World Organisation for Animal Health

SEACFMD

SEACFMD EPIDEMIOLOGY NETWORK MEETING

FMD Surveillance Strategy in China

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13-15 April 2025,
Qingdao, People's Republic of China

Monitoring Objectives

- Master distribution of foot-and-mouth disease (FMD) pathogens
- identify animal infection status in high-risk areas and key links
- Identify risk factors for transmission
- Verify the FMD-free status of immunized zones
- Track and monitor the characteristics and trends of viral mutation
- Evaluate the effectiveness of herd immunity and understand the overall immune status of animal populations.

Monitoring Targets and Scopes

Targets:

- Pigs, cattle, sheep, deer, and other cloven-hoofed animals.

Scopes

- Breeding farms, large-scale breeding farms, free-range farmers, live animal trading markets, slaughterhouses, harmless treatment plants and so on.
- High-risk areas such as epidemic areas and border areas.

Monitoring methods

Passive monitoring:

- Any unit or individual who discovers cloven-hoofed animals or wild animals (such as pigs, cattle, sheep, or deer) showing symptoms similar to FMD, such as blisters, lameness, or hoof rot, should promptly report to the local livestock and veterinary authorities or animal disease prevention and control institutions. The animal disease prevention and control institutions should promptly collect samples for monitoring.

Active monitoring:

- Pathogen monitoring
- Antibody monitoring

Monitoring content

Reinforcement of border area monitoring

- To increase the intensity of monitoring and arrange the monitoring sites scientifically.
- To strength pathogenicity monitoring in key areas such as bordering areas and distribution points for animals or animal products.

Reinforcement of key link monitoring

- To strengthen the monitoring of the weak links of immunization such as transfer, slaughtering and Small-scale farms, increase the proportion and frequency of sampling and testing, timely organization of supplemental immunization, and build a firm barrier against epidemic.
- Pay close attention to the infection and prevalence of different strains of FMDV in the herd, and discover mutated strains in time.

Pig slaughterhouses in key provinces：

- In each province, **2-3** regional pig slaughterhouses are selected for sampling, with the provincial capital city being mandatory; **30** copies of pig **serum** and **30** copies of **submandibular lymph nodes** are collected from each sampling site.

Great Northeast Free Zone：

- **Three** districts (municipalities) in each province were selected for monitoring, and **3** sampling points (1 each for cattle and sheep, and 1 for pigs in slaughterhouses) were selected for each prefecture and municipality. Priority was given to the distribution chain, and **20** animals were collected from each sampling point, with synchronized collection of **serum** and **O-P fluid** from cattle and sheep, and **serum** and **submandibular lymph nodes** from pigs in slaughterhouses.

High-risk zones and animal checkpoints along the western border

- **Yunnan and Guangxi**, focusing on monitoring of border areas and areas where animal flows are concentrated, each province collects samples from 2-3 prefectures and cities, and each prefecture and city selects 2 counties (cities and districts), and each county (city and district) collects 2 points of cattle (or sheep) and 1 point of pig slaughterhouse.
- **Gansu and Xinjiang**, focusing on Gansu Province, Liuyuan Animal and Plant Quarantine Inspection Station and Xinjiang Hami Highway Animal and Plant Joint Quarantine and Quarantine Station reported random sampling of animals, the specific sampling program jointly developed by the National Foot and Mouth Disease Reference Laboratory and the local animal epidemic prevention departments.

High-risk zones and animal checkpoints along the western border

- **Qinghai and Ningxia**, focusing on monitoring of animal flow to concentrated areas, trading markets, etc., each province to collect samples from 1-2 cities and municipalities, each city and municipality to select two counties (cities and districts), each county (city and district) to collect cattle and sheep each 1 point, each sampling point to collect 20 animals, the simultaneous collection of serum and O-P liquid.

Non-infected areas

- Sampling in conjunction with annual surveillance and epidemiological survey missions.

Detection Methods

Pathogen Detection

Nucleic acid detection

- O-P fluid in cattle and sheep, submandibular lymph nodes or tonsils in pigs
- RT-PCR or RT-qPCR

Virus isolation

- Virus isolation from suckling mouse
- Virus isolation from cells

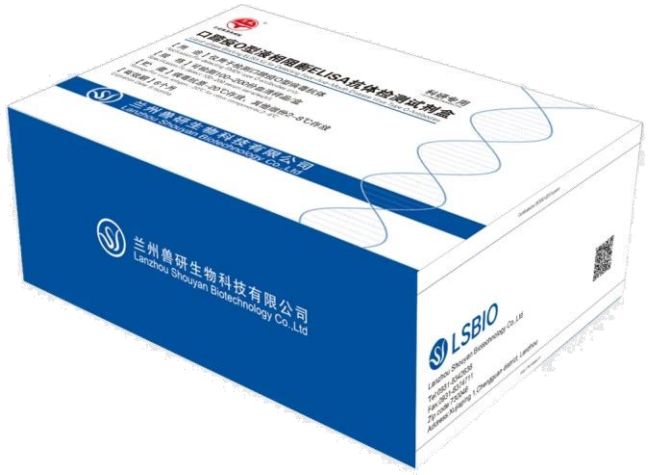
Antibody Detection

Immuno-antibody detection：

- Antibodies to FMD type O: Detection using **liquid phase blocking ELISA** or forward indirect hemagglutination test; antibodies produced by immunization with peptide vaccine are detected using VP1 structural protein ELISA.
- Antibody to FMD type A: **liquid phase blocking ELISA**.

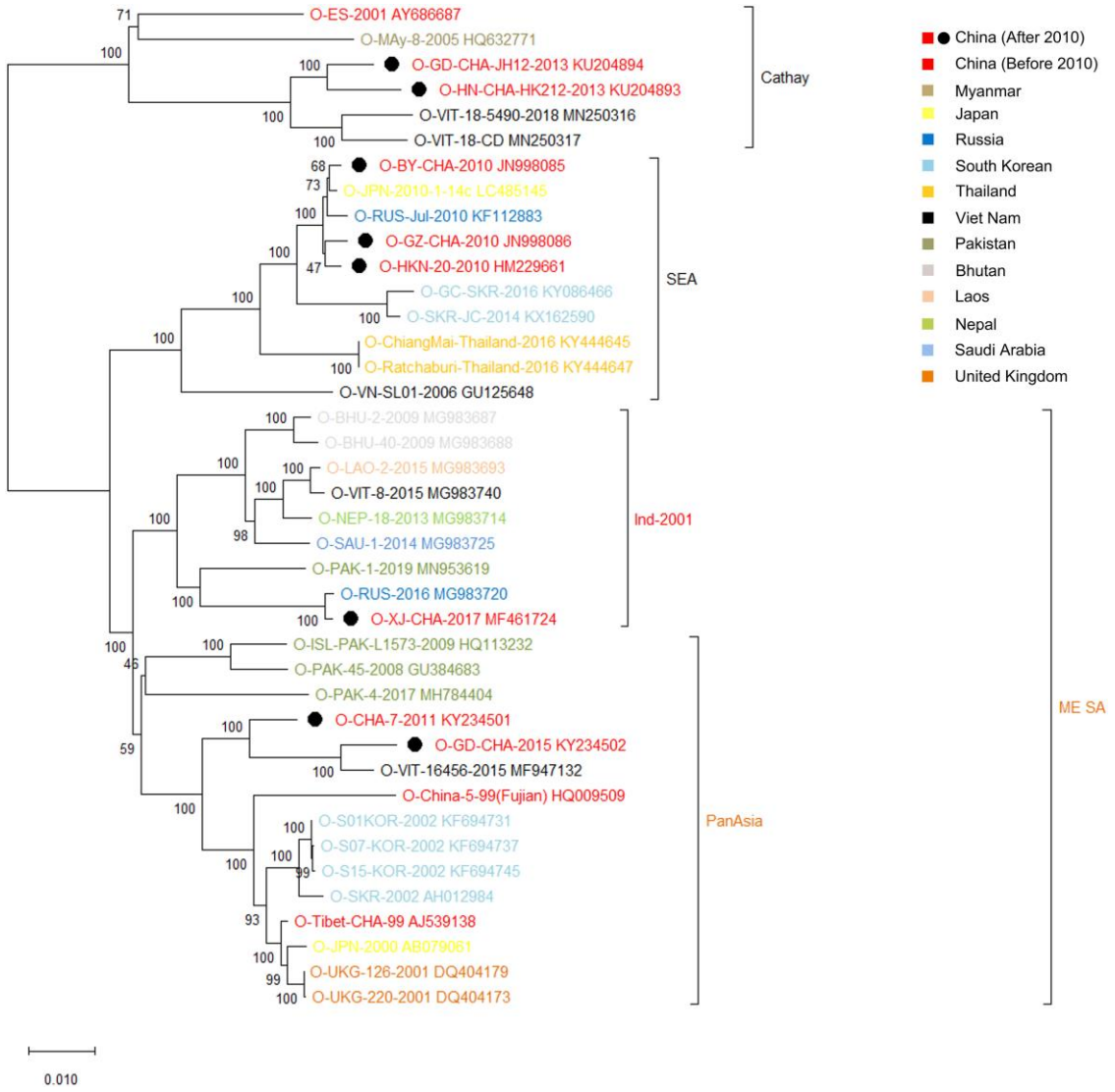
Non-structural protein antibody detection：

- Detection by non-structural protein antibody ELISA.



Molecular Epidemiological Analysis

VP1 sequencing and sequence comparison, can be used for genotyping, strain traceability and analyzing strain variation.



Virus Neutralisation Test

The relationship between the field isolate and the vaccine strain (‘r’ value)

- r1 value > 0.3, the vaccine is protective.
- r1 value < 0.3, the vaccine is not sufficiently protective.

$$r1 = \frac{\text{reciprocal arithmetic titre of reference serum against field virus}}{\text{reciprocal arithmetic titre of reference serum against vaccine virus}}$$

Virus Attack Protection Tests

- **PD_{50} test (median protective dose)**
  - The gold standard for measuring the vaccine's ability to resist prevalent strains.
  - ≥ 6 PD_{50} per head of vaccine.
  - 10,000 ID_{50} per head for cattle and 1,000 ID_{50} per head for pigs.

Thank You