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Sanitation: a set of interventions mandated by the Italian government to limit the spread of SARS-CoV-2 in non-medical facilities

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Abstract. There have been several concerns about the environmental persistence of SARS-CoV-2 virus. These concerns led to the formulation of sanitation measures that try to lower the risk of indirect transmission of SARS-CoV-2 in non-medical facilities.

This manuscript will elucidate the topic of environmental persistence of SARS-CoV-2. This will benefit the occupational health professionals two-fold. It describes the proper techniques for an effective sanitation of the workplace. It also explains how to protect workers who are responsible for carrying out these interventions.

Sanitation is an important measure for a safe workplace. Sanitation is legally established and referenced by all the decrees so far enacted by the Italian government. It is defined as a set of actions and procedures that aim to lower the risk of indirect transmission of SARS-CoV-2 virus.

Keywords: SARS-CoV-2, sanitation, occupational medicine, ozone, ultraviolet radiation

Introduction

Concerns regarding SARS-CoV-2-related pneumonia were first publicly announced by the Italian Ministry of Health on Jan 22nd, 2020¹. This announcement included general public health measures that aimed to contain the spread of the virus. Mention was made about a cluster of pneumonia of unknown etiology in Wuhan, in the Chinese province of Hubei. Most of these cases could be traced back to a common place: a fish and livestock market.

On Jan 9th, 2020, the Chinese Center for Disease Control and Prevention had announced the spread of a new strain of coronavirus that was likely responsible for these cases of pneumonia and acute respiratory distress syndrome. The Chinese government ordered the closure and sanitation of the fish market.

It was later confirmed that the new coronavirus was able to survive in the environment for several hours. With these raising concerns, the WHO started to advocate for environmental sanitation as an important step to stop the spread of the virus². The Italian government also started to promote and subsidize sanitation interventions. Estimates on the environmental persistence of SARS-CoV-2 virus were made by drawing comparisons with similar strains of coronavirus. If mixed with biological fluids, the coronavirus can survive up to 96 hours in the environment and up to 72 hours on porous surfaces.³ Survival rate is also influenced by the presence of dirt on the surface, environmental humidity, and temperature. The virus is stable at 4 degrees Celsius, but sensitive to temperature elevations. At 70 degrees Celsius, for example, the virus can remain viable for 5 minutes only³.

On Feb 22nd, 2020, the Italian Ministry of Health detailed the modalities of sanitation for spaces potentially contaminated by SARS-CoV-2⁴. Measures are explained in the following decree: *“Protocolli condivisi di regolamentazione delle misure per il contrasto e il contenimento della diffusione del virus Covid-19 negli ambienti di lavoro”*^{3,7,8,9,10}.

In the Italian law, sanitation is defined by the norms of the art. 1. of DM n. 274 of 7th July 1997, of the Ministry of Commerce and Industry. These norms consider sanitation as “activities that concern the complex procedures and operations that are needed in order to restore a healthy and safe environment, through cleaning and disinfection procedures; also through the control and improvement of the microclimatic conditions such as temperature, humidity, ventilations, also for illuminations and noise”.

Therefore, the process of sanitation is not limited to disinfection of surfaces. It consists of a set of actions and procedures that lower the overall risk of viral transmission¹¹. For this reason, sanitation procedures cannot be limited to cleaning interventions. The sanitation process must actively involve all employees. Generic interventions are not sufficient. Businesses should evaluate the risk derived from each activity. For example, they should identify areas and instruments more likely to be contaminated by the virus, assess the type of material to disinfect, the frequency of potential contamination of surfaces, and numerous other factors.

Elements that might prevent from an effective environmental sanitation must be addressed. For example, surfaces should be free of objects and rooms should be efficiently ventilated. Both chemical

and physical agents can be used for disinfection. Focused interventions to areas that are more likely to become contaminated can prevent the need for more expensive and intensive interventions. Tools that are frequently used should be disinfected after every use. For this purpose, users should be instructed on how to properly disinfect these. Cleaning agents, gloves, and instructions on how to dispose of the contaminated material should be provided¹².

It is important to note that disinfection procedures constitute an infection risk per se. For this reason, workers should be properly instructed. They should be instructed on the products to use, the types of personal protective devices to wear, and procedures to follow even in emergency situations^{13,14}. These different phases might require the supervision of the occupational physician. The cleaning products must be approved for this use. The most effective chemical agents include ethyl alcohol 62-71%; hydrogen peroxide 0.5%; sodium hypochlorite 0.1% applied for at least one minute.

It is important to note that these chemical agents can constitute a health hazard. They are corrosive and irritant. The biological risk can be both dose-dependent (acute or chronic intoxication) or dose-independent (hypersensitivity). The assessment and management of this type of risk is regulated by the D.L.g.s 81/08 (Title IX "Dangerous Substances").

Ozone can be used to sterilize both medical and non-medical equipment. Other methods include UV rays of short wavelength (220 nm) or vaporization/aerosolization of hydrogen peroxide. Ozone or UV lamps should be considered for surfaces that cannot be treated with chemical agents or are difficult to reach.

Ozone is classified as a dangerous substance^{10,15}. It irritates the eyes and the upper respiratory tract. Long-term exposure is dangerous for the respiratory apparatus as it leads to irreversible parenchymal remodeling and compromises the respiratory function. It is listed in Group 1 in the IARC (2016) classification. It is an environmental pollutant and is carcinogenic to humans. Proper technical and organizational measures should be implemented to reduce the exposure risk of ozone to workers. These measures include proper education, medical surveillance, and use of personal protective equipment. The ECHA website describes how to lower this risk¹³.

UV rays can also be used for disinfection¹⁶. UV rays induce mutations in microbial DNA or RNA that impede replications. They are used to disinfect water, air, and foods. Radiations are dangerous to human eyes and skin. They are classified as Group 1 carcinogens on the IARC classification. The Italian law D.lgs n. 81/2008 sets exposure limits to reduce the dangerous sequelae of these radiations to eyes and skin.

The efficacy of UV-C emitting lamps can be hindered by dust. Their effectiveness is also time-dependent. These types of lamps can complement conventional cleaning, but should be deployed at night, when work personnel is not present.

Recent studies have shown that short wavelengths (between 200 and 222 nm) are effective to inactivate pathogens without being cytotoxic for human cells^{9,17}.

Conclusions

Sanitation is of utmost important to lower the risk of indirect transmission of SARS-CoV-2. The need for sanitation is reiterated in each decree enacted since the beginning of the pandemic. A careful assessment and planning are important to ensure that this process is executed effectively. The risk derived from the sanitation process should be assessed and mitigated, as mandated by the D.L.gs 81/08¹⁸. Different techniques and chemical agents with proven virucidal activity can be deployed^{15,16}. Elements that prevent from an effective sanitation should be identified and removed. In door ventilation should be improved. The whole process should be documented. Notes should be made on the types of interventions adopted, the different phases, and the protective measures for those who carry out the sanitation process. All activities should be recorded as they constitute a fundamental element to lower the spread of SARS-CoV-2 in the workplace¹⁹.

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