

# WOAH Reference Laboratory Reports Activities 2024

This report has been submitted: 21 janvier 2025 05:41

## LABORATORY INFORMATION

<b>*Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:</b>	Foot and mouth disease
<b>*Address of laboratory:</b>	No.1, Xujiaping, Chengguan District, lanzhou city, gansu province
<b>*Tel:</b>	+86-931 834.25.85
<b>*E-mail address:</b>	liuxiangtao@caas.cn
<b>Website:</b>	<a href="https://lvri.caas.cn/">https://lvri.caas.cn/</a>
<b>*Name (including Title) of Head of Laboratory (Responsible Official):</b>	Liu Xiangtao
<b>*Name (including Title and Position) of WOAH Reference Expert:</b>	Liu Xiangtao
<b>*Which of the following defines your laboratory? Check all that apply:</b>	Governmental 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
LPB-ELISA (Type O)	Yes	3035	0
LPB-ELISA (Type A)	Yes	3035	0
NSP-3ABC ELISA	Yes	3035	0
Direct diagnostic tests		Nationally	Internationally
Virus isolation	Yes	4	0

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Real time-RT-PCR	Yes	2961	0
VP1 sequencing	Yes	26	0
Whole genome sequencing	Yes	1	0

## TOR2: REFERENCE MATERIAL

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

No

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

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOA?H Member Countries	Country of recipients
Guinea pig hyperimmune sera of different FMDV strains	ELISA	Produced	20 ML	0	1	CHINA (PEOPLE'S REP. OF),
FMDV pig positive serum	ELISA	Produced	150 ml	0	1	CHINA (PEOPLE'S REP. OF),
FMDV cattle positive serum	ELISA	Produced	200 ml	0	1	CHINA (PEOPLE'S REP. OF),
Inactivated FMDV cell culture	RT-PCR	Produced	50 ml	0	1	CHINA (PEOPLE'S REP. OF),
FMD LPB ELISA (Type O)	ELISA for type O	Produced	14700 kits	0	1	CHINA (PEOPLE'S REP. OF),
FMD LPB ELISA (Type A)	ELISA for type A	Produced	10007 kits	0	1	CHINA (PEOPLE'S REP. OF),
FMD NS ELISA	ELISA for FMD	Produced	1479 kits	0	1	CHINA (PEOPLE'S REP. OF),
SPCE for FMDV antibody detection	ELISA for FMD	Produced	2603 kits	0	1	CHINA (PEOPLE'S REP. OF),
Conventional PCR	RT-PCR for FMD	Produced	60 kits	0	1	CHINA (PEOPLE'S REP. OF),
FMDV real-time qPCR	qRT-PCR for FMD	Produced	1400 kits	0	1	CHINA (PEOPLE'S REP. OF),
Typing real-time qPCR	qRT-PCR for FMD	Produced	240 kits	0	1	CHINA (PEOPLE'S REP. OF),

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOA?H Members?

No

## 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 WOAHS 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)	Cao Y, Li F, Xing X, Zhang H, Zhao Q, Sun P, Fu Y, Li P, Ma X, Zhang J, Zhao Z, Yuan H, Wang J, Wang T, Bao H, Bai X, Li D, Zhang Q, Li K, Lu Z. 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. Microbiol Spectr. 2025 Jan 8:e0223424. doi: 10.1128/spectrum.02234-24. Epub ahead of print. PMID: 39772731.
automatic tubular chemiluminescence immunoassay using magnetic particles	Li F, Bao Y, Jiang T, Li T, Zuo Y, Yang G, Li X, Cui Y, Lin M. Development of an automatic tubular chemiluminescence immunoassay using magnetic particles for the detection of antibodies against foot-and-mouth disease virus serotype A. Microb Pathog. 2024 Dec 6;199:107211. doi: 10.1016/j.micpath.2024.107211. Epub ahead of print. PMID: 39647542.

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

Yes

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

Yes

Name of the new vaccine developed	Description and References (Publication, website, etc)
Virus-like particle-based multipathogen vaccine of FMD and SVA	Song H, Waheed Abdullah S, Yin S, Dong H, Zhang Y, Tan S, Bai M, Ding Y, Teng Z, Sun S, Guo H. Virus-like particle-based multipathogen vaccine of FMD and SVA elicits balanced and broad protective efficacy in mice and pigs. Vaccine. 2024 Jul 11;42(18):3789-3801. doi: 10.1016/j.vaccine.2024.04.092. Epub 2024 May 6. PMID: 38714448.
Chimeric Porcine Parvovirus VP2 Virus-like Particles with Epitopes of South African Serotype 2 Foot-and-Mouth Disease Virus	Li Q, Ma X, Shen Y, Dai J, Nian X, Shang X, Chen J, Wubshet AK, Zhang J, Zheng H. Chimeric Porcine Parvovirus VP2 Virus-like Particles with Epitopes of South African Serotype 2 Foot-and-Mouth Disease Virus Elicits Specific Humoral and Cellular Responses in Mice. Viruses. 2024 Apr 17;16(4):621. doi: 10.3390/v16040621. PMID: 38675963; PMCID: PMC11054767.
A recombinant multi-epitope trivalent vaccine for foot-and-mouth disease virus serotype O in pigs	Shao J, Liu W, Gao S, Chang H, Guo H. A recombinant multi-epitope trivalent vaccine for foot-and-mouth disease virus serotype O in pigs. Virology. 2024 Aug;596:110103. doi: 10.1016/j.virol.2024.110103. Epub 2024 May 10. PMID: 38781710.

## TOR4: DIAGNOSTIC TESTING FACILITIES

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

No

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

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Yes

Name of the WOA Member Country receiving a technical consultancy	Purpose	How the advice was provided
CHINA (PEOPLE'S REP. OF)	WOAH Terrestrial Animal Health code chapter 8.8	Consultative report
CHINA (PEOPLE'S REP. OF)	FMD active surveillance in 2024 in China	Training courses, meetings, draft plan
CHINA (PEOPLE'S REP. OF)	FMD vaccination and PVM in 2024 in China	Meeting, draft plan
CHINA (PEOPLE'S REP. OF)	FMD epidemiology in Tajikstan and Kryzstan	Consultative report
CHINA (PEOPLE'S REP. OF)	Evaluate the efficacy of our FMD vaccines against Pakistanian field isolates	proposal & experimental design
CHINA (PEOPLE'S REP. OF)	Evaluate if the semen from pakistan buffaloes are positive for FMDV	detection methods & experiment design

## TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOA 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
International Science & Technology Innovation Program of Chinese Academy of Agricultural Sciences (CAASTIP)	5 years	Epidemiological investigation and prevention and control technology of zoonosis and emerging infecitous diseases in central asia	Institute of Veterinary Medicine, Tajik Academy of Agricultural Sciences, Tajikstan	TAJIKISTAN
International Science & Technology Innovation Program of Chinese Academy of Agricultural Sciences (CAASTIP)	5 years	Epidemiological investigation and prevention and control technology of zoonosis and emerging infecitous diseases in central asia	Kyrgyz Research Institute of Veterinary, Kyrgyzstan	KYRGYZSTAN
International Science & Technology Innovation Program of Chinese Academy of Agricultural Sciences (CAASTIP)	5 years	Epidemiological investigation and prevention and control technology of zoonosis and emerging infecitous diseases in central asia	Kazakh National Agrarian Research University	KAZAKHSTAN
China-Africa partner		Establishment of International Joint Laboratory for Prevention		

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institution exchange project	3 years	and Control of Major Animal Disease between LVRI, CAAS and Mekelle University	Mekelle University	ETHIOPIA
Prevention and control of TADs in China-Japan-Korea	5 years	prevention and control of TADs, such as FMD, PPR, ASF, HPAI	Official organizations	KOREA (REP. OF)
Prevention and control of TADs in China-Mongolia-Russia	5 years	Prevention and control of TADs, such as FMD, PPR, HPAI	Official organization	JAPAN

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

No

## 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:

During 2024, total 3 outbreaks have been reported in China. Instead, 4 outbreaks were reported in 2023 in 3 provinces. In pro-active surveillance, 26 out of 2204 samples were shown to be FMDV positive. In post-vaccination monitoring, among 2368 serum samples, the LPBE positive rate for Serotype O and Serotype A is 74.9% and 76.9%, respectively. There appear to be fewer lineages circulating in China: currently O/ME-SA/Ind-2001e (12 samples) and O/CATHAY (14 samples). The O/SEA/Mya-98 is not detected since 2021, although it is thought to still be circulating in pigs. Serotype A has not been detected since 2019. Generally, the commercial vaccines in China displayed a good match against the field isolates collected from China. However, the porcine O/A FMD bivalent vaccine has little protection against field isolate O/CATHAY.

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:

In 2024, 3 FMD outbreaks reported to WOA (WAHIS). However, 26 samples from active surveillance were positive for FMDV RNA. We performed phylogenetic analysis to evaluate the epidemiological changes of FMDV circulating in China. Share the genomic information with WRLFMD, SEACFMD member countries and WOA/FAO FMD reference laboratory network members.

MARA, China. <http://www.xmsyj.moa.gov.cn/yqfb/>

19th Annual Meeting of the WOA/FAO FMD Reference Laboratories Network (25th – 27th Sep, 2024)

The 4th Regional Meeting for WOA Reference Centres in Asia and the Pacific (17th Jul – 19th Jul, 2024)

27th sub-commission meeting of SEACFMD (4th Sep – 6th Sep, 2024)

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)

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### a) Articles published in peer-reviewed journals:

1

Zhang X, Ma W, Liu B, Shen C, Yang F, Yang Y, Lv L, Wu J, Liu Y, Shang Y, Guo J, Zhu Z, Liu X, Zheng H, He J. Phylogenetic analyses and antigenic characterization of foot-and-mouth disease virus PanAsia lineage circulating in China between 1999 and 2023. *Virology*. 2024 Oct;39(5):747-754. doi: 10.1016/j.virus.2024.09.006. Epub 2024 Sep 16. PMID: 39293543.

### b) International conferences:

4

1. 27th SEACFMD Sub-Commission Meeting, 2024.09.03-09.06;
2. The 4th Regional Meeting for WOA Reference Centres in Asia and the Pacific, 2024.07.17-07.19;
3. 19th WOA/FAO FMD Reference Laboratory Network Annual Meeting, 2024.09.25-09.27;
4. 23rd Federation of Asian Veterinary Associations Congress, 2024.10.25-10.27.

### c) National conferences:

23

The national conferences on FMD control and prevention, vaccine and vaccination, diagnosis technique and training courses at national level (n=10) and provincial level (n=13), respectively.

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

1

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 WOA Members?

Yes

a) Technical visit : 6

b) Seminars : 8

c) Hands-on training courses: 2

d) Internships (>1 month) 1

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	KAZAKHSTAN	4
A	KYRGYZSTAN	6
A	TAJIKISTAN	4
	PAKISTAN	

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A		4
A	IRAN	1
A	ETHIOPIA	3
B	CHINA (PEOPLE'S REP. OF)	20
C	CHINA (PEOPLE'S REP. OF)	12
D	CHINA (PEOPLE'S REP. OF)	3

## 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	ISO 17025 Certificate English.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 WOA/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

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

Yes

National/					
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International	Title of event	Co-organiser	Date	location	No. Participants
International	International Training Workshop on Major Transboundary Animal Diseases (TAD) Diagnosis Technology	Lanzhou Veterinary Research Institute	2024-09-05	Gansu, Lanzhou	20
National	2024 National Major Animal Disease Diagnosis and Comprehensive Prevention Technology Training Course	Lanzhou Veterinary Research Institute	2024-03-09	Gansu, Lanzhou	600
National	2024 Major Animal Disease Diagnosis, Detection and Practical Technology Training Course	Lanzhou Veterinary Research Institute	2024-09-09	Gansu, Lanzhou	30

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

Yes

Title of event	Date	location	Role (speaker, presenting poster, short communications)	Title of the work presented
The 4th Regional Meeting for WOA Reference Centres in Asia and the Pacific	2024-07-16	Tokyo	Short communications	None
19th WOA/FAO FMD Reference Laboratory Network Annual Meeting	2024-09-24	Rome	Speaker	Country report
WOAH 27th Meeting of the Sub-Commission for FMD in South-East Asia, China, and Mongolia	2024-09-02	Bangkok	Speaker	The advance in FMD Diagnosis by LVRI, China
23rd Federation of Asian Veterinary Associations Congress	2024-10-24	Korea	Speaker	Foot-and-mouth disease in pool 1 countries: changed and unchanged
National Committee of Experts on Epidemic Prevention	2024-12-02	Shandong province	Speaker	Epidemiological status and control and prevention measures of FMD
2024 National Animal Disease Epidemiology Conference	2024-03-27	Shandong province	Speaker	Epidemiological status and control and prevention measures of



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				FMD in China
The 11th Chinese Veterinary Medicine Congress	2024-08-24	Hubei province	Speaker	Epidemiological status and control and prevention measures of FMD in cattle and sheep

## TOR10: NETWORK WITH WOAHP REFERENCE LABORATORIES

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

Yes

24. Do you network (collaborate or share information) with other WOAHP Reference Laboratories designated for the same pathogen?

Yes

NETWORK/DISEASE	ROLE OF YOUR LABORATORY (PARTICIPANT, ORGANISER, ETC)	NO. PARTICIPANTS	PARTICIPATING WOAHP REF. LABS
WOAH/FAO FMD Reference Laboratory network/Foot-and-mouth disease	participant	26	World Reference Laboratory for Foot-and-mouth disease, Pirbright institute
SEACFMD/Foot-and-mouth disease	participate	50	The WOAHP regional reference laboratories for FMD in Thailand

25. Did you organise or participate in inter-laboratory proficiency tests with WOAHP 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 WOAHP Ref. Labs/organising WOAHP Ref Lab
Proficiency testing & Interlab comparison for FMD typing qPCR	Organiser	34 provincial labs	WOAH/China national reference laboratory for FMD

26. Did your laboratory collaborate with other WOAHP 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 WOAHP Reference Laboratories
Monitoring and analysis of the genetic and antigenic evolution of the FMDV from China (WOAH/FAO FMD Reference lab network MOU)	Evaluation of the efficacy of the current vaccine; selection of the new vaccine strains; Effective control of Foot-and-Mouth Disease.	The World reference laboratory for FMD, The Pirbright Institute, UK
Development of ELISA kits for detecting antibody against FMDV SAT2	Development of an ELISA kit for detecting antibody against FMDV SAT2 in serum	The World reference laboratory for FMD, The Pirbright Institute, UK
evaluating the FMDV NSP 3ABC detection kits	specificity & sensitivity	The WOAHP regional reference laboratory for FMD in Thailand

## TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

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

Yes

Purpose for inter-laboratory test comparisons <sup>1</sup>	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the test	WOAH Member Countries
FMD and other TADs such as ASF, PPR, POX antibody detection	organizer	5	antibody detection	CHINA (PEOPLE'S REP. OF),

## TOR12: EXPERT CONSULTANTS

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

Yes

Kind of consultancy	Location	Subject (facultative)
Review of WOAHO code and Manual	China	Review of WOAHO code and manual revision 2024
SEACFMD National Coordinators to discuss the preparation of the 27th SEACFMD Sub-Commission Meeting	Virtually	To discuss the preparation of SEACFMD Sub-Commission Meeting including the presentation template, surveys and Sub-Commission Meeting agenda papers

29. Additional comments regarding your report:

No