



Impacts of COVID-19 Pandemic on Dairy and Poultry Sectors: Future Guidelines for Overcoming these Effects

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Abstract

Coronavirus disease (COVID-19) has affected the current food system globally. Like the health system, the stability of the food system should be a priority during any pandemic and associated lockdowns. COVID-19 pandemic is severely affecting food safety, food security and overall food chain. Livestock sector is a major source of animal food products and by-products. The economics of the processed milk and meat industries are being severely affected during the lockdown. Due to the lack of transportation facilities, livestock products are not available to everyone. Several issues are faced by agriculture, dairy and poultry farmers during this pandemic. This review article highlights the importance of incorporating new technologies into the livestock sector to lessen the undesirable effects of the pandemics on the animal-based food industry and farming. Animal production and disease resistance must be improved through breeding and genetics discussed in this article below. The role of veterinarians in maintaining animal health and preventing zoonotic diseases during infectious diseases has also been highlighted. Digitalization and implementation of new policies in the livestock and poultry sector regarding the telemedicine, online sale and purchase of animals and their products is inevitable especially in underdeveloped countries. Such guidelines could help the state overcome crises related to food, livestock and human health in pandemics.

Keywords: COVID-19; Livestock Sector; Telemedicine; Meat and Milk; Zoonosis

Introduction

In March, 2020 the World Health Organization announced that COVID-19 has now become a global issue. Countries around the world have devised different policies to prevent the spread of this pandemic via lockdowns, inter-regional traffic restrictions, prohibition of various activities like religious and political gatherings, strict implementation of Standard operating procedures (SOPs) and large-scale COVID-19 testing [1]. According to Djalante, *et al.* 2020 government has established a community health emergency in the framework of accelerating the handling of COVID-19 through Presidential Decree No. 11 of 2020 and Government Regulation

No. 21 of 2020 [2]. The pandemic not only has a negative impact on the health sector but also threatens various sectors such as the food, economy, society, education and many others [3]. Faced with the current situation, scientists and stakeholders have predicted that the current pandemic will have both short and long-term effects. Livestock sector that, is predicted to attain the Sustainable Development Goals (SDGs) in 2030, cannot escape the negative effects of this global crisis [4]. Not only the impacts mentioned earlier, but also the lack of animal-derived food, is one of the challenges and risks of the current COVID-19 pandemic and post-pandemic rehabilitation period [5]. Numerous fields related to animal-based

food supplementation have been suspended during the pandemic because production processes, distribution and consumption are not functioning normally [6,7]. Data from various online articles, journals, and books has been reviewed and summarized. In particular, this review article presents that how the COVID-19 lockdown affects the actual animal origin food supply and how we can optimize these effects especially related to food resources management during future pandemics.

Importance of stable livestock sector during pandemics

Food security (with new concepts nutrition security) is primary task of every state. Like agriculture sector, livestock sector has its great importance in providing food to all of us from animals (meat, milk & by-products) and birds (meat and eggs). The importance of Agro-industrial complex can never be ignored especially during pandemics. Similarly, significance of livestock domain is also crucial. Balance between food sources and population requirement is much necessary to provide sufficient food supplies during lockdown situations [8,9]. As urbanization is increasing the consumption of livestock products is increasing unceasingly. Commercial livestock and poultry farms with processing units are somewhere present in big cities but not in every city. Many cities are facing huge shortage of livestock products like milk and meat during pandemics and lockdowns [10,11].

Numerous fields related to animal-based food supplementation have been suspended during the pandemic so that production processes, distribution and consumption are not functioning normally [7,12,13]. In addition to the effects of COVID-19, the ability to produce many animal-derived products that have not yet met the requirements, the risk factor for antibiotic resistance in meat and milk, causes a shortage of food for humans. According to One Health concept, animal health is very important for keeping human healthy [14,15].

Optimization of food services during pandemics

The facts obtained from already conducted research studies about veterinary hygiene and medicine can help a lot in boosting up the production of livestock products. By using such scientific data, we want to get the minimum cost of livestock products by optimizing the parameters of the climate and maintaining production mechanisms up to the optimum level [16]. Effective solutions of food systems during pandemics save time, money and provide food sources to everyone [17]. Technology is crucial if we

want to optimize production of animals, their feed consumption, environmental system of animal farms and livestock products [18].

Improved genetics and modern breeding technologies

Modern breeding technologies can improve genetic potential of food animals and animal products. Current pandemic has shed light on the importance of such advances in all livestock fields [19]. An effective breeding strategy in food animals is one of the ways in which cattle breeders can be successful. In many under developed countries, cattle selection is usually traditionally performed with phenotypic observations. This choice is less efficient. This is evidenced by the self-sufficiency of meat which has not been announced since 2010. The mapping of Quantitative Trait Loci mapping - encoding the quantitative role of genetic loci in food animals - is expected to provide a more accurate selection process. Animal selection through genome selection begins with an understanding of genome mapping. Genome mapping is used to identify the location of genes, locus on chromosomes and mutations [20]. Quantitative Trait Loci or QTL is the locus that is mapped. Many of these characteristics are important, both economically and medically, such as resistance to diseases, meat and milk production. The basic concept in genomic selection is that single nucleotide polymorphisms (SNPs) are considered as a marker on the relationship between locus.

Next, identification or marking of SNPs can be done by identifying QTL locations in the genome for genetic mapping of species [21]. However, some simple markers can be used to understand the advantages and disadvantages of these markers. The precision of genomic selection depends on the distance of the marker with QTL, the process identification of phenotype, and the number of genes to be identified [22].

The flow of genetic mapping can easily be described as

- To use SNPs as markers, the genome needs to be read using microarrays. Unfortunately, the use of micro-arrays is less common in underdeveloped countries than the use of electrophoresis.
- Using a marker other than SNP would mean an easier flow, namely: DNA extraction – amplification of DNA by utilization of (polymerase chain reaction) PCR – electrophoresis using markers-Readout of results [23].

- The application of electrophoresis or micro-array imaging results in genome mapping.

This genome mapping can be used extensively in animal husbandry. In cattle meat, it can be used to evaluate and improve certain characteristics such as meat quality (water content in meat or juiciness, typical cow odor and protein content), feed efficiency ratio, resistance against parasites or certain diseases, heat resistance and other quantitative genetic characters [24].

Whereas in dairy cows, some of the characters that can be added are genes encoding bioactive substances on milk to be produced so that dairy products can be more nutritious [25].

Due to the limited supply of feed, animal feed management also needs to be prepared to deal with food safety. Safe production of animal feed is one of the most important method for the health and management of livestock. Genome mapping can also be done in animal feed plants. Selection through this genome can improve the accuracy of phenotype selection, which has been done extensively in Pakistan. Several parties can involve in the development of the livestock sector in Pakistan have been able to work together to obtain selective livestock genomes through the collection of integrated livestock genome data [20,25].

Branding and digitalization of livestock products to overcome the decline in sales

In this pandemic, breeders and distributors of livestock products have to maintain cash flow to sustain their business [26]. Fortunately, livestock products can be marketed through remote interactions. This is supported by the guidance and research and provided by Widayat and his team. The study found that consumers between the ages of 15 and 25 buy food and ingredients prepared during pandemics online [27]. This can be done through the various platforms and communities that are formed on social media. Promotion media can be done by many people with a large number of followers or paid promotion on accounts with access to large media [28]. Promotional material in the form of a campaign to use nutritious livestock products during the current pandemic can be an interesting selling point. Processed food made from livestock products or local culinary products can be sold by this tricky way [29].

The second step is delivery services, which are very important in this situation. Delivery services can be made through form em-

ployee courier or using campaign services, or it can also use e-commerce which provides delivery services and even free shipping coupons [30].

Easy access to product information, payment and product delivery can help propel the market forward to keep the business going during the lockdown [31]. Small-scale farms can encourage each other through collaboration to maximize their impact on improving livestock product development methods and marketing processes. It is expected that these two solutions will solve the problem of low market for livestock products and help in distribution of livestock products [29,31].

Practices and amenities for processing and marketing of Animal products

Improving the processing techniques and marketing facilities of animal products by increasing their distribution facilities and increasing the marketing force are necessary steps to prevent food shortage during lockdown and pandemics [32]. If the current lockdown lasts longer, then people will need animal products and by-products that are long-term stable, durable and have quality packaging [33]. Processed Livestock Product like meat which has high nutritional and water level, is the right medium for growing micro-organisms thus making it more susceptible to rot. Therefore, proper processing is much necessary. Because meat may store for longer durations in stores or at homes in lockdown situations [34]. To preserve meat through freezing, the meat is cooked with selected herbs and then packaged and frozen. Freezing techniques are also used mostly in indoor areas [35]. In addition, thermal processing and smoking products are used in other scales to avoid the damage caused by decaying conditions [36]. Processing techniques, flavoring skills and preservation techniques are key to improving the quality of livestock products [37,38]. The creative ability to make coffee flavor with milk can be an attractive product to increase sales during such pandemics. Some other preparations for milk processing such as doodle milk may be another option [39].

The future of animal husbandry

The complexity of these food issues requires a multifaceted and appropriate strategy for mutual cooperation. So that we can fight malnutrition during COVID-19 pandemics. After recovering from the current pandemic, we must better prepare for the future crisis [40,41]. The malnutrition warning alarm starts when one-third of the world's population experiences limited mobility [42]. The

pandemic of COVID-19 will definitely reduce the attention of different countries on livestock health and production. The Food and Agriculture Organization (FAO) recommends that countries pay special attention to food and develop strategies to deal with it in order to create food safety during coronavirus emergencies. The long-term effects will need to be taken seriously. The livestock sector also supports success in meeting food security [43]. To improve the health of food animals especially during pandemics and during communicable health issues telehealth technologies should utilize proactively in livestock sector.

Telehealth facility

This is causing difficulties and delay in providing treatment to animals. By using telehealth facility this problem can be solved. Barriers in the use of telehealth at each community level should be solved as prime priority. Cases other than emergency situation can tackle easily from farmer's farm [45]. This way animals can remain safe and food resources will not decline. Government should prepare telehealth doctors force for livestock and related courses should be included in curriculum of veterinary education [46]. Telehealth is safe for doctors and it will also decrease the stress of farmers and their families [47].

New policies regarding food resources management

It is responsibility of political leaders and educational institutes to make such policies regarding food resources management for whole nation during pandemics [48]. We can't say anything about the occurrence of such pandemics in future. Because epidemics and pandemics are occurring from hundreds of years and we can't say anything even about COVID-19 reoccurrence in future [49]. But we can prepare public for such future crisis by improving our health facilities especially related to food animals. Because COVID-19 also has some origin from wet food market so directly involvement of animal health should concern first [50].

COVID-19 vaccination preparation and use of animals

Till new advances in developing vaccines against pandemics causing viruses. Scientists are using laboratory animals for vaccination trials [51]. Therefore new policies and guidelines are very necessary for lab or experimental animal health and production management. Industry and government co-ordination can solve such problems by collaborating with academic institutes [52].

Role of veterinarians in meat markets

Meat markets, where animals of different kinds (wild and domestic) are sold, are a main source of origin of zoonotic disease.

Many researchers have suggested that bats are reservoir hosts for many coronaviruses. Bats are asymptomatic to coronaviruses [53,54]. The SARS-CoV-2 was also transmitted between different species in wet markets in Wuhan. Therefore, these markets should be considered by veterinarians from a zoonotic point of view [55]. Such markets are not banned but with new rules and regulations we can regulate these markets. It is now imperative to reduce the likelihood of this pandemic occurring in the future in a collaborative process between veterinarians, doctors and environmental scientists nationally and internationally [56]. Because there is a direct relationship between humans, animals and their common environment [57]. Therefore, it is important for everyone's health to protect themselves from future outbreaks and pandemics, such as from SARS, MERS and COVID-19 like pandemics [58,59].

Conclusion

Based on the above explanation, the effects of COVID-19 have affected the livestock sector severely. This is evident from the poor condition of the livestock domain. In addition, the risk of future malnutrition and food shortage is also predicted. To solve these issues, farmers should be encouraged to increase the immunity of their domestic animals by adding micronutrients to their rations. It is important to avoid feed shortages in the future, especially during pandemics. Healthy eating and drinking food animals are a source of healthy meat and milk. Animal food shortages can be overcome by improving the genetics of animals and animal feed plants and incorporating unconventional feed resources into their diets. Telehealth or telemedicine facilities should be improved to provide proper treatment to the farmers in case of any kind of lockdown. Increase the number of meat and milk processing plants in all cities to provide permanent fresh food to the people during any future crisis. Increasing the value addition of livestock products can ensure an increase in income. Digitization in the livestock business will make it easier, faster and safer to sell and buy livestock products. This will be helpful, especially during infectious and contagious diseases pandemics. Online buying and selling, such as the use of information technology and computer science, can create new markets for livestock products and services by implementing the COVID-19 security protocol. Farm biosafety and biosecurity are essential to prevent infectious and zoonotic diseases. These suggestions can help academic researchers, food sector scientist and livestock sector to reduce losses and waste of food. New research is much needed to identify alternative safe sources of protein that can meet all kinds of nutritional needs of people in under-developed countries.

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