



## SAGE Advisory on the outbreak of foot-and-mouth disease in KwaZulu-Natal in June-July 2021: mitigating a potential emergency

### SAGE Sub-committee on Foot and Mouth Disease

Authors – Munyaradzi C. Marufu, Musafiri Karama, Marizvikuru Mwale-Manjoro, Cletos Mapiye, Jerome Singh, Sershen Naidoo, Aliza Le Roux **Date:** 12 July 2021

### Executive summary

Foot and Mouth Disease [FMD; serotype Southern Africa Territory (SAT) 2] is highly contagious and affects all cloven-hoofed livestock and wildlife, with cattle being the primary host of the virus, pigs serving as infection multipliers (not carriers), and recovered sheep being potential virus carriers. In addition, FMD severely affects the production of livestock and disrupts trade in animals and animal products. The most current outbreak of FMD in northern KwaZulu-Natal (KZN) in June 2021 merits concern and necessitates increased awareness around risk factors amongst all stakeholders. Uncontained, FMD could spread beyond KZN and South Africa, given the unique geographical characteristics of KZN. Such a situation could constitute an emergency and merits the implementation of urgent risk mitigation measures. To this end, biosecurity measures, surveillance, awareness-raising, and capacity building, particularly in smallholder farming communities, could facilitate rapid detection of the disease, prevent its introduction into disease-free areas, reduce its spread, and mitigate its socio-economic impact.

### Background

Foot-and-mouth disease (FMD) is an acute, highly communicable disease of livestock that also affects wild animals. Of the three South African Territories (SAT) foot-and-mouth disease (FMD) serotypes endemic to sub-Saharan Africa, SAT-2 is most often associated with outbreaks of the disease in livestock in southern Africa. In 2014, South Africa was officially recognised by the World Organisation for Animal Health [or the Office International des Epizooties (OIE)] as a 'country having a foot and mouth disease (FMD)-free zone where vaccination is not practised'. Following an outbreak in South Africa of FMD in 2019, the country's FMD-free status was suspended by the OIE with effect from 2 January 2019. South Africa has since reported other FMD outbreaks to the OIE (in cattle in the provinces of Limpopo and Mpumalanga between January 2021 and May 2021). These outbreaks are ongoing and also have the potential to spread to other provinces or neighbouring countries. Disease control costs associated with these outbreaks have been significant and recovery has been prolonged.

More recently, South Africa reported another outbreak of FMD to the OIE. FMD was first detected in UMkhanyakude District based on clinical symptoms in cattle on the 25<sup>th</sup> of May 2021 and confirmed by laboratory diagnosis to be the SAT2 serotype on the 27<sup>th</sup> of May 2021. On the 30<sup>th</sup> of June 2021, South Africa's National Minister of Agriculture, Land Reform, and Rural Development, Thoko Didiza, designated the district municipalities of King Cetshwayo (Richards Bay), Umkhanyakude (Mkhuze) and Zululand (Ulundi) as KZN Disease Management Areas (meaning that no cloven-hoofed animals, their products and genetic material are allowed to move out of, into, within or through the KZN Disease Management Area, without authority of a permit issued by the State Veterinary Services). While emerging reports suggest that the latest outbreak may be coming under control, the detection

of FMD in cattle from a previously FMD-free zone in the northern part of KZN, is cause for concern. The continued spread of FMD could signal a potential emergency if the outbreak is not rapidly brought under control. This is based on KZN's unique geography, being the only province in South Africa that is bordered by three provinces (Mpumalanga to the north, Free State to the west and Eastern Cape to the south) and three countries (Mozambique and Eswatini to the north east, and Lesotho to the south west). KZN is also home to major nature reserves, such as Hluhluwe-Imfolozi Game, as well as smaller reserves such as Ndumo Game Reserve (which borders Mozambique), and Pongolapoort Nature Reserve (which borders Eswatini), all of which house several cloven-hoofed species which may serve as FMD viral reservoir hosts. KZN is also home to an international airport (King Shaka International Airport) and two major seaports (Durban and Richards Bay), which connects the province to the world. These factors facilitate connectivity and trade, but more significantly, disease spread, too. Rearing of cloven-hoofed animals (cattle, sheep, goats, pigs and wild ungulates) is the mainstay of the rural economy in most parts of South Africa, especially in northern KZN, which is particularly vulnerable to the current FMD outbreak. Hence, the spread of FMD can have devastating socioeconomic implications for the rural economy of KZN, surrounding provinces, and neighbouring countries.

The serotype affecting cattle in the current outbreak of FMD in cattle in KZN is the SAT2 which is the same serotype detected in the outbreak in Limpopo in November 2019 and Mpumalanga in March 2020. Linkage of these outbreaks to the current outbreak in KZN is, however, inconclusive. This serotype is bovine-derived (rarely affecting pigs), with a great propensity to spread over large geographical areas and has been shown to spread to other parts of Africa. Development of laboratory capacity for the early and accurate diagnosis of the different FMD serotypes is quite important for the control of the disease. Currently the Agricultural Research Council's Onderstepoort Veterinary Research is the designated OIE-recognised laboratory that conducts confirmatory tests for FMD in South Africa. A gap exists in the capacity for viral isolation and serotyping in the provincial laboratories which may provide more rapid response and diagnosis in suspected cases. Control of the SAT2 serotype can be achieved by means of vaccination primarily in cattle, however, recently novel vaccines have been found to be effective to protect cattle and pigs (which can serve as virus multipliers) against the serotypes SAT1 up to 3. There is no cross-immunity across different serotypes of the FMD virus hence quick and accurate laboratory diagnosis of the serotype causing the outbreak is required to enable the use of a vaccine that protects against the outbreak serotype. This must be accompanied by increased biosecurity measures, surveillance, awareness-raising, and capacity building particularly in smallholder farming communities in order to prevent this most current outbreak from becoming an emergency.

### **Impact of previous FMD outbreaks and implications for the current KZN outbreak**

A previous outbreak of SAT2 serotype of FMD in Limpopo province in 2019 resulted in the ban of exports of beef from South Africa to several key regional and international markets. This ban has been perpetuated by subsequent FMD outbreaks in the country (including the current outbreak in KZN). The control of movement of cloven-hoofed animals, which was implemented as the first line of control of the disease in previous and the current outbreak, has had the undesired effect of devastating the livestock industry, creating food (e.g., milk and meat) shortages and price escalations locally, ultimately leading to the shedding of jobs in the farming and downstream industries. Keeping animals on the farm that are ready for slaughter and lengthened feeding of such stock has led to many businesses suffering steep losses as a result of the prolonged implementation of movement control measures.



## Mitigation measures

- Enhanced biosecurity measures: i. Always wear clean personal protective equipment (PPE) when working on livestock; disinfect and change PPE and other equipment soon after handling animals; boots must be washed with disinfectant after contact with livestock. ii. Do not share equipment or vehicles between farms and avoid travel to infected farms. iii. Prevent contact between livestock from different farms, free roaming animals and wildlife. iv. All livestock waste must be disposed off hygienically; constantly clean and disinfect barns or storerooms. v. Restrict access to farms by visitors and prevent their contact with livestock. vi. Visitors and their vehicles should disinfect before entering or leaving the farm. vii. Deliveries should be left at the farm entrance and a log of delivery vehicles must be kept.
- Movement control: (prohibit movement of all cloven-hoofed animals, products and genetic material, into, within, through and out of the Disease Management Area, unless allowed after strict risk-mitigation measures by the State Veterinary Services who will issue a permit for such movement); however, prolonged movement control can hold extremely negative implications for the livestock industry with consequential effects on downstream industries.
- Early reporting to the OIE is essential, as late reporting may lead to delays in the re-establishment of the country's zonal freedom from FMD and return to normal business operations. The return to 'normal' business operations is not easy for most farmers as increased biosecurity measures need to be implemented with associated costs leading to aversion or stakeholder fatigue.
- Continued FMD surveillance. Surveillance lapses result in FMD spreading to a larger geographical area (due to its airborne spread) before its detection and the implementation of control measures. Such factors prolong the movement control period.
- Control of cloven-hoofed wildlife movement is often not feasible and these may serve as reservoirs of infection for domestic stock. In addition, recovered sheep may remain carriers of the virus potentially infecting susceptible livestock.
- The virus may persist in animal products such as milk, meat, hides, and pig swill; hence, these products have to be treated (e.g. using heat treatment of meat and pig swill, ultra high temperature pasteurisation of milk, deboning of meat, maturing/pH reduction of meat, salting of hides, skins and live embryos, scouring and carbonation of wool) to render the virus inactive and prevents these products from spreading FMD. Vaccination of cattle in the outbreak and surrounding zones has helped to reduce the spread of the disease. However, vaccination may be delayed due to inadequate vaccine stocks and other logistical and technical deficiencies within the State Veterinary Services.
- Successful control of FMD depends on the involvement and co-operation of multiple stakeholder groups (including animal transporters, farm workers, farmers, veterinary and para-veterinary personnel and livestock auctioneers who are most directly impacted by national and international decisions on control strategies) in continuous active disease surveillance and reporting. Implementation of an education drive to increase stakeholder awareness and buy-in, and improve disease surveillance before the implementation of risk mitigation strategies, is thus imperative.

## Recommendations

1. The return to normal business operations and trade can only become possible through the reestablishment of an FMD free zone where vaccination is not practised (i.e., all livestock-producing provinces other than northern KZN, Limpopo and Mpumalanga) within South Africa.

2. The granting of zonal freedom from FMD by the OIE will be beneficial. To attain this status, the prevention of further FMD outbreaks for the next 24 months should be prioritised. To this end, the following measures should be deemed requisites:
  - a. the establishment of clear and realistic disease boundaries;
  - b. stepping up of biosecurity and phytosanitary measures to reduce virus introduction into other parts of South Africa and neighbouring countries;
  - c. increased supervision of regulatory measures for the prevention of FMD by the State Veterinary Services.
3. An effective surveillance system (which should involve education drives for all stakeholders in the livestock industry e.g., animal transporters, farm workers, farmers (including rural and subsistence farmers), veterinary and para-veterinary personnel and livestock auctioneers), is required for early detection of the virus in the surveillance zones and implementation of control measures early in the disease curve to prevent massive spread and socioeconomic impacts.
4. Implementation of sufficient biosecurity standards (including the application of basic tenets of situational awareness, segregation, cleaning and disinfection) with a focus on minimising disease impact should be prioritised.
5. Risk analysis and implementation of risk reduction system (e.g., Hazard Analysis Critical Control Points (HACCP)) that works to effectively mitigate the introduction and spread of FMD from diseased to disease-free zones is important.
6. A national Livestock Identification and Traceability System should be implemented as a matter of urgency.
7. There is no disease-specific treatment for FMD. As infected animals lose production value even after recovery, preventing viral spread through vaccination is critical. Accordingly, government, in collaboration with international, regional, and local stakeholders, should step up efforts towards establishing and stockpiling a regional vaccine bank to mitigate the threat of ongoing FMD outbreaks.
8. Capacity for viral isolation and serotyping in provincial laboratories, which may provide more rapid response and diagnosis in suspected cases, should be prioritised. This will necessitate investment in a biosafety level 3 (BSL3) facility, and highly skilled personnel to operate and maintain such a facility. Public-private partnerships (PPP) could catalyse the establishment of such a facility.
9. Expedited regulatory review, accreditation, and approval of validated point-of-care diagnostics for FMD.
10. Information sharing, joint risk assessment exercises and development of joint strategies to control FMD by countries that share borders could mitigate the risk of FMD outbreaks.
11. The potential impact of social unrest and restrictions related to the COVID-19 pandemic should be factored into FMD countermeasures.

## Conclusion

The current FMD outbreak in northern KZN has the potential to cause morbidity in cloven-hoofed livestock, disrupt livestock production and by-products manufacture, and hinder trade, resulting in significant socioeconomic losses for local, regional and international communities. Accordingly, the current FMD outbreak in KZN should be treated as a potential emergency necessitating an urgent coordinated response by all stakeholders at local, provincial, national and international levels.

## References

1. OIE. Follow-up report 8 Foot and mouth disease virus (Inf. with), South Africa. <https://wahis.oie.int/#/report-info?reportId=16855>.
2. OIE. Follow-up report 11 Foot and mouth disease virus (Inf. with), South Africa. <https://wahis.oie.int/#/report-info?reportId=31000>.
3. Smith J. Focus on Foot-and-Mouth Disease and Emergency Preparedness. 1 November 2019. <https://www.emergence-msd-animal-health.com/focuson-article/focus-on-foot-and-mouth-disease-and-emergency-preparedness/>
4. OIE. Foot and mouth disease. <https://www.oie.int/en/disease/foot-and-mouth-disease/>
5. Food and Agricultural Organisation. Early reaction contingency planning for a FMD emergency. <http://www.fao.org/3/Y4382E/y4382e09.htm>
6. United States Department of Agriculture Animal and Plant Health Inspection Service (APHIS). Planning and Preparing for Foot-and-Mouth Disease. October 2020. [https://www.aphis.usda.gov/animal\\_health/emergency\\_management/downloads/fmd-briefing.pdf](https://www.aphis.usda.gov/animal_health/emergency_management/downloads/fmd-briefing.pdf)
7. Jo, HE., You, SH., Choi, JH. et al. Evaluation of novel inactivated vaccines for the SAT 1, SAT 2 and SAT 3 serotypes of foot-and-mouth disease in pigs. Virol J 2019; 16: 156. <https://doi.org/10.1186/s12985-019-1262-1>.
8. Animal Diseases Act 35 of 1984. Control measures related to Foot and Mouth Disease in certain areas. R.569: No. 44783. 30 June 2021. [https://www.gov.za/sites/default/files/gcis\\_document/202106/44783rg11301gon569.pdf](https://www.gov.za/sites/default/files/gcis_document/202106/44783rg11301gon569.pdf).
9. OIE Bulletin. South Africa – Suspension of ‘country having an FMD-free zone where vaccination is not practised’ status. <https://oiebulletin.com/?official=2019-1-zaf-fmd-en>.



## SAGE Subgroup on Food and Mouth Disease contact details

Name	Institution	Telephone	Email Address
M.C. Marufu	Department of Veterinary Tropical Diseases, University of Pretoria	+2712529822 7	<a href="mailto:chris.marufu@up.ac.za">chris.marufu@up.ac.za</a>
M. Karama	Department of Paraclinical Veterinary Studies, University of Pretoria		<a href="mailto:Musafiri.karama@up.ac.za">Musafiri.karama@up.ac.za</a>
M. Mwale-Manjoro	School of Agriculture, University of Venda		<a href="mailto:Marizvikuru.Manjoro@univen.ac.za">Marizvikuru.Manjoro@univen.ac.za</a>
C. Mapiye	Department of Animal Sciences, Stellenbosch University		<a href="mailto:cmapiye@sun.ac.za">cmapiye@sun.ac.za</a>
J.A. Singh	SAGE, Academy of Science of South Africa (ASSAf)		<a href="mailto:jerome.singh@assaf.org.za">jerome.singh@assaf.org.za</a>
S. Naidoo	Institute of Natural Resources		<a href="mailto:snaidoo@inr.org.za">snaidoo@inr.org.za</a>
Aliza Le Roux	Department Zoology & Entomology, University of the Free State		<a href="mailto:LeRouxA3@ufs.ac.za">LeRouxA3@ufs.ac.za</a>

**About SAGE:** The Scientific Advisory Group on Emergencies (SAGE) is housed within the Academy of Science of South Africa (ASSAf) and is steered by members of ASSAf and the South African Young Academy of Science (SAYAS). SAGE aims to provide rapid, independent, multi-disciplinary science advice to relevant stakeholders on emergency issues that require strategic attention. SAGE also aims to undertake engagement with relevant stakeholders to create awareness and facilitate resilience in relation to emergencies. In the context of SAGE activities, an “emergency” denotes a serious, unexpected, and potentially dangerous situation that has either already caused loss of life, health detriments, property damage, or environmental damage, or has a high probability of escalating to cause immediate danger to life, health, property, or the environment. To support Africa’s response to COVID-19, the Africa Rapid Grant Fund has supported the establishment of the Scientific Advisory Group on Emergencies (SAGE). The Africa Rapid Grant Fund is supported by the National Research Foundation (NRF) of South Africa, the Canadian International Development Research Centre (IDRC), the Swedish International Development Cooperation Agency (SIDA), the United Kingdom (UK) Department for International Development (DFID), UK Research and Innovation (UKRI) through the Newton Fund, South Africa’s Department of Science and Innovation (DSI), and Fonds de Recherche du Québec (FRQ).

**SAGE Webpage** on ASSAf website; Contact: [SAGE@assaf.org.za](mailto:SAGE@assaf.org.za)

**About ASSAf:** ASSAf is the official national Academy of Science of South Africa. ASSAf's mandate encompasses all fields of scientific enquiry and it includes the full diversity of South Africa's distinguished scientists. The Parliament of South Africa passed the Academy of Science of South Africa Act (Act 67 of 2001), as amended, which came into operation in May 2002.  
Website: <https://www.assaf.org.za/>