

FMD Reference Laboratory Report

LVRI, China

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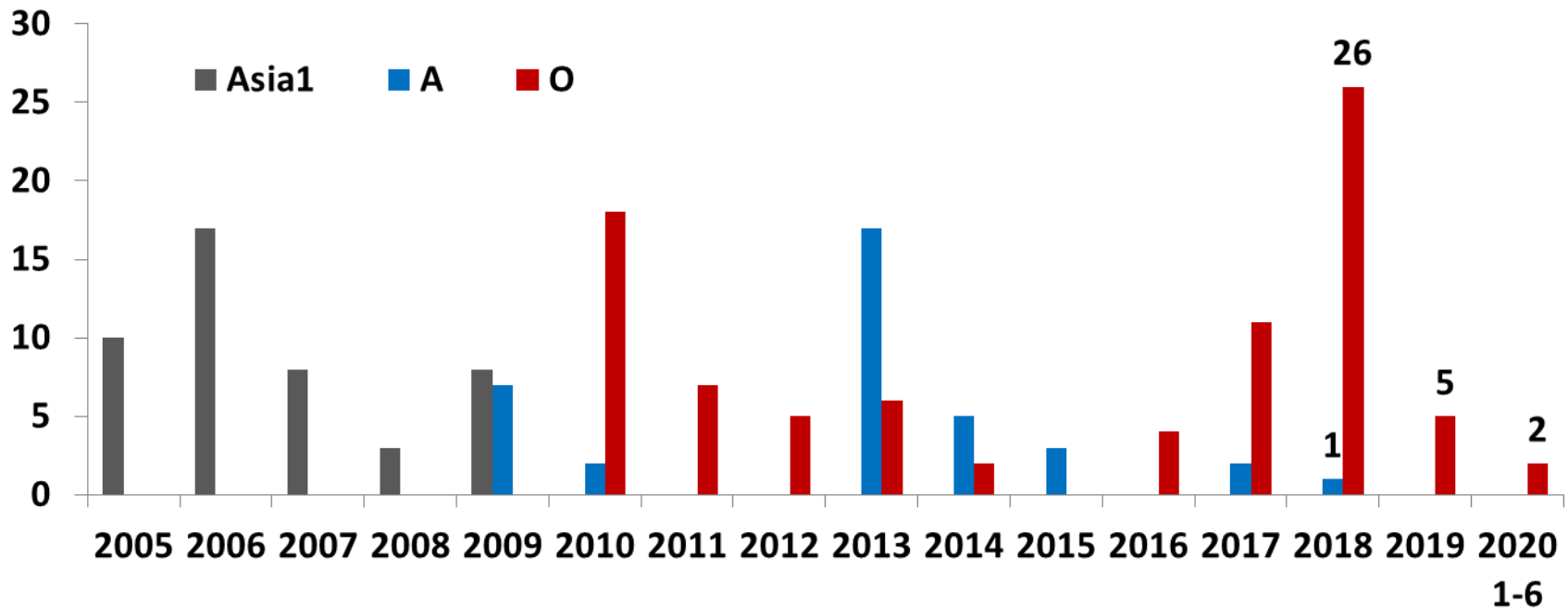
Acknowledgments: Weimin Ma, Lv Lv, Yamin Yang, Ye Jin, Bingzou Lu, Juan Song,
Yanmin Li, Jianhong Guo, Zaixin Liu, Xiangtao Liu, Hong Yin



outline

- FMD situation with virus analysis
- FMD surveillance by FMDRL, LVRI
- Vaccine matching test
- Other technology supporting
- Work plan

1. FMD situation in China



- Total 169 outbreaks reported since 2005
- Type O n=86; Type A n=37
- No type Asia1 outbreaks since 2009

Distribution of FMD outbreaks in China (2019.1-2020.6)



Type O n=7; Type A n=0

3 provinces covered

Most outbreaks caused by animal movement

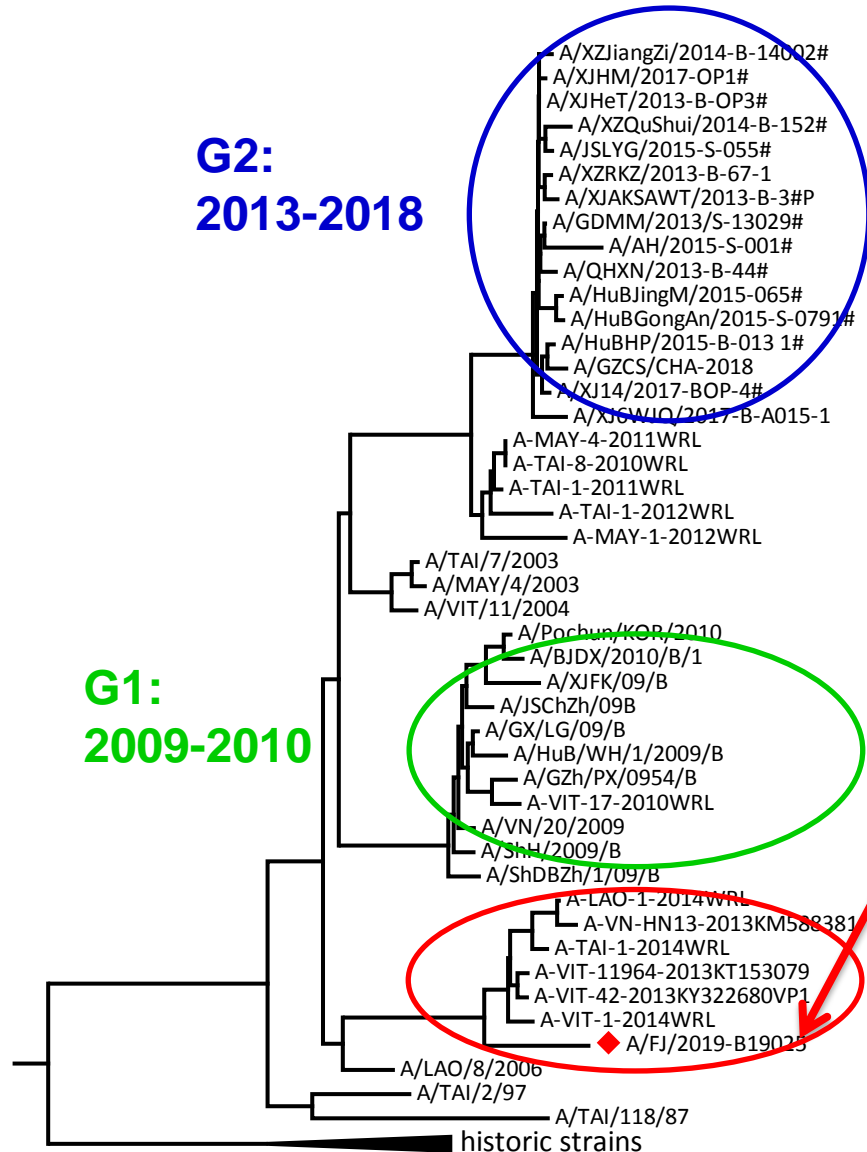
Complex strains of FMDV type O in China

- **O/Ind-2001**
 - O/Ind-2001e sublineage
 - Still circulating around SEA and EA
- **O/PanAsia**
 - Re-introduced virus in 2018
 - Close relationship with viruses from SEA during 2017-2018 (WRL report)
- **O/Mya-98**
 - two genetic clusters observed
 - infecting cattle cluster and infecting pigs cluster; Maybe, different source of these two clusters
- **O/CATHAY**
 - Circulating in field, but less outbreaks
 - Multiple clusters→→virus variation or multiple source
 - Low matching between vaccine strain and field strain

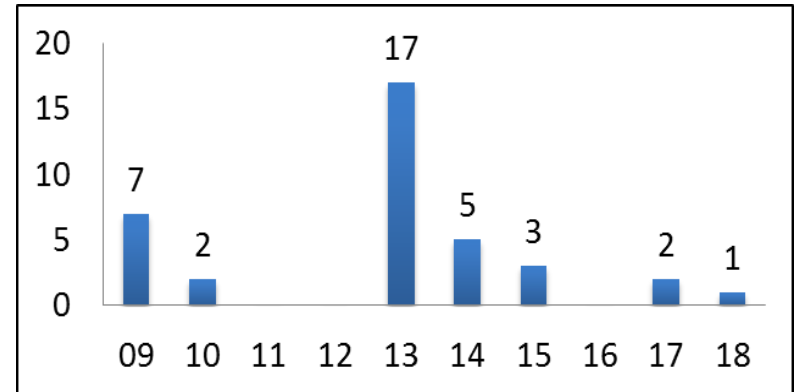
Type A: A/Sea-97

**G2:
2013-2018**

**G1:
2009-2010**

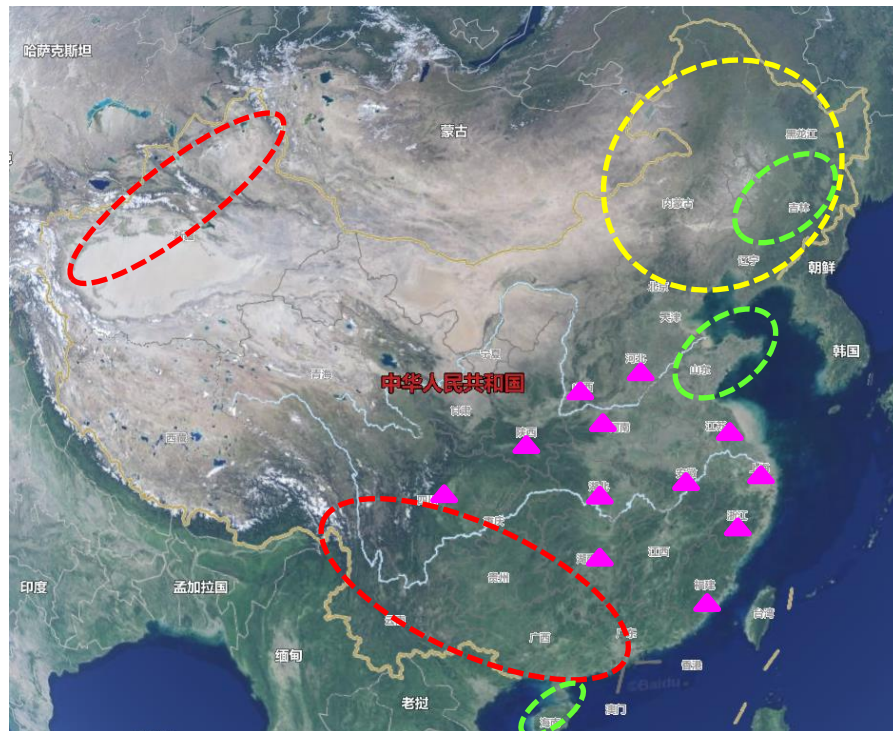
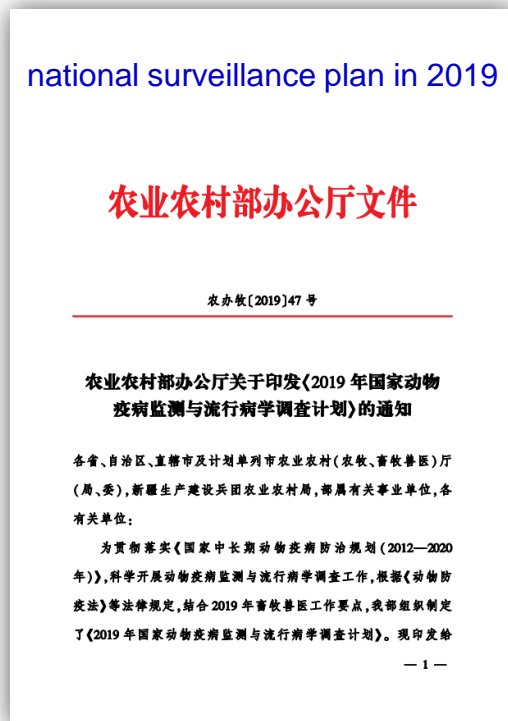


FMD type A in China from 2009-2019



- Isolated from cattle OPF in May, 2019
- VP1 sequencing: ~88% homology with A/GDMM/2013; ~90% with G1 viruses; **~96% with Vietnam, Thailand and Laos strains during 2013 to 2014(Genbank)**
- VNT: using vaccine serum vaccinated with Re-A/WH/09, neutralization titer is 1:1024→vaccine effective
- After that, no cases found in field

2. FMD active surveillance taken by LVRI, 2019



- Sampling and surveillance in pig slaughterhouses from 12 provinces ▲
- FMD epidemiological survey in North East of China, where to establish FMD free zone with vaccination(4 provinces) ●
- FMD Special epidemiological investigation around border areas in South West and North West of China (5 provinces) ○
- Routine monitoring in FMD free zone with vaccination(3 provinces) ○

Main results observed:

- ✓ No new strains (such as A/ASIA/G-VII and Asia1/G-VIII) found, but the risk is still high
- ✓ Type A is decreasing; O/CATHAY topotype strain and O/Mya-98 are main strains in pigs;
- ✓ Nearly , the positive rate of FMDV RNA was 0.01% (national wide) in healthy animal in field
- ✓ The qualified rate of immune antibody reaches 70% averagely, but in some cases, FMD vaccination should be strengthen, especially those animals in backyard or before movement



3. vaccine matching test

Field isolate	lineage	host	Match or not
18056#	O/PanAsia	cattle	M
18074#	O/CATHAY	pig	N
19011#	O/Ind-2001	cattle	M
19028#	O/CATHAY	pig	N
19025#	A/Sea-97	cattle	M

Methods used: VNT

Vaccine strain used: O/MYA98/BY/2010; re-A/WH/09

M: $r > 0.3$; N: $r < 0.3$

If $r < 0.3$, animal challenge test would be used for confirmation

O/18074(r=0.13) challenge test with pigs

Method: PGP, OIE standard

Vaccine	Vaccinated	Unprotected	Protect%
Monovalent	16	0	16/16
Bivalent	16	3	13/16
Control	3	3	0/3

Virus: O/18074, collected from China in 2018; belong to O/CATHAY ; $ID_{50}=10^{-4.5}$

Monovalent vaccine: Inactivated swine FMD vaccine type O (BY 2010 strain), batch number is P180518J ; $PD_{50}=9.00$

Bivalent vaccine: Inactivated swine FMD vaccine type O+A , Batch number is A180405J; $PD_{50}=10.32$ (O) and 10.81 (A)

Vaccines potency against O/Ind-2001

FMD Vaccine manufacturer in China	PD ₅₀
A	13.59
B	7.19
C	9
D	15.59
E	9
F	13.59
G	11.21



- Organized by IVDC, MARA, Jul-Sep, 2019
- Vaccines: type O+A FMD vaccines produced by 7 FMD vaccine manufacturers in China.
- Virus: challenge with O/Ind-2001/17006, collecting from China in 2017.
 $BID_{50} = 10^{-8.0}$, $10\,000 \times BID_{50}$
- Challenged at 21 dpv
- Calculated using Reed-Muench method
- All cattle vaccines' PD₅₀ are high than 6.0; the current vaccines used in China are effective against O/Ind-2001 virus

4. Technological supports

Trainings

- ✓ 1 National training course on FMD diagnostic techniques
- ✓ 4 series of Training Courses jointly organized by FMDRL and Diagnosis Center, LVRI.
- ✓ 8 reports or seminars at workshops organized by provincial labs.
- ✓ 3 Biosafety trainings held in LVRI
- ✓ Field training (sampling during active surveillance)

PTS

National PT for major animal disease organized by CADC and FMDRL in May 2019, funded by MARA; FMD and SVA blind samples prepared and provided by FMDRL for real-time RT-PCR test; 32 provincial labs were invited.

Evaluation of FMDV molecular detection methods

Validation and recommendation of FMDV typing real-time RT-PCR and VP1 sequencing primers in SEA.

This work will be continued.



International collaboration—international conference, workshop or visiting

- Delegations from North Korea(July, 2019) and Thailand (Sep,2019) visited LVRI
- 22nd SEACFMD NCP Meeting , June 25-27, 2019, Ulaanbaatar, Mongolia
- 31st conference of the OIE Regional Commission for Asia, the Far East and Oceania, Sendai, Japan, 2-6 Sep,2019
- 12th SEACFMD Laboratory Network Meeting and Regional Training on FMD Sample, Packaging and Transport, Pakchong, Thailand, 4-6 November 2019
- The 14th OIE/FAO FMD Reference Laboratories Network Annual Meeting, Busan, Korea, 2-6 Dec,2019



5. Work plan

- Real time FMD outbreaks conformation and reporting
- Study and analysis of field isolates
- National PTS in 2020 (FMDV antibody detection)
- Participating in national FMD surveillance program (focus on high risk areas and points)
- FMD vaccine strain screening and recommendation
- Technical support, such as training courses for FMD and other TADs
- Strengthen the international collaboration, including information sharing, risk analysis, bilateral and multilateral collaboration, joint control programme

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- OIE
- SEACFMD
- WRLFMD

