MAG. DR. MARTIN KIRCHMAIR

GENERAL SWORN COURT CERTIFIED EXPERT

for 02.10 Hygiene and microbiology, virology, specific prophylaxis and tropical hygiene (including room air hygiene, spore load in the air); 02.23 Pharmacology and toxicology (including mushroom poisoning, mycetism); 03.90 Biology, various: mycology; 39.90 Wood and wood processing, various: fungal infestation, dry rot diagnosis

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Comments on the report from Dr. Schmelz on the "Disinfection efficacy (effect response) of the "STEREX" process with the "CUBUSAN" product against *Enterococcus faecium* according to the recommendations of the "Deutsche Gesellschaft für Hygiene und Mikrobiologie" (German Society of Hygiene and Microbiology – DGHM)" and additions from Dr. Schmelz

The **introduction** first talks generally about airborne transmission of pathogens and then more specifically about the transmission paths of SARS-Cov-2. It is stipulated that room air disinfection further reduces the probability of transmission in the event of compliance with the normal hygiene measures (distancing, masks, hand hygiene). A detailed description is provided about the mode of action and advantages of disinfection using devices to generate low-temperature plasma. There is a brief description of the test set-up to check pathogen reduction. The generation method for the generation of aerosols and the description of the test room is anticipated in the method section.

The **method section** states the laboratory equipment required and provides a detailed description of the conduct of the experiments. The experiments conducted are therefore reproducible and in principle can be repeated by an independent center.

The **results** are clear and presented in a very well-arranged manner. The effect of using "Cubusan" is clearly demonstrated.

In the **interpretation and assessment** of the results, reference is made to the effect of this room air disinfection and to the reduction of the risk of airborne pathogen transmission to a "maximum low level". This was inspected with the test bacterium *Enterococcus faecium*.

The eponymous "Disinfection efficacy (effect response) of the "STEREX" process with the "CUBUSAN" product against *Enterococcus faecium"* was clearly and comprehensibly demonstrated.

Various published studies (https://www.baulinks.de/webplugin/2020/1074.php4) and scientific publications (Alshraiedeh et al. 2013, Bourke et al. 2017, Filipić et al. 2020, Guo et al. 2018, Weiss et al. 2017, Wu et al. 2015, Xia et al. 2019) show that the use of cold plasma has a virucidal effect.
It can therefore be assumed that a functional technology on the basis of cold plasma (the function of the present device has been demonstrated on the basis of the effect against *Enterococcus faecium*) is also effective against viruses, including SARS-Cov-2.

Cited literature:

Alshraiedeh, N.H., Alkawareek, M.Y., Gorman, S.P., Graham, W.G. and Gilmore, B.F. (2013) Atmospheric pressure, nonthermal plasma inactivation of MS2 bacteriophage: effect of oxygen concentration on virucidal activity. J Appl Microbiol 115, 1420–1426.

Bourke P, Ziuzina D, Han L, Cullen PJ, Gilmore BF. Microbiological interactions with cold plasma. J Appl Microbiol. 2017 Aug;123(2):308-324. doi: 10.1111/jam.13429. Epub 2017 Jun 22. PMID: 28245092.

Filipić A, Gutierrez-Aguirre I, Primc G, Mozetič M, Dobnik D. Cold Plasma, a New Hope in the Field of Virus Inactivation. Trends Biotechnol. 2020 Nov;38(11):1278-1291. doi: 10.1016/j.tibtech.2020.04.003. Epub 2020 Apr 17. PMID: 32418663; PMCID: PMC7164895.

Guo L, Xu R, Gou L, Liu Z, Zhao Y, Liu D, Zhang L, Chen H, Kong MG. Mechanism of Virus Inactivation by Cold Atmospheric-Pressure Plasma and Plasma-Activated Water. Appl Environ Microbiol. 2018 Aug 17;84(17):e00726-18. doi: 10.1128/AEM.00726-18. PMID: 29915117; PMCID: PMC6102979.

Weiss M, Daeschlein G, Kramer A, Burchardt M, Brucker S, Wallwiener D, Stope MB. Virucide properties of cold atmospheric plasma for future clinical applications. J Med Virol. 2017 Jun;89(6):952-959. doi: 10.1002/jmv.24701. Epub 2017 Feb 13. PMID: 27696466.

Wu Y, Liang Y, Wei K, Li W, Yao M, Zhang J, Grinshpun SA. MS2 virus inactivation by atmospheric-pressure cold plasma using different gas carriers and power levels. Appl Environ Microbiol. 2015 Feb;81(3):996-1002. doi: 10.1128/AEM.03322-14. Epub 2014 Nov 21. PMID: 25416775; PMCID: PMC4292470.

Xia T, Kleinheksel A, Lee EM, Qiao Z, Wigginton KR, Clack HL. Inactivation of airborne viruses using a packed bed non-thermal plasma reactor. J Phys D Appl Phys. 2019 Jun 19;52(25):255201. doi: 10.1088/1361-6463/ab1466. Epub 2019 Apr 23. PMID: 32287389; PMCID: PMC7106774.