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Impact of COVID-19 pandemic on food supply chain: An overview

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Abstract. Since 2020, the rapid spread of the SARS-CoV-2 virus has caused the global pandemic COVID-19, generating health, economic and social impacts. The rapid spread of the infection in the human population required an accelerated adaptation to the new circumstances to protect human health and mitigate financial losses. As the ongoing pandemic has caused reported cases in the multi-millions, all stakeholders need to prevent further outbreaks and mitigate associated risks. Hence, besides government, health care systems, business stakeholders, public authorities, non-governmental organizations, and other socially responsible associations, the food sector has a crucial role in combating COVID-19. The food sector in this context is referred to as every actor in the food supply chain. This paper explores the difficulties in the entire food supply chain's reactions to the pandemic crisis and underlines the meat sector's response.

1. Introduction

Last year, 2020, was challenging due to the pandemic of COVID-19, a highly contagious disease caused by a new virus, officially named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first cases of infection arose in December 2019 and were linked to the Huanan Seafood Market (Wuhan, China) [1]. The virus was isolated on January 7, 2020, and complete genome sequencing was performed. On January 12, 2020, the World Health Organisation (WHO) named the coronavirus the 2019-novel coronavirus (COVID-19). After studying the genome sequence results and evolutionary analysis, bats were suggested as the natural host of SARS-CoV-2 [2]. On March 11, 2020, WHO declared COVID-19 a pandemic due to its rapid spread and severity. According to WHO data, so far, SARS-CoV-2 has affected more than 170 million people worldwide, with a mortality rate of about 2%. More than 700,000 COVID-19 cases were registered in Serbia from the beginning of the pandemic, with a mortality rate of approximately 0.97% [3].

Although there is a lack of information and evidence of how COVID-19 is transmitted, it is known that this virus can infect humans. The most common signs of illness shown by patients affected with COVID-19 were fever, cough, and sometimes gastrointestinal disorders [4]. The prevention of virus spread and protection of human health quickly became priorities for multi-stakeholders, including the food sector as one of the responsible and key actors. In that context, it is essential for the whole food



supply chain to identify, control, and decrease food safety risks during the current pandemic crisis. Preventive measures at governmental level included travel restrictions, border controls, and country lockdowns.

In contrast, within the food sector, preventive actions cover measures from the implementation of good hygiene practices (GHP) to improving already established food safety management systems (FSMS). However, preventive actions differ among countries and food sectors within them, at the same time causing severe global consequences. Thus, the need for food security protocol alignment on a worldwide scale arose [5]. To date, the possibility that SARS-CoV-2 can survive in vegetables, meats or other foods is based only on assumptions with no direct and unmistakable evidence to show that SARS-CoV-2 can be transmitted from food or food packages to humans [6]. Available data about COVID-19 outbreaks showed that slaughterhouses and meat processing plants are suitable environments for spreading SARS-CoV-2. Additionally, in previous literature, several outbreaks in slaughterhouses and meat processing plants worldwide have been analysed [7]. This study aims to explain how COVID-19 disease affected the food supply chain, highlighting the meat sector's concerns.

2. Impact of the COVID-19 pandemic on the food supply chain

2.1. Affected actors of the food supply chain

The COVID-19 pandemic introduced unexpected stresses on food systems, inducing the rapid response of food supply chains [8]. The range and type of responses varied depending on the stage within the food supply chain, but food safety is a priority in each phase. The common bottlenecks for almost every actor within the food supply chain were shortage of workers, maintaining social distancing, transport restriction, etc. Food processing industries are especially vulnerable, as they have an intensive number of production staff in the facilities' limited closed space. On the other hand, the absence of workers due to prevention measures or disease isolation can cause short or long-term shutdowns in production, especially in less automated systems such as meat industries and slaughterhouses. The challenge that emerged from the current crisis is how to balance the need to keep production going and the need to protect the workers.

According to Djekic et al. [9], retailers were identified as the food supply chain link affected mainly by the pandemic, in contrast with food storage facilities, ranked as least affected. From the perspective of consumer food-related demands, the pandemic has led to a drastic shift. In that sense, hotels, restaurants, catering, and cafés were most affected due to COVID-19 lockdowns on a global level [8]. As the last actor in the food supply chain, consumers have a significant role in influencing behaviour and food choices. In other words, besides the legislative measures established, consumer demand for safe food induces the whole food supply chain to implement all necessary steps to prevent zoonoses and reduce other risks for humans [5]. Besides this consumer role in the food supply chain at the point of purchase, consumer actions can directly affect food safety at the moment of consumption. These actions are mainly adequate personal hygiene and ensuring the hygiene of food preparation surfaces. Thus, to avoid cross-contamination in various directions, such as cooked-uncooked food, human factor-food, or contaminated surfaces-food, every actor in the food supply chain exposed to this type of risk should follow WHO suggested measures referring to food handling and preparation practices [10].

Additionally, with the pandemic crisis, hygiene procedures need to be more stringent in the retail and food industries. More stringent hygiene practice was followed by other requirements, such as the need for more additional personal protective equipment. Requirements associated with the implementation of pandemic prevention procedures varied from hygiene improvement, staff awareness, recommended measures from WHO/government, temperature checks of workers, the physical distance between workers, limited visits to the facilities, etc. It was revealed that increasing staff awareness and improving hygiene are the two most critical prevention actions. On the other hand, temperature checks of workers were declared as less important [9].

The integrative overview of the current COVID-19 pandemic considering food supply chain issues is concerned with food security, food safety and food availability. Some consider that authorities should

encourage food enterprises to gather information about their suppliers of raw materials and fresh products (e.g., vegetables) and connect them with sellers to improve food availability. Furthermore, specialized mobile device shopping applications can assist farmers in finding alternative buyers in small city centres. Many countries react to pandemic crises by ensuring food reserves. While China assured the sufficient nourishment of the local population by releasing at least 300,000 tons of pork reserves, Italy implemented relevant laws to force food makers to keep resources for emergency purposes [10]. When it comes to emergency preparedness within food companies, it was revealed that less than a half of food companies had documented any emergency plan associated with pandemics [9].

2.2. Changes within meat supply chain during COVID-19

Although meat is not necessary for the diet, the inclusion of meat and meat products makes it easier to ensure a good and healthy diet. In Serbia, meat in general, especially barbecued meat and different types of roast meat, has an important role in daily meals [11]. From the nutritional quality aspect, meat is a good source of high-quality proteins as it contains essential amino acids that must be ingested. Furthermore, meat and meat products are characterized as important sources of all the B-complex vitamins and excellent sources of some minerals, such as iron. On the other hand, fresh meat is a perishable food [12]. In that context, providing safety assurance of this food is a concern, especially in emergencies. Safety assurance within the meat sector is not a simple task for every meat supply chain, especially in terms of greater potential risks. As a risk-based meat safety assurance system needs to be periodically reviewed and its development constantly in focus [13], system revisions, including of COVID-19 associated risks, should be done. Moreover, it was recognized that livestock farmers, slaughterhouse workers, meat processors, traders, and policymakers need mutual support to ensure a stable meat supply chain [14].

The COVID-19 pandemic has direct and indirect impacts on meat production. Direct impacts were based on decreasing numbers of production workers due to infection and adverse market conditions for farmers. Furthermore, for meat producers, the market was not desirable due to the reduced income status of consumers. Although consumers started to stock items with longer shelf life during COVID-19, the demand for particular meat products such as hamburgers and minced meat also increased [14]. Additionally, in recent research conducted in Serbia, authors confirmed that risks and associated preventive actions linked with the COVID-19 pandemic significantly influenced consumers' eating habits and food shopping behaviour [15].

3. Response of meat sector in Serbia to the pandemic crisis

According to available public statistics data from the Statistical Office of the Republic of Serbia [16], some trends within the meat sector emerged. Observations are based on the statistical indicator of meat production (Figure 1).

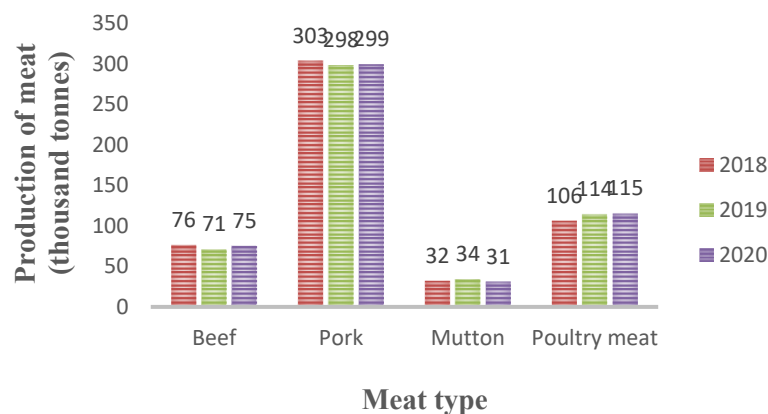


Figure 1. Meat production in Serbia during 2018 to 2020

Data on production of the most common types of meat produced in Serbia were obtained for potential determination of differences. The analysed period covered one year before the critical year of the pandemic.

4. Conclusion

According to relevant representative studies of how COVID-19 affected the food sector, it was revealed that all actors of the food supply chain were affected in particular ways. The most common triggers originating from pandemics, such as lockdowns, social distancing, and worker illness, caused changes in every sector in the food supply chain. Implemented preventive measures varied from increasing staff awareness and improving hygiene to making food reserves and revising safety assurance systems. For the meat sector, adverse conditions on the global market were detected. In contrast, public statistics data from Serbia for the critical pandemic period showed increased beef, pork, and poultry production. However, studies are leading meat scientists, producers, and other actors in the meat supply chain to develop preventive actions and safety assurance systems to overcome food insecurity under pandemic situations.

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