

World Organisation for Animal Health Founded as OIE









Advances in fundamental research on FMD in LVRI

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We mainly engaged in the Basic and Applied Research for prevention and control of Major Animal Infectious diseases, Parasatic diseases and Zoonotic diseases caused by Viruses, Bacteria and Parasites.



Viral diseases

Foot and Mouth Disease (FMD), African Swine Fever (ASF), Lumpy Skin Disease (LSD) and Sheep/Goat Pox, Peste Des Petits Ruminants (PPR), animal coronavirus infection such as PEDV/TGEV, and also PRRS etc



Bacterial diseases

Brucellosis, Animal Tuberculosis, Mycoplasmosis, etc.



Hydatid Disease, Toxoplasmosis and Tick-Borne Diseases like Theileriosis, etc..



Lanzhou Veterinary Research Institute (LVRI)





Administration building

Academic building - SKLADCP



Biosafety level-3 facility



A corner of LVRI

WOAH/National Ref Lab for FMD

• Center of FMD diagnosis, fundamental research, translational research and consulting service in China.

- It is based at LVRI, CAAS;
- Found in 1958 (FMD research group);
- 2002, Designated as National FMD Reference Laboratory (NFMDRL) by MOA (MARA), China;
- 2011, Designated as WOAH/China National Reference Laboratory for FMD.



Prof. Xiangtao Liu



DG: Prof. Haixue Zheng

	Organisation	World	Organización					
	de la Santé	for Animal	de Sanidad					
	Animale	Health	Animal					
Our Ref.: KM/SL 35.921		14 June 201	11					
De Thomas Theorem in								
Dr Zhang Zhongqu Deputy Director General								
Ministry of Agriculture								
Veterinary Bureau								
No.11, Nongzhan Nanli Chaoyang Dist 100125, Beiling	rict							
CHINA (PEOPLE'S REP. OF)								
Dear Dr Zhongqiu								
Application for designation of	OIE Reference La	horatories for E	oot and mouth disease					
Equine infectious anaemia, Whit nec	te spot syndrome, I rosis and Spring vir	nfectious hypod aemia of carp	fermal and haematopoletic					
I am pleased to advise you that durin Delegates of the OIE confirmed the de Academy of Agricultural Sciences as Dr Xiangtao Liu as the OIE designate of the Chinese Academy of Agricultur anaemia, with Dr Jianhua Zhou as the	g its recent annual (signation of the Lanz a new OIE Referen d Expert, and also of al Sciences as a new OIE designated Expe	General Session thou Veterinary F ce Laboratory fo the Harbin Vete OIE Reference art.	in Paris, the World Assembly of Research Institute of the Chinese re Foot and mouth disease, with rinary Research Institute (HVRI) Laboratory for Equine infectious					
Regarding applications for aquatic ani Sea Finbries Research Instlue (YSF Reference Laboratories for White spo with Dr Jie Huang as the OIE desig Diseases, Shenzhen Exit & Entry Ins Laboratory for Spring viraemia of carp	mal diseases, the A RI), Chinese Acade t syndrome and Infe nated Expert, and pection and Quaran with Dr Hong Liu as t	ssembly confirm my of Fishery Sc cticus hypoderm of the Reference tine Bureau of (he OIE designate	ed the designation of the Yellow iences (CAFS), as two new OIE al and haematopoietic necrosis, e Laboratory of Aquatic Animal China as a new OIE Reference ed Expert.					
Thank you for your willingness to co- with Drs Xiangtao Liu, Zhou, Huang an	perate with the OIE d Hong Liu in the fut	and its Member ure.	s, and I look forward to working					
With best regards,								
	Yours sincerely							
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		Dr Bernard	vallat					
		Director Ger						
OFFICE INTERNATIONAL		or: Dr Ving	otao Liu Dr. Japhus Zhou					
an o'dawan		Dr. Lin F	Huang, Dr Hong Liu					
12, rue de prony			and the second rate					
75017 paris france								
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- It infects mammals such as cattle, sheep, goats and pigs, causing lesions on the feet and in the mouth.
- > The disease is estimated to circulate in 77% of the global livestock population.
- > It is an WOAH-listed disease and must be reported to the Organisation
- Seven serotypes (A, O, C, SAT1, SAT2, SAT3, and Asia1), no cross-protection.





FMDV lesionsFMD pyre at a UK farm, 2001FMD particles

Outbreaks of foot and mouth disease can have serious economic consequences.

O/ME-SA/Ind-2001e is more prevalent in China





- Distribution of causative strains;
- Conclusion: O/ME-SA/Ind-2001e is one of dominant strains in China.

O/ME-SA/Ind-2001e in China between 2017 and 2021



FMDV pseudoknots (PKs): determinants for FMDV replication



For translation, the 40S ribosomal subunit binds not at the 5' end of the RNA, but internally at the IRES.

FMDV pseudoknots (PKs): determinants for FMDV replication



Plaque assay

The RNA pseudoknots in foot-and-mouth disease virus are dispensable for genome replication, but essential for the production of infectious virus.

Ward JC, et al, Plos pathogen 2022

- A 10-amino-acid deletion in the 3A protein that is responsible for the decreased pathogenicity of Cathay topotype FMDVs in bovines.
- In the pig-adapted Cathay topotype FMDVs, a 43-nt deletion in the PK region and the 3A deletion coexisted.
- > An O/ME-SA/PanAsia lineage strain O/GD/CHA/2015 was isolated in China.
 - 1. Pig-adapted;
 - 2. 86-nt deletions in the PK regions;
 - 3. Intact 3A.



How the 86-nt deletion in the PK region affects viral tropism and virulence of foot and mouth disease virus.

FMDV pseudoknots (PKs): determinants for FMDV host tropism

- > A strain O/CHA/7/2011 was used as backbone.
 - 1. Good infections in pigs and cattle;
 - 2. Intact PK regions;
 - 3. Intact 3A.





An 86-nt deletions in the PK regions could not affect virus replication in porcine cells.

FMDV pseudoknots (PKs): determinants for FMDV host tropism





FMDV pseudoknots (PKs): determinants for FMDV host tropism



FMD vaccines at **CAVET**

The company is an exclusive manufacturer to produce all different kinds of FMD vaccines which was authorized by MARA, China



FMD virus-like-particle (VLP) vaccines in LVRI



SDS-PAGE (lane 1) Western blot (lane 2)





FMDV-specific immune response in pigs

Group	No	Neutralizing titer		Protection	Rate of protection	
		9 dpi	16 dpi	21 dpi	10 dpc	
One dose	#4536	2.408	2.709	2.107	yes	100(5/5)
	#4572	2.107	2.408	2.408	yes	
	#4574	2.408	2.709	2.107	yes	
	#4590	2.107	2.408	2.408	yes	
	#4592	2.408	2.709	2.408	yes	
1/3 dose	#4501	1.806	1.806	1.806	yes	80(4/5)
	#4561	1.204	1.505	1.806	yes	
	#4575	1.806	2.107	2.107	yes	
	#4593	1.806	1.806	1.806	yes	
	#4597	1.204	1.204	1.505	no	
1/9 dose	#4534	1.505	1.505	1.806	no	40(2/5)
	#4563	1.505	1.505	1.204	yes	
	#4564	1.204	1.505	1.505	no	
	#4594	1.806	1.806	1.806	yes	
	#4598	1.204	1.505	1.505	no	
Healthy cattle	#4576	0.778	0.903	0.778	no	0(0/5)
	#4580	0.903	0.778	0.602	no	

The neutralizing titer and protection of cattle

Electron microscopy

FMD virus-like-particle (VLP) vaccines in LVRI

• Virus-like particles vaccine is under progress.



Virus-like particles vaccine

Prof. huicheng guo, guohuicheng@caas.cn



Production license



Three Class I new veterinary drug

certificates

2025 International Training Workshop

• We need you.

2025 International Training Workshop on Major Transboundary Animal Diseases (TAD) Diagnosis Technology :

- Will be held in Lanzhou on 6th Sep 20th Sep, 2025
- More than 20 positions
- No lecture fee;
- Free accomodation;
- Beautiful views along yellow river;
- Mouth-watering food.







感谢关注,感谢支持!