Surveillance and Control of Foot and Mouth Disease: Following the Progressive Control Pathway

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ADED Rounds Sept 2015
Presentation Outline

– Background
  • EuFMD
  • Foot and Mouth Disease (FMD)
  • FMD in W. Eurasia

– Progressive Control Pathway (PCP-FMD)
  • Principles, Stages
  • Application in W. Eurasia
  • Other applications
  • Lessons learned
Key Messages

• FMD is challenging to control
• Need multi-disciplinary approach including economists, sociologists
• PCP is a framework to facilitate this approach
• Useful for other diseases
  – complementary to OIE tool for evaluation of Performance of the Veterinary Services (PVS)
Acknowledgements

- **EuFMD**: Keith Sumption, Chris Bartels, Jenny Maud, Fabrizio Rosso, Eoin Ryan, Kees van Maanen, Carsten Potzsch, Gunel Ismayilova
- **FAO/OIE FMD working group**: G Ferrari, S Metwally, J Domenech, J Pinto, N Leboucq, L Weber-Vintzel
- **Veterinary Services**: Georgia, Iran, Israel, Palestine, Turkey and other W. Eurasia countries
- EUFMD Commission member states
- EC (DG-SANCO –Trust Fund; Alf Füssel)
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- Supporting centres:
  - EUFMD Secretariat staff (N Rumich, C Carraz, I DAlessandro, E Tomat)
  - FAO Ankara
Introduction to EuFMD

EuFMD is a Commission of the Food and Agriculture Organisation of the UN (FAO) (established 1954)

- Established to support member countries (37) in the European region to prevent and/or control FMD
- Actions coordinated through DG SANTE of the European Commission
What is FMD?

- Family: *Picornaviridae*
- Genus: *Aphthovirus*
- Seven serotypes
- Multiple strains
- Inactivated by heat, and low/high pH
- Moderate/low environmental persistence
- Can survive in animal products
What is FMD?

- Cloven hoofed animals are susceptible:
  - Cattle, sheep/goat, Pigs
  - Buffalo,
  - Deer, ...

- Acute vesicular disease

- Clinical signs: milk drop, salivation, lameness
What is FMD?

Highly contagious because...

• Wide host range

• High morbidity but low mortality

• Virus shedding before clinical signs

• High viral shedding, low infective dose

• Subclinical infections (sheep)

• Pigs shed very high quantities of virus
GEOGRAPHIC DISTRIBUTION

Asia – serotypes O, A, Asia1
Africa – serotypes O, A, SAT1, SAT2, SAT3
Different regions – specific strains
FMD in “free” countries

OIE Member Countries' official FMD status map
Last update May 2015

© OIE 2015

- Green: Member Countries/zones recognised as free from FMD without vaccination
- Light Green: Member Countries/zones recognised as free from FMD with vaccination
- Dark Red: Suspension of the status free without vaccination
- Red: Suspension of the status free with vaccination
- Light Grey: Countries/zones without an OIE official status for FMD

Click on a specific region to zoom in.
FMD IMPACTS IN “FREE” COUNTRIES

FMD free countries

UK 2001
- 6.5 million animals slaughtered
- GBP 3.1 billion direct costs
- GBP 3.6 billion indirect costs

(Korea Enquiry, 2002)

Korea 2010-11
- Three incursions (2 serotypes)
- 3.5 million animals culled
- 12 million animals vaccinated
- Total costs in $billions (~ $ 3 billion for farmer compensation costs alone)
### Incursions between 1992 and 2003

- UK, France, Netherlands, Ireland, 2001
- Bulgaria, 1993, 1996
- Italy, 1993
- Yugoslavia (Serbia), 1996
- S. Korea, 2000, 2002
- Japan, 2000
- Taiwan, 1997
- Brazil, 2000
- Paraguay, 2000
- Argentina, 2000
- Uruguay, 2000, 2001
- Swaziland, 2000
- S. Africa, 2000

### Outbreaks in officially free countries/zones 2004-2014

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FMD in endemic countries

- Occurs commonly
- Clinical signs can be much less severe than in naive population
- Often complex: multiple serotypes and strains
FMD in endemic countries

Review of published serosurveillance results

http://www.slideshare.net/ILRI/serosurveillance-fmd
FMD IMPACTS IN ENDEMIC COUNTRIES

Direct production losses:
- Reduced milk yield, growth rates, loss of draft power, some deaths

Indirect losses:
- Cost of control
- Trade restrictions

Estimate: annual global impact of FMD in terms of production losses and vaccination costs alone are in the region of **5 billion US dollars** (Rushton, J et al, 2012).
FMD in West Eurasia

- Diverse region: 14 countries including ex-USSR, Turkey, Iraq, Iran, Pakistan, Afghanistan
- 3 serotypes circulating (O, A, Asia 1)
- Movement of viruses from East to West
West Eurasia
Simplified summary and conjectured routes

- Spectrum of vaccines required to cover different threats

O/SEA/Mya-98
O/ME-SA/PanAsia
A/ASIA/Sea-97

O/ME-SA/PanAsia-2 (2010-12)
A/ASIA/Iran-05 (2012)

A: 2013

O/ME-SA/PanAsia-2
A/ASIA/Iran-05
Asia-1

O/ME-SA/Ind2001??

Spectrum of vaccines required to cover different threats
FMD in West Eurasia

FMD Cases 2014 and 2015

Source: 2015 W. Eurasia Roadmap meeting
Outbreaks in Turkey: 2001-2012

- Most are laboratory confirmed & serotyped
FMD in Iran: Jan 2013-Feb 2015

1381 outbreaks reported between April 2014- March 2015

Source: Darab Abdolahi from Iran Vet Organisation
Control in endemic countries

- Vaccination
- Movement control
- Biosecurity
- Surveillance and monitoring
Challenges for control

• Highly contagious

• Vaccine immunity:
  – Short-lived
  – No cross-protection between serotypes and variable between strains within serotypes

• Lack of resources

• Incentives often missing
  – At national and individual levels
The Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD)

- Joint FAO-EuFMD-OIE tool, in use since 2008
- Framework to progressively increase the level of FMD control
- Key tool of FAO-OIE FMD Global Strategy
The Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD)

5 Stages

• Each with well-defined outcomes which may be achieved through a variety of activities (NON-prescriptive approach)

• Risk analysis principles
  • Make best use of limited resources
The Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD)

- Regional roadmap meetings held regularly
  - Regional coordination and info exchange
  - PCP progress assessed, peer review
- Assessment of what Stage a country (or zone) is in is evidence based and transparent

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PCP-FMD stages of West Eurasia countries as of May 2015

*Indicates provisional status given to the countries in 2014
** Indicates provisional status (countries have until October 2015 to provide additional information including a Control Plan; if not, they will be downgraded to the previous stage)
*** Indicates that country have entered the OIE pathway for recognition of an FMD-free zone without vaccination
Application of the Progressive Control Pathway for FMD in 2014

- West and South Eurasia Roadmap
- E. Africa Roadmap
- S. Africa Roadmap
- SAARC Roadmap
- Countries in the SEACFMD 2020 Roadmap

PCP based projects supporting the Hemispheric Plan for Eradication - PHEFA

Legend:
- Orange: PCP Stage 1
- Yellow: PCP Stage 2
- Green: PCP Stage 3
- Blue: OIE endorsed control programme
- Pink: PCP project
- Brown: Roadmap planned
- Blue: Established project applying PCP
Stage 1: Gain understanding of epidemiology and develop risk-based approach to reduce FMD impact.
Stage 1: Gain understanding of epidemiology and develop risk-based approach to reduce FMD impact

- Estimate FMD incidence
- Identify circulating strains
- Risk assessment along value chain
- Socio-economic impact assessment
- FMD strain identification
- Develop risk-based FMD control strategy

Required to progress to stage 2
Template: Risk-Based Strategic Plan for FMD Control

- Includes all relevant issues in one document to enable an integrated approach (socio-econ, risk hotspots, monitoring etc)


Six chapters

1. Situation analysis
2. Benefits of FMD Control
3. Goal, objectives, tactics and activities
4. Monitoring and evaluation
5. Operational plan
6. Technical assistance
Stage 2: Implement risk based control measures such that the FMD impact is reduced

Ongoing risk assessment PLUS risk management

**Monitoring system** essential to:
1. Demonstrate reduction in FMD impact
2. Monitor implementation....and prove that reduced impact is related to the control measures

To progress to Stage 3:

A revised, more aggressive control strategy that has the aim of eliminating FMD from at least a zone of the country
Stage 3: **Progressive reduction** in incidence, followed by **elimination of FMD** virus circulation

**Rapid detection and response** for ALL outbreaks

- Needs stakeholder engagement to ensure rapid detection and response (incl compliance with movement controls)

> **NB:** Once a country has entered the GF-TADs-supported PCP-Stage 3 and has decided it wants to continue along the pathway to Stage 4 and beyond, implicating the intention to eradicate FMD virus from the domestic animal population, it may ask for formal OIE-endorsement of its national FMD eradication programme
PCP-FMD Stages

PCP Stage 4 Focus

- “To maintain ‘zero tolerance’ of FMD within the country or zone and eventually achieve OIE recognition of FMD-free with vaccination”
PCP-FMD Stages

PCP Stage 5 Focus

• “To maintain ‘zero tolerance’ of FMD within the country or zone and eventually achieve OIE recognition of FMD-free without vaccination”
PCP in W. Eurasia

- First applied here-
  - Roadmap meeting in Shiraz, Iran in 2008
Stage 1 examples: Value chain mapping in Iran

- Understanding animal movement patterns can be critical for planning effective FMD control.
Slide 35

Movements of pig and pig meat in Armenia (mapped by workshop participants)

Stage 1 examples: Value chain mapping in TCC

Putting together national info to get a regional picture
Using NSP-ELISA to identify FMD prevalence

- Can be useful to target control
- Baseline for comparison after interventions introduced

Preventive Veterinary Medicine 2015 May 1;119(3-4):114-22.
Risk-based FMD Control Strategy Development

1] Value-chain analysis

2] Working hypothesis on how FMD circulates

3] Socio-economic impact

4] Identification of virus strains

5] Enabling Environment

6] Regional cooperation

7] Identification of Risk hotspots

8] FMD control strategy revised

0] Plan to study epidemiology and impact of FMD
PCP Stage 1 – developing national strategy - with national ownership

1) Susceptible host: میزبان حساس

2) Bovine در ان بتواند ایجاد بیماری بالینی

1) انتقال بیماری در اثر تماس: Contact transmission

2) انتقال که در اثر تماس مستقیم یا غیر مستقیم بین حیوان آلوده و حیوان حساس ایجاد می‌شود. انتقال از طریق تماس مستقیم (direct contact) در بیماری‌های آمیزشی Indirect می‌باشد و انتقال از طریق تماس غیر مستقیم (contact) در اثر آلودگی حیوان
Stage 2: focus on monitoring

FMD virus is injected in the tongue of a cow to test for the potency of the vaccine.

Implementation

Impact

2010 Village Seroprevalence

Incidence
- 80.00 - 100.00
- 60.00 - 80.00
- 40.00 - 60.00
- 20.00 - 40.00
- 0.00 - 20.00
- No data

Coverage by Region

vaccinated animal
coverage by region

region
Stage 2: focus on monitoring

- Strong need and demand for training, especially in epidemiology
Stage 3 and beyond

- Need for improved contingency planning
  - Kazakhstan: zone free-without-vaccination
  - Turkish Thrace recognised as free-with-vaccination
- Ongoing collaboration with Warwick University to develop a disease spread model for Turkey

'communities' identified through network analysis (from Peter Dawson)
Regional coordination through W. Eurasia Roadmap meetings

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Vaccination schedules

Reported Vaccination coverage: 2014

W. Eurasia database: vaccination and outbreaks
Lessons learned from implementing PCP

• Focus on fundamentals:
  – difference between ‘disease’ (clinical effect) and ‘infection’ (virus)
  – establish vaccine quality assurance

• Management issues are important:
  – planning, prioritising, monitoring
  – inter-departmental FMD task force
  – trying to reach out to field level: district, local vets, farmer associations, NGOs.
Lessons learned from implementing PCP

- PCP-FMD is about changing mindsets:
  - Support decision makers to make changes
  - To embed this mindset in organisations with relatively high turn-over of staff
- How to make best use of our limited resources
- Infrastructure to collect, validate, analyse data is often not in place
  - Difficulty to change from monitoring on inputs (administrative, often in place) to outcomes
Lessons learned from implementing PCP

- FMD as a pilot: Applicable for control of other diseases as well

Risk assessment
Strategy development
Ongoing monitoring

Similar frameworks now developed for rabies, PPR
Stepwise Approach towards Rabies Elimination

**COUNTRY FREE FROM DOG TRANSMITTED RABIES**

**STAGE 5**
Freedom from human and dog-transmitted rabies being monitored

- No dog-to-dog transmitted rabies for a consecutive 12 months
- Maintenance of human rabies freedom, elimination of dog rabies

**STAGE 4**

- No deaths due to indigenously acquired human rabies for a consecutive 12 months

**STAGE 3**
Full-scale implementation of the national rabies control strategy

- National rabies prevention and control strategy endorsed and funded
- Development of the national rabies prevention and control strategy

**STAGE 2**

- Assessment of the local rabies epidemiology, elaboration of a short term rabies action plan
- Functional intersectoral rabies task force in place, rabies is a notifiable disease

**STAGE 1**

- Rabies occurrence in any species is reported to international agencies
- No information on rabies available but rabies is suspected to be present

**STAGE 0**

- Country endemic for dog transmitted rabies

http://caninerabiesblueprint.org
Progressive control and eradication of *peste des petits ruminants*

Building on the experience of rinderpest eradication, FAO and OIE have developed a **STAGE-WISE** and progressive approach to control and eradicate PPR.

Each stage has a defined set of outcomes to be achieved by each participating country to move progressively from Stage 1 to Stage 4 along the control and eradication pathway, leading to obtaining an official OIE freedom status.

**Stage 1** – assessment: provides understanding of the PPR situation in a country and identifies the animal populations to be vaccinated.

**Stages 2 and 3** – control and eradication: focuses on targeted, followed by much wider, vaccination to achieve levels that will stop further clinical disease and circulation of the virus.

**Stage 4** – post-eradication: demonstrates that eradication has been achieved through absence of disease or virus without vaccination for a 24-month period. At this stage, the country can apply for OIE official status of freedom from PPR according to the relevant articles of the OIE *Terrestrial Animal Health Code*.

Global control and eradication of *peste des petits ruminants* Investing in veterinary systems, food security and poverty alleviation.
Thank you for listening!
Questions?