UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

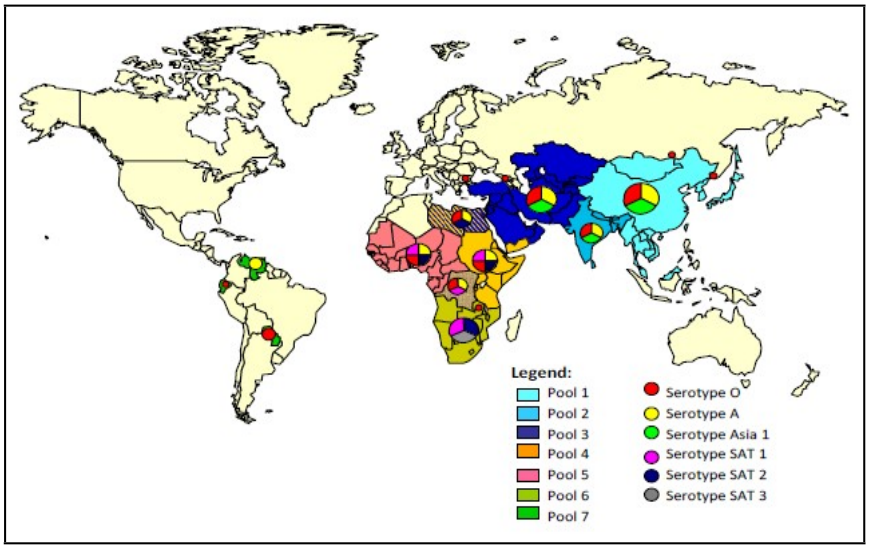
TAD SCIENTIFIC

Unique features of foot and mouth disease in Southern Africa

Gavin Thomson

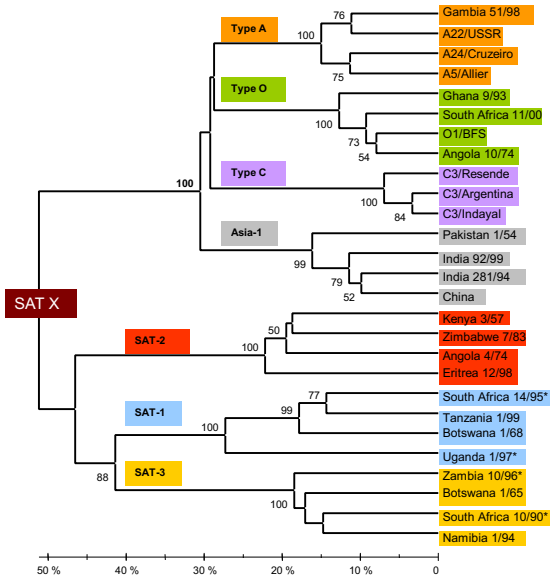
Wildlife Friendly Beef: Working towards a win-win solution for livestock agriculture and wildlife conservation in Ngamiland

Maun; 8-9 November 2017



Approximate distribution of endemic FMD in the world today

FMD virus family tree based on molecular phylogeny



Eurasian types (O, A, C & Asia 1) – evolved over last 500 years in domestic livestock. These viruses are infections of livestock

So FMDV genus has two distinct lineages that separated about 500 years ago

SAT X – Progenitor of all FMD viruses; SAT types have co-evolved with African buffalo in sub-Saharan Africa buffalo for about 1000 years. SAT viruses are natural infections of buffalo

Acknowledgement: N J Knowles, Pirbright, UK

The fundamental conundrum

- Management of all diseases, whether plant or animal, is only possible if their characteristic behaviour (epidemiology) is understood
- The behavioural characteristics of SAT & Eurasian type FMD differ significantly – see w/s folder
- Other important differences that influence the control of the two forms of FMD also identified
  - we have provided evidence that unlike Eurasian FMD, SAT viruses in southern Africa are not eradicable (published)
- Current international standards & recommendations for the control of FMD are based on Eurasian-type FMD
- Consequently, sub-Saharan Africa – where SAT-type FMD is endemic – is saddled with a problem, i.e. trying to fit square pegs into round holes!
- Because nowhere else in the world has this problem, we will have to come up with the solution
- Unsurprisingly, management of SAT-type FMD is not proving effective in the SADC Region currently, especially since the advent of 21st Century
- So, clearly, things need to change (ideas on this tomorrow)
- But first we need to understand the details & implications of the differences between these two viral lineages

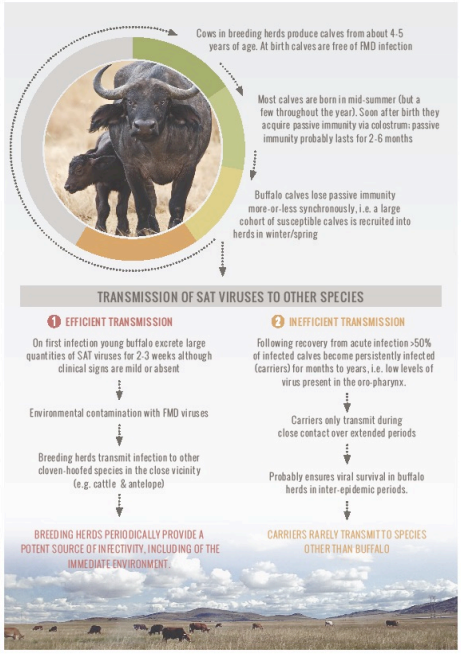
Major differences between the two lineages of FMD virus

Factor	SAT-type FMD viruses	Eurasian-type FMD viruses
Relationship with wildlife	Evolved in and maintained naturally by African buffalo populations	Evolved in livestock; not maintained by any wildlife population
Rate of transmission	Commonly slow and inefficient in endemic areas of southern Africa	Commonly rapid and efficient
Severity of disease	Generally a mild or unapparent disease in both wildlife and livestock	Generally a serious disease in cattle & pigs
Vaccine efficacy	• Compromised by exceptional antigenic diversity • Lack of clear subtypes → difficulty in matching vaccine and field viruses	• Less antigenic diversity • Favoured by existence of clear subtypes → effective 'matching' of field and vaccine viruses

SAT viruses & African buffalo

Understanding this relationship is beginning to improve:

- Calves are likely the major transmitters of SAT viruses within buffalo herds & also to other susceptible species
- Persistently infected buffalo (carriers) are vital for maintaining SAT viruses in buffalo herds - unlike cattle where so-called carriers are a biological dead-end (they don't transmit)
- Essentially buffalo transmit SAT viruses in two ways; one efficient & the other inefficient
- See folder papers for more detail
- However, much more research needed!



Severity of disease

- The OIE defines FMD as the occurrence of infection with FMD viruses, irrespective of whether it is accompanied by disease or not (Article 8.8.1)
- Diseased animals excrete more 'infectivity' than animals that develop only mild or no disease at all

Summary of FMD 'disease events' reported to OIE: 2011-2015

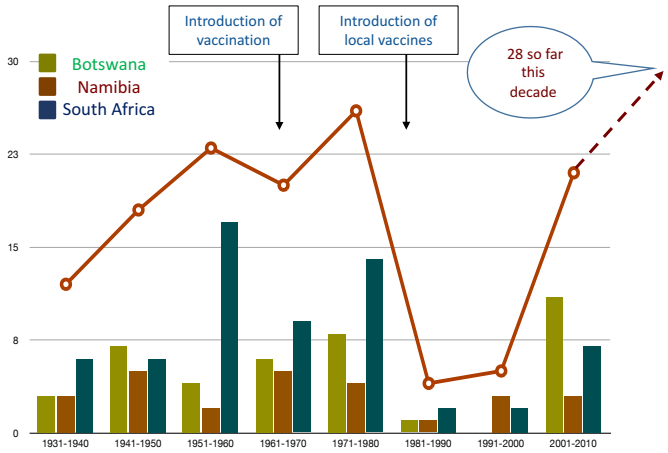
FMD viral lineage	No of events	Apparent morbidity rate >10%	Average apparent morbidity rate (%)
Eurasian (World-wide)	51	30 (58.8%)	35.4
SAT (Southern Africa)	43	3 (7%)	3.3

So, mild disease & unapparent infection appear to be more common in cattle as well as wildlife (buffalo & antelope) infected with SATs

Potentially benefits the management of FMD in southern Africa in future

Cattle 'suffering' from FMD at Mohembo West, 2008

Apparent role of vaccine in incidence of cattle FMD in Southern Africa



Incidence of FMD 'events' in cattle over 8 decades in three southern African countries

At face value, the efficacy of vaccination programmes against FMD appears to have been excellent for 20 years but to have declined since about 2000

However, this is a complex issue & therefore needs to be examined carefully because there are many potential explanations for these trends

Conclusion

- SAT- & Eurasian-type FMD constitute two different forms of the disease; they differ not only in their evolution but also in the way they behave in the field
- Despite the struggle against SAT-type FMD in southern Africa since it was first recognised in 1931, the local realities are still not appreciated and/or understood
- This situation is complicated by international standards & recommendations being founded almost exclusively on Eurasian-type FMD
- We need to change this state of affairs, but the question is how?
- Ideas on that tomorrow ….