Im Niedernfeld 4
D-31542 Bad Nenndorf
Tel.: +49-5723-9440-0
FAX: +49-5723-9440-30
E-Mail: info@bioclimatic.de
URL: www.bioclimatic.de

Evaluation of the inhibiting effect of an air sterilizer manufactured by the company Bioclimatic regarding the SARS-Corona Virus

Tests conducted by:

PD Dr. rer.nat. Stephan Becker
Klinikum der Philipps-Universität Marburg
Institut für Virologie
Robert-Koch-Str. 17
35037 Marburg
Germany

01.11.2004

1. measured object:

The influence of ionisated air and UVC-radiation on the infectivity of SARS-Corona Virus (SARS-CoV) was investigated.

2. test method:

To investigate the inhibiting effect of the air sterilizer, a test was performed which measured the infectivity of SARS-Corona virus in cell cultures (TCID50; Bonin 1973).

devices:

A air sterilizer of the company Bioclimatic equipped with special ionisation tubes and specialized UV-lamps.

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3. experimental:

The Bioclimatic device (ionisation + UV-radiation) was switched on. To reach the operation temperature the device run for 1 minute initially. Afterwards a plate with the cell culture was exposed to the device under a safety work bench (distance ionisation tubes – plate approx. 20 cm, distance UV-lamps – plate approx. 3 cm, highest operation level of the device). After 0, 1, 2, 3, 5, 10, 20, 30 and 40 minutes a sample from the plate with the cell cultures was taken from 2 slots in the plates 500 µl each.
From the control plate with cell cultures, which wasn't exposed to UV-radiation and air ionisation, a sample was taken after 0 and 40 minutes. The samples were taken double each. All samples were stored cold.

55 µl of all samples were transferred in 96 well culture plates and in dilution series to the base 10 (10^0 to 10^{-7}). Abtrypsinated Vero-cells have been added to this dilutions and incubated for 4 days in a cell incubator at 37 °C in presence of 5 % CO_2. The actual status of the cells was controlled with a microscope daily.
The complete experiment was performed in the high security laboratory of the Institute for Virology, Marburg (Germany).

results:

After 4 days the experiment was aborted and the results were analyzed. The following situation occurred:
The infectivity of SARS-CoV was reduced by the treatment with the air sterilizer drastically. The titter was below the detection limit after 1 minute (see pic.1 and 2).
The probes which were examined after 20 min. of irradiation with UVC radiation a substance was found, which react toxic to the cell culture (pic.1) at highest concentration (10^0). This effect was also detected after 30 and 40 minutes. In the control probes this effect was not observed (pic.2). This toxic effect could be differentiated very good from the cytophatic effect of the virus infection.

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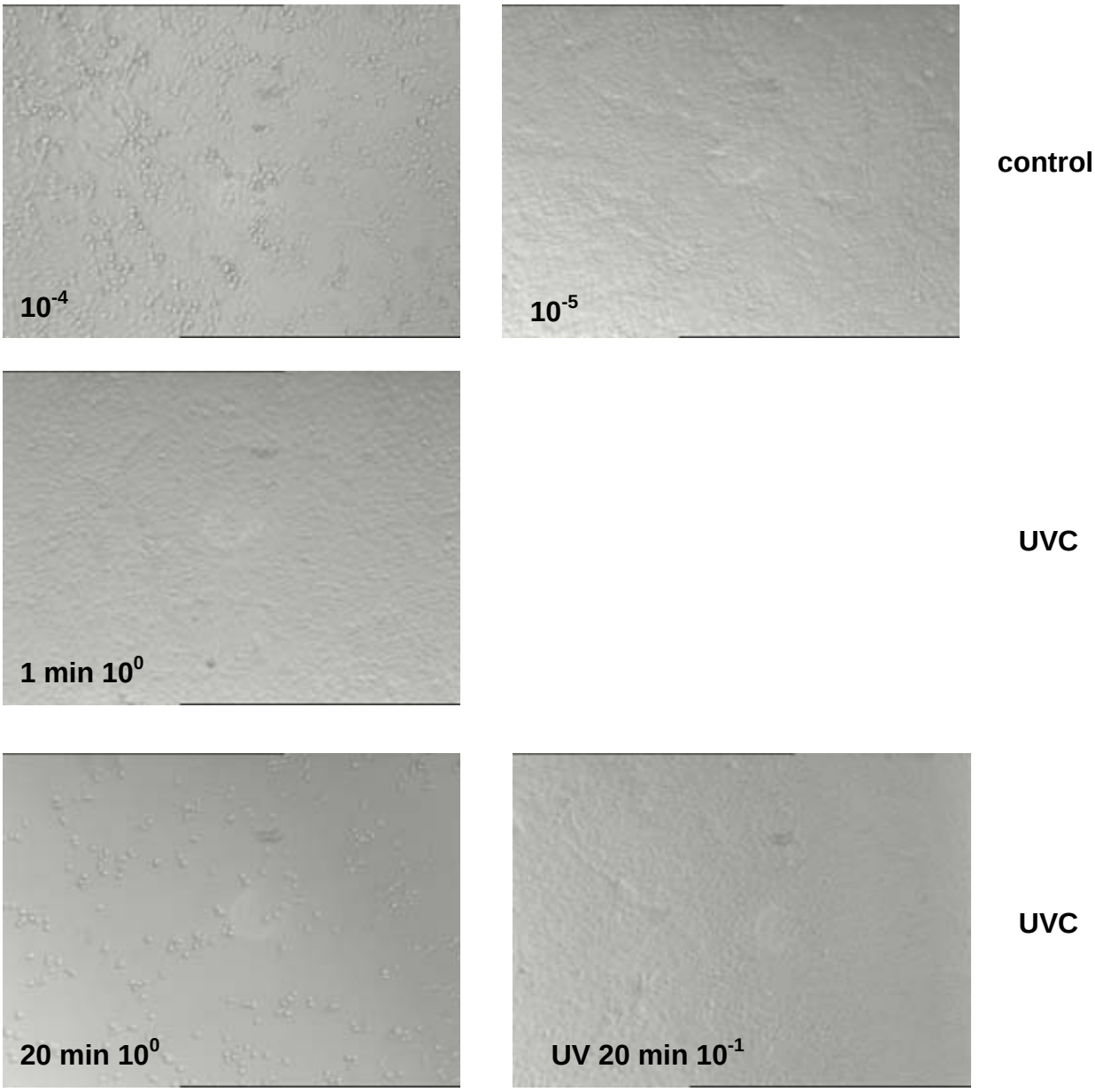

pic. 1: The influence of ionisated air and UVC-radiation on the infectivity of SARS-CoV.
A suspension of SARS-CoV were treated 40 min. Depicted are cells, which were incubinated with the control virus (first row: no treatment with ionisated air and UV) and cells which where treated with a virus suspension, which were exposed to the device for 1 min. In comparison to the control probe, which causes at a concentration of 10^{-3} no cytophatic effect could be observed; the treated probe even in the highest concentration (10^{0}) could not infect the cells. In the pictures below (treatment for 20 min), the dilutions 10^{0} and 10^{-1} show the toxic effect of the treatment on the cells. After 20 min. treatment the cells which were treated with the virus suspension in the highest concentration, show a toxic effect, which causes separating of cells and rounding of the remaining cells. At a dilution of 10^{-1} this effect was not detected any longer.

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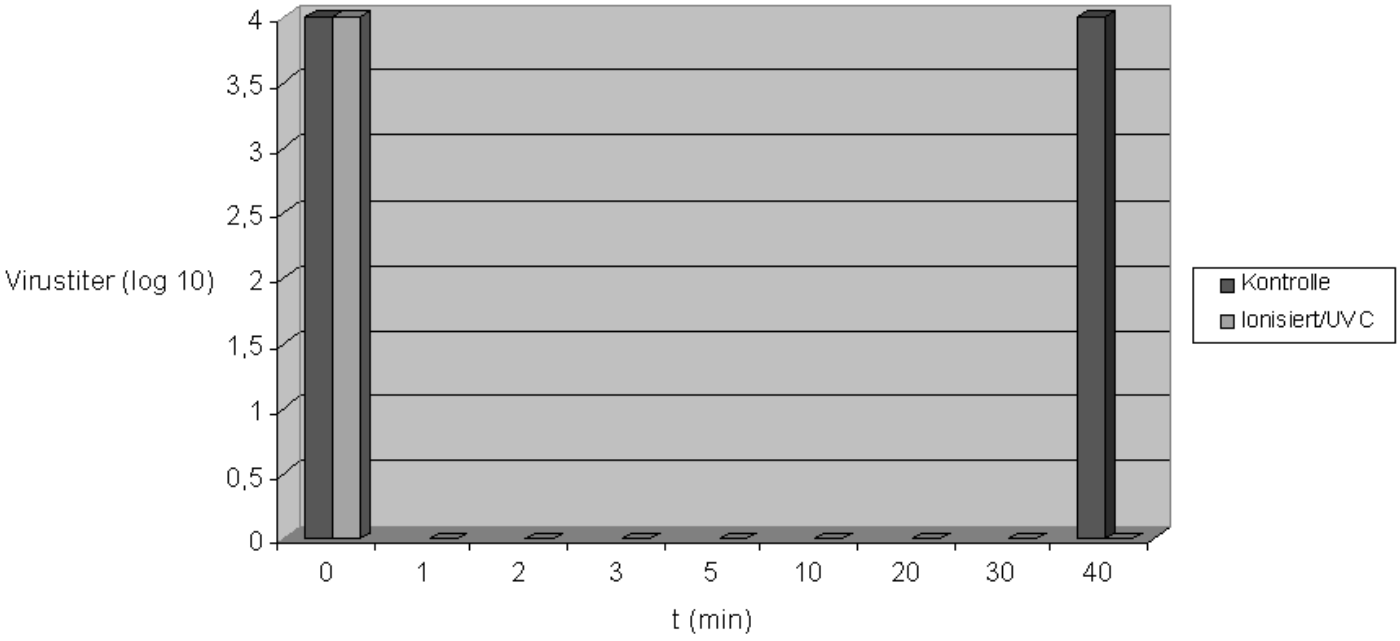

pic 2: The influence of ionisated air and UVC-radiation on the infectivity of SARS-CoV.
A suspension of SARS-CoV were treated 40 min. Depicted are the average values of the virus titter (n=8).

discussion:

The effect of the tested device regarding the infectivity was significant and fast. Already after 1 min. no infectious viruses were detectable. The inactivation were not influenced by the presence of serum proteins. Regarding the literature the infectivity of SARS-CoV could be inactivated after 1 h treatment with UV radiation (Duan et. Al., 2003). In comparison the method from Bioclimatic seems quite efficient. Further more it must be stated that the volumes of aerosols containing viruses which should be treated with the bioclimatic device are much smaller than the volumes used in this experiments. For this reason the UV radiation can reach it's targets in smaller volumes much more efficiently. It can be assumed that the inactivation of the viruses under this conditions will be even faster.

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4. summary of the results:

The treatment of SARS-CoV suspension with the device from the company Bioclimatic reduced the infectivity in 1 min. under the limit of detection (reduction by more than 4 log steps).

5. literature:

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Duan SM, Zhao XS, Wen RF, Huang JJ, Pi GH, Zhang SX, Han J, Bi SL, Ruan L, Dong XP. (2003). Stability of SARS coronavirus in human specimens and environment and its sensitivity to heating and UV irradiation. SARS Research Team. Biomed Environ Sci. 2003 Sep;16(3):246-55.

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