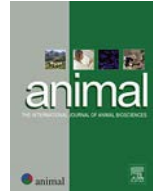




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Opinion paper: COVID-19 and the livestock sector

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Pandemics are a recurring theme in human history, with evidence from the beginning of civilization up to the current Corona virus disease 2019 (**COVID-19**) pandemic. The genotype of the severe acute respiratory syndrome coronavirus 2 (**SARS-CoV-2**) virus that has paralyzed the entire world since early 2020 is most closely related to a coronavirus from bats, eventually passed via Pangolins, although is not identical (Zhu et al., 2020). One of the most accredited hypotheses is that the virus first infected a human at or near a wet market in Wuhan, in the Hubei region of China; this city was the epicenter of the outbreak. In spite of some dis-information which circulates in the social media, it is clear that the virus originates in the over-exploitation of a wildlife at risk of transmission of diseases to humans and, moreover, in danger of extinction. In spite of the very numerous alerts which have been given in the past about the risk of a major outbreak coming from bats which host a high number of SARS viruses, the uncontrolled use of wildlife as a source of meat, bones, scales, blood, horns, hair and many other tissues has never ceased. These products, coming from poaching of endangered and not farmed species, feed both un-official and official markets of food or/and pharmacopeia. We should clearly affirm here that these processes should stop in a near future as they are not only destroying biodiversity but also producing pandemics which have major socio-economical consequences.

It has been demonstrated by the World Health Organization (WHO) that the most recent pandemics, such as Ebola, West Nile Virus, SARS, and Lyme disease, are embedded in environmental change and destruction of natural ecosystems; the pathogens causing these diseases originated from wild animals. It is estimated that more than 70% of the infectious diseases that have emerged in humans since the 1980s can be traced to animals, both wild and domesticated (Wang and Cramer, 2014; High Level Panel of Experts on Food Security and Nutrition, 2017); however, there is no evidence until now that farmed animals play a role in spreading COVID-19 (Khamisse et al., 2020). On the contrary, the different organizations in place for veterinary surveillance of both domestic and wild animals,

coordinated by the World Organization for Animal Health, have impaired, until now, the emergence of major epizootia which may have been transformed into pandemics like COVID-19. Although there are many unknown characteristics of the SARS-CoV-2 virus, like how it can spread from people to animals in limited and specific situations, it has become clear, after the initial transmission from bats or Pangolin to humans, that the spread of COVID-19 is primarily from person-to-person. Thus, farmed animals are completely out of the transmission process of the virus until now. However zero risk does not exist and we should continue to check its potential transmissibility to domestic animals. Food is not a risk factor for transmission of infectious diseases; however, if the virus is found on food, it is not known how long it can survive. There is currently no evidence that eating meat from farmed animals or ingesting animal products increases the spread of the virus.

The economic crisis produced by the pandemic, together with the considerable impact on food supply and demand, has affected the poor and vulnerable within the global population most severely. Most low- and middle-income countries especially in Africa, Caribbean, Asia, and South America have limited capacity to respond to the pandemic and therefore the pandemic will likely have major impact on livelihoods and food security in these nations. In this regard, global action through international organizations such as the Food and Agriculture Organization (FAO) may be the most appropriate way to mitigate against potential global food crisis. It is clear that the risk of diminishing global food availability and rapidly fluctuating food prices will depend on the duration of the current COVID-19 outbreak and on the level of containment measures taken. Furthermore, the potential impact of the lockdown measures implemented due to the pandemic on food production in major food producing and exporting countries will certainly have large repercussions on world food availability and food prices in the mid- and long term. It is worth noting that the national lockdowns in some parts of the world recognized the importance of agriculture and accordingly placed an exemption on the food chain.

The reason why the economic impact of the COVID-19 pandemic has been so drastic has less to do with the spread of the disease itself and more to do with the consequent lockdown strategies implemented by most countries. We are experiencing the largest global recession in history and more than a third of the global population at the time has been simultaneously placed in lockdown.

The effects of the lockdown have been manifold, with panic buying and consequent shortages of some types of food and other products common. At the onset of March 2020, the stock markets around the world saw their largest declines since the 2008 financial crisis. And in the following month, major indices continued to decline worldwide. The full economic impact and the extent of the financial crisis are yet to be determined, but it is expected to be large and global.

Several measures such as home confinement, travel bans and business closure to control the rate of infection were put in place worldwide. Because of such restrictions, food supply and distribution were negatively affected. If the global world merchandise trade is estimated to decline by 13 to 22% due to COVID-19 (World Trade Organization. Frequently asked questions: The WTO and COVID-19), the impact on the livestock farming sector is even more drastic. The first country to observe an appreciable impact on animal farming was logically China, as the result of the immediate limited access to animal feed and shortage of labour (X. Zhang, International Food Policy Research Institute Blog about Chinese livestock farms struggle under COVID-19 restrictions, IFPRI, Washington, DC, USA). Travel bans in many countries have affected delivery of breeding stock and animals for slaughter. Fresh meat and milk are short-life food products and therefore the unsold production due to the global constraints reduced their quality, increased the production cost, and finally limited the production itself. Dairy farmers in the USA have been dumping nearly fifteen million liters of milk each day (Forstadt, 2020). Due to the global trade disturbances, farmers are facing shortages of agricultural inputs like seed, fertilizer, and pesticides (Marlow, 2020). Many farm producers are facing a shortage of manpower, workers health, and labour shortages have been major issues in the agricultural industry because of the high rate of transmission of COVID-19. These problems in the supply chain of animal products have provoked closure of slaughterhouses for varying periods and ultimately animals remained in the farms longer than expected creating welfare issues from the overloading of available space on farm.

There has been a diminishing consumption of animal protein due to the misleading perception of animals as a reservoir of the virus. Moreover, food insecurity in developing countries might arise due to decline in international trade, problems in the food supply chain, and, more generally, in food production (High-Level Panel of Experts on Food Security and Nutrition, 2020).

Pandemics will also have inevitable consequences on animal research and will be experienced through the post-pandemic economic recession, with higher impact not only on public, national or international support but also on the more difficult agreements between research institutes and private companies. A secondary negative outcome for animal research is the loss of employment opportunities for scientists and technicians. Moreover, many research centres have already been negatively affected by strict travel bans preventing international students, in particular those from Asian countries, from attending their institutes.

To mitigate both the short- and long-term damage of the crisis, policy makers should strengthen their commitment to fund innovation especially in order to prevent the future sanitary crises. The COVID-19 crisis may have opened the path to new research areas which could be of high interest for the livestock sector. The private sector should also be incentivized to invest in livestock agricultural research. This is particularly important, as agriculture in general and livestock agriculture in particular are a major sector of the economy in the developing world. By supporting research institutes, it will be possible to better

address potential future crises and create the necessary commitment to participate in international scientific cooperation.

We are currently facing distancing and other necessary measures that deeply change our daily existence and also science dissemination. In these difficult weeks, COVID-19 is not modifying our habits for only a short period as widely believed at the beginning, but it is changing almost all aspects of our personal and professional lives. Probably nothing in science dissemination and interaction among scientists will be as before. Living with the pandemic also means moving from the current moments, necessarily lived as an emergency, to the one in which we will settle different habits.

The pandemic created the opportunity to change scientific dissemination. The entire scientific community is reconsidering the need for travel and therefore the role for virtual conferencing is expanding. Nowadays, we experience that technological capabilities are not limited, and scientists are already used to online environments.

Animal science organizations are getting ready for this new situation. Some of them are creating virtual systems allowing researchers to participate in conferences from their home or office. The methods of remote use must be therefore also interpreted as a result of the pandemic. Nonetheless, it must be recognized that the strict necessity inflicted by COVID-19 has given virtual meetings and working from home a big boost.

Through the COVID-19 pandemic experience, we have come to understand that increased interaction between human and wildlife creates conditions which generate and encourage the spread of viruses. This is in connection with habitat destruction due to commercial agriculture, unchecked urbanization, and the subsequent intensification of land use and resources creates more risks. The accelerated circulation of pathogens is worsened by climate change, ecosystem destruction like deforestation, and biodiversity loss – in short, the removal of essential protective barriers is faster than it ever was in the past. The globalization of animal farming systems, linked to global trade, has facilitated the removal of barriers protecting biodiversity. Despite this, the spread of COVID-19 is not related to farmed animals. On the contrary, its origin from the marketing and consumption of fresh meat from wild animals, with the obvious exclusion of ungulates slaughtered and processed following strict biosafety protocols, shows that a full ban of this type of trading will help limit the generation and spread of similar future viruses.

If we have one single lesson to learn from COVID-19, it could be: trust livestock farmers and their organizations and stop eating and using wild animals in danger of extinction and risky on a sanitary point of view!

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Not applicable.

Data and model availability statement

Not applicable.

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Author contributions

All authors contributed equally to the manuscript.

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