Analysis of the Worldwide FMD Situation
Trends and Regional Differences

Dr. Jef M. Hammond, Donald King, Nick Knowles, Valerie Mioulet and Yanmin Li

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Outline

• Introduction
• Global Incidence/Trends
• Regional Differences
• Way Forward
FMD

- The most infectious disease known
- A present and continuing severe global threat
FMD

- The most infectious disease known
- A present and continuing severe global threat
- Devastating economic, social and environmental impacts
  - severe productivity losses
  - disruptions in a wide range of agricultural, industrial and social activities
  - major threat to food supply/food security
FMDV

- 7 serotypes O, A, C, Asia1, SAT1, SAT2, and SAT3
- And multiple subtypes
- No single vaccine
- No single test
- Each outbreak/situation is different
FMDV Global/One Health Issues

- Health
  - Animal welfare – mass slaughter of healthy stock
  - Human welfare – loss of livelihood
FMDV Global Issues

- **Health**
  - Animal welfare – mass slaughter of healthy stock
  - Human welfare – loss of livelihood

- **Global Trade**
  - Excludes many poorer nations from trade
  - Restrictions on many goods (not just meat)
FMDV Global Issues

- Health
  - Animal welfare – mass slaughter of healthy stock
  - Human welfare – loss of livelihood

- Global Trade
  - Excludes many poorer nations from trade
  - Restrictions on many goods (not just meat)

- Cost of Prevention and Outbreaks
  - Surveillance
  - Direct and Indirect (compensation, trade and tourism)
Susceptible species

- FMD affects more than 70 animal species
- Cattle, Buffalo, Pigs, Sheep and Goats
  - Feral pigs, wild boar & deer

Most commonly spread- live animals or products
FMD in cattle
FMD in cattle

UK 2007
FMD Reference Laboratories at Pirbright

- **European Community Reference Laboratories for FMD**
  - Support and diagnosis for EU Member States

- **OIE Reference Laboratory for FMD**
  - Support of safeguarding and promoting international trade

- **World Reference Laboratory for FMD designated by FAO**
  - WRLFMD
  - Global surveillance and threat recognition
  - Reference Laboratory Network of OIE/FAO FMD Labs
World Reference Laboratory for FMD - WRLFMD®

FAO, OIE, EU and National Responsibilities

- 24/7 Diagnostic Service
- Global surveillance
- Strain characterisation
- Vaccine matching (Bulgaria, South Korea, Egypt)
- Extensive library of isolates
- Test improvement & Development, validation,
- Quality assurance
- Reagent supply
- Training
- Advice & Reports

WRLFMD Quarterly Report
April-June

World Reference Laboratory Report

Yemen Arab Republic: 38 type O FMD viruses isolated during the previous reporting period were analysed and shown to belong to the EA.3 topotype. 23 of the viruses, collected in 2009, were closely related to Ethiopian viruses also collected in 2009. Six viruses from 2008 and five from 2009 belonged to a different sub-lineage of EA.3 and were most closely related to viruses from Ethiopia in 2008 and Yemen in 2006.

Batch: WRLFM02009/0001/15; received: 16/03/2009

BANGKOK, THAILAND 27-29 JUNE 2012
Enhanced Surveillance: OIE/FAO Lab network

- **WRLFMD**: Pirbright, UK
- **RRLSEA**: Pakchong, Thailand
- **LVRI**: Lanzhou, China
- **FGI ARRIAH**: Vladimir, Russia
- **PDFMD**: Mukteswar, India
- **RRLSSA**: Gabarone, Botswana
- **FMD-Laboratory**: Embakasi, Kenya
- **PANAFTOSA**: Rio de Janeiro, Brazil
- **SENASA**: Argentina
- **ARC-OVI**: Onderstepoort, RSA
- **PIADC**: Plum Island, USA
- **CODA-CERVA-VAR**: Ukkel, Belgium

Approximately ~2400 samples tested during 2011

*OIE/FAO FMD Reference Laboratory Network*

*Annual Report 2011*

*Editor: Dr Jef Hammond, IAH, Pirbright, UK.*
FMD Distribution

- FMD is endemic in most of Southern Asia, Africa and parts of South America.
- Most of Europe, North and Central America, Australia, New Zealand and Japan are free
Conjectured Status of FMD

- Intermediate, sporadic
- Endemic
- Free
- Virus present in game parks
- Countries with multiples zones: FMD-free, free with vaccination or not free
- Free with vaccination

Legend:
- Red: Endemic
- Yellow: Intermediate, sporadic
- Green: Free with vaccination
- Countries with multiples zones: FMD-free, free with vaccination or not free
- White: Free
- Orange: Free. Virus present in game parks
Visualization of Regional Virus Pools as an Aid to Global Control

Divides the Globe into 7 pools each with

- Multiple serotypes but topotypes mainly confined to that pool

- Each pool may need tailored vaccines and strategies
The conjectured status of FMD showing approximate distribution of regional virus pools.
The conjectured status of FMD showing approximate distribution of regional virus pools.
The conjectured status of FMD showing approximate distribution of regional virus pools.
The network labs received >2,300 samples in 2010 from 38 countries. 80% were serotype O.

Serotypes C and SAT 3 were not detected. Asia 1 only in India
The network labs received >2,400 samples in 2011 from 34 countries. 60% were serotype O.

Increased Asia 1 activity

Serotype C was not detected.
Serotyping results for 2012 - so far!

From > 300 samples in 2011 from 13 countries 43% were serotype O

No Serotype C (not reported since 2004)
Trends - Serotyping results for 2010-2012

- O
- Asia1
- A
- SAT 2

Bar chart showing the trends for different serotypes from 2010 to 2012.
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No Asia 1 in 2010
69 in 2011 ***

Afghanistan, Bahrain
Pakistan, Iran &
Turkey
all had outbreaks of
Asia 1
FMD Outbreaks 2012
SAT 2 in North Africa and Middle East

Northern Africa and the Middle East
FMD Outbreaks 2012
SAT 2 in North Africa and Middle East

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Egypt now has at least 3 serotypes of FMDV and a number of topotypes

4. A/Asia/Iran-05 (Bar-08) (2010-2011)
5. A/Africa/G-IV (ISM-12) (2012)
6. SAT2/VII/Alx-12 (2012)
7. SAT2/VII/Ghb-12 (2012)
FMD Outbreaks 2012

500 Samples from 18 Countries

18 countries
~500 samples
~300 positive
Regional Analysis - 2012
Regional Analysis - 2012

Pool 3
O, A, Asia 1 & SAT 2

Pool 1
O, A, Asia 1

Pool 2
O, A, Asia 1

Pool 4
A, O, SAT 1, 2, 3

Pool 5
O, A, SAT 1, 2

Pool 6
SAT 1, 2, 3

Pool 7
O, A
Current FMD Threat Analysis: from reported incidence

**Serotype O** - widespread circulation
- FMDV type O – ME-SA topotype – PanAsia-2 lineage
- FMDV type O – SEA topotype – Mya-98 lineage

**Serotype A** - widespread circulation
- FMDV type A – ASIA topotype – Iran-05 lineage
- FMDV type A – ASIA topotype – other

**Serotype Asia 1** – limited circulation - BUT risk of further spread
- Reports from 6 countries in 2011 and now 2012
- Laboratory vaccine matching failed with Asia 1 Shamir
- Continues to be closely monitored by WRLFMD – Pirbright Vaccine trial carried out for EU

**Serotypes SAT** – restricted circulation
- Have not established outside of Africa
- But recent spread of SAT 2 into North Africa and Middle East

**Serotype C** - No reports of serotype C since 2004
## Vaccine Recommendations (National & European Antigen Banks)

<table>
<thead>
<tr>
<th>HIGH PRIORITY</th>
<th>O Manisa*</th>
<th>O PanAsia -2*</th>
<th>O BFS or Campos</th>
<th>A-Iran-05</th>
<th>A24 Cruzeiro</th>
<th>A22 Iraq</th>
<th>Asia 1 Shamir*</th>
<th>SAT 2 Saudi Arabia (or equivalent - SAT 2 Eritrea)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIUM PRIORITY</td>
<td>A Argentina 01</td>
<td>A Iran 96</td>
<td>A Iran 99</td>
<td>A Eritrea</td>
<td>A Iran 87 or A Saudi Arabia 23/86 (or equivalent)</td>
<td>A Malaysia 97 (or Thai equivalent such as A/Sak/97)*</td>
<td>O Taiwan 97 (pig-adapted strain or Philippine equivalent)*</td>
<td>SAT 1 South Africa</td>
</tr>
<tr>
<td>LOW PRIORITY</td>
<td>A15 Bangkok related strain</td>
<td>A Kenya</td>
<td>A87 Argentina related strain</td>
<td>SAT 1 Kenya</td>
<td>SAT 2 Kenya</td>
<td>SAT 3 Zimbabwe</td>
<td>C Noville</td>
<td>Within category: not in order of importance</td>
</tr>
</tbody>
</table>
Is FMD Control Necessary?

• South Korea- 2010-2011
  – >3 million slaughtered- $3 billion USD

• Japan 2010
  – > 300 outbreaks- 300,000 cattle – $3 billion USD

• Egypt 2012 SAT2
  – 1st time since 1950
  – > 3000 outbreaks
• FMD present in many regions
• Significant impact on livelihoods
• Major risk of spread through movement of animals and products
• Vaccination alone is not enough - Education and bio-security
• Improve surveillance
• We can do more together within networks
• The situation is complex
• A major combined effort both National and Global is needed for control

• **Accurate & Timely disease information is vital**

• **The FMD Reference Laboratory Network provides the Engine Room for the Global Control Initiative**
The FMD World Cup

The Rest of the World vs FMD