Research Priorities in Support to the Global FMD Control Strategy

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PCP Stages (5)

Countries at PCP stages per region

Source: GF-TAD FMD-WG, WB
• **Stage 0-1:** gain an understanding of the epidemiology of FMD in the country and develop a risk-based approach to reduce the impact of FMD

• **Missing Tools:**
  
  – Develop and validate on-farm testing lateral flow device:
    
    • Universal antigen and serotype specific tests
  
  – Develop and standardize methods for socioeconomic impact studies
  
  – Develop and validate more sensitive and specific antigen and antibody typing ELISA (recombinant-based)- low cost
  
  – Strategy of safe and effective vaccination in the face of an outbreak
  
  – Share and develop farm biosecurity manual including disinfectants, carcass disposal …etc
• **Stage 1-2**: “implement risk based control measures such that the impact of FMD is reduced in one or more livestock sectors and/or in one or more zones”

• **Missing Tools:**
  – Develop and validate molecular serotype-specific assays
  – Designing control programs and conducting applied research relevant to regional and national FMD control programs,
  – Establish reliable method for sample preservation,
  – Non-invasive samples for surveillance such as oral fluids and meat juice for swine and cattle,
  – Carrier buffalo: Improved methods of VI and viral sequence, identify sites of virus localization in buffalo,
  – More studies to understand the efficiency of carrier buffalo in transmitting the virus,
• Stage 2-3: “Progressive reduction in outbreak incidence, followed by elimination of FMD virus circulation in domestic animals in at least one zone of the country”

• Missing Tools:
  – Validated computer-based models to delineate possible vaccination zones which are required to aid decision-making during outbreaks
  – Establish warning system for early detection and reporting
• **Stage 3-4**: “To maintain ‘zero tolerance’ of FMD within the country or zone and eventually achieve OIE recognition of FMD-free with vaccination”
Post Vaccination Monitoring (Why)

- One of the most important components of FMD control is vaccination;
  - Vaccine cost $0.7-1.0/dose and vaccination is up to $0.7
  - Vaccination represents the highest cost of FMD control ~90% (12:1)
- Timely needed for global FMD control initiative
- Cost-benefits to vaccination = effectiveness of the vaccine
- Outbreaks have been reported in vaccinated animals
- Effectiveness of vaccine is complicated to measure because it is affected by a number of crucial elements
Goals and Outcomes

• Design PVM system to evaluate FMD vaccine effectiveness
  – Universal
  – Country/region - specific
• Publish guidelines for PVM with associated SOPs and protocols for field use
  – FMD specific
  – With modification, this can be used for other vaccines
• Identify cause(s) of vaccine inadequacy or failure for timely improvement of control program
• Evaluate vaccine performance and provide feedback to manufacturer
• Create field data for correlation between field protection and SP antibody titers
PVM working group (Jan 13, 2012)
virologists, diagnosticians, epidemiologists, statisticians, field vets

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- **Merial and MSD**
PVM: Elements contribute to vaccine effectiveness

- Vaccine quality including potency; low vs. high PD$_{50}$
- Vaccine performance characteristics in relation to circulating virus strains, r-value..etc
- Strategic vaccination dictated by epidemiological setting
- Vaccine coverage
- Age of vaccinates
- Vaccine shelf-life
PVM: (continued)

Elements contribute to vaccine effectiveness

- Vaccination program: cycle, time of the year and frequency
- Vaccine availability during campaign
- Health condition of vaccinates
- Vaccine storage at recommended temp (cold chain)
- Training of vaccinators for proper vaccine delivery
- Vaccination campaign and taskforce for PVM
Parameters for PVM

- desired percent protection
- desired percent coverage of vaccinates

- Protective antibody titer to structural protein
  - Some published data showed strong correlation between in-vivo protection and virus neutralization test

- NSP at herd level
  - NSP best used in PCP stage 0 to determine FMDV prevalence at the country or regional level
  - In population vaccinated with pure vaccine, NSP can be used towards the end of PCP stage 3 to proof absence of virus circulation
Design of PVM

- serological surveillance:
  - population selection based on farming system
  - animal identification (retention of tags) for serological surveillance
  - sample collection post vaccination;
    - day post vaccination
    - sample size at standard error of 5% & ≥ 95% confidence interval,
  - dx assays to use for SP and NSP analysis

- Clinical and passive virological surveillance:
  - conduct regular field investigations for early detection and characterization of circulating virus isolates

- data analysis:
  - Front end information on vaccine and vaccination
  - Serological and virological surveillance
• **Gaps of PVM:**
  – Vaccine quality control centers
  – Validated PVM screening tools; using vaccine virus strain in SP ELISA and VNT
  – Producers awareness and incentives
Thank You for Your Attention