Received: 02 June 2021 | Revised: 19 July 2021 | Accepted: 20 July 2021
DOI: 10.22034/ecc.2021.293309.1195

Eurasian Chemical Communications
SAMI

FULL PAPER

Post corona: Chemicals, environmental factors, and public health

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Nowadays that some countries are applying exit plans from corona restriction rules, the role of environmental health will become clear. The COVID-19 pandemic is driving the demand for disinfectants, pharmaceutical agents, masks and nutritional strategies, which has led to increased interest in public and environmental health. There is an urgent need to identify the health effect of various chemicals in our environment and consider the development and application of environmentally friendly chemicals including magnetic nanoparticles, carbon nanotubes, silver nanowires, antibody-linked graphene sheets to verify them for various health problems. This review inspects the strategies to prevent and improve environmental health and the impact of chemicals in post-coronavirus infection.

KEYWORDS

Coronavirus; environmental factors; public health; chemicals.

Introduction

Covid-19, or acute respiratory syndrome, is a sudden onset of peak pneumonia caused by the coronavirus family, which originates in one of China's southern states and spreads to almost every country in the world [1,2]. The virus is transmitted through close contact with infected people as well as the contaminated objects of an infected person [3,4]. According to the latest meta-analysis of 60000 patients with 19-COVID, the virus death rate is 4.1 percent [5]. However, most of the dead peoples had previous illnesses such as cardiovascular disease, high blood pressure, weakened immune systems, and diabetes. At-risk individuals include the elderly, people living with the patient, and health care personnel who are responsible for the care and treatment of these patients [6]. Researchers now believe that despite the temporary stagnation of the disease, the outbreak of corona is likely to lead to widespread pandemics around the world. The incubation period of the disease is between 4-8days and sometimes up to 14 days. The disease begins and develops with symptoms of the common cold, a fever of 38 degrees, muscle aches, and a dry cough. Pulmonary imaging in some patients shows symptoms of unilateral or bilateral pneumonia. Laboratory symptoms can include lymphopenia, decreased blood oxygen, and increased CPK and LDH. By identifying the virus genome, the cause of the disease is a new type of coronavirus family. New molecular methods of virus detection have been made possible in clinical specimens using RT-PCR within a few hours. The virus appears to be caused by domestic animals, especially birds, including bats [7] (Figure 1).

FIGURE 1 Covid-19 coronavirus infection transmission ways

Viruses are an important factor in acute and chronic diseases in humans. Regardless of the frequency of infection in communities, most types of viruses are important hospital pathogens. Infections related to health measures are an important source of infection and mortality in patients. Disinfection is a major way to reduce or stop the transmission of viruses through environmental surfaces, tools, and equipment, which is done by disinfecting chemical disinfectants and antiseptics, respectively [8]. Viral infections can also place a heavy burden on health care systems and systems, and an important predisposing factor for secondary infections is more severe and possibly bacterial lethal. Viral infections account for 60% of human infections. About 5% of nosocomial infections and 30% of childhood infections are due to contact with viruses [9]. Viral disease spread control includes vaccination, blood and tissue screening, the use of barriers such as condoms, masks, and gloves, etc., and the use of antiviral drugs, each of which is currently banned. Some include exposure to vaccines for all viruses, different immunosuppressive responses to vaccination, a limited range of antiviral drugs, viral resistance to non-viral and viral infections, and most often proper isolation of patients with the disease. However, the heavy burden of controlling the transfer and expansion of the virus through environmental surfaces, or contaminated medical equipment contain chemical disinfectants [10]. Person to person transmission through "contact" or "drop" is the key way of transmission of coronavirus. In "contact" mode, failure to observe a distance of 1 to 2 meters with the patient will cause transmission. Exhalation, coughing, sneezing, or talking can cause the patient to transmit the disease through a "drop." It hangs in the air and forms an aerosol [11]. Virus-carrying aerosols that float in the air can cause illness when inhaled.

Factors affecting the chemical inactivation of viruses (Environmental health)

Virus target

Target sites in the virus structure for viruses in the following order: They, as well as their proliferation and inactivity in the environment, have fewer target locations. In the early 1960s, De Forest and Kelin divided viruses into three groups based on their susceptibility to micro biocides (alcohol, including methanol, ethanol, propane, and butane): Influenza, vaccinia, large, non-influenza-free (partially lipophilic) viruses with moderate susceptibility such as adenovirus, and small-virus-free (hydrophilic) viruses that have the lowest sensitivity [12] such as poliovirus, Coxsackie B1. There are also differences between viruses. Viruses differ in their susceptibility to microbicides due to their external lipid coat. Also, the destruction of this lipid coating, which contains the virus-binding receptors that bind to the host, is effective and more easily involved in the inactivation of these viruses against virus-free viruses. Therefore, in non-vector viruses, it has been observed that larger viruses are disabled more easily than smaller viruses, and this difference is due to the overall structure of these viruses. Surfaces are usually divided into two categories: Living surfaces, such as human hand surfaces, and inanimate objects.

Inanimate surfaces are divided into two categories: Porous, paper, carpet, and non-porous, such as ceramic. Intrauterine factors include surface characteristics (surface type, available moisture), virus characteristics (family, species, headline, virus-associated material), and the state of the virus attached to them. And extrinsic factors include ambient temperature and humidity. At laboratory and hospital levels and in similar situations that are slightly affected by changes in pH and natural UV radiation, these variables also have little effect on the survival of the virus in such environments [13]. It has been observed that astroviruses and adenoviruses survive for more than 90 and 30 days on the paper surface (perforated) and 60 and 15 days on the initial virus titer on the aluminum surface (without disturbance), respectively. On the surface, it can make the virus last longer. Also, intestinal non-invasive viral viruses have a longer shelf life than viruses on the surface, such as virus A Hepatitis (HAV, astrovirus, and rotavirus, which can be compared with two viruses per month or more [14] (Figure 2).

FIGURE 2 How long does the coronavirus survive on surfaces?

The virus family is also affected by these changes, for example, the coronavirus E229 lasts between 12 hours, and the coronavirus OC43 lasts up to three hours on survival levels. And the CoV-SARS-2 coronavirus can survive for several days [15]. Temperature changes reduce the survival of an asteroid from eight days to less than one day but do not affect HAV, adenovirus 40, and p13 rotavirus. High humidity causes viruses such as enteroviruses and rhinoviruses to survive longer. Humidity reduction also has a negative effect on the survival of viruses such as HAV, adenovirus 40, and P13 rotavirus. Viruses outside the host organism are not proliferative in the environment and therefore do not produce biofilm, caused by environmental proliferation, but viruses may be trapped in the biofilm as a result of the environmental proliferation of bacteria or fungi. It somehow protects them from environmental factors and disinfectants, but in these cases, sometimes some enzymes of bacteria or fungi can be dangerous for viruses [16].

An appropriate disinfectant can complete the microbiological sterilization process without harming humans and their environment. Disinfectants used in homes should never be mixed with other cleaning agents as they may cause dangerous chemical reactions [17].

Disinfectants effectiveness evaluation

Most of disinfectants are destructive to humans, animals and environment. As commonly used disinfectant, sodium hypochlorite is effective in hospital wastewater treatment. Sodium hypochlorite easily can enter the sewage and lead to drinking water resources pollutions.

Chlorine disinfectants is another example of environmental concerns and because of easy binding properties with other agents, they can form detrimental mixtures and could threaten aquatic organism and plants [17].

Phenol is a standard disinfectant, and "phenol coefficient" is using as rating system for comparing of the effect of various disinfectants. Disinfectants with higher coefficient (>1) are more effective than phenol [18]. Another method of determining the effectiveness of disinfectants has been classified by the United States Environmental Protection Agency into three levels: High, medium, and low.

Except for bacterial spores, high-level disinfectants kill all microrganisms. Medium-level disinfectants kill all viruses, bacteria and mycobacteria [19].

Types of disinfectants

Air disinfectant

Air disinfectants are typically chemicals that can disinfect airborne microbes. Previous studies showed that dilute bleach could killed microbes in the air. Adequate concentration of air disinfectant as vapor significantly reduce the number of strong infectious viruses in the air [20]. Triethylene glycol is one of the most effective disinfectants for the air controlled in lab but it is more problematic to use successfully in public locations due to its strong chemical compounds that may cause respiratory problems in the air outside the laboratory. However, other disinfectants can quickly fight and kill germs and airborne viruses. Air disinfectants can be one of the ways to prevent this dangerous disease these days when the dangerous coronavirus has become very widespread [21].

Alcohol

Quaternary ammonium cation compounds that containing alcohol are suitable disinfectants for surfaces and are used in hospitals and medical centers as the main disinfectant for medical equipment and various levels. Water-soluble Isopropyl Alcohol or 70% ethanol easily effective in combat with varied range of bacteria. In addition, higher concentrations (5% isopropanol + 80% ethanol) are very effective in eliminating viruses containing lipids [22]. Mixing of alcohol with coconut soap (lauric acid detergent) is greatly improved its effectiveness. In addition, using of 29.4% ethanol with dodecanoic acid is the effective way against wide range of bacteria, fungi, and viruses is very significant. Alcohol is also used to disinfect wounds and prevent infection.

Aldehydes

Formaldehyde and glutaraldehyde as aldehydes have strong antimicrobial and antifungal properties. Aldehydes are the result of hydrogenation from type 1 alcohol and have antiseptic properties.

Oxidizers

Oxidizing agents including oxygen and chlorine oxidize the cell membrane of microbes, which leads to the destruction of the cellular structure and thus their death.

Proxy acids

Proxy acids are powerful oxides and highly effective disinfectants in a variety of forms: Performic acid, Peroxybenzoic acid peroxypropionic acid meta-chloroperoxybenzoic acid peroxymonosulfuric acid

Phenols

Most of household disinfectants and disinfectant soaps and some mouthwashes have phenols, as active ingredients which is toxic for the new born. Phenols are one of the oldest disinfectants, but in some cases, they may be allergenic.

The fourth type ammonium cation

The fourth type of ammonium cation is another group of disinfectant compounds. Ammonium cations in doses of 200 ppm or higher, as well as alcoholic solutions, have potent antiseptic effects against the elimination of viruses such as Norovirus, Rotavirus, or Poliovirus. Ammonium cation formulations with lower alcohol content have also developed stronger disinfectants with faster exposure times in combat with most of microorganisms. As an additive, ammonium cation compound is also a dioxide that also kills algae and is used in industrial water treatment.

Nutritional recommendations for the prevention of respiratory and Covid-19

Immune system function plays an significant role in the prevention of respiratory illnesses, including coronavirus. The causative agent of the virus is underlying diseases such as diabetes and lung disease, heart disease, malnutrition, and lack of proper nutrition [23]. Lack of food intake and deficiency of vitamins such as vitamins C, A, and D, and immune weakness increase the risk of disease. With daily intake of vitamin C foods such as vegetables and salads with food, fruits containing vitamin C such as oranges, tangerines, lemons, kiwis, and vegetables with vitamin C such as cabbage, cauliflower, turnips, green peppers, and bell peppers, Parsley, onion, watercress, and tomato are good sources of vitamin C. For example, a daily intake of one orange or two tangerines provides the daily vitamin C your body needs [24]. Carrots, squash, and dark green vegetables such as spinach, beet leaves, and dark lettuce are also good sources of vitamin A. In general, to prevent disease and strengthen the immune system, it is recommended to consume 3 units of vegetables per day, except starchy vegetables (and at least 2 units of fruit (25). Children under 5 years of age, pregnant and elderly mothers, and patients taking corticosteroids are at higher risk [26].

Discussion

The World Health Organization (WHO) Standard General Recommendations to reduce exposure to pathogenic microbial agents and to prevent diseases wide range transmission, for the general public including are hand hygiene, respiration, and food hygiene. COVID-19 virus, environmental disinfection control methods must also be implemented. The US Health Care Hub guidelines outline the usual cleaning and disinfection methods suitable for the COVID-19.

However, a systematic review of similar studies of various disinfectants (including ethanol concentrations between 62 and 71%) disabled several coronaviruses associated with SARS-COV-2 within one minute. Furthermore, the inevitable elimination of abrasive devices and non-living surfaces is effective in controlling the chain of transmission of coronavirus in hospital settings and prevention of healthcare-associated viral infections [27].

Future perspective

Using of eco-friendly chemicals and antioxidants could be effective in post-corona era to circumvent the occurrence of health risks. Magnetic nanoparticles, carbon nanotubes, and silver nanowires as effective substitutes for masks coating can help in production of environmentally friendly and reusable agents.

Also, environmental virus sensors including antibody-linked graphene sheets coud be used on face masks as as coatings to combat with COVID-19 [17].

Conclusion

However, not all chemical and physical disinfectants are necessarily viruses unless they are tested using standard methods, proven to be viral, and used based on the tested desktop [28]. Recent research, in addition to experiments with serious chemical agents to find out their viral properties by standard methods as well as promoting viruses, has led to the mechanism which affects viruses to elucidate the cause of virus susceptibility or resistance [29].

Acknowledgments

The authors are thankful to Maragheh University of Medical Sciences, Maragheh, Iran.

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How to cite this article: Zahra Asefy, Shakar Mammadova, Aygun Nasibova, Rovshan Khalilov*, Elvin Aliyev, Renad I. Zhdanov, Aziz Eftekhari*. Post corona: Chemicals, environmental factors. *Eurasian Chemical Communications*, 2021, 3(8), 526-532. **Link:** http://www.echemcom.com/article_133935.html