Coronavirus (COVID-19): What could be the environmental effects of disinfectant use in the pandemic?

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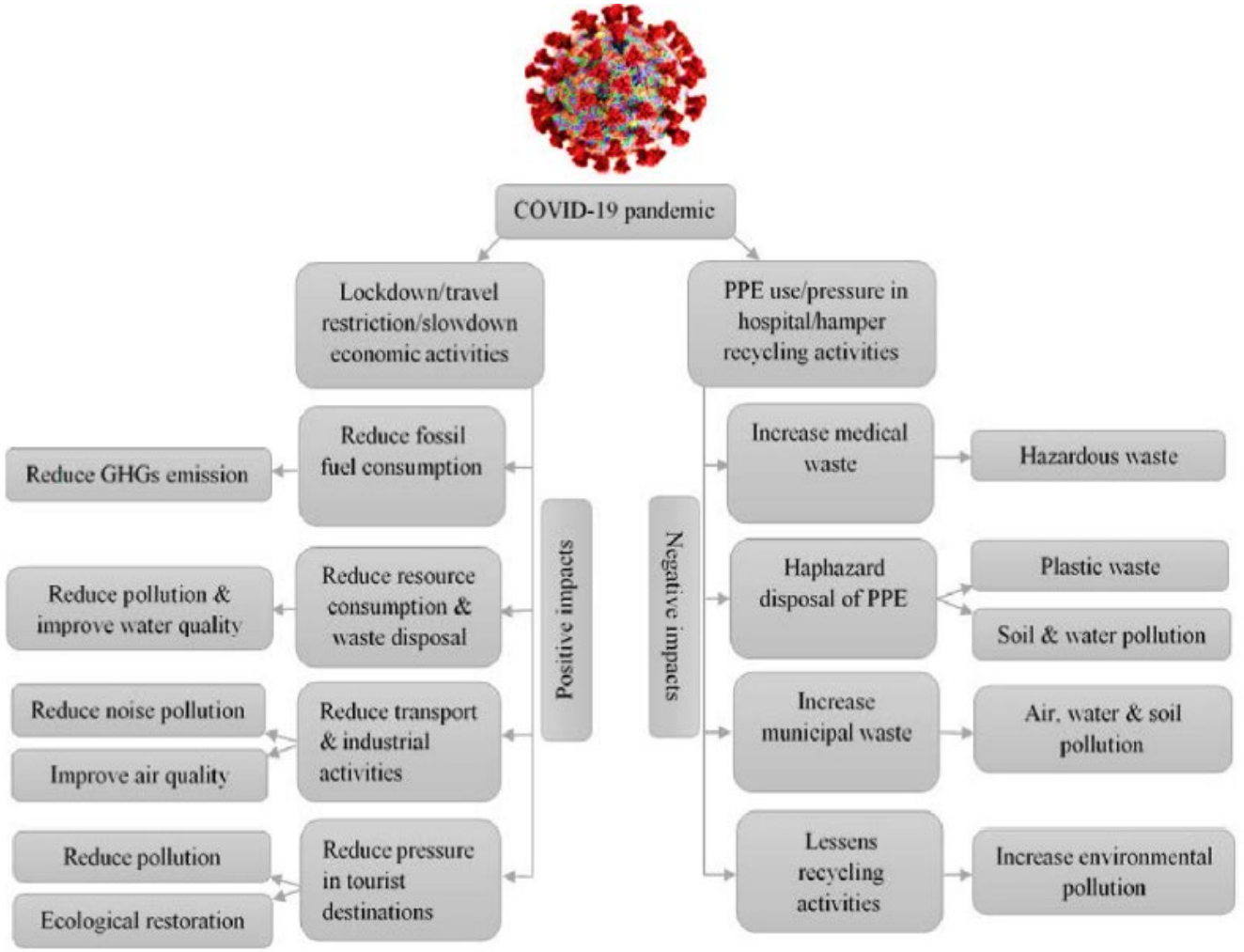
Introduction

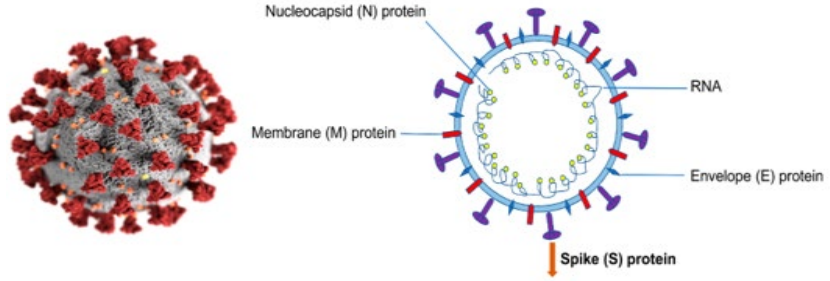
- Pandemic; It is a general name given to epidemic diseases that spread in a wide area in more than one country or continent in the world and according to the definition of the World Health Organization (WHO), there should be three criteria for a disease to be a pandemic. These are the fact that it is a mutated or new virus, can easily infect humans, and can be easily and continuously transmitted from person to person. Coronavirus Disease (COVID-19) first emerged as a new type of coronaviruses in Wuhan, China at the end of December 2019.
- Due to the compulsory lockdown and social-economic activities caused by COVID-19, positive effects such as a decrease in water pollution, improvement in air quality (CO_2, NO_2, vehicle emission, etc.), decrease in noise pollution in different parts of the world have been observed in different parts of the world. In contrast, face masks, gloves, disinfectant products, etc. increased use, their haphazard disposal, and the generation of large amounts of hospital waste have had negative effects on the environment.

- Both positive and negative environmental effects of COVID-19 are present in **Fig. 1.**

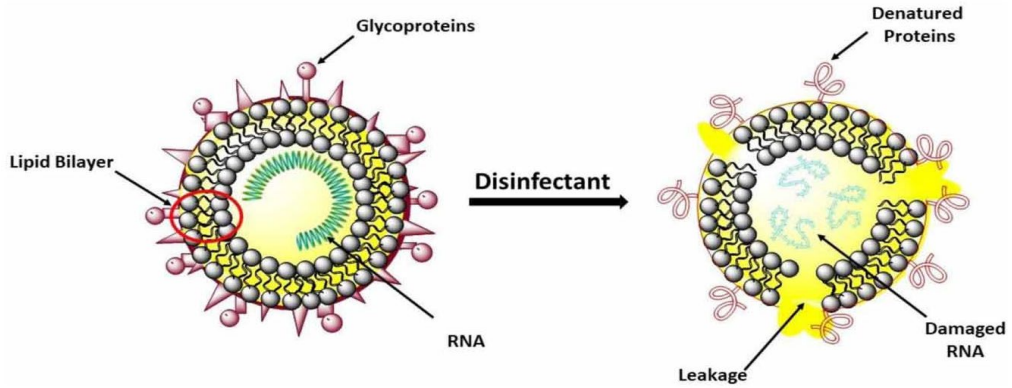


Disinfectants in spite of coronavirus

- Disinfection with the use of chemicals has been a common practice for years to remove pathogenic microorganisms. Disinfection is a method involving the use of a chemical agent to eliminate almost all recognized pathogenic microorganisms on inanimate surfaces. Today, it is a widely used practice to prevent COVID-19 infection in homes and public areas. In many parts of the world, high concentrations of disinfectant solutions are used by spraying in urban public areas to control the pandemic.



a) Schematic representation of the coronavirus



b) The effect of disinfectants on its structural components

- The list of highly effective chemical disinfectants against coronavirus is summarized in **Table 1.**
- WHO recommends correct and consistent disinfection and environmental cleaning procedures.

Active ingredients	Effective contact time (min)	Formulation type
Quaternary ammonium (Quats)	10	Dilutable
Hydrogen peroxide	10	Dilutable
Isopropanol	0.5	Wipe
Sodium hypochlorite	10	Dilutable
Octanoic acid	2	Dilutable
Phenolic	10	Dilutable
Ethanol	2	Ready-to-use (RTU)
Triethylene glycol	5	Pressurized liquid
L-lactic acid	10	RTU
Peroxyacetic acid	1	Dilutable
Glycolic acid	10	Impregnated materials
Hydrogen peroxide	5	Dilutable
Citric acid	1	RTU
Hypochlorous acid	10	RTU
Ammonium carbonate	6	RTU

- As COVID-19 spreads around the world, the increased use of disinfectants can lead to global secondary disasters in human health and ecosystems. Scientific researches have been conducted on exposure to the most commonly used disinfectant compounds (sodium hypochlorite, hydrogen peroxide, alcohol, etc.) previously. All of these, when used regularly, increase the risk of chronic obstructive pulmonary disease (COPD), asthma, and eye irritation on healthcare workers and individuals. Chemical residues remaining on a surface can be airborne and inhaled, thus contributing to poor indoor air quality, often with adverse effects for asthmatic, allergic, or sensitive persons. These residues may contain chemicals that can cause cancer, reproductive and respiratory disorders, central nervous system impairment.

- Both soaps and alcohol-based disinfectants work by dissolving the lipid membranes of germs and thus deactivate them. Disinfectants serve as an alternative product in situations where soap and water can not easily procure. The minimum alcohol content of 60% is required for its germicidal effect.
- The World Health Organization (WHO) recommends alcohol-based hand sanitizers because of their rapid effect, proven benefits, and a wide range of germicidal protection against bacteria and viruses. Hand disinfectants containing 62% -95% alcohol are the most effective products, as they denature germ proteins and deactivate viruses.

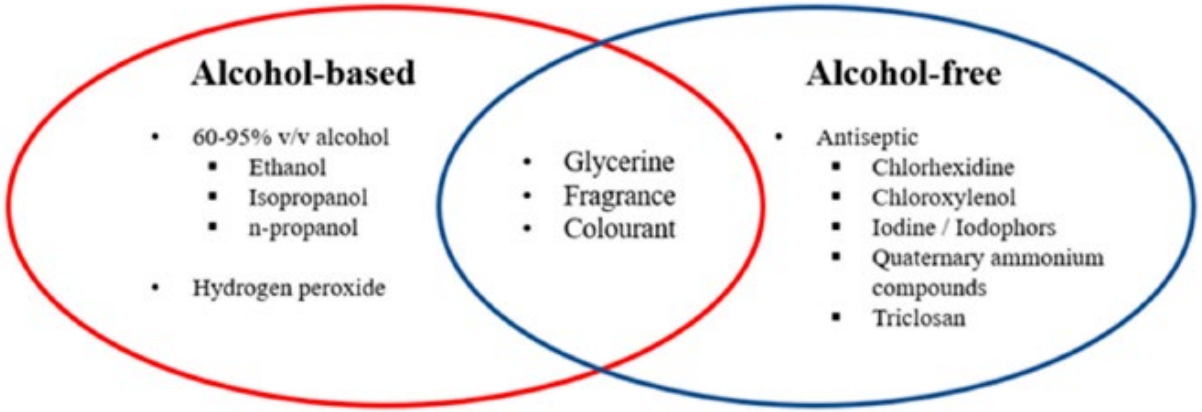


Figure 3. Hand sanitizer types and contents

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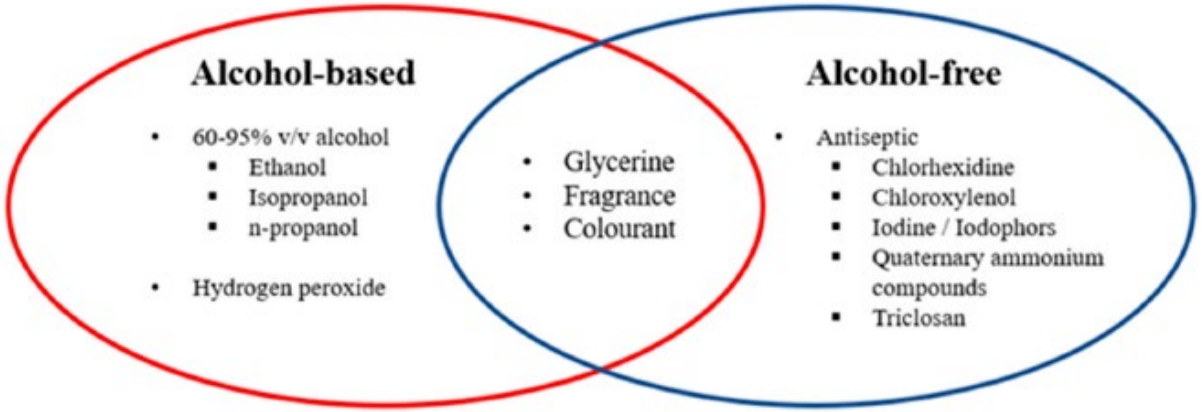


Figure 3. Hand sanitizer types and contents

- Homes, quarantine centers, and hospitals have been generating large amounts of biomedical waste (BMW) worldwide since the COVID-19 pandemic. Personal protective equipment, test kits, surgical face masks, and nitrile gloves are the biggest contributors to waste volume. Described as COVID-19 waste, BMWs are a major global concern for public health and environmental sustainability when discarded improperly. These wastes must be disposed of after being disinfected with appropriate disinfection conditions and methods. The first step of strategies for the disinfection of COVID-19 waste is the classification of hospital waste. Classification of waste at its source is both efficient and the best practice to prevent the virus from spreading to other environments by waste. COVID-19 waste needs to be collected in separate bags, disinfected with specific solutions, and sealed. While it is possible to control these processes in hospitals, disinfection processes cannot be performed adequately because the control of COVID-19 wastes in home quarantines is difficult.

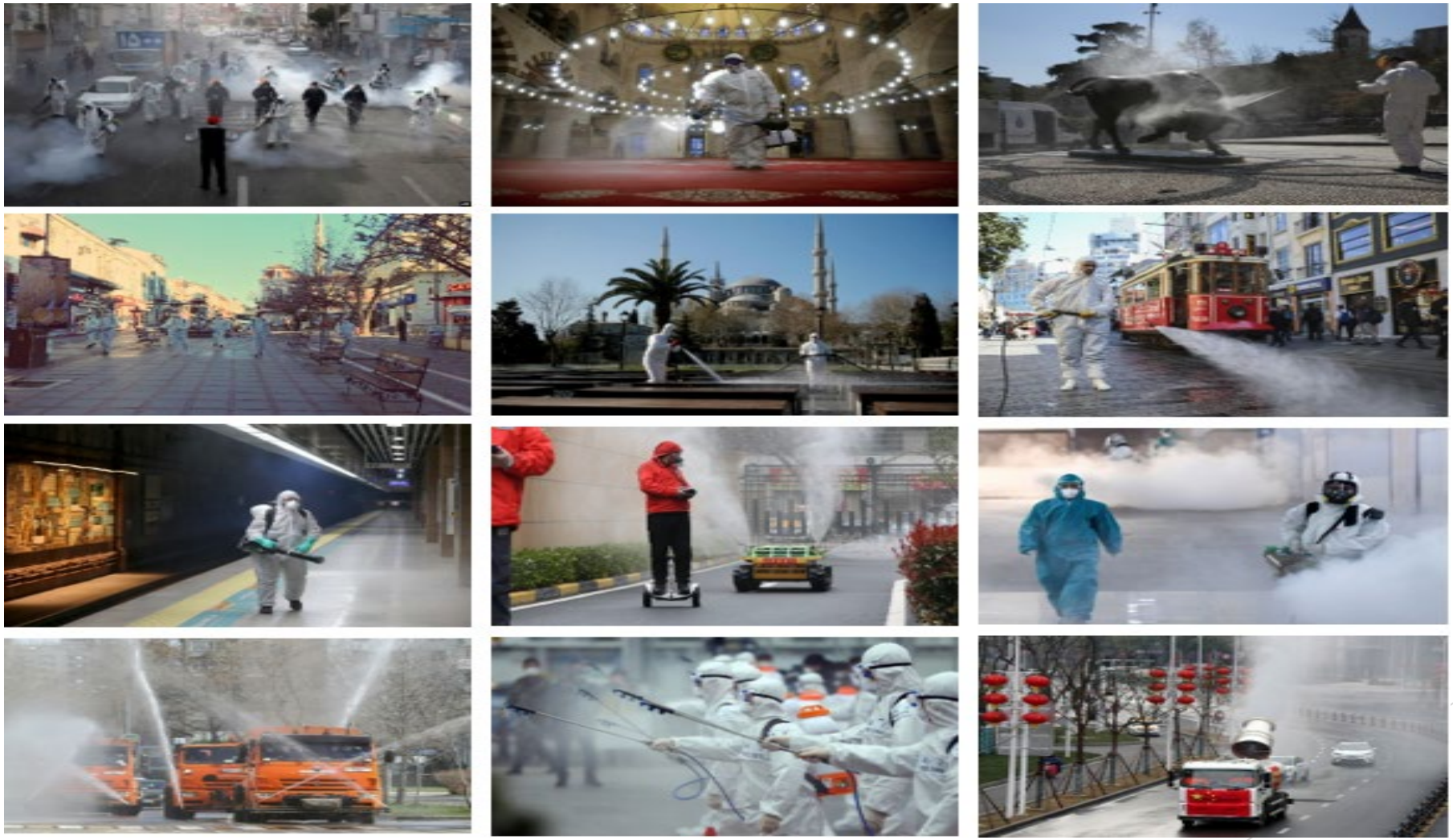
Figure 4. Biomedical waste (BMW) produce and disposal processes.

- Disinfection is an effective manner to remove pathogenic microorganisms that cause infectious diseases. There are scientific norms for the selection and proper use of disinfectants in hospitals, laboratories and homes that take into account their efficiency, suitability and health risks. However, disinfectants used in outdoor environments to control infectious diseases such as COVID-19 do not have comparable guidelines or monitoring mechanisms. Considered the toxicological effects of disinfectants on both terrestrial and aquatic animals, this practice is likely to pose a serious threat to the urban environment, wildlife and biodiversity in general. For example, the application of such high volumes of disinfectants can contaminate food and water supplies or living spaces of free-living animals.Therefore, it is important that disinfectants used to control COVID-19 in urban areas are selected and applied in a way that prevents unnecessary environmental pollution.

Conclusion

- Since there is no legislation for the large-scale use of disinfectants in urban areas settings, it is very important to develop strategies to minimize the environmental pollution caused by this practice. Several possible strategies can be proposed to respond to public health issues such as COVID-19 without harming the urban environment, individuals and biodiversity.
- First, public health and environmental safety should be considered when deciding on when, where and how disinfection should be carried out and which disinfectant to use.
- Second, as information on the ecological consequences of excessive application of disinfectants in cities is limited, further research on the potential threats of these practices to the environment and to biodiversity is urgently needed.
- Third, disinfectants should be developed as soon as possible which are low-risk, non-toxic, intervenable with in a sudden and unexpected situation and suitable for common application in open urban environments.
- Fourth, antibacterial products (soap, wipes, gels etc.) should not be preferred especially in hand disinfectants. Because these products cause the death of beneficial bacteria in the human skin, the immune system of the individuals may be adversely affected.

To summarize, biological and environmental safety assessment and prevention system needs to be laid out, especially when managing future pandemic provisions.

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Dziękuję Ci
Danke
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Tack
Takk skal du ha
Thank You!
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