World Organisation for Animal Health

Xiangtao Liu - - CHINA_(PEOPLE'S_REP_OF)

WOAH Reference Laboratory Reports Activities 2025

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LABORATORY INFORMATION

***Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:**	Foot and mouth disease
***Address of laboratory:**	No.1, Xujiaping, Chengguan District, Lanzhou city, Gansu province
***Tel:**	+86-931 834.25.85
***E-mail address:**	liuxiangtao@caas.cn
Website:	https://lvri.caas.cn/
***Name (including Title) of Head of Laboratory (Responsible Official):**	Prof. Liu Xiangtao
***Name (including Title and Position) of WOAH Reference Expert:**	Prof. Liu Xiangtao
***Which of the following defines your laboratory? Check all that apply:**	Research agency Academic institution

TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAH Manual (Yes/No)	Total number of test performed last year	
Indirect diagnostic tests		Nationally	Internationally
LPBE Type O	Yes	2784	0
LPBE Type A	Yes	2784	0
NSP-3ABC ELISA	Yes	2784	0
Direct diagnostic tests		Nationally	Internationally
RT-qPCR RT-PCR	Yes	2611	0
Virus isolation	Yes	11	0
Antigen typing ELISA	Yes	16	0
VP1 sequencing	Yes	83	0
Whole genome sequencing	Yes	6	0

TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAH?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOAH Members?

Yes

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Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOAH Member Countries	Country of recipients
Guinea pig hyperimmune sera of different FMDV strains	ELISA	produced	15 ml	0	1	CHINA (PEOPLE'S REP. OF),
FMDV pig positive serum	ELISA	produced	120 ml	0	1	CHINA (PEOPLE'S REP. OF),
FMDV cattle positive serum	ELISA	produced	150 ml	0	1	CHINA (PEOPLE'S REP. OF),
Inactivated FMDV cell culture	RT-PCR	produced	25 ml	0	1	CHINA (PEOPLE'S REP. OF),
FMD LPB ELISA	ELISA for FMD O and A	produced	24000 kits	0	1	CHINA (PEOPLE'S REP. OF),
FMD NSP ELISA	ELISA for FMD	produced	1500 kits	0	1	CHINA (PEOPLE'S REP. OF),
SPCE	ELISA for FMD O and A	produced	3500 kits	0	1	CHINA (PEOPLE'S REP. OF),
Conventional PCR	RT-PCR for FMD	produced	20 kits	0	1	CHINA (PEOPLE'S REP. OF),
FMDV real-time qPCR	qRT-PCR for FMD	produced	1800 kits	0	1	CHINA (PEOPLE'S REP. OF),
Typing real-time qPCR for FMD A and O	qRT-PCR for FMD	produced	200 kits	0	1	CHINA (PEOPLE'S REP. OF),

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAH Members?

TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

Yes

7. Did your laboratory validate diagnostic methods according to WOAH Standards for the designated pathogen or disease?

Yes

Name of the new test or diagnostic method developed	Description and References (Publication, website, etc.)
Competitive enzyme-linked immunosorbent assay (C-ELISA) for detecting neutralizing antibodies against FMDV serotype O	In this study, a porcine broadly neutralizing monoclonal antibody (PO18-10) against FMDV was obtained from the heterologous sequentially vaccinated pig using single-B-cell antibody technology. A competitive enzyme-linked immunosorbent assay (C-ELISA) for detecting neutralizing antibodies against FMDV serotype O was developed using biotinylated PO18-10 as a detector antibody. The sensitivity and specificity of the assay were 100% and 99.55%, respectively, and the positive/negative coincidence rate with VNT was 94%, suggesting that C-ELISA based on natural host-derived monoclonal antibody (mAb) could be a promising tool to detect neutralizing antibodies against FMDV serotype O and evaluate the vaccine efficacy. Cao Y, Li F, Xing X, et al. Preparation and application of porcine broadly neutralizing monoclonal antibodies in an immunoassay for efficiently detecting neutralizing antibodies against foot-and-mouth disease virus serotype O[J]. Microbiology Spectrum, 2025, 13(2): e02234-24.
Virus-like particle-based liquid phase blocking ELISA	In this study, a novel LPBE was developed by replacing inactivated antigens with serotype O foot-and-mouth disease virus (FMDV) VLPs expressed in Escherichia coli. Zhang Y, Wei T, Ren M, et al. Virus-like particle-based liquid phase blocking ELISA for evaluating the efficacy of O-type foot-and-mouth disease vaccines[J]. Applied Microbiology and Biotechnology, 2025, 109(1): 241.
	In this study, we successfully established a high-efficiency magnetic particle-based chemiluminescence immunoassay (MP-CLIA) using two previously characterized monoclonal antibodies (W125 and W145) generated through single B cell antibody technology. The MP-CLIA method exhibited a sensitivity of 95.93% and specificity of

A chemiluminescence immunoassay for detecting neutralizing antibodies of foot-and-mouth disease virus serotype A	100%, with a cut-off value of 41.395 activity units (U) by detecting the known 221 positive and 122 negative sera. The positive/negative coincidence rate between the MP-CLIA and VNT was 92.2% and the kappa coefficient was 78.19%, indicating a relatively high level of consistency. Sun M, Bao Y, Li K, et al. A chemiluminescence immunoassay for detecting neutralizing antibodies of foot-and-mouth disease virus serotype A[J]. Applied Microbiology and Biotechnology, 2025, 109(1): 1-12.

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

9. Did your laboratory validate vaccines according to WOAH Standards for the designated pathogen or disease?

TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAH Members?

No

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAH Member?

Yes

Name of the WOAH Member Country receiving a technical consultancy	Purpose	How the advice was provided
CHINA (PEOPLE'S REP. OF)	Global Epidemic Situation and Prevention and Control Strategies of Foot-and-Mouth Disease O/ME-SA/SA-2018 Strain	Conference paper Prevention and control suggestions
CHINA (PEOPLE'S REP. OF)	Epidemic Situation and Prevention and Control Lessons Learned from Foot-and-Mouth Disease in Europe in 2025	Conference paper Prevention and control suggestions
CHINA (PEOPLE'S REP. OF)	FMD situation in Pakistan	Consultative report
CHINA (PEOPLE'S REP. OF)	WOAH Terrestrial Animal Health code chapter 8.8	Consultative report
CHINA (PEOPLE'S REP. OF)	Evaluation of Epidemic Status and Immunoprotective Efficacy of FMDV/O/Ind-2001 Strain during 2017–2024	Conference paper
CHINA (PEOPLE'S REP. OF)	National FMD vaccination plan 2025	Draft programme
CHINA (PEOPLE'S REP. OF)	National surveillance plan for FMD in China 2025	Draft programme

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAH Members other than the own?

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	WOAH Member Countries involved other than your country
Epidemiological investigation and prevention and control technology of zoonoses and emerging infectious diseases in central Asia	5 years	strengthen the cooperation with Central Asian countries to combat zoonoses and newly emerging infectious disease	Kyrgyz Rsearch Institute of Veterinary Kazakh National Agrarian Research University	KAZAKHSTAN KYRGYZSTAN TAJIKISTAN UZBEKISTAN
China-Africa Agricultural Science and Technology Innovation Alliance (CAASTIA)	5 years	a platform for cooperation and exchange among agricultural research and education institutions, agribusinesses, and international organizations from China and Africa	African Academy of Sciences (AAS)	ETHIOPIA KENYA SOUTH AFRICA
Establishment of International Joint Laboratory for Prevention and Control of Major Animal				

Disease between Lanzhou Veterinary Research Institute, Chinese Academy of Agricultural Sciences, and Mekelle University, Ethiopia as China-Africa Partner Institution Exchange Project	3 years	cooperation on prevention and control of major animal diseases	Mekelle University	ETHIOPIA
Cooperative creation and application studies of new products for prevention and control of major transboundary animal diseases	3 years	Cooperative creation and application studies of new products for prevention and control of major transboundary animal diseases	Kazakh National Agrarian University, Kazakhstan/Prof. Gulnaz Ilgekbayeva	KAZAKHSTAN
Construction and Application of Integrated Digital Early Warning Platform for FMD and Major Animal Diseases Surveillance	1 year	Digital Early Warning Platform for FMD and Other Animal Diseases: Construction & Application	Messay Univesity/Prof. Masako	NEW ZEALAND

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOAH?

Yes

Research need : 1

Please type the Research need: Strengthen the promotion and sale of national brand vaccines in international market

Relevance for WOAH Capacity Building, Standard Setting,

Relevance for the Code or Manual

Field Vaccines,

Animal Category Terrestrial,

Disease:

Foot and mouth disease

Kind of disease (Zoonosis, Transboundary diseases) Transboundary diseases,

Additional keywords if needed: One keyword per entry

National brand vaccines,international market,promotion and sale

If any, please specify relevance for Codes or Manual, chapter and title

(e.g. Terrestrial Manual Chapter 2.3.5 - Minimum requirements for aseptic production in vaccine manufacture)

Answer:

Notes:

Answer: The international brand vaccines are widely recognized in the international markets. However, due to high prices, they are not accessible for livestock owners from developing countries. We hope, some national brands vaccines with low prices but good quality could be promoted in the international markets to help the prevention and control of FMD globally.

TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:

In 2025 three FMD outbreaks have occurred (all in Xinjiang Province, China). These cases were in cattle and were found to be due to the O/ME-SA/Ind-2001e lineage.

The general situation of FMD in China is stable and sporadic. There is no serotype A outbreak since 2019. In 2025, active surveillance activities have collected 2611 samples, of which 83 were positive for FMDV RNA by RT-PCR. Sequencing of these samples detected O/CATHAY (n=53) and O/ME-SA/Ind-2001e (n=30).

· The current O-type vaccines appear to be poorly matched to field viruses from the O/CATHAY topotype; findings that have been recently verified by an in-vivo study.

· Chinese teams are developing a new recombinant vaccine candidate called Re-O/CATHAY and Re-O/MYA-98, which have generated encouraging protective responses.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:

MARA, China. http://www.xmsyj.moa.gov.cn/yqfb/
20th Annual Meeting of the WOAH/FAO FMD Reference Laboratories Network (23rd – 24th Oct, 2025)
SEACFMD Epidemiology Network Meeting 2025; 27th SEACFMD National Coordinators Meeting 2025;
National trainings/Conferences in 2025

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

0

b) International conferences:

7
The 20th WOAH/FAO FMD Reference Laboratories Network Annual Meeting;
27th SEACFMD National Coordinators Meeting 2025;
SEACFMD Epidemiology Network Meeting 2025;
2025 General Assembly of the China–Africa Agricultural Science and Technology Innovation Alliance (CAASTIA);
The 8th China-UK CERAD Meeting & International Symposium on Animal Disease Control;
7th International Conference on New Horizons in Basic and Applied Science (ICNHBAS2025);
WOAH Asia Regional workshop on Swine Disease Diagnosis;
Workshop of 1st anniversary of China-Mongolia Joint Laboratory for Animal Disease Prevention and Control;

c) National conferences:

21
2025 Seminar on the Prevention and Control Situation of Cattle and Sheep Diseases ;
2025 Fujian Province Technical Exchange on Animal Disease Prevention and Control ;
2025 National Meeting on Epidemiological Investigation of Animal Diseases ;
2025 Shaanxi Province Training Course on Prevention and Control of Major Animal Diseases and Immunization Technology for Zoonotic Diseases ;
2025 National Training Course on Animal Disease Monitoring Technology ;
Shandong Province Official Veterinarian Trainer Training ;
2025 Training Program for Breeding Talents of the National Industrial Technology System for Cashmere and Wool-Producing Sheep Serving County-Level Economy ;
2025 Mid-Year Meeting on Analysis of Epidemiological Dynamics of Major Cattle and Sheep Diseases ;
The 12th China Veterinary Congress ;
2025 • Jincheng Veterinary Forum ;
The 2nd Taishan Forum on Swine Diseases and Training Course on Efficient Detection and Prevention & Control of Swine Epidemic Diseases ;
Hunan Province Training Course on Diagnostic Testing and Management Technology of Veterinary Laboratories ;
2025 Annual Consultation and Seminar on Animal Epidemic Situation and Training Course on Veterinary Laboratory Construction ;
2025 Shaanxi Shiyang Group Exchange ;
Jilin Provincial Veterinary Association • Forum on Healthy and High-Quality Development of the Cattle and Sheep Industry ;
Seminar on Risk Assessment of Foot-and-Mouth Disease Introduction from Southeast Asia ;
2025 Jilin Province Training Course on Epidemiological Investigation Technology ;
2025 Anhui Province Training Course on Management and Testing Technology of Veterinary Laboratories (Phase II) ;
2025 Annual Consultation and Seminar on Animal Epidemic Situation and Training Course on Veterinary Laboratory Construction ;
Anhui Province Training Course on Management and Testing Technology of Veterinary Laboratories ;
Liaoning Province Training Course on Prevention and Control of Major Animal Diseases and Examination Affairs of the National Licensed Veterinarian Examination

d) Other (Provide website address or link to appropriate information):

3
International training workshop on major transboundary animal diseases (TADs) detection and diagnosis technology;
FMD situation and vaccine quality control (IAEA);
The details of FMD outbreaks reported in China: http://www.xmsyj.moa.gov.cn/yqfb/

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAH Members?

Yes

a) Technical visit : 8

b) Seminars : 8

c) Hands-on training courses: 2

d) Internships (>1 month) 4

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
A	CHINA (PEOPLE'S REP. OF)	28
B	CHINA (PEOPLE'S REP. OF)	14
C	CHINA (PEOPLE'S REP. OF)	26
D	CHINA (PEOPLE'S REP. OF)	6

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
ISO 17025	JPG. English	ISO 17025 Certificate English.jpg
ISO 17025	JPG, Chinese	ISO 17025 Certificate Chinese.jpg

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
LPB ELISA for FMDV antibody detection	CNAS
ELISA for FMDV NSP antibody detection	CNAS
FMDV Antigen detection ELISA	CNAS
RT-PCR for FMDV	CNAS
Real-time RT-PCR for FMDV	CNAS
FMDV 1D Gene sequencing	CNAS
SPC ELISA for FMDV antibody detection	CNAS
virus isolation(VI)	CNAS
virus neutralization test (VNT)	CNAS

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

The ABSL-3 laboratory is accredited by CNAS. At the same time, manipulation of FMDV is accredited by MARA, China. A biosecurity commission is established in WOAH/China national reference laboratory for FMD which is responsible for technical requisites. All the SOPs are elaborated and all the employees comply with the requirements according to ISO 17025. All the actions and procedures are consistent with Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 1.1.4

TOR9: SCIENTIFIC MEETINGS

Xiangtao Liu - - CHINA_(PEOPLE'S_REP_OF)

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOAH?

No

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOAH?

Yes

Title of event	Date	location	Role (speaker, presenting poster, short communications)	Title of the work presented
SEACFMD Epidemiology Network Meeting 2025	2025-05-12	Qingdao, China P.R	Speaker	Advances in fundamental research on FMD in LVRI
27th SEACFMD National Coordinators Meeting	2025-08-18	Luang Prabang, LAOs	Presenting Poster	Advances in basic and applied research on FMD in LVRI
20th WOAH/FAO FMD Reference Laboratory Network Meeting	2025-10-22	Istanbul, Turkey	Speaker	1: FMD situation in China in 2025 2: From bench to market: translating basic research into development of new FMD vaccines
2025 General Assembly of the China–Africa Agricultural Science and Technology Innovation Alliance (CAASTIA)	2025-10-26	Addis Ababa, Ethiopia	Speaker	From bench to market: development of highly efficient FMD vaccines
The 8th China-UK CERAD Meeting & International Symposium on Animal Disease Control	2025-10-17	Lanzhou, China	Speaker	Recent review of Foot-and-Mouth Disease in China-Southeast Asia: Changed and Unchanged
7th International Conference on New Horizons in Basic and Applied Science (ICNHBAS2025)	2025-08-28	Hurghada, Egypt	Speaker	Foot-and-Mouth Disease in China-Southeast Asia
WOAH Asia Regional workshop on Swine Disease Diagnosis	2025-07-14	Guangxi, China	Speaker	Epidemiology and prevention and control of FMD in China
Workshop of 1st anniversary of China-Mongolia Joint Laboratory for Animal Disease Prevention and Control	2025-06-17	Hebei, China	Speaker	Prevention and control strategy

TOR10: NETWORK WITH WOAH REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOAH Reference Laboratories designated for the same pathogen or disease?

Yes

24. Are you a member of a network of WOAH Reference Laboratories designated for the same pathogen?

Yes

NETWORK/DISEASE	ROLE OF YOUR LABORATORY (PARTICIPANT, ORGANISER, ETC)	NO. PARTICIPANTS	PARTICIPATING WOAH REF. LABS
			WOAH Reference Laboratory for FMD, Dirección de Laboratorio Animal, SENASA, Argentina;WOAH collaborating Centre for validation, quality assessment and quality control of diagnostic assays and vaccine testing for vesicular diseases in Europe, and FAO Reference Centre for Vesicular Diseases Sciensano, Belgium;WOAH Reference Laboratory for FMD; Botswana Vaccine Institute (BVI), Botswana; Centro Panamericano de Fiebre Aftosa (PANAFTOSA) and PAHO /WOAH Reference Laboratory for FMD, Brazil; WOAH/FAO FMD Reference Laboratory, National Centre for Foreign Animal Disease, Canadian Food Inspection Agency, Canada; WOAH and

WOAH/FAO FMD Reference Laboratory Network	Participant	17	China National FMD Reference Laboratory, Lanzhou Veterinary Research Institute (LVRI), CAAS, People's Republic of China; WOAH/FAO FMD Reference Laboratory, French Agency for Food, Environmental and Occupational Health & Safety (ANSES), France; FAO Reference Centre for FMD in South Asia, Indian Council for Agricultural Research, National Institute of FMD (NIFMD), Bubaneswar, India; WOAH/FAO FMD Reference Laboratory, Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Italy; Diagnosis and Control of Animal Diseases and Related Veterinary Product Assessment in Asia, National Institute of Animal Health (NIAH), Japan; WOAH Reference laboratory for FMD, Animal and Plant Quarantine Agency (APQA), Republic of Korea; FAO FMD Reference Laboratory, Wageningen Bioveterinary Research, The Netherlands; FAO Reference Centre for FMD for Central Asia and West Eurasia and WOAH Reference Laboratory for FMD, Federal Governmental Institute, Centre for Animal Health (FGI ARRIAH), Russian Federation; FAO Reference Laboratory for FMD in Africa and WOAH FMD Reference Laboratory, Transboundary Animal Diseases Programme, ARC-Onderstepoort Veterinary Institute (ARC-OVI), South Africa; Regional Reference Lab for FMD in SouthEast Asia, Pakchong, Thailand; FAO World Reference Laboratory (WRLFMD) and WOAH Reference Laboratory for FMD The Pirbright Institute, United Kingdom; WOAH FMD Reference Laboratory, Foreign Animal Disease Diagnostic Lab, Plum Island Animal Disease Center (PIADC), United States of America
The South-East Asia, China and Mongolia Foot and Mouth Disease (SEACFMD) Campaign	Participant	12	Regional Reference Laboratory, Pak-chong

25. Did you organise or participate in inter-laboratory proficiency tests with WOAH Reference Laboratories designated for the same pathogen during the past 2 years?

Yes

Purpose of the proficiency test:	Role of your Reference Laboratory (organiser/ participant)	No. participating Laboratories	Participating WOAH Ref. Labs/ organising WOAH Ref Lab
Detection of FMD antigen (genome and protein) and antibody in the serum	Participant	Unknown	The Pirbright Institute, World FMD reference laboratory

26. Did your laboratory collaborate with other WOAH Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

Yes

Title of the project or contract	Scope	Name(s) of relevant WOAH Reference Laboratories
MOU with the Pirbright Institute, WOAH FMD Reference Laboratory	to strengthen the cooperation on virus characterization, data sharing, personnel exchange and joint project	The pirbright institute, World FMD Reference Laboratory

	application.	

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOAH Reference Laboratories for the same pathogen during the past 2 years?

Yes

Purpose for inter-laboratory test comparisons1	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the test	WOAH Member Countries
Proficiency testing & Interlab comparison for FMD typing qPCR	Organizer	34		CHINA (PEOPLE'S REP. OF),

TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOAH?

Yes

Kind of consultancy	Location	Subject (facultative)
Review of WOAH code and Manual	China	Review of WOAH code and manual revision 2025
FMD situation and vaccine quality control	IAEA (virtually)	share the informations about FMD situation globally and share our experience in FMD inactivated vaccine quality control in Lanzhou Veterinary Research Institute, CAAS

29. Additional comments regarding your report:
NO