Foot and mouth disease situation and control strategies in sub-Saharan Africa – the current situation

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Introduction

• FMD is widespread throughout Africa
  —Endemic in many countries
  —Controlled in southern and northern countries

• Attitudes to control differ based on various factors
  —Access to export markets
  —Financial constraints and other priorities
  —Political will
  —Unrest

• By 2010 Africa may account for nearly two-thirds of the undernourished people in the world (USDA study)
Introduction

• The 7 serotypes are defined due to lack of cross protection
• Based on epidemiology, Africa has its ‘own FMDV’
  — Unique SAT types
    • More genetic and antigenic variation
  — Wildlife maintenance hosts with apparent co-evolution
    • New genetic and antigenic FMDV variants are generated
  — Unclear role of other cloven-hoofed wildlife in spreading and maintaining the disease
  — Various epidemiological patterns
    • Involvement of wildlife
    • Primarily livestock involvement
Summary of FMD status in Africa

Pool 4
SAT1, O, SAT2, A
Wildlife and domestic cycle

Pool 5
SAT1, SAT2, O, A
Domestic cycle

Pool 6
SAT1,2,3
Mainly wildlife, increasingly domestic

Adapted from WRL website
Outbreaks of FMD recorded since 2005
Control actions in Africa

• **Endemic countries**
  — No actions
  — Limited vaccination
  — Limited movement control

• **Free countries**
  — Zoning
  — Vaccination (routine and emergency)
  — Movement control (permits, fencing)
  — Stamping out
Evidence of increased number of FMD outbreaks

- Summary of outbreaks in South Africa since 2000
  - Previous outbreak in FMD-free region 1957 and in control zone 1983
  - Since 2000: 6 outbreaks in cattle
    - 2000 SAT-1 and O
    - 2001 SAT-2
    - 2003 SAT-2
    - 2004 SAT-2
    - 2006 SAT-3
Evidence of increased number of FMD outbreaks

• Summary of outbreaks in Botswana
  — 1948-1970 8 outbreaks
  — 1977-1979 mixed SAT-1 and SAT-2 outbreaks
  — 1980 SAT-2
  — 2002 SAT-2
  — 2003 SAT-1
  — 2005 SAT-1
  — 2007 SAT-2
  — 2008 SAT-2

• Recently a SAT-2 outbreak in Angola
28 % difference between outbreak strains

Dec 2007

Aug 2008

Kindly provided by R. Dwarka, TADP, OVI
To control FMD in the face of increasing integration of land-use, we need to understand the behaviour of SAT viruses in domestic animals and wildlife and how FMD is transmitted from wildlife to livestock.
Role of African buffalo in the epidemiology of FMD in southern Africa

- The 3 SAT serotypes are maintained by African buffalo (Syncerus caffer) that can be a source of infection for susceptible livestock in close proximity.

- Buffalo can maintain FMDV for up to 5 years in a single animal.

- FMD viruses change during persistent infection and may give rise to new antigenic variants.
Features of the interaction between buffalo and the SAT type viruses

- Mode of transmission between buffalo and susceptible animals is not known, but there are 2 theories
  - childhood infection in young calves
  - sexual transmission

- Evidence of sexual transmission from persistently infected buffalo is tenuous
## Role of other wildlife species in FMD persistence and spread

<table>
<thead>
<tr>
<th>Species/animal</th>
<th>Duration of viral persistence</th>
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<tbody>
<tr>
<td><strong>Domestic animals:</strong></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>2.5 to 3.5 years</td>
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<tr>
<td>Sheep</td>
<td>9-12 months</td>
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<tr>
<td>Goats</td>
<td>2-3 months</td>
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<tr>
<td><strong>Wildlife:</strong></td>
<td></td>
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<tr>
<td>Wildebeest (<em>Connochaetes taurinus</em>)</td>
<td>28 days</td>
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<tr>
<td>Sable (<em>Hippotragus niger</em>)</td>
<td>28 days</td>
</tr>
<tr>
<td>Eland (<em>Taurotragus oryx</em>)</td>
<td>32 days</td>
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<tr>
<td>Fallow deer (<em>Dama dama</em>)</td>
<td>63 days</td>
</tr>
<tr>
<td>Kudu (<em>Tragelaphus strepiceros</em>)</td>
<td>104-160 days</td>
</tr>
<tr>
<td>Water buffalo (<em>Bubalis bubalis</em>)</td>
<td>2-24 months</td>
</tr>
<tr>
<td>African buffalo (<em>Syncerus caffer</em>)</td>
<td>5 years</td>
</tr>
</tbody>
</table>
Role of impala in FMD epidemiology in KNP, SA

- Outbreaks in impala are derived from buffalo herds
- Impala can be a source of infection to domestic animals
- Serological survey indicated sub-clinical infection
Factors that impact on FMD prevalence in impala

• Risk factors
  — Summer and autumn were highest risk factors for seropositivity, but clinical infection were mostly observed at the end of the dry season
  — More females and adults were sero-positive

• Animal and herd behaviour
  — Herds remain as relatively stable, discrete entities
  — Although their home ranges may overlap to some extent, contact occurs most frequently at focal drinking points (if the herds occur away from perennial water) and not during grazing
  — Impala are a sedentary species with small home ranges, and contact with other herds of impala on the rangeland is infrequent
  — Breeding herds groom, male groups don’t
  — Disease spread relatively slowly in contrast with intensively farmed livestock
Factors that impact on FMD prevalence in impala

- **Ecological factors**
  - Suitable grazing
  - Water points (rivers versus drinking points)

- **Impala:buffalo densities**
  - Ratio the more likely contact would be
  - Factors influencing contact will impact on transmission

- **Models would be needed for different ecological regions and for different wildlife species**
Molecular epidemiology of FMD in Africa

- For all serotypes occurring in Africa, geographically distinct genotypes / topotypes occur
- SAT-2 demonstrates the most genetic variation with numerous topotypes
- Viruses evolve in distinct genotypes when no animal movement occurs
- Phylogenetic relationships indicate movement between various regions of Africa
- The genetic and antigenic variation have implications for vaccination policies
Within and between topotype variation indicates the need for various vaccine strains.
Potential impact on FMD control by Transfrontier Conservation Areas

• The establishment of TFCAs
  — Pressure to remove fences
  — Human encroachment into wildlife areas
  — Increased wildlife migration
  — Introduction of novel FMD virus topotypes and impact on vaccines
Conclusions

- Challenges for FMD control remain and are on the increase
- Regional collaboration is increasingly important
- Improved vaccines will be the mainstay for control
  - Vaccination of wildlife species
- Other options to improve exports should be investigated
  - Commodity based trade
  - Certification schemes
- Epidemiology of FMD in wildlife species need in depth investigation
- Role of small stock should be clarified
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