TAFS Update – Foot-and-Mouth Disease Global Situation

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While Foot-and-Mouth Disease (FMD) remains a concern of global economic importance, changes in approaches to FMD control are needed in the context of global food security. Even though stamping out has been a mainstay of FMD control for some countries in the past, the public is less-and-less willing to accept the mass culling of healthy animals. The animal welfare and waste of protein considerations make stamping out an unsustainable disease control method.

FMD is highly contagious and causes acute infection in cloven-hoofed animals. It has disrupted trade in animals and animal products across the globe due to international efforts to keep the virus out of countries. FMD-freedom is maintained mainly through trade restrictions with affected countries, surveillance, and/or routine vaccination. FMD-endemic countries are therefore substantially limited in their ability to participate in the international trade market of certain animals and animal products. Some countries have been forced to use stamping out as a control method, where routine vaccination would otherwise limit export options based on current trade regulations.

The outbreak of African Swine Fever in the Dominican Republic in July shows that pathogens can travel long distances, and that no country can guarantee immunity to disease incursion. In this article, we present recent news in FMD outbreaks globally, the potentially underrated risk of FMD virus introduction through the importation of commercial feed, and new technologies in FMD detection.

Recent FMD outbreaks and spread globally

FMD outbreaks and spread over the last years have been occurring mostly in Asia and Africa (OIE WAHIS, 2021). There are several challenges that hinder FMD control in these endemic regions, including vaccine procurement and wildlife reservoirs. The latest headline-grabbing news on FMD in select countries is summarized here.

India

There are several ongoing FMD outbreaks across the northern areas of India. FMD occurs seasonally in Kashmir, the northernmost geographical region of the Indian subcontinent. This year, interruptions in the vaccine supply chain due of the COVID-19 pandemic have exacerbated a “massive” outbreak (Dev, 2021). Starting in the spring and through the end of July 2021, up to 20,000 cases in domestic animals were reported across all ten divisions of Kashmir (Hassan, 2021). The government requires vaccination of animals at least once per year, but no vaccines were delivered in Kashmir this year due to COVID-19-related disruptions in the supply chain (Dev, 2021). The lack of available FMD vaccines has resulted in heavy losses to farmers and cattle rearers (Hassan, 2021).

At the same time, hundreds of cases of FMD have been reported in cattle across the Kangra districts of the neighboring Himachal Pradesh state (News18, 2021). Cattle owners in the district believe that FMD has spread from animals from Punjab, Jammu, and Kashmir who strayed into the Kangra districts (News18, 2021).

The government-led vaccination program in India that launched in September 2019 has faced some challenges. The goal of the flagship vaccination scheme is to vaccinate 100 % of cattle, buffalo,

sheep, goat and pig population for FMD for five years, with the overall aim to control FMD by 2025 and eradicate it by 2030 (Government of India, n.d.). However, a vaccination campaign was interrupted midway in November 2020 after random samples of a Hyderabad-based vaccine manufacturer failed quality tests (Goyal, 2020; Tribune, 2021).

Namibia

FMD serotype O has been introduced for the first time and has spread to four constituencies of Namibia's Zambezi region, in the northeast of the country, since June 2021 (Kooper, 2021). Previously, only serotypes SAT 1, 2 and 3 were identified in the country (Kooper, 2021). Over 1,300 head of cattle are infected as of August 2021 (Kooper, 2021).

The Zambezi region is within a pre-established zone covering about 20 % of the country that does not have a FMD status recognized by the OIE (OIE, 2021). The other 80 % of the country is recognized as an FMD-free zone where vaccination is not practiced.

Ninety-three percent of the target cattle population in high-risk areas was vaccinated against FMD by July (Xinhua, 2021). However, the current vaccines used for emergency vaccination in the region do not match the new FMD serotype O (Coleman, 2021). While investigations to establish the source of the FMD serotype O are ongoing, illegal cross-border cattle movement between the affected region and Zambia are suspected (Coleman, 2021). Most FMD serotypes are endemic in Zambia, with the outbreaks of serotype O and SAT 2 occurring between 2018 and 2020 (WRLFMD, n.d.).

South Africa

At the end of May this year, an outbreak of the SAT 2 serotype was detected in an area of KwaZulu-Natal for the first time in a previously FMD-free zone since the suspension of the status in 2019 (Ash, 2021; Miya, 2021; OIE, 2019). Twenty-six FMD-positive locations in KwaZulu-Natal have been identified and placed under quarantine as part of this outbreak (Republic of South Africa, 2021; Maromo, 2021). While FMD outbreaks in cattle and buffalo were reported in Limpopo province in 2019, the origin of the May outbreak in KwaZulu-Natal is still unknown (OIE WAHIS, 2021).

Wildlife reservoirs are one of the main challenges for FMD control in Africa. African buffalo are the natural maintenance hosts of the SAT types and serve as a potential source of infection for other wildlife and livestock (Blignaut et al., 2020). Most FMD outbreaks in domestic animals in South Africa since 2000 have been associated with wildlife (Blignaut et al., 2020).

Recent political unrest has caused some delays in the investigation of FMD in the KwaZulu-Natal province due to road blockages and redirection of security resources into communities (Maromo, 2021). Although the potential effect of the unrest on disease spread is not indicated, the Ministry of Agriculture maintains that veterinary services and police were nevertheless able to enforce animal movement controls effectively (Maromo, 2021). In a concerted effort to combat the disease, a Ministerial Task Team on Animal Biosecurity with special emphasis on FMD, African Swine Fever and Highly Pathogenic Avian Influenza was appointed in late August (gov.za, 2021).

Uganda

FMD has been endemic throughout Uganda since 1953, with serotypes O and SAT2 being predominant (Rutebarika, 2012).

In August this year, FMD was reported in pastoralist cattle in Jinja city, on the border of the Central and Eastern regions, and in Nwoya district in the Northern region, with 1,000 adult cattle infected (The Independent, 2021; Ochola, 2021). The Ministry of Agriculture is responding with a national

vaccination campaign, starting with the affected districts (Masaba, 2021). The government response also includes enforcing control measures at the Uganda-Tanzania border, where animals from both countries are freely grazing from common and water sources, resulting in a "breeding ground" for FMD according to farmers (Ssekweyama, 2021). FMD is endemic in Tanzania, with outbreaks of mainly serotypes A, O, SAT1 and SAT2 occurring every year in different parts of the country (Madege, 2018).

Despite efforts to implement FMD-zoning since at least 2012, Uganda still struggles with regular FMD outbreaks in all four regions for several reasons (Rutebarika, 2012). Susceptible wildlife act as reservoirs and spread the virus to domestic animals. While serotypes O and SAT2 are most common, there are delays to procurement as well as vaccine mismatch to the circulating serotype. These challenges limit Uganda's export potential for meat and meat products (Rutebarika, 2012).

Risk of FMD introduction through commercial feed

There are many pathways for FMD introduction and spread in a country. While the risks to FMD virus spread via imports of animals and animal products are well studied and regulated, there has been less consideration of the risks posed by import of contaminated commercial feed.

The suspected association between the PEDV incursion and legal importation of commercial pig feed products in the U.S. in 2013 has raised concerns about the possible introduction and spread of other transboundary animal diseases, including FMD, via this route (Stenfeldt, 2021). FMD virus contamination of both animal protein-based commercial feeds and plant-based commercial feeds such as soybean meal can occur through raw materials, the environment in which the feed is manufactured, and the transportation of ingredients and feed to and from the facility (Jones et al., 2020).

FMD virus has been found to remain infectious in pig feed ingredients for durations compatible with transoceanic transport (Stenfeldt et al., 2021). Pigs may be particularly vulnerable to FMD infection through contaminated feed due to their susceptibility to infection via the upper gastrointestinal tract (Stenfeldt et al., 2021).

At the regional level for Southeast Asia, the OIE recommends a specific risk assessment with respect to the potential release for FMD virus from feed imported to the region (Bartels et al., 2017). If warranted by the risk assessment, a system to monitor feed imported to the region, the corresponding origin countries and the disease risks associated with the origin countries should be developed. At a national level, OIE recommends applying strict regulations for products i.e., bone meal, straw, manure, that carry a higher risk of being contaminated with FMD virus.

New FMD diagnostic technologies

There are several commercially available PCR-based point-of-care tests for FMD. A new isothermal PCR that can detect the virus in less than an hour has been developed by TokaBio, a South African biotechnology company (Kgobotlo, 2021). The point-of-care diagnostic system connects to a mobile device that gathers preliminary information on viral detection and strain identification that can be sent to the lab for further analysis and to a government database. Even though the technology is not yet registered and is therefore not yet directly available to farmers in South Africa, the potential widespread use could reduce the turnaround time for results and identification of the most suitable vaccine.

Genetic sequencing has been used to rapidly control the spread of FMD in Morocco (Broussard, 2020). Shortly after a first-time O-type FMD outbreak in 2019, the specific virus genome was

sequenced by the Moroccan veterinary laboratory and compared with the locally circulating strains (Broussard, 2020; Gauntlett, 2019). Once the O serotype was identified, the proper vaccine type could be selected. The Moroccan veterinary authorities implemented successful vaccination campaigns, and the country has since been free from the disease.

Conclusion

FMD control continues to be a challenge for many countries. Eradication of FMD, especially in regions with infections in wildlife, might not be achievable. Therefore, other strategies to control the disease need to be considered.

Diagnostics remain an important tool for quickly identifying the serotype so that vaccine can be procured and delivered efficiently. Vaccination can be used both for FMD outbreak control as well as outbreak prevention. The export of animal products from countries that vaccinate against FMD has been successful without any incidence of FMD introduction.

At this time, the gold standard for FMD control is freedom without vaccination. Robust surveillance systems and border controls have been shown to successfully keep the disease out. However, with increasing globalization and intensive animal production, keeping diseases out of countries becomes more and more difficult. Contaminated commercial feed is just one pathway of FMD introduction that may be underestimated.

In the interest of global food security, animal welfare, and development of livestock sectors, a change in perception toward vaccination as an FMD-prevention method may be needed.

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