

THE EFFICACY OF THE 99TECHNOLOGIES (99T) DISINFECTION SYSTEMS AS PART OF EFFECTIVE PREVENTIVE MEASURES AGAINST THE NOVEL CORONAVIRUS

The capability of the 99T environmental disinfection technology to eradicate the Novel Coronavirus from inanimate surfaces is the result of its wide-spectrum virucidal activity verified through the EN 14476 international standard. In light of the impossibility to carry out direct efficacy test on Novel Coronavirus, it is crucial to highlight the ability of the 99T systems to remove from surfaces strains of viruses, used in the EN14476 testing procedure, which are significantly much more resistant to the inactivating effect of disinfectants than the Novel Coronavirus.

The 2019 Novel Coronavirus, also known as 2019-nCoV, is a virus which has been identified as the cause of an outbreak of respiratory illness first detected in the city of Wuhan (China) at the end of December 2019. The outbreak is still ongoing, and it is generating a high level of concern among local and international health authorities [1].

2019-nCoV belongs to the family of coronaviruses, which are enveloped viruses that can infect both humans and animals. Since 2002 two other strictly related coronaviruses infecting animals (SARS-CoV in 2002 and MERS-CoV in 2012) have evolved and caused outbreaks in humans, that have led to a high mortality rate (10% for SARS and 35% for MERS) [2].

Common signs of 2019-nCoV infection include respiratory symptoms, fever, cough, shortness of breath and breathing difficulties. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death [3].

Considering that investigations are still ongoing, it is not fully known how the virus spreads: the events initially suggested animal-to-person spread, and nowadays it has been confirmed that person-to-person spread can occur as well. The most probable transmission routes of human coronaviruses are represented by respiratory droplets coming from sneezes and coughs of infected people, close personal contact (such as touching and shaking hands) and contaminated objects and surfaces [1]. Although enveloped viruses are usually susceptible to environmental stresses, it has been demonstrated the ability of human coronaviruses to survive and remain infectious for at least 5 days on many common touch surfaces, including polytetrafluoroethylene (Teflon; PTFE), polyvinyl chloride (PVC), ceramic tiles, glass, silicone rubber, and stainless steel [4].

The most effective form of prevention is represented by avoiding being exposed to the virus [1] because there is currently no vaccine available.

For this reason, the relevant health authorities have released recommendations and guidelines, which are inclusive of measures intended to assure adequate environmental infection prevention and control during 2019-nCoV outbreak:

- WHO (World Health Organization) suggests to ensure that environmental cleaning and disinfection procedures are followed consistently and correctly. Regarding disinfection, commonly used hospital level disinfectant should be used (as it is the case for the 99S disinfectant solution). Moreover, WHO suggests to clean and disinfect carefully all the equipment that needs to be shared among patients, and to routinely clean and disinfect surfaces which the patient is in contact with, in order to minimize the risk of exposure to the virus [5].
- CDC (the US Center for Disease Control and Prevention) recommends to clean and disinfect frequently touched objects and surfaces [1].
- ECDC (European Centre for Disease and Prevention and Control) considers that the potential impact of 2019-nCoV outbreak is high and for this reason suggests adopting appropriate infection prevention and control practices, particularly in health care settings and during aerosol-generating procedures [2].

The 99S solution, used in the 99T's bio-decontamination procedures, is certified to have virucidal activity according to the international standard EN 14476. The virus strains tested in order to be compliant with the norm are the Poliovirus type 1 LSc-2ab, the Adenovirus type 5 and murine Norovirus, which are non-enveloped viruses and are considered highly resistant to disinfection.

Coronaviruses are, by and large, significantly more susceptible to the destructive action of 99T's systems when found on surfaces because they are enveloped viruses which are known to be less resistant to disinfectants than non-enveloped viruses.

In fact, the structure of the enveloped viruses includes a lipid envelope easily compromised by effective disinfection: once the lipid envelope is dissolved, the core is exposed, and it becomes vulnerable to termination.

On the contrary, non-enveloped viruses, such as Poliovirus type 1 LSc-2ab and the Adenovirus type 5, are rather resistant to most disinfectants. Indeed, despite the lack of a lipid envelope, these organisms have a stable viral capsid made up of protein [6]. As a consequence, the elevated

bio-decontamination capabilities of 99T can be effectively included among the prevention measures to be adopted for the containment of the Novel Coronavirus.

The 99T systems supersede the traditional and/or manual disinfection process, and thanks to the HyperDRYMist® technology, the disinfectant solution 99S is truly delivered to every spot of the treated environment. Their portability and ease of use allow them to be deployed rapidly. In addition, the 99T systems are fully automated, thus they inherently reduce the time in which cleaning crews are exposed to contaminated environments, consequently lowering the overall risk for operators.

Disinfection protocols executed with the use of 99T systems can target several areas such as:

- 1) The critical units where patients suspected of having been infected by the Novel Coronavirus are seen by doctors and/or admitted.
- 2) The isolation rooms used to house VHF positive patients.
- 3) Any type of equipment used to treat or transport any suspected or confirmed infected patient.

Thorough cleaning procedures need to be carried out before the implementation of the disinfection process executed with the 99MS system and personnel needs to wear the PPE in accordance to the specific guidelines.

Efficacious and thorough disinfection of surfaces is a cardinal element in the set of preventive measure to be taken on order to contain the spread of the Novel Coronavirus. The 99T system can consequently be effectively enlisted in the preventive measures adopted to contain the spread of the Novel Coronavirus.

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