and 120 minutes. The germ content during operation of the Airsteril® Multiflex Air Purifier decreased faster than in the reference experiment. The test room was preconditioned for the effectiveness test for 12 hours with the device, i.e. the device was operated and the corresponding ozone was released into the test room. The measured value for the ozone content in the room at the start of the nebulization of the bacteriophages was <0.02 ppm.

Bacteriophages were then applied in this preconditioned room for 30 minutes in the same way as in the reference experiment. Accordingly, the germ concentration in the germ solution to be nebulized was also 7.00lg/ml. Mathematically, the theoretical load of the air in the test room is 8.13lg/m³. After completion of the nebulization, the concentration of the bacteriophages in the room air was determined to be 5.11lg/m³. This value is lower than in the comparative experiment. Since ozone was already contained in the room air in the experiment in which the Airsteril® Multiflex Air Purifier was operated, some of the bacteriophages in the room air are killed immediately at the start of the nebulization of the bacteriophages. After the end of the nebulization (time T0), a germ count that is already reduced compared to the reference experiment is measured. In the next measurement (time 10 minutes after the aerosol had been applied), no more bacteriophages were detectable in the room air.

The following germ concentrations were determined in the air at the different measurement times and the corresponding reduction factors were calculated:

Time	phi X174		
	Control experiment [PfU/m³]	Airsteril® Multiflex Air Purifier operated [PfU/m³]	Reduction factor*
T0	7.23	5.11	2.12
10	7.10	<2.20	>4.90
20	6.67	<2.20	>4.47
30	5.83	<2.20	>3.60
60	4.51	<2.20	>2.31

* The detection limit here is 2.20lg/m³ air, with values in the table of <2.20lg/m³ no test germs could be isolated from the air.
PFU = Plaque forming unit

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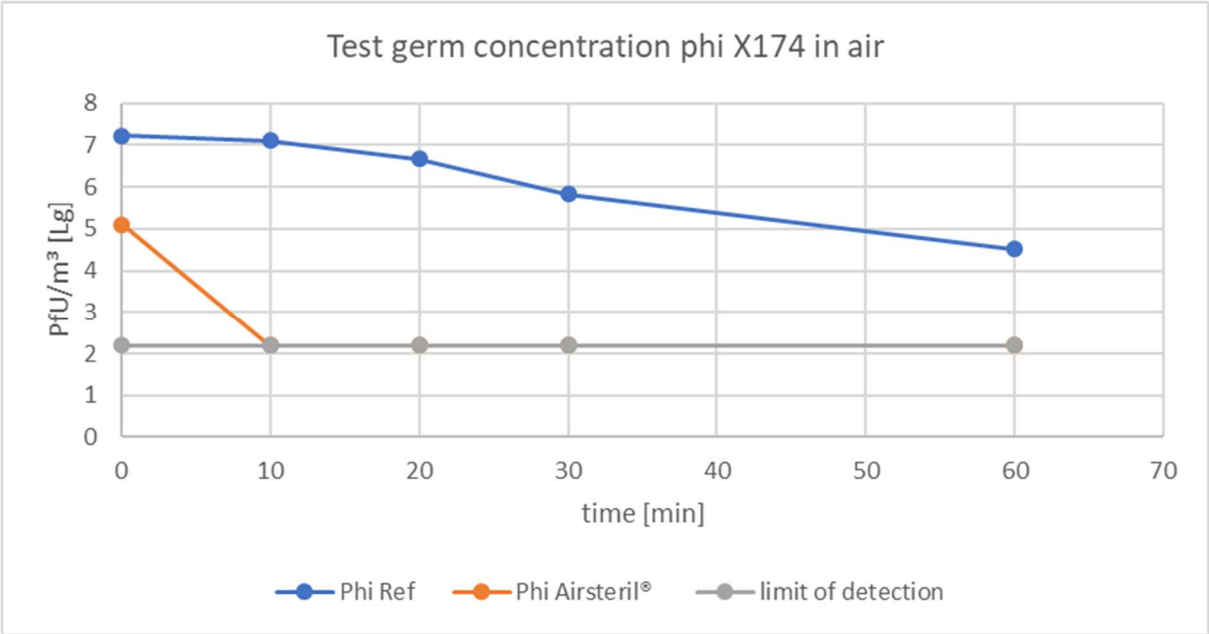

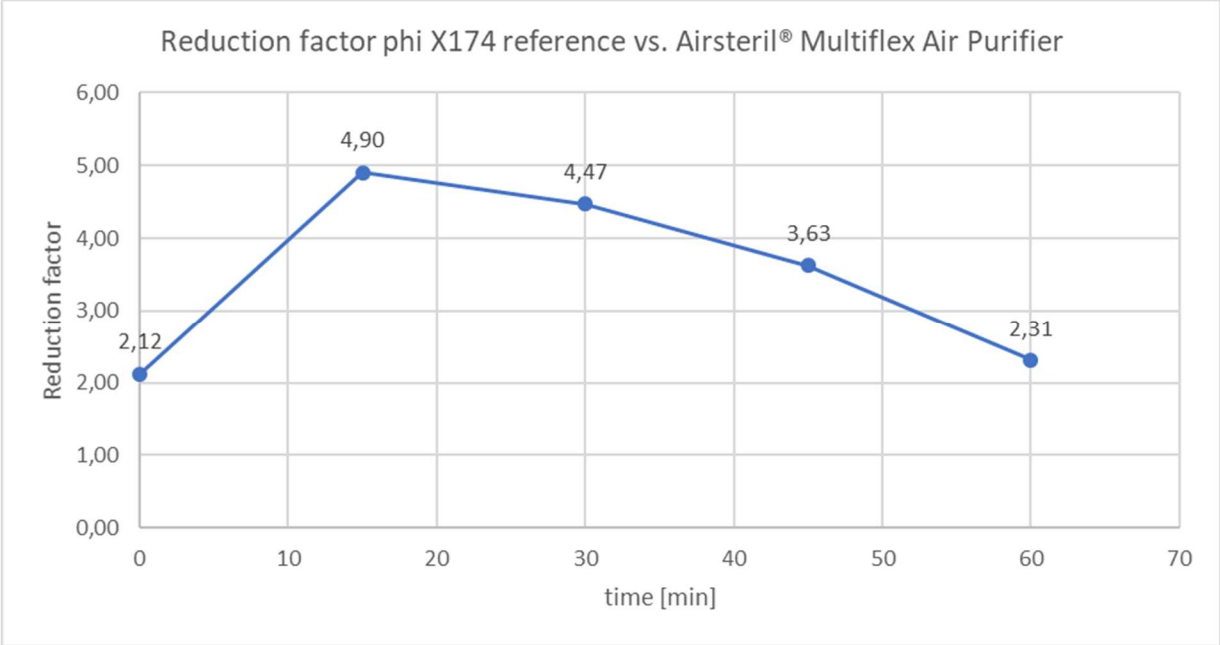

* The test germs settle down to the ground over the time during the test or are decreasing in their amount in the room air due to drying effects. The achievable reduction rates are therefore lower over time, since the value in the reference measurement also decreases over time.

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Summary and evaluation:

After 10 minutes, a reduction of 4.90lg of the test germ per m³ of room air was the largest reduction factor in compared to a reference measurement without using the Airsteril® Multiflex Air Purifier. The measured value for the ozone content in the room at the start of the nebulization of the bacteriophages when the Airsteril® Multiflex Air Purifier was operated for a preconditioning of the test room was lower than 0.02 ppm. Based on the present reduction rates for phi X174, comparable efficacy of the process can be assumed also for other viruses (at least enveloped viruses, including coronaviruses).

A statement on the virus efficacy in the case of agents with disinfecting effectiveness requires, by definition, a killing of virus particles by 4lg levels. When this criterion is applied, the tested method can be stated to be sufficiently effective.

The method is able to achieve a statistically significant reduction in the germ content of air compared to the control. Within 10 minutes the effectiveness of killing bacteriophages in an aerosol was higher than 4lg levels.

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