Understanding The Life Cycle Of FMDV In Endemic Settings

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FMD Ecology

• Epidemiological knowledge on FMD clinical occurrence is extensive
  • Geographic distribution (pools) of serotypes/topotypes derived primarily from clinical occurrence

• Less known about FMD ecology:
  – Where is FMD between outbreaks?
  – Role of persistence (e.g. Asian buffalo) in long term maintenance?
  – What determines emergence of epidemic viral strains?
Subclinical Infections

• In endemic settings the great majority of infections are subclinical
  • Prior immunity (vaccination, maternal)
  • Prior exposure
  • Other factors – genetic resistance?

• Subclinical infections:
  – Acute
    • replication at primary site – clears infection
  – Chronic
    • Replication at primary site – does not clear infection (carrier definition >28 dpi)
When we study clinical FMD are we seeing the full picture?
Acute infections, outbreaks

Serotype A, O
Example 1: VIETNAM
MOLECULAR EPIDEMIOLOGY, SURVEILLANCE AND PREDICTIVE TOOLS FOR FMD CONTROL IN VIETNAM

58-1940-0-070F, 057 14S
6/1/2010-9/30/2012

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Collaborators
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Design

**Objective 1 – Acute Clinical Samples**
- Samples collected during outbreak
- Pigs, buffalo and cattle
- Northern and Southern Vietnam

**Objective 2 – Longitudinal Field Study**
- HCMC region – transmission cells
- Hanoi-SonLa region – carrier cattle and buffalo (field necropsy)

**Objective 3 – Persistent buffalo studies**
- Field necropsies
- Molecular characterization (tissue level, cytokine mRNA, protein expression)

*(Dr. Dung and Dr. Arzt will present progress of this project in their presentation)*
Example 2 PAKISTAN

CHARACTERIZATION OF LOCAL ISOLATES OF FMDV AND DEVELOPMENT OF VACCINES

58-1940-7-161F; 057 002S
9/1/2007 - 8/31/2012

REAL TIME DATA ANALYSIS AND RESEARCH CAPACITY BUILDING TOWARDS FMD CONTROL IN PAKISTAN

1940-32000-052-14S
09/27/2012 - 09/26/2014

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Collaborators:
Dr. Zaheer Ahmed
Dr. Anna Ludi
Study Design

- **Acute Clinical Samples**
  - Clinical case reports, geographic location, demographics, etc
  - Clinical samples, viruses, sequence

- **Longitudinal Field Study**
  - Serological survey of farms for NSP positive animals, probang, history
  - Selection of 40 farms for sampling (probang) 4X year for 1 year ==
  - NSP-ELISA, RT-PCR and virus

- **Establish panel of reference sera for vaccine matching testing**
  - Vaccination of 10 cattle and 10 buffalo with commercial vaccine to be used in field
  - Serum collection at 0, 21 dpv, boost vaccination
  - Serum collection at 42 dpv
  - Carry out vaccine matching studies

(More details in next presentation – U. Farooq et al)
Example 3 CAMEROON
TRANSMISSION AND EVOLUTION STUDIES OF FMDV IN LIVESTOCK IN
THE LAKE CHAD BASIN

Collaborators:
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Objective

• To understand the epidemiology of infectious diseases in the ecological context of networks of host movement

• How different networks of livestock movement affect disease epidemiology
## Sampling strategy

<table>
<thead>
<tr>
<th></th>
<th>Routine sampling</th>
<th>Transboundary trade routes/market</th>
<th>Additional sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
<td>Mobile herds</td>
<td>Sedentary herds</td>
<td>Reports of clinical disease</td>
</tr>
<tr>
<td>Number of herds</td>
<td>15</td>
<td>15</td>
<td>Variable</td>
</tr>
<tr>
<td>Animals / herd</td>
<td>5 / herd&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>5 / herd&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>10-30 / sampling day</td>
</tr>
<tr>
<td>Sample frequency</td>
<td>2x year (rainy season/dry season)</td>
<td>2x year (rainy season/dry season)</td>
<td>4x year (2x rainy season/2x dry season)</td>
</tr>
<tr>
<td>Samples / activity</td>
<td>Serum, probang, survey</td>
<td>Serum, probang, survey</td>
<td>Serum, probang, abbreviated survey, lesion swab/tissue sample/vesicular fluid</td>
</tr>
</tbody>
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(Details in poster P7 by C. BravodeRueda)
SAMPLING LOCATIONS

[Map showing sampling locations in Nigeria and Chad]
CONCLUSIONS

• Studies combining clinical and subclinical surveillance are necessary to understand ecology
• Longitudinal studies – help understand virus circulation (life cycle?)
• Characterization of persistent animals – viruses necessary to assess their role in long term maintenance of infection
• Understanding where the virus hides between outbreaks will help target control programs
• This information is relevant to modeling control programs in the both endemic and non-endemic regions
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Thank you!

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