FMD in the SADC region: historical perspectives, control strategies and trade implications

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Summary

*The epidemiology of foot and mouth disease (FMD) in southern Africa is complicated by the dominance of buffalo-maintained and transmitted Southern African Territories (SAT) serotypes, which co-evolved with buffalo over approximately 900 years. So far, most countries of the region have prevented SAT viruses from becoming endemic in livestock populations by rapid elimination of infection when it has spilled over into cattle. Nevertheless, there are indications that in some countries SAT serotype infections are now also endemic in cattle. Serotypes O and A also occur in northern parts of the Southern African Development Community (SADC) region, but there is no indication that wildlife maintains non-SAT serotypes. FMD control in the SADC region is based on combinations of methods depending on the export status of countries; these include separation of animal populations – wild and domestic – by fencing systems to create FMD-free zones, control of movement of animals and their products, routine vaccination and surveillance. Countries in the region that export beef to high-value markets employ all these measures. Botswana, Namibia, South Africa and Swaziland made good progress in managing FMD between the late 1970s and the turn of the 21st Century, probably largely because of the use of improved FMD vaccines manufactured locally from the late 1970s onwards. However, since 2001 the situation has deteriorated, with intervals between FMD outbreaks becoming shorter while individual outbreaks lasted longer and were more difficult to control. Outbreaks characterised by mild or unapparent infection have also become more evident. In an effort to improve this situation, SADC has teamed up with development partners, international and regional FMD reference laboratories, the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE) to implement measures, focused initially on mapping the FMD viruses circulating in wild buffalo populations and cattle at the wildlife/livestock interface, to satisfy requirements of the Progressive Control Pathway for FMD (PCP-FMD). SADC is developing a strategy that will include a roadmap for the management of FMD in the region to guid*e this process.

Keywords
Buffalo – Foot and mouth disease – Southern African Territories serotypes – Vaccination.

Introduction

The presence of transboundary animal diseases (TADs) and the escalating costs of their control, coupled with the ever increasing costs of regulation and meeting export standards for beef exporters from southern Africa (8) is a major constraint to the development of the livestock industry in the Southern African Development Community (SADC) region. Of all the TADs in the region, foot and mouth disease (FMD) has been identified by the Chief Veterinary Officers of SADC Member States as a disease of strategic importance for the whole region. Apart from limiting market access for livestock commodities and impeding regional integration, the disease is increasingly being considered as a hindrance to improving the livelihoods and food security needs of livestock communities. In the SADC region, FMD is unique because of the role played by wildlife, particularly the African buffalo (*Syncerus caffer*), in the epidemiology of the disease (9), even if transmission of the virus from buffalo to livestock is inefficient.

The involvement of buffalo in the epidemiology and, therefore, outbreaks of FMD is resulting in continued conflict between wildlife conservation and livestock development.

Epidemiology of FMD in the SADC region

The Southern African Territories (SAT) types predominate in the SADC region. In southern Africa, as in other parts of the continent, the epidemiology of FMD is influenced by two different, but sometimes overlapping, patterns, namely a cycle in which wildlife maintains and spreads the disease to other susceptible domestic animals and wild ungulates and a cycle that is maintained within domestic animals, independent of wildlife. In southern Africa, the former cycle predominates due to the presence of African buffalo, the only wildlife species for which long-term maintenance of FMD has been described (3, 4, 5, 9, 11, 12). The lack of the latter cycle in some countries in southern Africa may also be because some countries in the region have been adept at preventing SAT viruses becoming endemic in cattle populations.

The African Development Bank-funded 'Strengthening institutions for the risk management of transboundary animal diseases' (SADC TADs) project embarked on a buffalo sampling exercise with a view to determining the FMD viruses circulating in wild buffalo populations in the region's national parks. The samples are being tested at the Botswana Vaccine Institute (BVI), the Onderstepoort Veterinary Institute (OVI), the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE) Reference Laboratory for FMD at Pirbright in the United Kingdom. The data collected from the exercise will form part of the information that will be used to update the SAT serotype database developed with the assistance of the EU-funded FMD project (2007–2009) and to develop, and later update on a regular basis, the region's FMD strategy. They will also be used by BVI to quickly react to FMD outbreaks in different parts of the region with, hopefully, faster production of vaccine suitable for each outbreak. The region's agriculture/livestock ministers have committed to continue the sampling exercise on an annual basis beyond the project's life.

Present PCP status of SADC countries

The progressive control pathway (PCP) for FMD proposes a stage-wise approach, allowing for a regional or ecosystem-based synchronisation between countries, similar to the approach known as OIE rinderpest pathway followed under the Global Rinderpest Eradication Programme (GREP), now concluded. The FMD PCP consists of six stages ranging from zero, where there is continuous FMD virus circulation with no reporting or control actions, to five, where a country is ready to be officially recognised by the OIE as free without vaccination. The OIE currently recognises only three categories for countries with regards to FMD:

1. countries not free from FMD (PCP Stages 0–3)
2. FMD-free countries or zones practising vaccination (PCP Stage 4) and
3. FMD-free countries or zones where vaccination is not practised (PCP Stage 5).

However, the region felt it was important to utilise the full classification spectrum of the six stages because of the diversity of countries with regard to FMD control within the region.

The table below summarises the status and desired ambition of the countries in relation to the PCP stages they wish to attain over the next ten years from 2011 (Table I). The classification was arrived at after a consultation of countries without formal OIE recognised status for FMD, conducted in March 2011 under the auspices of OIE and FAO (13).

Table I
PCP status of SADC Member States

Countries	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Angola	1	1	1	2	2	2	3	3	3	3
Angola (zonal)	1	1	1	2	2	3	3	4	4	4
DRC	1	1	1	1	2	2	2	2	2	3
Malawi	3		3	3	3	3	3	3	3	3
Malawi (zonal)	3		3	4	4	4	4	4	4	4
Mozambique	2	2	3	3	3	3	3	3	3	3
Mozambique (zonal: Tete, Manica)	2	2	3	3	3	5	5	5	5	5
Mozambique (zonal: South)	2	2	3	3	4	4	4	4	4	4
Seychelles	Hist freed	5	5	5	5	5	5	5	5	5
Tanzania	1	1	2	2	2	3	3	3	3	3
Tanzania (Mainland:zonal)	1	1	2	2	2	3	3	4	4	4
Tanzania (Islands: Zanzibar, Pemba)	1	1	2	3	3	4	4	4	4	4
Zambia	2	2	3	3	3	3	3	3	3	3
Zambia (zonal)	2	2	3	3	4	4	5	5	5	5
Zimbabwe	1	2	3	3	3	3	3	3	3	3
Zimbabwe (zonal)	1	2	3	3	3	4	4	5	5	5

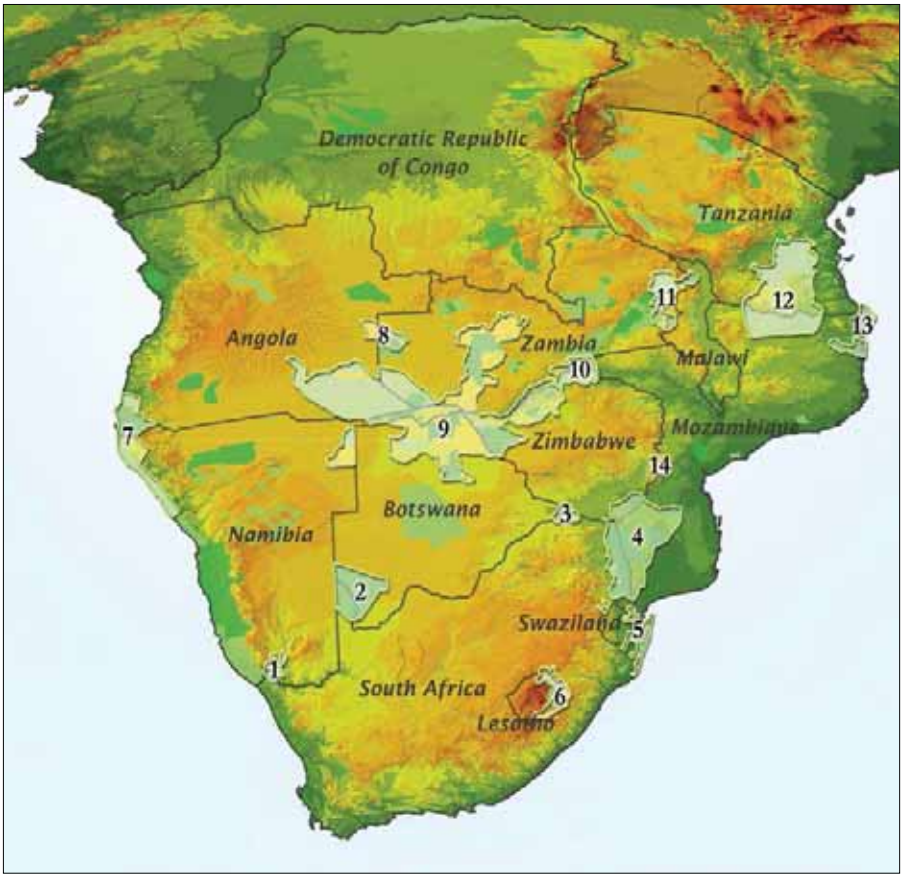
Table courtesy of OIE SRR-SA

TFCAs and the wildlife factor in the epidemiology of FMD

The region has, in the last ten years, witnessed an increase in the formation of transfrontier conservation areas (TFCAs). Currently, the list of existing and proposed TFCAs in the region stands at 17. The largest TFCA in the region is the Kavango-Zambezi (KAZA) TFCA, spanning five southern African countries – Angola, Botswana, Namibia, Zambia and Zimbabwe – and centred on the Caprivi–Chobe–Victoria Falls area (Fig. 1). The KAZA TFCA covers an area of approximately 287,132 km^2, almost the size of Italy (300,979 km^2), and includes no fewer than 36 formally proclaimed national parks, game reserves, forest reserves and game/wildlife management areas, as well as intervening conservation and tourism concessions set aside for consumptive and non-consumptive uses of natural resources (see www.kavangozambezi.org). Given that livestock are traditionally pivotal to societies that live in TFCAs and the immensity and geographical span of most TFCAs, it is inevitable that people, wildlife and livestock live together in most parts of the KAZA TFCA.

FMD control strategies in the region

In Botswana, Namibia, South Africa and Swaziland excellent progress was made in managing FMD from the late 1970s to the turn of the 21st Century. The dramatic fall in the rate at which outbreaks occurred over that period was probably largely because of the production of FMD vaccine locally from the late 1970s onwards. However, since 2001 the situation has deteriorated, with intervals between FMD outbreaks becoming shorter while individual outbreaks last longer and are more difficult to control.



1. Ai-|Ais/Richtersveld Transfrontier Park *(treaty signed)*
2. Kgalagadi Transfrontier Park *(treaty signed)*
3. Limpopo/Shashe TFCA *(MoU signed)*
4. Great Limpopo TFCA *(treaty signed)*
5. Lubombo TFCA *(MoU signed)*
6. Maloti-Drakensberg Transfrontier Conservation & Development Area *(MoU signed)*
7. Iona-Skeleton Coast TFCA *(MoU signed)*
8. Liuwa Plain-Mussuma TFCA *(MoU pending)*
9. Kavango-Zambezi TFCA *(MoU signed)*
10. Lower Zambezi-Mana Pools TFCA *(MoU pending)*
11. Malawi/Zambia TFCA *(MoU signed)*

12 – Niassa-Selous TFCA *(conceptual phase)*

13. Mnazi Bay-Quirimbas Transfrontier Conservation & Marine Area (TFCMA) *(conceptual phase)*
14. Chimanimani TFCA *(MoU signed)*

Fig. 1
Kavango–Zambezi Transfrontier conservation areas (TFCAs)
Courtesy of Peace Parks Foundation 2013

The SADC region follows a dualistic approach to the control of FMD. The countries that export to the lucrative markets employ a combination of the following control options:

– Separation of livestock from infected wildlife populations (fencing being the primary tool). Game-proof fences have been erected to restrict the movement of cloven-hoofed animals all regularly maintained and patrolled and intended to constitute physical barriers to movement (6). Fencing remains a controversial issue in the region attracting the ire of those concerned with environmental issues (2) and those advocating transfrontier conservation areas, who argue for the removal of fences to allow free movement of game.

– Routine vaccination of cattle in high-risk areas (in and adjacent to infected buffalo populations). Bi- or tri-annual vaccination of cattle in proximity to infected zones populated by buffalo complements these other measures. This is done in conjunction with the ongoing surveillance of cattle in endemic areas (8) and/or high-risk areas (10).

– Stamping out if the populations involved are small. In South Africa and Botswana, when FMD outbreaks have occurred in the designated FMD-free zone, they have sometimes been controlled by the compulsory slaughter of infected and in-contact animals when relatively small numbers of animals are affected (7). This is not without controversy, especially over issues of compensation.

– Movement control of susceptible animals and their products. In most exporting countries animal movement control is administered through a permit system under authorisation of the veterinary department. It is supported by livestock identification and traceability measures including branding, eartags and a networked database (in the case of Namibia) and micro-chipped reticular boli (in the case of Botswana's Livestock Identification and Trace Back System), and enforced with roadblocks (8).

– High levels of surveillance often carried out irrespective of whether or not the disease is present. It is becoming increasingly difficult to justify the high expenditure related to active disease surveillance, especially in the absence of overt clinical disease in cattle. However, since infection will always be present in buffalo populations, surveillance cannot be done away with.

These approaches have achieved considerable success over 60 years in the exporting countries (see Fig. 2). Until the late 1990s outbreaks were rare and, when they did occur, they were quickly controlled and a successful (but preferential, in terms of tariffs) beef export system emerged. That is now under severe threat because of the increase in both frequency and severity of outbreaks, especially over the last ten years.

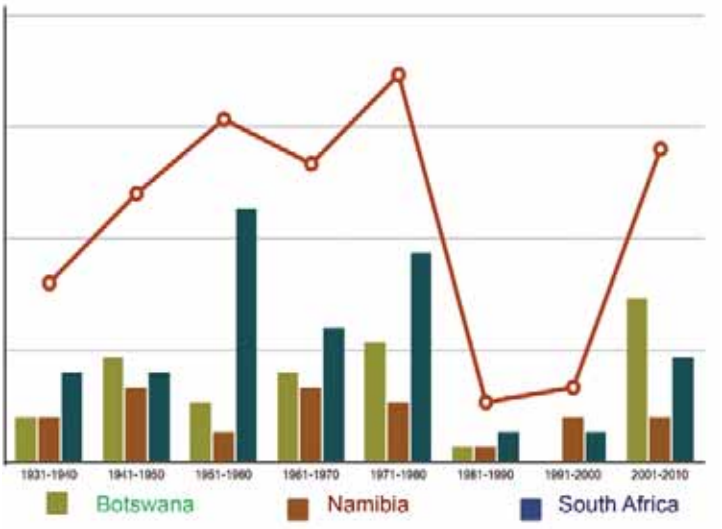


Fig 2
Incidence of FMD outbreaks in cattle over eight decades in three southern African countries

Courtesy of M. Atkinson

Non-exporting countries of the region control FMD outbreaks through:

– Vaccination of cattle following an outbreak. Vaccination is hardly routine but is carried out following an outbreak of FMD as part of the control measures.

– Movement control of animals from and into outbreak areas. Even though, on paper, movement restrictions may form part of the national control strategy, it is usually the case that these restrictions are rarely maintained for long periods after an outbreak. The lack of funds to sustain permanent roadblocks is a major contributing factor to the ineffectiveness of this control option in the non-exporting countries. It is also often difficult to justify such expenditures to the treasury in the absence of tangible returns from the livestock sector because the country is not generating income from exports of livestock products.

– Active surveillance is also constrained due to inadequate funding.

The region's only FMD vaccine producer, the Botswana Vaccine Institute (BVI), has, in the last four years, made significant improvements to the quality of the vaccine. This follows field trials in Malawi, Botswana and Namibia to evaluate the effectiveness of the vaccine and vaccination. The culmination of these efforts was new recommendations on the vaccination frequency, an increase in the payload of the vaccine and the commissioning of the new production plant at BVI that has the capacity to produce a purified vaccine.

In summary, the seven main thrusts of the strategy under development are gaining knowledge of virus strains circulating in the wild buffalo population, designing effective vaccination programmes in the region, improving

early detection and identification of the disease at field level and how this information is speedily relayed to headquarters for rapid reaction, definition of and maintenance of common regional minimum standards for improved surveillance in member states, improved laboratory diagnosis, co-existence of the reality of TFCAs and advocacy for implementation of the commodity-based trade (CBT) concept to benefit livestock farmers in areas where the risk of FMD spread is negligible.

Trade restrictions due to FMD

Most countries in southern Africa either already or aspire to export fresh or chilled beef into high-value markets. Unfortunately, beef production in the region is not internationally competitive, as even current exports are only possible because of tariff protection enjoyed by the region's exporters (e.g. provisional *economic partnership agreements* (EPAs) signed by Botswana and Namibia with the European Union). Improvement of competitiveness requires investment and adoption of modern farming methods and massive infrastructural developments in the region's transport and other related sectors. However, investment in the sector is dependent (among other things) on access to markets and prospects for a good return. Market access is in turn constrained by the current FMD rules that require the setting up of FMD-free zones from which the exports should originate. As indicated earlier, it is becoming increasingly difficult to set up and maintain fences for FMD control surrounding FMD-free zones because of the land use pressure exerted by, among others, mushrooming of TFCAs in the region. In fact, recent studies have shown that in some cases, the revenue from wildlife, tourism, conservation and land use may exceed that from livestock in the region's rural areas.

Unless the region can gain acceptance for non-geographic international standards for trade in animal commodities and products, the prospects for increasing beef exports are unlikely to be realised. Fortunately, the OIE, which is the relevant international standard-setting body, has in recent years begun to adopt non-geographic standards – they now exist for deboned beef and a number of other commodities (including live animals) and products (e.g. Article 8.5.25). Unfortunately, many Veterinary Services of importing countries do not accept these standards without reasons other than being perceived as 'unsafe' and 'unacceptable'.

It is felt that even the progressive control pathway for FMD (PCP-FMD) may not live up to the critical need to fully accept and push for more recognition of non-geographic-based standards. Although the PCP-FMD mentions non-geographic approaches, there is pervading advocacy for zoning and zonation. That does not appear to be compatible with the need for balanced rural development that incorporates the initiatives for poverty alleviation and conservation of wildlife and invaluable wilderness areas alongside livestock production. It is also clear that, for the SADC region and also for East Africa, getting rid of buffalo is not an option. Therefore, a way has to be found to accommodate both wildlife and livestock land use practices in the region.

Going forward

Most economies in the region are growing at a fast rate, resulting in the emergence of a small but rapidly expanding middle class, whose consumption of livestock products is also increasing. Therefore, in the short and medium term this increasing demand will have to be satisfied by an increase in livestock production and productivity. At the same time, the interaction between wildlife and livestock is bound to increase and, therefore, one way to enhance trade in livestock and livestock products will be for countries to fully adopt and implement Article 8.5.25 of the *Terrestrial Animal Health Code*, which deals with commodity-based trade (CBT) of 'safe products'. SADC will work with member states in the region to raise awareness of the CBT and improve in-country understanding of the CBT in both the ministries responsible for agriculture and trade (public sector) and in the business community (private sector). Likewise, it would be desirable for all OIE Member Countries to adopt and implement in full the said article, if beef exports from SADC countries are to be sustained or even increased.

At the national level, countries will be assisted to develop national strategies that are aligned with the FMD regional strategy.

At the regional level, the objective is to develop a medium- to long-term strategy for the progressive control of FMD in the SADC region, the expected outputs of which will include development of improved tools for managing variation in SAT-type viruses circulating in the region and an improved knowledge base on integrating FMD control

with rural development and management of TFCAs. The setting up of regional SAT antigen banks will also be considered in the strategy under development while regional research will focus on development of NSP tests.

Conclusion

Foot and mouth disease presents a critical impediment to the expansion of trade in livestock and livestock commodities in the SADC region. The recent deterioration in both the number and severity of outbreaks and the transboundary nature of the disease make a regional approach to its control an absolute necessity if success is to be achieved (1). There should also be deliberate steps aimed at promoting the implementation of Article 8.5.25 in the region and advocacy for its wider acceptance internationally. Finally, the advent of TFCAs is a reality and has been shown to be contributing just as much as, if not more than, agriculture in parts of the SADC region. Integrated mechanisms for the mutual and beneficial existence of TFCAs and control of TADs along the wildlife/livestock/environment interface must be worked out to ensure holistic rural development. The Global FMD Strategy should take cognisance of the unique nature of FMD epidemiology in the region.

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