



## REVIEW ON THE IMPACT OF COVID-19 ON CHEMICALS AND WASTE

### Executive Summary



The coronavirus (COVID -19) outbreak has led to the widespread use of chemical disinfectants to treat public spaces and prevent infection. Disinfectants and antiseptics are designed to protect the population from viruses and pathogens, so their quality is especially important.

#### **Basic information and preventive measures for COVID-19**

Coronavirus is a viral disease characterized by a primary lesion of the respiratory system. On March 11, 2020, the World Health Organization declared the outbreak of the coronavirus COVID-19 a global pandemic. Suggested measures to prevent the incidence of coronavirus included:

- Wear personal protective equipment (masks and gloves);
- Wash hands regularly;
- Wipe hands with alcohol-based antiseptics; and
- Ventilate the premises regularly.

#### **Kazakhstan restriction measures to prevent the spread**

Between March 16 and May 11, 2020, a state of emergency was introduced in Kazakhstan to prevent the spread of the virus: restrictions on entry and exit were imposed; quarantine or other restrictive measures were introduced in all regions; and the activities of large, non-food retail outlets, cinemas and other places with potential mass crowds of people were suspended.

One of the preventive measures used to prevent the spread of coronavirus infection was the treatment of streets and premises with the use of detergents and disinfectants. According to the Resolution of the Chief State Sanitary Doctor, the Committee of Quality Control and Safety of Goods and Services, the Ministry of Health of the Republic of Kazakhstan dated April 9, 2020 “On measures to ensure the safety of the population of the Republic of Kazakhstan in accordance with the Decree of the President of the Republic of Kazakhstan,” “On the introduction of a state of emergency in the Republic of Kazakhstan”, processing with detergents and disinfectants should be carried out for public transport before each flight; in airports, railway and bus stations, markets, public transport stops (at least twice a day); and on railings of above and underground pedestrian crossings, sports equipment, playgrounds and sports grounds, benches, ATMs, bank and POS terminals.

#### **Requirements for disinfectants**

By the decree of the Chief State Sanitary Doctor, instructions for carrying out disinfection measures were developed in order to prevent the spread of COVID-19:

1. Disinfectants must be registered and authorized in the prescribed manner for use in the territory of the Republic of Kazakhstan and the Eurasian Economic Union and included in the

Unified Register of State Registration Certificates of the countries of the Eurasian Economic Union.

2. Disinfectants must be used with strict adherence to the instructions attached to them, which reflect the disinfection regimes for viral infections.

3. Preparation of solutions of disinfectants must be carried out in a fume hood or under an exhaust hood in a specially designated place.

4. It is not allowed to transfer disinfectants to unauthorized persons and leave them unattended.

5. Disinfectants must be transported by specialized vehicles or other vehicles adapted for the transport of dangerous goods.

6. Disinfection (processing) must be carried out using personal protective equipment.

7. Only adults who have no contraindications for health reasons are allowed to work with disinfectants.

### **Methodology of work**

To prepare the review, a search, analysis and monitoring of all available materials related to coronavirus infection were carried out. Statistical data on the spread of the coronavirus COVID -19 in Kazakhstan, measures taken by the Government of the Republic of Kazakhstan and the introduction of a state of emergency and the current regulatory legal acts were analyzed.

Requests were sent to local executive bodies (akimats) and other interested parties to obtain information on the disinfectants used for the treatment of streets and premises in different cities of Kazakhstan. In total, about 16 requests were sent. The received responses were processed and included in the relevant sections of the review.

Within the framework of the project, the Center conducted a study of antiseptics for the absence of toxic substances and compliance with the declared composition. For this, four samples of hand sanitizers were bought. Work was done to select a laboratory to conduct qualitative and quantitative analyzes. The analysis was carried out in the accredited laboratory “Ecology of the Biosphere”. Upon completion, a test report was received.

All available materials were analyzed to describe the waste management situation in Kazakhstan. From conversations with large enterprises and organizations that are engaged in the collection and processing of waste, we learned about an increase in municipal solid waste by 2 times.

To spread the information and draw attention to the problem of the use of disinfectants, an article was prepared for publication in national press releases and magazines, as well as a webinar. The article was published on the website and in the social networks of the Center and other partners.

### **Overview of the current situation on the use of disinfectants in Kazakhstan**

To assess the disinfection work carried out, the Center made requests to the local executive bodies of the cities of Kazakhstan to obtain data on disinfectants that are used to treat streets, courtyards, entrances and other premises. These data are shown in Table 1.

**Table 1 – Data on disinfectants used for disinfection of streets and premises in cities of Kazakhstan**

<b>№</b>	<b>City</b>	<b>Disinfectants</b>	<b>Manufacturer</b>	<b>Ratio</b>	<b>Application</b>
1	Almaty	Sodium hypochlorite	JSC “Caustic” Pavlodar	0.3% solution	Streets and sidewalks

2	Aktau	Calcium hypochlorite	Medic-hygiene	0.03% solution	Central and micro district roads, central square, squares, parks, playgrounds and crowded places
		Akma-chlorine	LLP “SierraDynamic”	0.03% solution	
3	Aktobe	Calcium hypochlorite		0.1% solution	Entrances of ownerless houses, stops, open areas
4	Karaganda	Deseconom			Yard territories, entrances of houses, playgrounds, suburban areas
		Akmoher			
		Hypochlorite			
5	Kostanay	Deo-chlorine		0.034% solution	Children's and sports courtyard grounds, and bus stops
6	Pavlodar	Sodium hypochlorite DP-2G		2 tablets for 10 liters of water	Street surfaces
7	Petropavlovsk	Diochlor		10% solution	Surfaces of streets of carriageways, sidewalks and squares
8	Taldykorgan	Hypochlorite			Streets and courtyards
		Whiteness, deochlor, desosteryl extra, desosteryl chlorine			Multi-story houses
9	Uralsk	Dichlor, whiteness			Stopping pavilions, squares and parks
10	Ust-kamenogorsk	Deschlor			

Based on the data obtained, it can be concluded that sodium and calcium hypochlorites are the predominant substance for surface treatment. From the data obtained from the local executive bodies of the cities of Kazakhstan, it can be understood that the ratio of solutions corresponds to the WHO guidelines. Even though all disinfectants and substances used in the cities of Kazakhstan have state registration and are presumably used in the correct ratio, it is important to remember that they can irritate the eyes and skin with repeated and prolonged exposure. When disinfecting with the above-mentioned agents, the rules and instructions must be strictly followed, all personnel must be trained and qualified.

During the state of emergency in Almaty, disinfectants were sprayed in tunnels in all large shopping and entertainment centers. However, according to WHO, this method is ineffective and is considered hazardous to health. Today, the spraying of disinfectants in the tunnels is carried out partially.

The WHO interim guidance says that spraying disinfectants outdoors and indoors is ineffective in the fight against COVID-19. According to the organization, this method can cause eye damage, respiratory tract or skin irritation.

Spraying disinfectants on people (for example, in corridors, offices, or other areas) is not recommended under any circumstances. This can be harmful from a physical and psychological point of view and will not reduce the spread of infection.

### Qualitative and semi-quantitative analysis of hand sanitizers

Within the framework of the project, the Center conducted a study of antiseptics available on the market in Kazakhstan for the absence of toxic substances and compliance with the declared composition. Gas chromatography with mass spectrometric detection (Agilent 7890A / 5975C) was used for qualitative and semi-quantitative analysis of hand sanitizers.

As a result, four types of liquid transparent antiseptics were subjected to chemical analysis.

Table 2 shows the quantitative data (% wt.) of the formulations of hand sanitizers on the label and in fact.

**Table 2 – Quantitative data (% wt.) of hand sanitizer compositions in the label and in fact**

Sample	On the label		In fact	
	Structure	% mass.	Structure	% mass.*
No. 1	Isopropyl alcohol	**	Isopropyl alcohol	96,6
	Distilled water	**	Water	3,4
	Glycerol	**	Glycerol	0
	Hydrogen peroxide	**	Hydrogen peroxide	0
No. 2	Ethanol	66,2	Ethanol	90,3
	Distilled water	**	Distilled water	9,7
	Glycerol	**	Glycerol	0
	Perfume composition	**	Perfume composition	0
No. 3	Isopropyl alcohol	70	Ethanol	92,3
	Distilled water	**	Distilled water	7,7
	Glycerol	**	Glycerol	0
	Hydrogen peroxide	**	Perfume composition	0
No. 4	Isopropyl alcohol	70	Ethanol	83,9
	Distilled water	**	Distilled water	16,1
	Glycerol	**	Glycerol	0
	Thickener	**	Thickener	0

Note:

\* – the calculation of the percentage was carried out by the method of normalization by peak areas

\*\* – no data

Studies have shown that only antiseptic No. 1 corresponded to the declared composition indicated by the manufacturer, in terms of alcohol content. In the rest there was an inconsistency. Two samples (No. 3, No. 4) contained ethanol instead of the isopropanol indicated on the label. By itself, the use of ethanol instead of isopropanol does not play a special role in terms of bactericidal properties. However, inconsistency with the declared composition is either deliberate misleading of the consumer, or poor quality control of raw materials.

In three samples (No. 2, No. 3, No. 4) the alcohol content exceeded the declared volume and in fact, they amounted to 90.3 %, 92.3%, 83.9 %. Chemical and microbiological studies have fully proved the direct dependence of the antimicrobial effect on the percentage of alcohol content: the more alcohol contains an antiseptic, the better it inhibits the growth of bacteria. However,

according to WHO-recommended formulations, hand sanitizers should contain alcohol in the range of 65-70%<sup>1</sup>.

It should also be remembered that antiseptics are not suitable for continuous use. Frequent use of antiseptics may be harmful for the skin as they can change the microflora of the skin and cause dryness and flaking. Itching and allergies may also occur due to the high content of chemicals and fragrances in the product.

### **Waste management issues during COVID-19**

Even though quarantine measures have been relaxed in Kazakhstan, a number of restrictive measures are still being observed, including the mandatory wearing of masks. However, used masks and gloves have become a new environmental pollution problem. Used masks and other personal protective equipment, if not handled properly, pose a threat to the spread of coronavirus infection and possible secondary effects on the environment and human health.

Medical waste is a source of harmful chemical and biological elements into the environment. Therefore, it is necessary to comply with the established rules for the management of medical waste.

In Kazakhstan, about 6 million tons of municipal solid wastes (MSW) are generated annually. Based on the results of various studies, the average morphological composition of solid waste in Kazakhstan was determined (Table 3).

**Table 3 – Average morphological composition of solid waste in Kazakhstan**

<b>Components</b>	<b>Share of MSW components, %</b>
Food waste	31.1
Waste paper	25.2
Polymer (plastic)	11.2
Glass	6.1
Metal	3.4

Considering that, in terms of morphology, the share of plastic waste is 11.2% of all solid waste, 672 thousand tons of plastic waste is generated annually, and 56 thousand tons per month. According to the data of large enterprises and organizations that collect and process, the volume of solid waste from the population increased by 2 times during the quarantine period. This means that the volume of plastic waste, originally 56 thousand tons per month, amounted to 112 thousand tons per month during quarantine.

One of the reasons for the increase of waste was the delivery of food to go. After the introduction of the state of emergency by the Government of Kazakhstan in March 2020 and the ban on the operation of catering facilities, CSD witnessed that the number of food products delivered in plastic packaging increased.

During the state of emergency, most of the waste sorting and recycling facilities suspended activities. Due to the state of emergency, the population had to stay at home, and as a result, manual waste sorting was not carried out. Waste, including hazardous waste, ended up in the landfill without sorting.

During the state of emergency, waste collection companies worked without interruption, and due to the increase in the volume of solid waste, an additional burden on the waste management system appeared. In connection with the state of emergency, the Government of the Republic of Kazakhstan provided support and postponed utility bills, including for the

<sup>1</sup> <https://www.euro.who.int/ru/health-topics/health-emergencies/coronavirus-covid-19/publications-and-technical-guidance/infection-prevention-and-control/cleaning-and-disinfection-of-environmental-surfaces-in-the-context-of-covid-19-interim-guidance,-15-may-2020>

removal of solid waste. Enterprises working in this area were left without any financial income, since they exist only at the expense of the tariff for waste disposal. Companies did not receive government subsidies or other support during the state of emergency. The financial state of companies involved in the export of solid waste was unstable even before the pandemic, and the situation in quarantine worsened.

During the state of emergency, the Center sent letters to the Ministry of Ecology, Geology and Natural Resources, the State Commission for Ensuring the State of Emergency under the President of the Republic of Kazakhstan and the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” with a request to allocate subsidies from the state for the purchase of fuels and disinfectants, and to provide PPE for employees for waste disposal. In order to avoid a massive reduction in the staff of landfills, sorting points, it was necessary to consider payments of the minimum wage as an additional incentive to participate in the disinfection of cities. The period of the state of emergency did not last long, and utility bills were soon resumed, and waste collection facilities began to operate normally.

### **Conclusions and recommendations**

1. Based on the data received from the akimats of the cities of Kazakhstan, it can be understood that the ratio of disinfectant solutions for the treatment of streets and premises corresponds to the WHO guidelines for cleaning and disinfecting premises and surfaces in the context of COVID-19. However, disinfectants have an odor that adversely affects the well-being of people with health problems. With the wrong ratio and repeated use, these agents cause irritation of the mucous membranes of the respiratory tract and eyes, as well as the skin.

2. During the state of emergency in Kazakhstan, mainly volunteers were involved in disinfection activities. When using disinfectants, the rules and instructions for use must be strictly observed, and all personnel must be trained and qualified.

3. According to WHO, spraying disinfectants on people in tunnels that are in all large shopping and entertainment centers in Almaty is considered hazardous to health. Due to the risk of possible damage to the eyes, irritation of the respiratory tract or skin, this disinfection method must be prohibited.

4. When disinfecting any surfaces, it is recommended to wipe with a cloth soaked in disinfectant instead of spraying.

5. According to the WHO recommended recipes, hand sanitizers should contain 65-70% alcohol in the composition. However, the study found an excess of alcohol in three samples of hand sanitizers. Control by authorized bodies should be tightened to avoid negative impacts on human health.

6. Inconsistency with the declared composition of the two samples of hand sanitizers and the use of isopropanol instead of ethanol shows poor control by the competent authorities and poor quality control of raw materials.

7. It is necessary to pay special attention to antiseptics, which contain fragrances, emollients and dyes. These ingredients can cause itching and allergic reactions.

8. In Kazakhstan, during the quarantine period, the volume of solid household waste from the population, including plastic, has increased. Prior to the COVID 19 pandemic, 56 thousand tons of plastic waste were generated in the country per month. However, during the pandemic the volume of plastic waste amounted to 112 thousand tons a month. This could have happened because of the increase in the number of take-away foods, as well as the use of personal protective equipment.

9. During the state of emergency there was an additional burden on the waste management system. Due to the volume of municipal solid waste generated, the garbage collection companies were working constantly without breaks or even on weekends. However, these businesses didn't receive governmental subsidies or other support during the state of emergency.

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