

# COVID-19 and its effects on the food production industry of South Africa

A Karodia<sup>1</sup>, M Hargovan<sup>2</sup>, R Fadal<sup>3</sup>, W Parker<sup>4</sup>, R Singh<sup>5</sup>, A Hoosen<sup>6</sup>, DN Qekwana<sup>1</sup>, S Mahomed<sup>7</sup>

<sup>1</sup> Department of Paraclinical Sciences, Faculty of Veterinary Science, University of Pretoria, Pretoria, South Africa

<sup>2</sup> Department of Agriculture, Land Reform and Rural Development, Durban, South Africa

<sup>3</sup> Bruma Medical, Johannesburg, South Africa

<sup>4</sup> Public health and communication specialist, San Diego, USA

<sup>5</sup> Education and Training, Democracy and Development Unit, Johannesburg, South Africa

<sup>6</sup> Department of Medical Microbiology, University of Pretoria, Pretoria, South Africa

<sup>7</sup> Occupational health medical practitioner, Pretoria, South Africa

**Correspondence:** Dr Shenaaz Mohamed, Occupational medical practitioner, PO Box 73434, Lynnwood Ridge, 0040, South Africa  
e-mail: shenaazm@worldonline.co.za

## INTRODUCTION

An outbreak of COVID-19 occurred at Tyson's pork-processing plant, Indiana, USA, in April 2020; more than 900 employees tested positive.<sup>1</sup> This resulted in the plant voluntarily closing in an effort to control the spread of the virus. While the outbreak was probably due to the long work hours and close contact of workers at the abattoirs and meat-processing plants, it has led to the question, "Will this affect food safety and act as another route of transmission for COVID-19?" A review by Pressman et al.<sup>2</sup> with references to Mycroft-West et al.<sup>3</sup> and Van Doremalen et al.<sup>4</sup> suggests that there is a possibility that meat can serve as a fomite. However, more research needs to be conducted in terms of how long the virus can survive on meat due to its biological nature and the chilling processes used.

There are many steps in the prevention of the spread of human diseases in abattoirs, e.g. sterilisation of equipment, daily health checks of personnel, and general hygiene spot inspections by government officials. Additional steps have been taken by the directors of the provincial veterinary public health departments in South Africa to control this risk, by sending guidelines to abattoir owners regarding the use of personal protective equipment (PPE), additional disinfection recommendations for equipment, and the management and monitoring of the health of workers.

Globally, the COVID-19 epidemic is impacting on food production.<sup>5</sup> This is partly due to the adoption of stringency measures that have constrained the labour market, as well as economic impacts on demand.<sup>5</sup> In South Africa, the government's goal is to maintain food security in the context of disease containment approaches, recognising that morbidity and mortality due to COVID-19 also impact on food production. Meat-processing plants in the USA, Europe and Australia have been sites of major outbreaks of COVID-19.<sup>6,7</sup>

## AFFECTED ABATTOIRS AND MITIGATION STRATEGIES IMPLEMENTED

The meat slaughtering and processing industries are under pressure as outbreaks among workers spur the pandemic. In the USA, at least 167 plants have had outbreaks, with 9 400 people having been symptomatically ill and 45 workers dying.<sup>8</sup> Thirty-eight meatpacking plants have halted production since the start of the coronavirus pandemic.<sup>9</sup>

The concentrated nature of the industry is having a critical impact

on local supply and meat prices. On 28 April 2020, President Donald Trump signed an executive order to keep meat plants open, despite the ongoing outbreaks,<sup>10</sup> to decrease the impact of a meat shortage. The order by the president did not prevent companies such as Tyson Foods, one of the largest US meatpacking companies, from shutting down four of its plants, along with three other companies, in the week of the announcement. What the executive order has provided is better access to PPE and a set of standards for protecting workers.

In Europe, countries that have reported outbreaks in abattoirs include Germany, France, Ireland and the Netherlands.<sup>11</sup> Despite Europe's attempt to increase health and safety protocols, more than 1 000 workers have tested positive.<sup>12</sup> The consequence was the temporary closure of the abattoirs, for periods ranging from one day to several weeks. Europe's industry comprises many small companies, allowing shutdowns to place the welfare of workers above the economic and production losses. Germany has gone so far as to ban meatpacking subcontractors via agencies as it recognises the role that they play in the exploitation of migrant workers.<sup>8</sup> The new law will increase the cost of meat but will improve regulations surrounding the working and living conditions of workers.<sup>13-18</sup>

## POTENTIAL EFFECTS OF COVID-19 ON THE FOOD INDUSTRY

### Direct effects

Mass infection of employees has been seen at many meat-processing plants, globally. These outbreaks could have direct impacts on the industry itself following high numbers of absenteeism, resulting in an inability to complete work, a break in the supply due to the inability to slaughter, and the cancellation of shipments due to high infection rates and attempts to prevent further geographical spread of the virus.<sup>19</sup>

Another problem in the USA, due to the shutting down of abattoirs, is the large number of animals that have nowhere to go. Farms and feedlots work on a finely tuned set period to grow animals to slaughter. The closure of many abattoirs has disrupted the slaughter of these animals, causing a backlog of animals at feedlots. This has resulted in the increased euthanasia of animals due to decreased farming space and, therefore, a decrease in animal populations in general, leading to future meat shortages.<sup>20</sup>

### Indirect effects

In the USA, the meatpacking industry has doubled production outputs and reduced the cost of meat in the last three decades. While this may seem impressive, the hidden cost has been exposed to the coronavirus. The conditions under which employees work, commute and live are overcrowded. The industry is reliant on rural and immigrant populations for cheap labour to keep costs low and meat affordable to the consumer.<sup>10</sup>

### Food safety security

Indicators of food security are food price levels, food inflation indices, and measures of local production.<sup>21</sup> Consumers, at the start of the pandemic, unexpectedly began bulk buying of essential household

items, resulting in an unanticipated shortage of products on shelves which, in turn, caused instability in the supply chain. The South African government proactively supported food security by monitoring food prices and enforcing strict regulations on businesses to prevent price inflation. Businesses guilty of price inflation were penalised. At the beginning of the national lockdown, the prices of milk, eggs and cheese increased by 2.9% compared to a 0.7% increase for meat products.<sup>22</sup> At the end of the five-week period, prices for all food categories had deflated except for milk, eggs and cheese, oils and fats, and 'other' foods.<sup>22</sup> Local production of red meat in March 2020 did not decrease from that in January 2020.<sup>22</sup> The meat industry is diverse in terms of large-scale farmers supplying high-throughput abattoirs, as well as

**Table 1. Risk factors for disease in abattoirs and butcheries<sup>19,24</sup>**

Risk factor	Problem/reason	Solution
Structure of facilities and operation	Close working spaces do not allow for social distancing of 1.5 m	Fewer workers; slower speed lines to enable social distancing; physical barriers between workers; group workers to ensure less contact between different people
Socio-economic status of workers	Migrant labourers come to work despite being sick (cannot afford to lose jobs)	Stronger enforcement of labour laws; encourage sick workers to remain at home (apply for UIF, share sick leave, or take an advance in sick leave)
Overcrowded working conditions		Rearrange workforce and working hours; allow shift work so that there are fewer workers in the limited workspace at all times
Workers residing in densely populated residential areas and multigenerational households		Screening for COVID-19 symptoms daily; have a dedicated isolation room where a worker can remain if he/she feels unwell; identify the relevant healthcare facility to which a worker can be referred for treatment and quarantine if needed, as the home environment might not be suitable for self-isolation
Public/shared transport	Low income workers are predominately employed in the sector; cannot afford private transport	Provide dedicated private transport for workers where distance can be maintained, everyone wears a mask, hand sanitisation is done before entering the vehicle, and the vehicle is cleaned or sanitised after every trip
Cold conditions	Decreased immunity and increased virus viability <sup>25</sup>	Activate UV lighting in cold rooms once workers have left for the day
Loud machinery	Increased shouting and increased viral aerosolisation	Provide physical barriers for workers, e.g. face shields and masks; provide communication headsets; train workers to use non-verbal (physical) cues for silent communication as far as possible
Poor ventilation		Position fans so that they do not blow air from one worker onto another; install high-efficiency air filters <sup>19</sup>
Humidity and temperature	For SARS-CoV-1 the dried virus on smooth surfaces has been reported to retain its full viability for 24 hours with a half-life of five days at temperatures of 22–25 °C and relative humidity of 40-50% (typical air-conditioned environment). <sup>26</sup> Viability under similar conditions was reported for MERS-COV. <sup>27</sup> No data were available for COVID-19, but caution should be taken until further research is done	Virus viability is rapidly lost (> 3 log <sub>10</sub> ) at high temperatures and high relative humidity (e.g. 38 °C, and > 95%, respectively). In aerosolised form, human coronavirus 229E is generally less stable in high humidity <sup>28</sup>
Long shifts	Increased contact with virus; increased discomfort from wearing masks, resulting in incorrect use (e.g. not covering nose)	Stagger shift schedules; split days; increase frequency of breaks
Ineffective hygiene practices		Provide education and training, and posters to remind staff to wash hands and sanitise (with pictures to overcome language barriers)
Poor sanitation		Develop a standard operating procedure (SOP) to increase disinfection of high-touch surfaces with anti-viral agents
Tool and equipment sharing		Educate workers about the risk of contracting COVID-19 from tool sharing as well as check daily to ensure workers have their own tools
Uncomfortable masks worn for long hours		Increased breaks
Improper donning and doffing of PPE		Education and training
Increased contact in canteens		Increase sanitisation of surfaces; stagger break times; add barriers between chairs and tables
Other		Provide masks as part of PPE and wash daily with overalls; provide adequate hand wash basins with soap in dispensers and disposable towels to dry hands; develop a protocol for what to do when a worker is believed to be infected

low-throughput and rural abattoirs facilitating small-scale farmers. The government is providing financial relief schemes to distressed small-scale farmers.<sup>23</sup> These actions demonstrate that South Africa is unlikely to experience shortages of food.

### Abattoirs and butchers – risk factors for transmission

Abattoirs in the USA, Europe and Australia have been identified as hot spots for outbreaks of disease. Butcheries form part of the meat supply chain and have therefore been added to the risk table (Table 1) as they share many of the risks with abattoirs.

### Risk of transmission of the virus from infected workers to food products, and from food products to consumers

The stability of COVID-19 has been reported to be 72 hours on plastic, 24 hours on cardboard and 48 hours on stainless steel.<sup>29</sup> This is relevant for producers, retailers and consumers, as cardboard and stainless steel form the basis of most preparation surfaces or packaging materials. In a study conducted in 2010 at the University of Hong Kong, it was found that the SARS coronavirus can survive for at least two weeks after drying at temperature and humidity conditions found in an air-conditioned environment.<sup>26</sup>

The best method to control the spread via fomites would be to stop the virus coming into contact with food products and equipment. This can be achieved by wearing PPE (especially face masks to stop respiratory spread and prevent workers from touching their faces), as well as regular handwashing and sanitisation of all surfaces.<sup>24</sup>

When purchasing food items, consumers should sanitise and discard packaging in areas away from food preparation surfaces, and transfer plastic-covered items to other containers. Cardboard packaging poses a problem for sanitisation due to its porous and absorbent nature. Therefore, we suggest discarding the cardboard packaging, where possible, or allowing products to stand for at least 24 hours in a room away from other food, due to the viability of COVID-19 on cardboard.<sup>4</sup>

Coronaviruses are sensitive to heat and ultraviolet rays.<sup>30</sup> COVID-19 is stable at 4 °C and can be stored for several years at –80 °C.<sup>30</sup> It is sensitive to heat and can be inactivated in five minutes at 70 °C or at 56 °C for 30 minutes (the most commonly used method to inactivate COVID-19 in the laboratory).<sup>30</sup> In addition, 75% ethenol-, peracetic acid- and chlorine-containing disinfectants can be used to effectively inactivate COVID-19.<sup>29</sup>

This information is important to consumers with regard to food preparation as the virus can survive refrigeration. We recommend storing raw and cooked meat separately and respecting cooking instructions, taking note of temperature and duration.

The virus is stable on inanimate objects at cold temperatures. What, though, is its stability on organic products such as beef, pork and poultry from abattoirs, or seafood, and what is the potential for transmitting the virus through consumers even if the cold chain is maintained? Research by Mycroft-West et al.<sup>3</sup> suggests that, because meat is rich in heparan sulphate (glycosaminoglycans), this property can provide “anchors for COVID-19 to interact with host tissue epithelia”.<sup>3</sup> While there is no evidence for foodborne transmission of COVID-19 at present, further investigation is warranted.<sup>2</sup>

### Trade

COVID-19 is challenging food security and safety in both developed and developing countries. The World Organisation for Animal Health (OIE) has raised the issue of potential contamination of meat imported from countries with severe outbreaks. Globalisation has led to

international food trade agreements which contribute to food security. Countries are responsible for implementing practical systems in intensive agriculture as well as non-commercial/rural farms to protect human health along the food supply chain. Principles and guidelines have been developed by the Codex Alimentarius Commission<sup>31</sup> (an international committee regulating food standards to contribute and facilitate fair practices of international food trade) to support the continuation of open food trade during production and distribution of food amidst the pandemic. The fundamental principles for reducing the risk of any contamination of food supply are environmental sanitation, personal hygiene and stringent food hygiene practices.<sup>31</sup>

In South Africa, ports of entry remain open to import and export agricultural commodities. South Africa is a net exporter. However, the minister of trade and industry was instructed by the Department of Agriculture, Land Reform and Rural Development to impose export restrictions should food products be in short supply.<sup>32</sup>

To date, livestock species, including pigs, chickens and ducks, appear to be resistant to infection in experimental studies.<sup>33,34</sup> It is hypothesised that livestock in contact with COVID-19 human cases have a high risk of exposure, as shown in cats.<sup>35</sup> Due to the lack of information on susceptibility of other livestock species, including cattle, sheep, goats and aquatic animals, one cannot rule out the role of food-producing animals and meat-processing in the pandemic, despite risk assessments and experimental studies showing no evidence.<sup>35</sup>

The OIE ad hoc Group on COVID-9 and Safe Trade in Animals and Animal Products<sup>35</sup> has pledged to:

1. Monitor new knowledge related to COVID-19 that may affect risks to human health or animal health associated with international trade in animals or animal products
2. Monitor risk assessments for animals and animal products, regarding COVID-19 infection
3. Recommend if risk mitigation measures for trade may be justified while balancing science-based risk with other considerations.<sup>35</sup>

### CONCLUSION

The food production industry must actively implement practical and effective strategies to reduce the risk of outbreaks of COVID-19 within abattoirs and the meatpacking industry. These strategies can reduce the transmission of the virus between people via physical contact and aerosolised particles, allowing for continued food safety and security, and preserving continued trade to avoid negative economic impact.

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