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Food safety practices in catering during the coronavirus COVID-19 pandemic

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Abstract:
On January 30, 2020, the Director-General of the World Health Organization declared the outbreak of COVID-19 a Public Health Emergency of International Concern. There is hardly a country in the world that is not currently facing this problem. The number of cases is constantly growing, patients and carriers being the main mode of transmission. The economies of all countries are at stake. However, people need essential goods and food, regardless of the situation. In this respect, agriculture, food industry, food market, and catering have become priority industries. A continuous operation of food service enterprises (FSE) is crucial for the uninterrupted food supply in the period of preventive measures. The paper describes how pathogen makes its way into FSEs, spreads, and infects people. This information makes it possible to assess the probability of coronavirus infection and to reduce its spread, thus ensuring the safe operation of the enterprise. There are three transmission routes the coronavirus can take at a FSE: (1) aerial transmission by droplets and aerosols during the main and secondary technological production processes, (2) person-to-person transmission from clients to staff or from employee to employee via direct or indirect contact, and (3) transmission via contaminated surfaces, e.g. packaging, furniture, equipment, etc. FSEs have to follow the recommendations published by the federal and/or local authorities, which may vary depending on the COVID-19 incidence rate in the area. These recommendations are based on the probability of the public health risk associated with person-to-person transmission, rather than on food safety.

Keywords: Coronavirus COVID-19, containment, food service enterprises, preventive measures, recommendations

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INTRODUCTION

An outbreak of coronavirus infection in Wuhan, China, has led to a global epidemic declared a Public Health Emergency of International Concern by the World Health Organization [1]. The emergence of a new human coronavirus has become a global public health problem. The virus has demonstrated a variety of forms, health effects, and incubation periods. COVID-19 is resistant to environmental factors, has a high penetration ability, and may be lethal. The challenge lies in the new form of the virus and the lack of experience in combating it, as well as in the absence of an effective medicine. An infected patient has practically no chance of recovery without medical intervention. Children under 14 and 65-plusers are at risk [2]. Since the current trajectory of the COVID-19 outbreak is unknown, authorities have to develop public health preventive measures to curb the spread and gain experience that could be transformed into treatment recommendations.

The COVID-19 pandemic has affected the whole world and all spheres of human life. Italy, Spain, France, Great Britain, USA, and China have suffered the most damage. The situation in Russia remains noncritical, which can be explained by its territorial features, long-term experience in anti-infection preventive measures, and their timely implementation. Risk awareness motivates people to adopt preventative behavior. The growing incidence and fatal outcomes abroad demonstrated Russians the need to follow official recommendations, both at home and at work.

COVID-19 is a global problem, and all global economies are going through hard times. However, there are vital industries that require priority measures, food supply being one of them. The US food and agricultural sector is 100% privately owned. It includes 2.1 million farms, 935 000 restaurants, and more than 200 000 enterprises of food production, processing, and

storage. This sector accounts for about 20% of economic activity. The American Food Industry Association (FMI) promptly issued a Coronavirus Preparedness Checklist. According to the FMI, a pandemic will require the mutual efforts of many related spheres, including health, supply chain, logistics, food safety, labor, emergency management, and the media.

The food sector is one of the strategic sectors of Russian economy. It owes its strategic implication to the fact that every citizen is a consumer of food products. The national security demands that citizens should have access to essential food products of domestic origin, regardless of imports. The food sector is represented by agriculture, food industry, food processing industry, and public food service. It is a backbone sphere of Russian economy. The food sector forms the agri-food market and ensures food security. Agriculture employs 4.346 million people, food and processing industry accounts for two million jobs, and one million people are engaged in public catering. Together, this is more than 10% of the total number of people employed in the economy. Russian food industry is represented by more than 50 000 enterprises, while public catering includes 187 000 enterprises [3]. Therefore, the national food sector is important, especially in emergency situations.

The Federal Service for Supervision of Consumer Rights Protection and Human Security responded to the epidemic as early as in February 2020. It developed Recommendations for the Prevention and Disinfection Measures against the Spread of New Coronavirus Infection in Catering Enterprises and Food Storage of Educational Organizations [4].

The coronavirus outbreak exposed serious problems in all sectors of human life, including food security. The research objective was an analysis and synthesis of the available information in order to bring it to the scientific community and the population engaged in the food sector, thus facilitating the adaptation of food service enterprises to the extreme conditions and preparing them for a possible worst-case scenario.

The practical application of the article is that it can inspire further studies of this urgent problem and set goals for the future scientific research. This seems to be the case when the development does not go "from science to practice" but "from practice to science".

RESULTS AND DISCUSSION

Canteens and refectories expose staff and clients to pathogenic microorganisms, e.g. viruses or bacteria. Workers in the production and service areas should know the so-called sanitary control points and be able to control them so as not to endanger the health of colleagues and clients.

The work of food service enterprises (FSE) during the COVID-19 pandemic is fraught with extreme conditions. At a FSE, the pathogen can spread via the following routes:

– by inhalation of microorganisms that can stay suspended in the air for a long time;
– by direct contact with oral fluids or other bodily materials that enter the FSE premises with clients;
– when the mucous membrane of the nose, mouth, and eyes is exposed to droplets and aerosols that contain microorganisms formed in the infected person and spread over short distances with coughing, sneezing, or talking without a face mask; and
– by indirect contact with contaminated tools and/or surfaces [5–10].

During the outbreak of COVID-19, the infection can spread by any of these routes, each of which is associated with an infected person visiting public places, including FSEs.

Hotels, catering and tourism incur huge losses. During the quarantine period, most enterprises were closed as high COVID-19 incidence is associated with crowded places. Therefore, it is extremely important to prevent a further spread of the virus in public places [11, 12]. Social distancing is one of the recommended preventive measures. Social distancing is most effective in all scenarios, e.g. airborne contamination when the microorganism stays viable in the air for a long time, or in cases of aerial transmission by coughing or sneezing, as well as in cases of direct or indirect physical contact, e.g. via contaminated surfaces, etc.

Adequate measures to combat the pandemic in crowded places are possible only with respect to a full understanding of the transmission mechanism and viability of the virus. Given the current global situation, the mechanism of transmission of the COVID-19 virus at FSEs requires an urgent and thorough research. Such research could help analyze and adapt measures aimed at COVID-19 risk reduction.

Food service employees run into danger of the COVID-19 infection. They communicate with clients face to face and have to deal with cutlery and table surfaces. Moreover, they are exposed to potentially dangerous biological material, e.g. saliva droplets on napkins and tableware. Therefore, FSE employees must know and follow the necessary safety rules, which may play a great role in preventing the spread of COVID-19 [5].

There is currently no evidence that COVID-19 can be transmitted via food or food packaging. Nevertheless, a person can get COVID-19 by touching a contaminated surface or object and then touching their mouth, nose, or eyes. However, this is not the main way the virus spreads. The US Centers for Disease Control and Prevention claim that COVID-19 does not live long on surface areas. Therefore, the risk of virus transmission via food or packaging is very low. It takes a few days or weeks to deliver food products and goods to FSEs. The person-to-person route is more likely, e.g. via close contact with a patient or carrier.

We performed a brief analysis of scientific literature that revealed the following COVID-19 transmission routes:

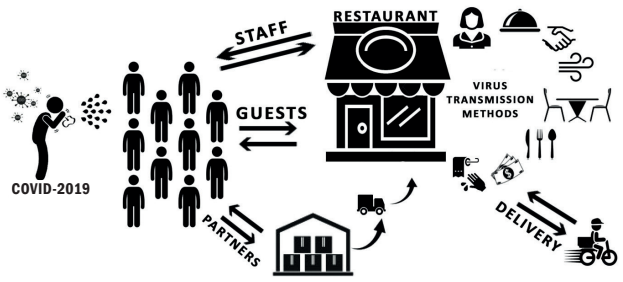

Figure 1 Transmission routes of 2019-nCoV at food service enterprises

– a person-to-person direct transmission through coughing, sneezing, inhalation of droplets, contact with oral, nasal, or ophthalmic mucous membranes, or indirect transmission via saliva [5, 11, 13, 14];
– from surfaces to humans;
– from animals to humans; and
– asymptomatic transmission [15].

There is currently no evidence that COVID-19 can be transmitted through food products. Yet, this fact does not mean that there is no risk. To assess the chance of coronavirus infection in FSE conditions, let us describe the mechanisms by which the pathogen enters a FSE, how it is transported and transmitted to humans.

Aerial transmission. This mechanism of COVID-19 transmission has been described in several studies [5, 7–8, 11, 15–18]. The pathogen can stay airborne and viable for a long time. It can spread via direct contact with oral fluids or other bodily substances. The conjunctiva of nasal or oral mucosa may contact with droplets and aerosols that contain microorganisms generated by an infected person and set in motion by coughing or talking at a close distance with no face mask on. Finally, the virus can spread through indirect contact with contaminated tools, dishes, or surfaces [7–10]. If an infected person is present on the FSE premises, the infection can follow any of these paths (Fig. 1).

Food production and catering practices show that many production processes result in droplets or suspensions that hang in the air, e.g. washing the dishes, equipment, and tools, or processing raw materials, etc. These droplets move freely in the air stream. As a result, there is a chance that they can capture the virus and carry it on [17].

Community transmission. The waitperson comes into direct or indirect contact with the bodily liquids (biological media) of the clients through table surfaces, dishes, cutlery, napkins, toothpicks, etc. Such exposure is likely to facilitate the COVID-19 spread [9].

Transmission via contaminated surfaces. The coronavirus remains viable on such surfaces as glass, plastic, wood, or metal [7, 18]. Therefore, all surfaces that food workers have to deal with are potential sources of COVID-19 transmission. There is a practice of detecting droplets and aerosols from infected people who can contaminate surfaces while visiting public places. At FSEs, the list of potentially contaminated surfaces includes tables, chairs, furniture, door handles, etc. The packaging surfaces of products and goods supplies are another potential source of the coronavirus infection. At the stage of the incoming goods inspection, the employees touch the surfaces that may contain traces of the viral infection. Thus, the virus can enter a FSE via supply transportation or simply via contact with external environment and infected people who contaminate the surfaces around them. Some types of coronavirus are known to remain viable at room temperature from two hours to nine days. Several studies showed that the virus has a better chance of survival at 50% of relative humidity than at 30%. According to Russian regulatory documents, the recommended relative air humidity at FSEs should be 60–40% in the cold season and 40–60% in the warm season. Therefore, maintaining a clean and dry environment at FSEs can help reduce the COVID-19 viability [2, 19, 20].

Popova, the Chief Sanitary Doctor of the Russian Federation, issued a monitoring system and a number of decrees that control the spread of the coronavirus infection in Russia. The decrees contain preventive measures against the COVID-19 infection. As the threat of importation and spread did not cease, Federal Law No. 53 On the Sanitary and Epidemiological Safety of the Population was issued on March 2, 2020. It introduced some further preventive measures. Additional recommendations on the COVID-19 prevention were developed for employees and heads of organizations, regardless of the legal forms of ownership.

FSEs had to limit public events during the pandemic. As for refectories and canteens, they received the following recommendations, depending on the specific conditions at the enterprise they serve:
– if the enterprise has a canteen, it is to be provided with disposable tableware. After using, the utensils are collected, disinfected, and destroyed in the prescribed manner. Reusable utensils are to be processed in specialized dishwashers at ≥ 65°C for 90 min, or manually at ≥ 65°C with disinfectants, as stated in the related sanitary standards;
– cooking process should involve high-level heat treatment technologies;
– sale or consumption of raw or insufficiently thermally processed products of animal origin is forbidden;
– butchers should observe personal hygiene rules, which include frequent hand washing after contact with raw materials and products of animal origin;
– expired raw materials can cause food poisoning; therefore, feedstock volume should be planned taking into account the decreasing amount of produced products;
– canteen and refectories should give preference to foods with a high nutritional value;

– the incoming goods inspection is to ensure a strict quality control of the incoming raw materials and the accompanying documents;
– if the enterprise has no canteen, employees are not allowed to eat at workplaces: they can have their meals only in a specially designated meal room; and
– should there be no meal room, employees are to be provided with a specially allocated meal area with a sink for hand washing and disinfectants.

The above recommendations also determine the list of food service enterprises that can be potentially dangerous:
– crowded places, e.g. food courts and canteens, with a high circulation of people, which increases the risk of encountering coronavirus patients and virus carriers;
– FSEs that sell finished products in reusable utensils are to ensure their proper sanitization with the recommended concentrations of disinfectants;
– self-service enterprises, e.g. self-service buffets, salad bars, etc.

FSEs that deliver finished culinary products have certain advantages in the current situation. Disposable tableware and shipping containers, e.g. thermal bags, reduce the risk of contamination. However, in this case, the risk zone shifts towards the person-to-person transmission route: the infection can be transmitted via airborne droplets from the delivery person to the consumer or vice versa. The surfaces the delivery person contacted with have to undergo additional disinfection, while both the employee and the client are to wear face masks and disposable gloves.

FSEs unlicensed to deliver finished products cannot operate in full during the quarantine. However, they can sell takeaway meals in disposable packaging, on condition they follow all recommended preventive measures concerning the seller – client communication [7].

Recommendations for restaurants offering takeaway services include the following points:
– FSEs can only accept online or phone orders, without face-to-face communication on the FSE premises, of which consumers should be informed via traditional advertising means;
– the delivery time should be individual for each client, i.e. they must not enter the premises until their order is ready;
– spontaneous clients are be advised to leave the premises to place their order by telephone or online and return at the appointed time to receive it;
– customers whose orders are ready must enter the site one at a time to collect their orders and make payments; and
– employees are to prevent crowding outside by using queuing systems to maintain the recommended two-meter distance.

In many Russian cities, including Moscow, public and leisure events consisting of 50 people or more were banned as early as in mid-March. Cafes, restaurants, and other FSEs fell under these restrictions, since the number of personnel and clients combined is likely to exceed 50 people. An exception was made only for cafes, restaurants, and FSEs that provide delivery service. In the Kuzbass, the flow of clients to cafes and restaurants decreased by an average of 50% in less than a week. During the quarantine, most consumers prefer to eat at home or take home-cooked food to work. On March 17, 2020, all FSEs received Recommendations for the Prevention of the New Coronavirus COVID-19 Infection and the Protection of Citizens in Trade and Public Catering Organizations from the Ministry of Industry and Trade of the Russian Federation. The recommendations set forth immediate preventive measures to protect citizens in public catering and trade organizations.

However, not all FSEs can switch to the takeaway mode. This type of activity has its own specific features associated with the quality and safety of remotely sold products. Food delivery imposes extra obligations on the businesses, i.e. appropriate permits from regulatory authorities for the delivery of finished catering products.

In Russia, regulatory documents that control food safety issues include Sanitary Regulations and Standards, Technical Regulations of Customs Union, etc. For instance, the On Food Safety Technical Regulation of Customs Union 021/2011 indicates the mandatory presence of a safety management system in the food industry[1]. According to Article 10 (Clause 2), food production processes must be based on the principles of Hazard Analysis and Critical Control Points. Otherwise, FSEs cannot fully ensure the production and sale safety, especially during the coronavirus pandemic. The basic systems for ensuring the quality and safety of food products in industrial practice include Good Manufacture Practice (GMP) and Good Hygiene Practice (GHP). Maintaining these systems can minimize the possibility of surface contamination or eliminate it. This factor is important for the safe operation of FSEs, both in the current situation and in the future.

Infection control at FSEs. Catering personnel and managers should be aware of coronavirus transmission routes, symptoms, and preventive measures.

Identification of potentially infected clients. All catering staff should be prepared to identify and report a client suspected to be infected. Ideally, COVID-19 patients are not allowed to visit public places. However, FSE employees ought to maintain COVID-19 alert and refuse to provide service to any client with symptoms. They must immediately inform the manager of possible infection, as well as appropriate authorities as instructed.

Protocol for assessment of FSE staff. The epidemiological safety of a FSE is the responsibility

[1] TR TS 021/2011. Tekhnicheskiy reglament Tamozhennogo soyuza "O bezopasnosti pishchevoy produktsii" [TR CU 021/2011. Technical regulations of the Customs Union "On food safety"]. 2011.

of its managers. They are to monitor the possible incidence among the employees every day. Managers must keep their staff updated on the situation and make sure that they take the situation seriously. Managers are to collect data that can be used as the primary method for identifying potential COVID-19 carriers. In other words, they are to measure the body temperature of their employees with a non-contact forehead thermometer.

A simple survey is another useful precaution. The list of questions may include the following: *Have you been abroad in the past 14 days? If yes, what country did you visit? Have you had a fever in the past 14 days? Have you participated in gatherings, meetings, or had contact with large groups of strangers? Have you had contact with a patient with confirmed coronavirus infection? Do you have breathing problems? etc*. If the employee gives a positive answer to any of the questions, he/she is suppoused to be self-isolated and quarantined, and the management must inform the appropriate authorities as instructed [5, 22]. If an employee proved COVID-19-positive, employers should inform the staff about the possibility of COVID-19 infection without revealing the identity of the infected employee. The latter is to be denied access to the premises until officially reported safe to return to work by health authorities.

Hand hygiene. Foreign sources reported cases of fecal-oral route of COVID-19 transmission, which makes the issue of hand hygiene even more important for FSE staff. Despite the fact that hand hygiene is mandatory in food production as part of sanitary and hygienic requirements, the level of compliance still leaves much to be desired. During the coronavirus pandemic, hand hygiene should be the golden safety rule and an essential element of personal hygiene. Hand washing is obligatory before commencing work; whenever your hands become dirty; after every trip to the toilet; after touching raw materials or packaging; between process operations, e.g. when proceeding from raw materials to finished products; after touching your hair, nose, ears, and eyes; after smoking or eating; after handling garbage, chemicals, or cleaning tools, etc. Proper hand washing is of particular importance for waitpersons, administrators, and cashiers, i.e. those who touch banknotes or various surfaces in the retail space. Any unprotected contact with environment and equipment without proper disinfection afterwards can be dangerous if one subsequently touches one's oral, nasal, or ophthalmic mucous membrane or damaged skin. Visitor service area staff should be especially careful [24].

Personal protective equipment for employees. There are currently no specific COVID-19 infection protection measures for catering staff. Taking into account the transmission route by airborne droplets, all employees are to wear goggles, face masks, gloves, protective clothing, and mop caps. Disposable protective equipment should be changed every 2–3 h [22, 23].

Disinfection. FSEs must take strict and effective disinfection measures according to the current sanitary standards. Public, industrial, storage, and utility areas should be washed and disinfected on a regular basis, including door handles, chairs, and tables. The same procedure holds for elevators. Employees that have to deal with cash and plastic cards, e.g. managers, cashiers, accountants, couriers, etc., should avoid touching any objects of shared use, e.g. terminals, cash desks, etc., after direct contact with the specified items [25, 26].

The list of scientifically approved anti-coronavirus surface disinfectants includes a 62–71% ethanol solution and a 0.1% sodium hypochlorite solution [23, 24, 27, 28]. Disinfectants that contain even small doses of these substances in the required concentration proved most effective. The Research Institute of Disinfectology of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare published a longer list of registered disinfectants.

Every FSE should have a sufficient supply of disinfectants. Disinfection procedures require protection of skin, eyes, and breathing organs. The personnel responsible for disinfection should wear protective equipment, i.e. face masks or respirators, goggles, and gloves, according to the specific application instructions.

All in all, FSE personnel should constantly monitor the existing risk assessments and safe working systems. Managers are to update the personnel responsible for human safety on any relevant official information. Managers should follow updates on the epidemic in other countries to be aware of possible new transmission routes. For instance, FSEs purchase raw materials of animal and fish origin to produce catering products. The World Health Organization published recommendations that are aimed at transmission risk reduction from animals to humans at the market. Visitors of live animal markets, seafood markets, or animal products markets should practice general hygiene measures. They include regular hand washing with soap and water after touching animals and animal products, avoiding touching eyes, nose, or mouth, and avoiding contact with sick animals or spoiled animal products. Buyers should also avoid contact with potentially contaminated livestock wastes or spilt liquids in stores and market facilities. Raw or undercooked animal products can be dangerous for consumption. According to food safety practices, raw meat, milk, and animal organs should be handled carefully to avoid cross-contamination.

CONCLUSION

The outbreak of COVID-19 has become a clinical threat to people around the world. The World Health Organization declared COVID-19 a global pandemic. The situation crippled healthcare, production of first priority goods, and service industry. Their employees cannot avoid face-to-face contact with clients while having to perform their professional duties even during epidemics. In spite of the fact that all countries are doing their best to solve the problem, our current knowledge about the new virus remains limited.

Scenarios for antiviral therapy and vaccination are still being developed. As a result, preventive and infection control measures remain the most effective instrument to combat the current spread of COVID-19. Scientists and pandemic experts are studying epidemics of the past to find options for urgent prevention and treatment of severe acute respiratory infections caused by COVID-19.

The rapidly growing number of person-to-person transmission cases delivered a hard blow to the catering industry. In conditions when self-isolation has become the main preventive measure, most food service enterprises switched to delivery or takeaway sales. However, a complete isolation of food service enterprises does not seem possible. A significant part of the population needs food service while at home or at work. By learning the mechanism of COVID-19 transmission, managers of food service enterprises can develop measures to reduce the risks. A further analysis and synthesis of methods should take into account the national, cultural, economic, and climatic features of specific countries. Many catering establishments will draw a lesson from their pandemic experience. On the one hand, they will understand that failure to comply with the Hazard Analysis and Critical Control Points system ruins production safety and increases the risk of infection. On the other hand, the negative experience can become a new growth point for the food service enterprises when they emerge from the crisis.

CONTRIBUTION

The authors were equally involved in writing the manuscript and are equally responsible.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests related to the publication of this article.

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