

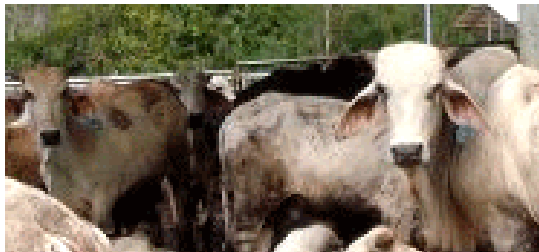


OIE/FAO Global Conference on Foot and Mouth Disease
with the support of the EC

THE WAY TOWARDS GLOBAL CONTROL

24-26 June 2009, Asunción Paraguay

*Opportunities and constraints posed
by wildlife in the diagnosis and
epidemiology of foot-and-mouth
disease virus infection*



Peter Roeder
Taurus Animal Health, UK

WHY IT IS IMPORTANT TO CONSIDER WILDLIFE IN THE EPIDEMIOLOGY OF FOOT-AND-MOUTH DISEASE (FMD)

This presentation will address wildlife and also feral populations of animals such as swine and swamp buffaloes.

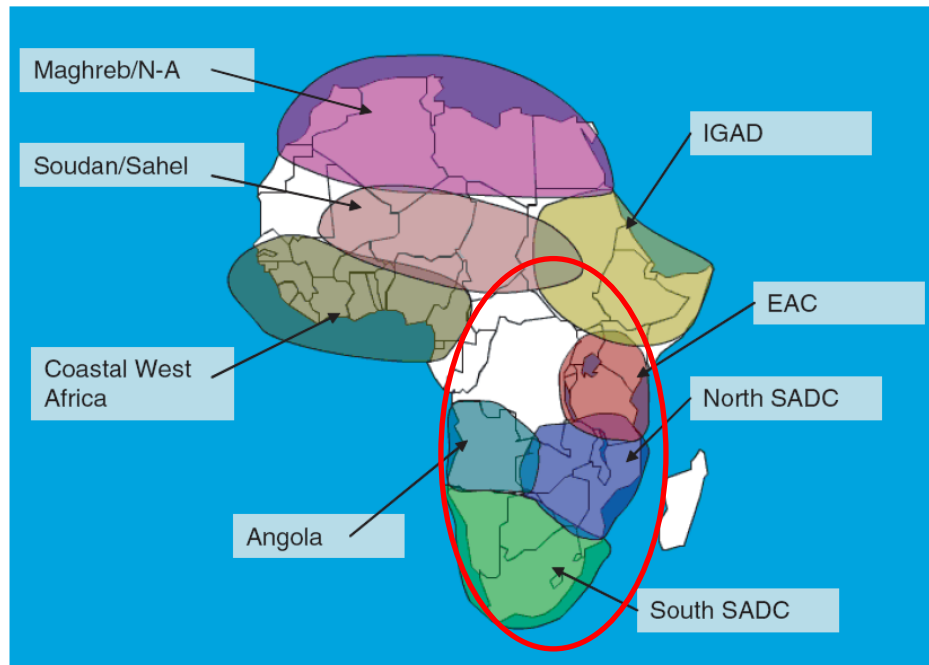
The overall FMD 'picture' is the result of complex interactions between sedentary farmed livestock, migratory/transhumant livestock, wildlife/feral animal populations and their migrations, trade in animal products and zoo-sanitary provisions.

1. Wildlife can suffer clinical disease – they can become infected from domesticated animals and can also pass infection to domesticated animals – it is a two-way dynamic exchange
2. Some wild populations can harbour FMD and are intimately involved in the epidemiology of FMD – *there is still much more to learn*
3. For a full knowledge of FMD viruses and their constant evolution we need to know the situation in wildlife
4. For accreditation of FMD freedom we need to include wildlife

THE AFRICAN WILDLIFE RESERVOIR

The pivotal role played by the African buffalo (*Syncerus caffer*) in acting as a reservoir of infection to maintain and propagate infection is well known.

Ecological groupings of FMD viruses



Area where
wildlife are
important in
FMD
maintenance
and
transmission



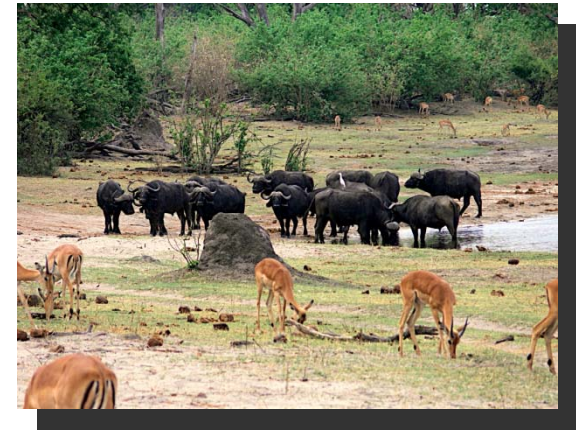
M.M. Rweyemamu, P.L. Roeder, D. McKay, K. Sumption, J. Brownlie, Y. Leforban, J.-F. Valarchet, N.J. Knowles and W. Wint (2008)
Epidemiological patterns of Foot-and-Mouth Disease Worldwide. *Transboundary and Emerging Diseases* 55, 57-72

THE AFRICAN WILDLIFE RESERVOIR

Evolving understanding of the role of wildlife in harbouring and propogating FMD

After all the years of study of wildlife in southern Africa and their role in generating cattle FMD, two interesting insights have recently emerged:

- (1) Impala (*Aepyceros melampus*) are important independently of buffaloes (*Syncerus caffer*) in maintaining and propogating FMD; there is a much more complex relationship than was suspected: sub-clinical, seasonally modulated infection occurs commonly in some populations of impala ¹.
- (2) There is ample evidence that FMD viruses spread repeatedly from buffaloes to cattle, but it has been difficult to reproduce this experimentally. There is now evidence that venereal transmission from bull buffaloes to domesticated cows could be one mechanism not recognised before ².



¹ W. Vosloo, P. N. Thompson, B. Botha, R. G. Bengis and G. R. Thomson (2009) Longitudinal Study to Investigate the Role of Impala (*Aepyceros melampus*) in Foot-and-Mouth Disease Maintenance in the Kruger National Park, South Africa. *Transboundary and Emerging Diseases*. 56, 18–30

² Bastos, A.D.S., Bertschinger, H.J., Cordel, C., Van Vuuren, C. De W. J., Keet, D., Bengis, R.G., Grobler, D.G. and Thomson, G.R., (1999). Possibility of sexual transmission of foot-and-mouth disease from African buffalo to cattle. *Veterinary Record*, 145, 77-79.

POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

ASIA

South Asia: feral swine/wild boar are abundant

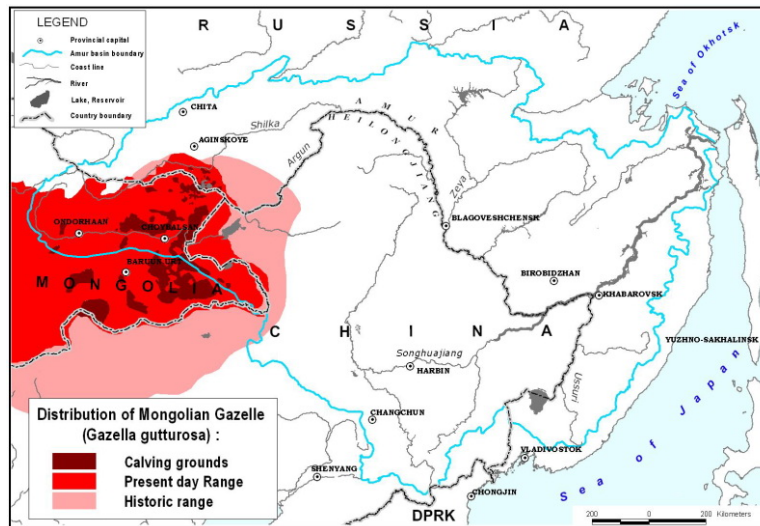
Unknown role in FMD epidemiology



POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

ASIA

Mongolia/China antelopes: transfrontier migration



Mongolian gazelle or zeren
(*Procapra gutturosa*)

A POSSIBLE MEKONG RIVER FOCUS

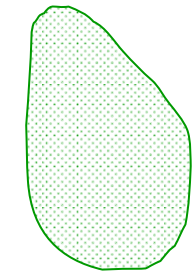
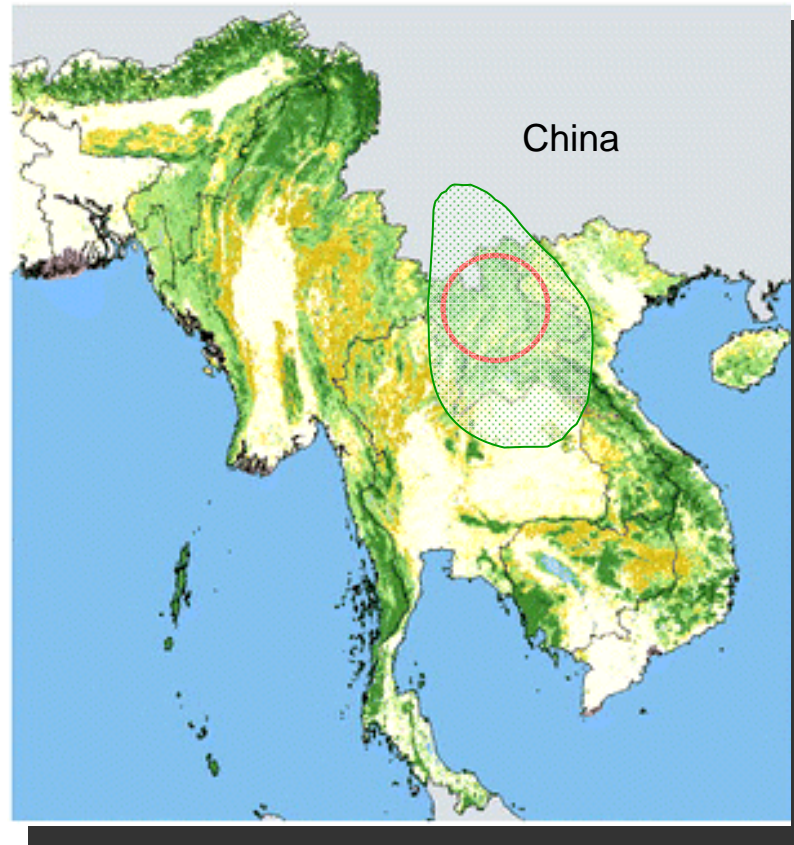
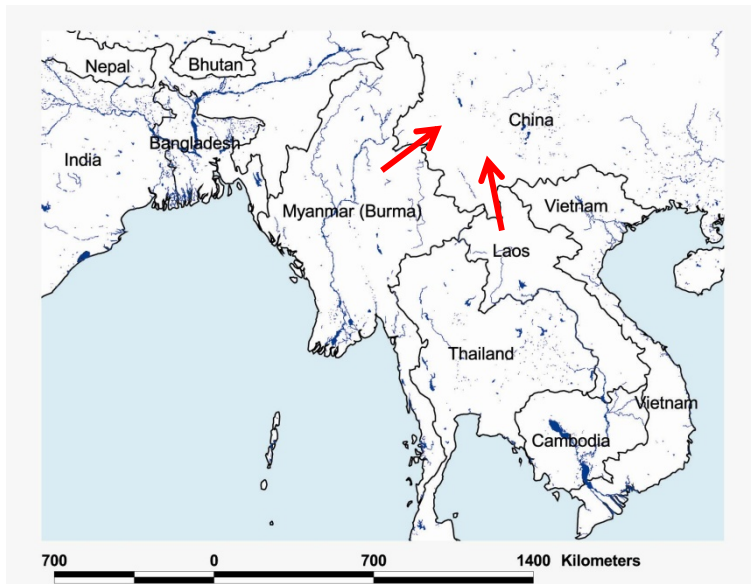
ASIA

Type A viruses of an eastern South-East Asian topotype have been detected repeatedly in **SE Asia** and have recently been described in China.



The Mekong River System





Serological evidence of Type A FMD



Feral swamp buffaloes



wild pigs

POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

ASIA



Wild bactrian camel (*Camelus bactrianus*)



Bactrian camels develop frank clinical disease¹ but wild populations are too small to be of importance

¹ Larska, M., Wernery, U., Kinne J., Schuster, J.R., Alexandersen, G. and Alexandersen, S. (2009) Differences in the susceptibility of dromedary and Bactrian camels to foot-and-mouth disease virus. *Epidemiology and Infection* 137, 549-554

POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

ASIA

Sri Lanka

Wilpattu National Park



FMD Type O



swamp buffalo
Bubalus bubalis



wild boar
Sus scrofa

POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

MIDDLE EAST

Israel/Palestine



Mountain gazelle (*Gazella gazella*)

Indicators of infection in small ruminants - sentinels

POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

EUROPE:

Caucasus/Transcaucasus



Involved in African swine fever

Wild boar (*Sus scrofa*)

Probably not important in FMD maintenance and propagation

POTENTIAL FOR WILD/FERAL SPECIES TO PLAY A ROLE IN FMD MAINTENANCE AND TRANSMISSION OUTSIDE AFRICA

SOUTH AMERICA

Camelids

Although the camelids can be infected with FMD virus by direct contact, they are not very susceptible and do not pose a risk of transmitting FMD to susceptible animal species ¹.

They do not become FMDV carriers.

Populations too small to sustain infection.



Vicuña (*Vicugna pacos*)



¹ Wernery, U. And Kaaden, O.-R.(2004) Foot-and-mouth disease in camelids: a review. The Veterinary Journal 168, 134-142

A DIVERSE ECOLOGY



Amazonian rain forest



Pantanal



Faunal diversity



Capybara (*Hydrochoerus hydrochaeris*)



Brown Agouti (*Dasyprocta variegata*)



Borugo (*Agouti taczanowskii*)



Brazilian tapir (*Tapirus terrestris*)



White-lipped peccary (*Tayassu pecari*)

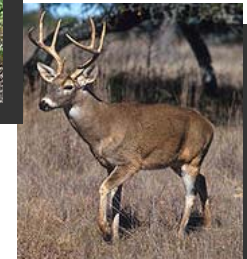


Chacoan peccary (*Catagonus wagneri*)

All susceptible to FMD infection



Brocket deer (*Mazama sp.*)



White-tailed deer (*Odocoileus virginianus*)



Collared peccary (*Pecari tajacu*)



New species of 'Giant peccary' discovered in Brazil in 2000 ¹ (*Pecari maximus sp. nov.*)



Feral swine (*Sus scrofa*)



Feral buffalo (*Bubalus bubalis*)

¹ Van Roosmalen, G.M., Lothar, F., van Hooft, P., Deioongh, H. and Leirs, H. (2006) Bonner zoologische Beiträge 55, 105-112

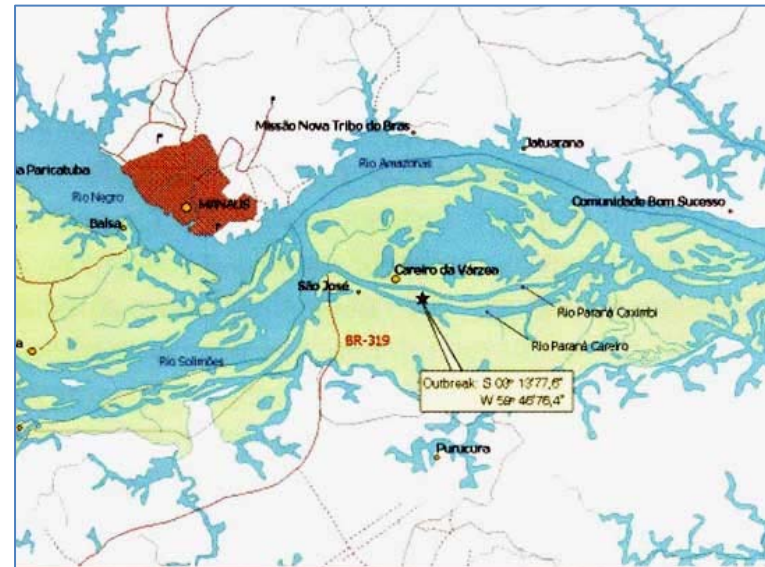
AN ENIGMA – TYPE C FMD IN BRAZIL 2004

“One of the most critical and as yet unsolved epidemiological problems in foot-and-mouth disease is the survival of the virus in the field during interepidemic intervals.”¹

Has this been resolved?

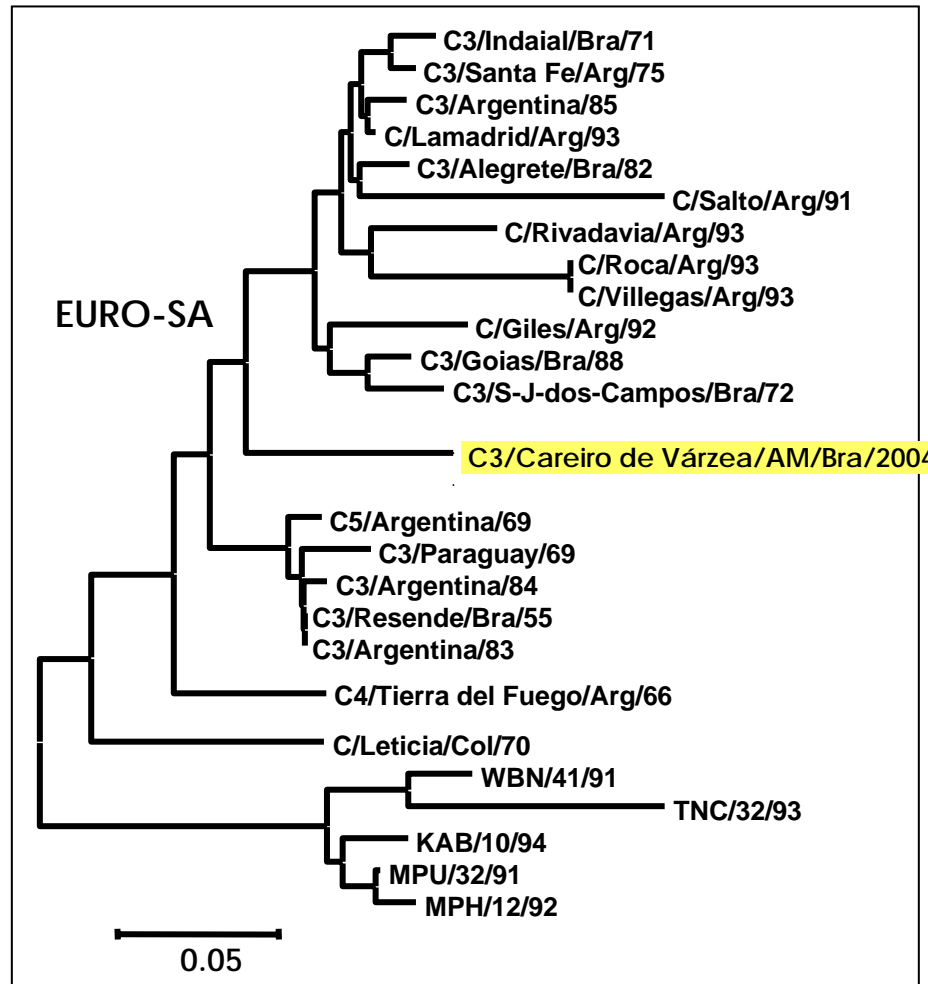


Mato Grosso do Sul: FMD Type C 2004



¹ Rosenberg, F.J. and Gomes, I. (1977) Susceptibility of capybara (*Hydrochoerus hydrochoeris hydrochoeris*) to foot-and-mouth disease virus. Bulletin Centro Panamericano Fiebre Aftosa 27-28, 43-48

AN ENIGMA – TYPE C FMD IN BRAZIL 2004



- a novel virus within C₃ group
- no closely related viruses known

▪ **WHAT WAS ITS ORIGIN?**

▪ **WHERE DID IT COME FROM?**

Courtesy of Dr N.J. Knowles, Institute for Animal Health, Pirbright Laboratory, UK

OPPORTUNITIES AFFORDED BY WILDLIFE IN THE STUDY OF FMD

- Trade: Geography-based *versus* commodity-based risk limitation ^{1, 2}
 - Monitoring wildlife infection will remain essential even if commodity-based certification gains greater acceptance
 - Wildlife is important in its own right – trade in meat from wild animals; to inform risk analysis.
 - Trade in meat from wildlife could become more important in future – The Transfrontier Conservation Area initiative in Africa promotes livelihood generation from sustainable harvesting of wild species
- Wildlife surveillance is an under-utilised tool:
 - Sentinels for undetected virus circulation in small ruminants
 - Sentinels for virus circulation in vaccinated cattle populations
 - Demonstrating freedom from infection
 - Monitor virus evolution: vaccine design/matching
- Combine with surveillance for other diseases

¹ Devising import health measures for animal commodities http://www.oie.int/eng/normes/guides/EN_commodity-based_approach.pdf

² Thomson, G. R., B. D. Perry, A. Catley, T. J. Leyland, M.-L. Penrith, and A. I. Donaldson, 2006: Certification for regional and international trade in livestock commodities: the need to balance credibility and enterprise. *Veterinary Record* 159, 53–57.

² Thomson, G.R., Leyland T.J. And Donaldson, A.I. (2009) De-boned beef – an example of a commodity for which specific standards could be developed to ensure an appropriate level of protection for international trade. *Transboundary and Emerging Diseases* 56, 9-17

THE CONSTRAINTS

1. ACCESS

- Capture and immobilisation of wild animals: cost
- Surveillance systems deficient in detecting disease in wildlife
- Insufficient use of opportunistic sampling – could be systematic and incorporated in hunting licensing
- Need more animal health personnel skilled in wildlife and disease management

2. SAMPLING TOOLS

- Need simpler means of sampling animals and virus detection
 - Current system of probang sampling with need for instant cryo-preservation of samples is logistically difficult, expensive and inefficient
 - Pharyngeal brush swab sampling has potential



3. TEST SYSTEMS

- Sensitive cell lines for culture from carrier animals
- Antibody assays fully validated for wildlife species and all serotypes of FMD virus e.g. SAT serotypes and NSP antibody assays

Gracias por su atención
Merci de votre attention
Thank you for your attention

TAURUS ANIMAL HEALTH
UK

