2. The progress of FMD prevention and control technology in NFMDL

- **For identification of agent or antigen**
  - FMD Ag-Capture ELISA
  - FMD Serotyping RT-PCR
  - FMD multiplex RT-PCR
  - FMD real-time RT-PCR
  - Sequencing
  - Colloid-gold test strips

- **For identification of antibody**
  - LPB-ELISA (liquid phase block ELSA)
  - SPC-ELISA (Solid phase competition ELISA, in developing)
  - IHA (Indirect hemagglutination)
  - Colloid-gold test strips

- **For differential Detection**
  - FMDV NSP-3ABC ELISA
  - FMDV NSP-2C3AB Mab B-ELISA
  - FMDV NSP-2C3AB antibody colloid-gold test strips
  - FMDV multi-NSPs Dot-blot
Diagnosis and Reagents provided in 2014, Jan-Jul

- 31 suspected samples detected, 5 from North Korea
- ~3000 O/P fluid and tissue samples were tested by RT-PCR for routine survey and emergency.
- ~20 Vp1 sequences for field strain or isolates.
- ~8,000 serum tested by LPBE and 3ABC ELISA for SP and NSP antibody

<table>
<thead>
<tr>
<th>Type of reagent</th>
<th>Related diagnostic test</th>
<th>Amount supplied nationally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea pig antisera (against FMDV type O, Asia 1 and A)</td>
<td>VNT</td>
<td>20ml</td>
</tr>
<tr>
<td>FMD NSP positive serum</td>
<td>ELISA</td>
<td>124ml</td>
</tr>
<tr>
<td>FMD NSP negative serum</td>
<td>ELISA</td>
<td>31ml</td>
</tr>
<tr>
<td>FMD LBP-ELISA kit (Type O, A, Asia 1)</td>
<td>ELISA for FMDV Antibody detection</td>
<td>6024 kits</td>
</tr>
<tr>
<td>FMDV 3ABC-I-ELISA kit</td>
<td>ELISA for FMDV NSP Antibody detection</td>
<td>1016 kits</td>
</tr>
<tr>
<td>IHA (type O)</td>
<td>IHA for FMDV Antibody detection</td>
<td>5226 kits</td>
</tr>
<tr>
<td>FMD antibody Colloid-gold test strips</td>
<td>pen-side test for FMDV Antibody detection</td>
<td>27 kits</td>
</tr>
<tr>
<td>FMDV multiple RT-PCR kits</td>
<td>RT-PCR for FMDV molecular detection</td>
<td>151 kits</td>
</tr>
</tbody>
</table>
Network and training

Diagnosis technology
Prevention and control technology
Vaccination technique

Theory teaching
Laboratory skill training

Provincial laboratory
Breeding enterprise technical staff
Visitors

~15 special training courses
~300 people attended
Training

✓ Training courses on prevention and control FMD to veterinarians from all over China every year.
✓ Biosafety and Biosecurity Management Training
✓ Training on Dangerous Goods (infectious materials) Transport by civil aviation of China.
Outline

1. Introduction of OIE/China National FMD Reference Laboratory (NFMDL)
   - Introduction of NFMDL
   - Re-organizing in the laboratory

2. The progress of FMD prevention and control technology in NFMDL
   - Vaccine development
   - Diagnosis and detection technology

3. Surveillance technology
   - FMD Status in China
   - FMD Control Activities
**FMD outbreaks reported in China in 2014**

<table>
<thead>
<tr>
<th>Report Date</th>
<th>Location</th>
<th>Animals</th>
<th>Destroy</th>
<th>Type</th>
<th>Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-1-8</td>
<td>Jiangzi, Rikaze, TIBET</td>
<td>Cattle 7</td>
<td>Cattle 12/sheep33</td>
<td>A</td>
<td>Sea-97</td>
</tr>
<tr>
<td>2014-4-18</td>
<td>Yintan, JIANGXI</td>
<td>Cattle 6</td>
<td>18</td>
<td>O</td>
<td>Mya-98</td>
</tr>
<tr>
<td>2014-6-30</td>
<td>Sihong, Suqian, JIANGSU</td>
<td>Pig 3</td>
<td>9</td>
<td>A</td>
<td>Sea-97</td>
</tr>
<tr>
<td>2014-9-23</td>
<td>Lasa, TIBET</td>
<td>Cattle 3</td>
<td>33</td>
<td>A</td>
<td>Sea-97</td>
</tr>
</tbody>
</table>

**serotype**

A and O

**Strains**

A/Sea-97

O/Mya-98

O/PanAsia

**No. of outbreaks:**

2013\(\text{n}=23\) (A17+O6)

2014\(\text{n}=4\) (A3+O1)

**Animals affected**

Cattle; Pig

**Provinces covered**

A: 6 provinces

GD, QH, XJ, XZ, YN, JS

- No. of outbreaks:
  - 2013: \(n=23\) (A17+O6)
  - 2014: \(n=4\) (A3+O1)

- Animals affected:
  - Cattle; Pig

- Provinces covered:
  - A: 6 provinces
    - GD, QH, XJ, XZ, YN, JS
FMD situation in China
(From 2005 to Aug. 2014)
Summary of FMD status in China:

• Type Asia I: No clinical cases in the past 5 years.

• Type A: An emerging virus strain (Sea97 G2) found in China in 2013, which is different from strains reported in 2009.

• Type O: Endemic, including Mya 98 and Pan Asia lineages.

• Never found type C, and SATs.

• FMD situation in China is generally stable.
MOLECULAR EPIDEMIOLOGY ANALYSIS

A/Sea-97 strain

• >99% identity with the virus collected in 2013; also located on the other genetic branch (named G2)
• Low genetic relationship with the virus (named G1) found in China in 2009: about 91% identity
• Shared close relationship with viruses from SEA nations: over 98% homology southern east asia
• Regional joint prevention and control
Analysis on O/Mya-98 strain

- Firstly found in 2010 in China;
- One of predominant strains in China;
- Total 26 cases reported;
- Outbreaks are on the decline;
- Vaccines used in China are effective for the strains.
Outline

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Technical Activities

National Action Plan

- MOA released 3 updated Annual National Plans on compulsory vaccination, surveillance and epidemiological investigation

- MoA held National Working Conference twice a year (spring & autumn) and Situation Analysis Meeting at pretty irregular intervals
• **Surveillance**

MOA has set up 304 animal epidemic surveillance and reporting stations and 146 border animal epidemic surveillance stations.

**China animal disease report and surveillance system**

Four levels: Country-provinces-prefectures-counties institutions for prevention, control and eradication of animal diseases.
Technical Activities

Monitoring & Evaluation

FMD Surveillance in the first half of 2014

<table>
<thead>
<tr>
<th>year</th>
<th>Number of serum samples (unit: million)</th>
<th>Number of pathogen samples (unit: million)</th>
<th>Number of positive samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>3.6</td>
<td>~0.3</td>
<td>11</td>
</tr>
<tr>
<td>2013</td>
<td>3.5</td>
<td>~0.4</td>
<td>24</td>
</tr>
<tr>
<td>2014 Jan-May</td>
<td>1.16</td>
<td>~0.13</td>
<td>0</td>
</tr>
</tbody>
</table>

The pathologically positive animals were handled immediately according to relevant regulations.
Active Surveillance work plan in 2014 sampled and tested by FMDRL

a) FMD surveillance on pig slaughterhouse in 12 provinces in China: Henan, Hebei, Hubei, Sichuan, Hunan, Yunnan, Guangxi, Guangdong, Zhejiang, Shanxi, Heilongjiang, and Jilin

b) FMD surveillance in Shandong Peninsula and neighbour provinces in China: 6 provinces

c) Evaluative surveillance for Asia1 FMD vaccination policy: national wide

d) Surveillance on FMD free zone with vaccination in China: Hainan; Liaoning province; Yongji, Jinlin province

e) Monitoring in high-risk areas: Guangxi, Yunnan

National Surveillance
Provincial level ACDC and other laboratory:
• Clinical surveillance
• Routine surveillance (serological and pathogenic) with fixed-point surveillance
• Centralized surveillance (conducted every six months)
• FMD Special epidemiological investigation around border areas in Yunnan and Guangxi

Laboratory testing is in progress......
Focus on high risk region: e.g. border areas
Pig slaughterhouses in key provinces: half fix-point, breeding centers
DFZ surveillance: support the national DFZ construction
Thanks for your attention!

Welcome to Lanzhou Veterinary Research Institute