Food and Agriculture Organization of the United Nations

eufmd
european commission for the control of foot-and-mouth disease

OIE/FAO Foot-and-Mouth Disease Reference Laboratories Network

Foot-and-Mouth Disease

April-June 2020
Quarterly report

FAST Reports
Foot-and-mouth And Similar Transboundary animal diseases

European Commission for the Control of Foot-and-Mouth Disease

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CONTENTS

Abbreviations and acronyms

BVI	Botswana Vaccine Institute
EIDRA	Emerging Infectious Disease Research Association
EuFMD	European Commission for the Control of Foot-and-Mouth Disease
FAST reports	Foot-and-mouth and similar transboundary animal diseases reports
FGBI “ARRIAH”	Federal Governmental Budgetary Institution “Federal Centre for Animal Health”
FMD	Foot-and-mouth disease
FMDV	Foot-and-mouth disease Virus
FMDV GD	Foot-and-mouth disease Virus Genome detected
FMDV NGD	Foot-and-mouth disease Virus Genome not detected
GF-TAD	Global Framework for the Progressive Control of Transboundary Animal Diseases
MEVAC	International Facility for Veterinary Vaccines Production (Egypt)
NT	Not tested
NVD	No virus detected
OIE	World Organisation for Animal Health
PIADC	Plum Island Animal Disease Center
rRT-PCR	Real-time reverse transcription polymerase chain reaction
SAARC	South Asian Association for Regional Cooperation
SADC	Southern Africa in collaboration with the Southern African Development Community
SAT	Southern African Territories
SEACFMD	South-East Asia and China FMD campaign
SSARRL	Sub-Saharan Africa Regional Reference Laboratory
SVD	Swine vesicular disease
VETBIS	Veterinary Information System of Turkey
VI	Virus Isolation
WAHIS	World Animal Health Information System (of the OIE)
WRLFMD	World Reference Laboratory for Foot-and-Mouth Disease

1. Highlights and headlines

Welcome to the second edition of the Foot-and-mouth disease (FMD) Quarterly Report produced by European Commission for the Control of Foot-and-Mouth Disease (EuFMD) and the World Reference Laboratory for Foot-and-Mouth Disease (WRLFMD). I take this opportunity to pass on my congratulations to Keith Sumption in his new role as the CVO for Food and Agriculture Organization of the United Nations (FAO) – and sincerely hope that he will still be able to dedicate some time to FMD-specific issues!

Over the past few months, we have all had to get used to a different way of working including learning new ways of exchanging information via remote meetings. I was pleased to "virtually" join in recent meetings of the South-East Asia and China FMD campaign (SEACFMD) National Coordinators to learn about the FMD situation in Southeast Asia and the inevitable impacts of COVID-19 upon local efforts to control the disease. During the shut-down period, staff from the WRLFMD have been deployed to hospitals to assist in routine COVID-19 RT-PCR testing and have also contributed to work to implement new ELISA tests to measure serological responses of COVID-19 vaccine candidates. Work at Pirbright is now slowly getting back to a new "normal" and we have started to receive overseas samples for testing as well as dispatch sample panels for the proficiency testing exercise. This report describes the results for samples that have been received from Pakistan where sequences recovered for the samples from Pakistan (2016, 2017, 2019, 2020) cover the three FMDV serotypes (O, A and Asia 1) that are endemic in the country. For serotype O, more than 50 percent of the sequences (n=19) belonged to the O/ME-SA/Ind-2001 clade; findings which indicate that this lineage has become more widely established in the country (after it was detected for the first time in 2019; see: https://mra.asm.org/content/9/18/e00165-20). Elsewhere, new cases of FMD have been reported in Libya (serotype A) and within the FMD protection zone in South Africa (serotype SAT 2). The information included in this report now complements the EuFMD FAST surveillance report for the European neighbourhood (http://www.fao.org/3/cb0215en/cb0215en.pdf).

Keep safe, Don King, Pirbright, July 2020

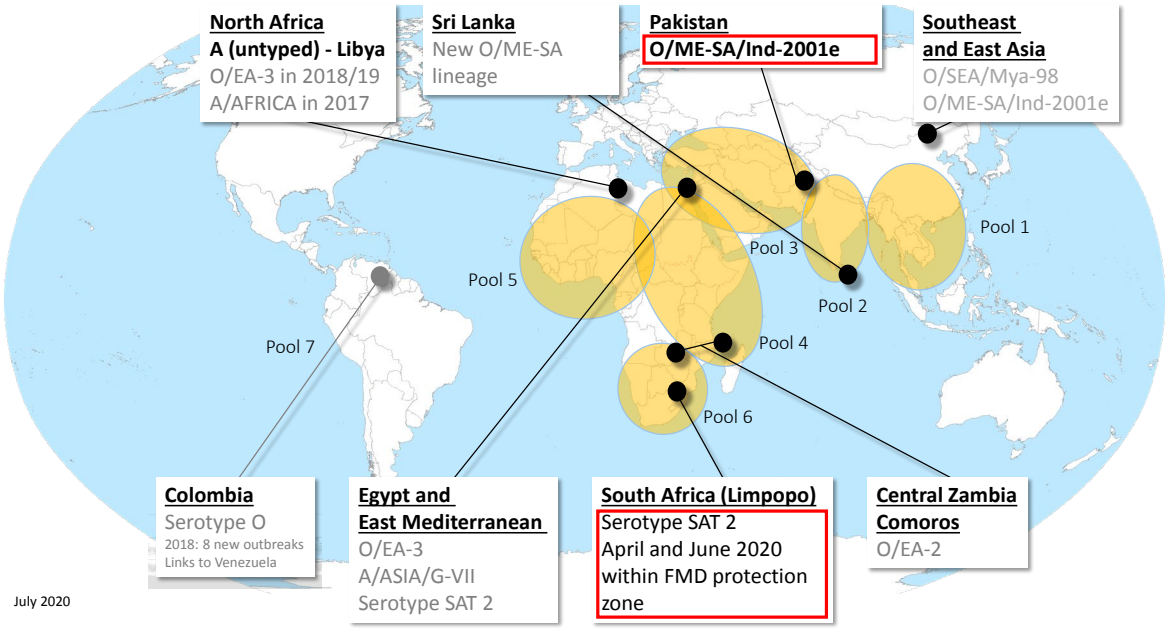


Figure 1: Recent headline events (April to June 2020) with endemic pools highlighted in orange
Source: WRLFMD. Map conforms to the United Nations World map, February 2020.

2. General overview

Endemic Pools represent independently circulating and evolving foot-and-mouth disease virus (FMDV) genotypes; within the pools, cycles of emergence and spread occur that usually affect multiple countries in the region. In the absence of specific reports, it should be assumed that the serotypes indicated below are continuously circulating in parts of the pool area and would be detected if sufficient surveillance was in place.

POOL	REGION/COUNTRIES	SEROTYPES PRESENT
1	**SOUTHEAST ASIA/CENTRAL ASIA/EAST ASIA** Cambodia, China, China (Hong Kong SAR), Taiwan Province of China, Democratic People's Republic of Korea, Republic of Korea, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Russian Federation, Thailand, Viet Nam	A, Asia 1 and O
2	**SOUTH ASIA** Bangladesh, Bhutan, India, Mauritius, Nepal, Sri Lanka	A, Asia 1 and O
3	**WEST EURASIA & MIDDLE EAST** Afghanistan, Armenia, Azerbaijan, Bahrain, Georgia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Syrian Arab Republic, Tajikistan, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan	A, Asia 1 and O (SAT 2)*
4	**NORTH AFRICA** Algeria, Egypt, Libya, Morocco, Tunisia	A, O and SAT 2
	EASTERN AFRICA Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Uganda, United Republic of Tanzania, Yemen	O, A, SAT 1, SAT 2 and SAT 3
5	**WEST/CENTRAL AFRICA** Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo	O, A, SAT 1 and SAT 2
6	**SOUTHERN AFRICA** Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia, Zimbabwe	SAT 1, SAT 2 and SAT 3 (O, A)†
7	**SOUTH AMERICA** Colombia, Venezuela (Bolivarian Republic of)	O and A

** Reported only in Oman in 2017*

† only in Angola and north Zambia as spill-over from pool 4

3. Summary of FMD outbreaks and intelligence

3.1. Global overview of samples received and tested

The location of all samples detailed in this report can be seen on the map below. More detailed maps and sample data, on a country by country basis, can be found in the following sections of this report.

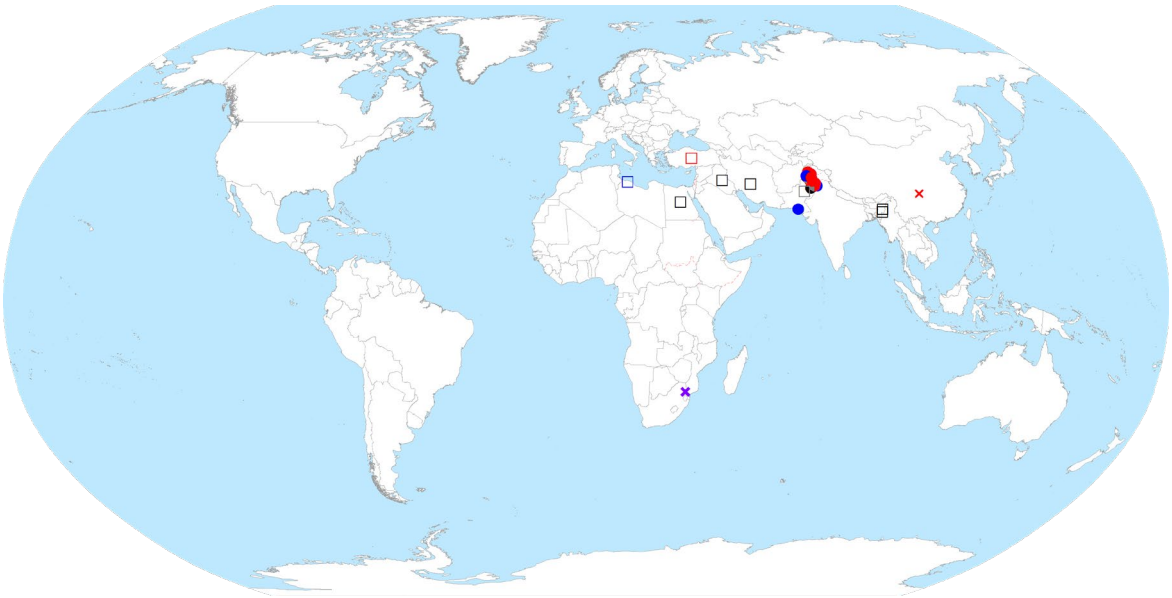


Figure 2: Samples tested by WRLFMD or reported in this quarter. ● indicates samples analysed; × indicates new outbreaks reported to the OIE, but where results to define the genotype have not been reported; □ indicates reports of FMD from other sources. Shape colours define the serotype detected ●O; ●A; ●C; ●Asia1, ●SAT1, ●SAT2, ●SAT3, ○ FMD not detected, ● serotype undetermined/not given in the report.

Source: WRLFMD. Map conforms to the United Nations World map, February 2020.

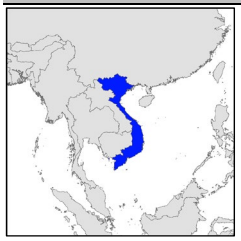
3.2. Pool 1 (Southeast Asia/Central Asia/East Asia)

People's Republic of China

An outbreak of **FMD type O** was reported to have occurred on 21 May 2020 in cattle at Daping Village, Hengshan Township, Qijiang District, Chongqing. No genotyping has been reported.

Immediate Notification and Follow up reports on WAHIS, OIE

The Socialist Republic of Viet Nam



A batch of 39 samples was received on 11 June 2020. Results are pending and will be described in the next quarterly report.

3.3. Pool 2 (South Asia)

The Republic of India

FMD reported in cattle of Churachandpur and Kangpokpi districts of Manipur State, India in early April.

ProMED-mail post

3.4. Pool 3 (West Eurasia and Middle East)

The Islamic Republic of Iran

The Islamic Republic of Iran reported 589 outbreaks of FMD since the beginning of 2020 (reported in official meeting with EuFMD on 24 June 2020).

Live animal trade with Turkey and Pakistan is currently banned. Only slaughtered animals and meat are being further permitted into the Islamic Republic of Iran. The Islamic Republic of Iran, Pakistan and Turkey have stated that one of their main priorities is to extend their mutual collaboration: this will also enable to tackle illegal animal movements from Pakistan to the Islamic Republic of Iran. In the Sistan and Baluchistan provinces, 11 modern slaughterhouses have been constructed and quarantine measures are in place at the border.

EuFMD, Report on Significant FAST disease events and information, April – June 2020

The Republic of Iraq

Iraq reported 210 FMD cases occurred between 1 May and 30 June (meeting with EuFMD on 2 July 2020)

A serosurvey conducted in large ruminants between May and June 2019 detected an 18.7 percent NSP prevalence (in line with a previous evaluation) and an 81.2 percent SP prevalence. A second serosurvey in large and small ruminants was planned for November and December 2019 but was not carried out due to the lack of diagnostic material. A mass vaccination campaign targeting cattle and buffaloes will be carried out between June and July 2020. It will be followed by post vaccination monitoring between July and September 2020 to assess the level of acquired immune response

EuFMD, Report on Significant FAST disease events and information, April – June 2020

The Islamic Republic of Pakistan

A batch of 50 samples was received on the 16 March 2020. Laboratory investigations found 29 **FMD type O**, five **FMD type A** and eight **FMD type Asia 1** viruses. An additional sample (PAK/59/2019) contained both **FMD types O** and **Asia 1**. FMDV genome was detected in a further six samples, while one was no virus detected (NVD). VP1 genotyping revealed the following: 19 O/ME-SA/Ind-2001e, 11 O/ME-SA/PanAsia-2^{ANT-10}, three A/ASIA/Iran-05, one A/ASIA/Iran-05^{FAR-11}, one A/ASIA/Iran-05^{SIS-13} and nine Asia1/ASIA/Sindh-08 (see below).

The country reported 1 501 outbreaks in 2019 and 316 in 2020 (at the time of a meeting with EuFMD on 22 April). Mass vaccination of cattle and buffalo within the FMD control zone (Bahawalpur Division) is carried out twice every year. Serosurveys are carried out after each round of vaccination: significant SP titers were detected against serotype A, O and Asia-1, whereas NSP titers showed decreasing trends. Pakistan is at Stage 2 of the PCP for FMD and has planned to achieve stage 3 by 2021. A development project called "Risk-based FMD control in Pakistan" has been approved with a total budget of Rs 763 million for six years.

EuFMD, Report on Significant FAST disease events and information, April – June 2020

The Republic of Turkey

The occurrence of 37 new outbreaks in Anatolia between 1 April and 28 June 2020 was reported to the ADNS, bringing the total to 89 outbreaks since the beginning of 2020. The last outbreak was recorded on 8 June 2020. FMD is endemic in Anatolia: currently, only Serotype O (O/ME-SA/PanAsia2^{Qom15}) is circulating. Serotypes A and Asia1 were not detected since January 2018 and July 2015, respectively. Surveillance has shown a sharp decline of NSP prevalence in 2020 (average 5 percent). Thrace region has been free with vaccination since May 2010 and NSP risk-based serological surveillance is currently in place in the region. Link to the ADNS report.

Due to the COVID-19 situation, the stamping out policy for FMD control in Anatolia has been postponed to the second half of 2020, whereas the vaccination of ruminants prior to movements to summer pastures was not hampered. All live animal markets are closed.

Turkey has implemented more activities aimed at enhancing FMD control including improved diagnostic capacity, outbreak investigation and management, functionalities of database and its use for official certifications and reporting, training and awareness programmes. Further strategy improvements are planned for: improvement of collaborations with neighbouring countries; establishment of an effective early detection system and an improved control of illegal cross-border movements of live animals.

The main goal of the control strategy for Anatolia is to move to the progressive control pathway (PCP) stage 3 in 2021, to obtain the endorsement of the Official Control Programme by the World Organization for Animal Health (OIE) in 2022 and to gain the free status with vaccination by 2024.

The veterinary services of **Turkey**, **Iraq**, **the Islamic Republic of Iran** and **Pakistan** are in the process to establish a protocol for the submission of FMD samples for molecular diagnosis and vaccine matching to the **Şap Institute**, located in Turkey. The protocol is discussed under the framework of the Statement of Intentions for improved cooperation against FAST diseases between Transcaucasia and neighboring countries. Overcoming the difficulties for the shipment of samples to international reference laboratories will allow a more immediate identification of strains circulating in the region and availability of vaccine matching results, thus enabling a more rapid and effective response to future disease events in the region.

EuFMD, Report on Significant FAST disease events and information, April – June 2020

3.5. Pool 4 (North and Eastern Africa)

The Arab Republic of Egypt

About 1.36 million large and small ruminants have been vaccinated against FMD within the context of a massive campaign launched on 1 June 2020 by the Egyptian veterinary services. No clinical outbreaks have been reported since the beginning of the year.

EuFMD, Report on Significant FAST disease events and information, April – June 2020

State of Libya

Four further outbreaks of **FMD type A** were reported to have occurred at the end of March in sheep in Tarabulus Governorate. No genotyping has been reported.

Immediate Notification and Follow up reports on WAHIS, OIE

Five outbreaks of foot-and-mouth disease (FMD) were notified to the OIE between March and April 2020: all of the events occurred in **sheep** farms close to **Tripoli**, in the **northwestern region** of the country, between 20 February and 30 March. A total of 1 100 cases among sheep and 185 deaths in lambs were recorded. Serum samples were analyzed to confirm the serotype and identify the strain: the samples tested with ELISA for structural proteins (SP) and non-structural proteins (NSP) indicated the presence of FMDV serotype A (20 serum samples were tested in March with an outcome of nine NSP positives, while 52 serum samples were tested in April with 15 positives). None was positive for serotype O. The viral strain has not yet been identified. Link to OIE Immediate notification and Follow-up reports.

The source of the infection is unclear, but animal movements from southern Libya represent a risk factor. Furthermore, the flocks are being concentrated in shared pastures in the northern part of the country because of the war and related security issues. Considering the animal movements in the region and given the absence of vaccination campaigns against FMD in Libya since 2016 due to lack of resources, a risk of FMD spread is reported for Tunisia and Algeria, where a consistent small ruminant population is not regularly vaccinated against serotype A.

EuFMD, Report on Significant FAST disease events and information, April – June 2020

3.6. Pool 5 (West/Central Africa)

No new outbreaks of FMD were reported in the West/Central Africa.

3.7. Pool 6 (Southern Africa)

The Republic of South Africa

Between 2 April 2020 and 4 June 2020, a further five outbreaks of **FMD SAT 2** were reported in cattle in Bushbuckridge, Mpumalanga Province. These outbreaks occurred in South Africa's FMD Protection Zone.

Immediate Notification and Follow up reports on WAHIS, OIE

3.8. Pool 7 (South America)

No new outbreaks of FMD were reported in South America.

3.9. Extent of global surveillance

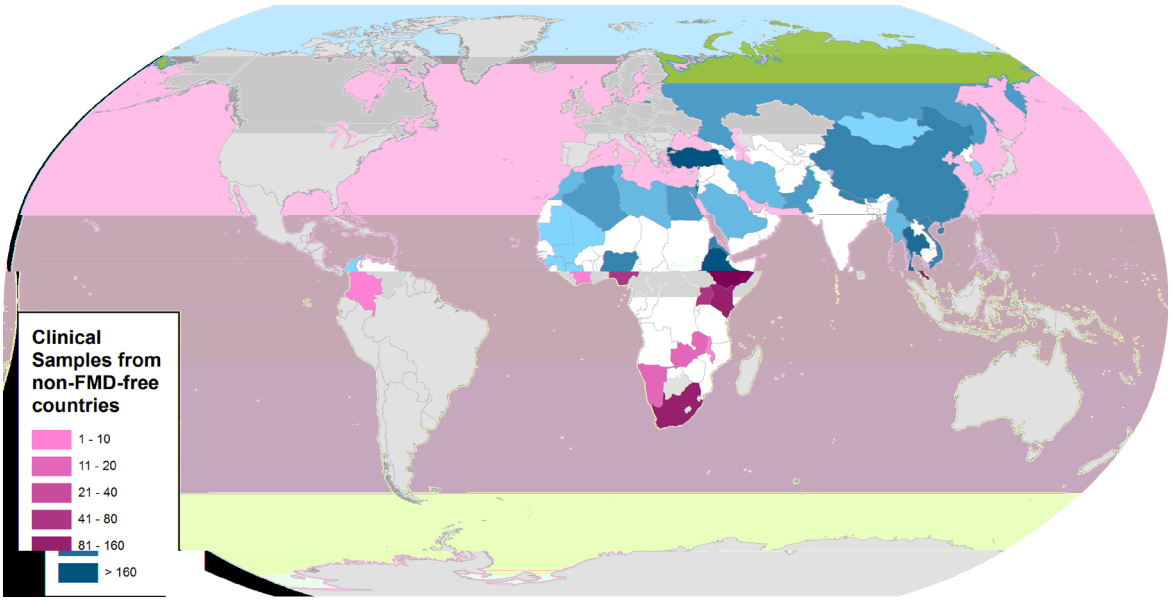


Figure 3: Samples received during 2019 from FMD outbreaks (white indicates territories where FMD circulates but results for testing of samples have not been reported during 2019). Data from presentations given at the OIE/FAO Reference laboratory Network annual meeting (https://www.foot-and-mouth.org/Ref-Lab-Network/Network-Annual-Meeting)

Source: WRLFMD. Map conforms to the United Nations World map, February 2020.

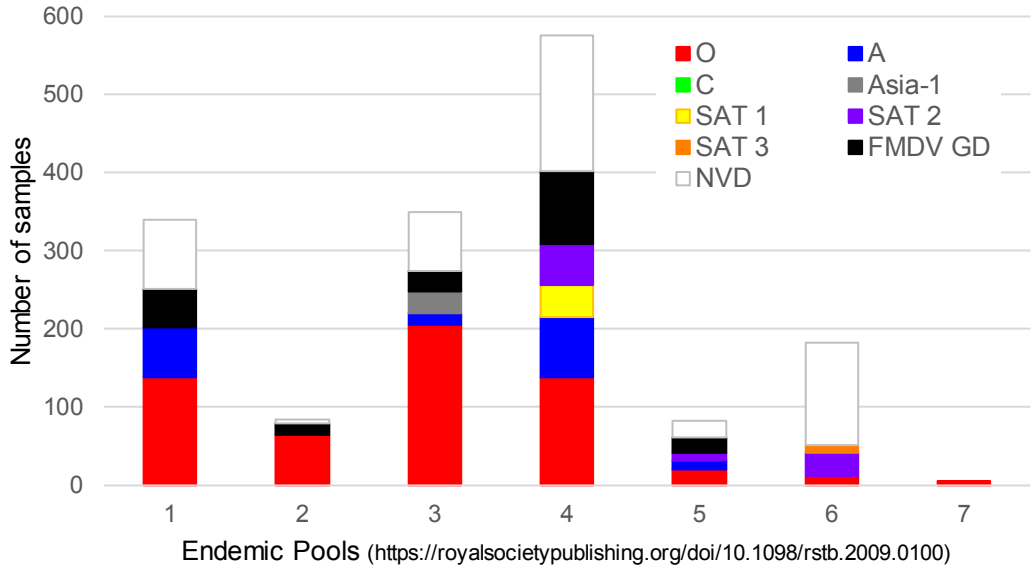


Figure 4: Representation of different FMDV serotypes detected in samples tested from the FMD endemic pools by the OIE/FAO FMD Laboratory Network during 2019 (draft data) (NVD = no virus detected; GD = genome detected)

In regions where FMD is endemic, continuous evolution of the virus generates geographically discrete lineages that are genetically distinct from FMD viruses found elsewhere. This report displays how different FMD lineages circulate in different regions; these analyses accommodate the latest epidemiological intelligence to assess the relative importance of the viral strains circulating within each regions (see Table 1, below).

Table 1: Conjectured relative prevalence of circulating FMD viral lineages in each Pool. For each of the regions, data represent the relative importance of each viral lineage [prevalence score estimated as a percentage (%) of total FMD cases that occur in domesticated hosts]. These scores can be used to inform the PRAGMATIST tool (see Annex 3)

Lineage	Southeast / Central / East Asia [Pool 1]	South Asia [Pool 2]	West Eurasia & Middle East [Pool 3]	North Africa	Eastern Africa [Pool 4]	West / Central Africa [Pool 5]	Southern Africa [Pool 6]	South America [Pool 7]
O ME-SA PanAsia-2			35					
O ME-SA PanAsia	10							
O SEA Mya-98	33							
O ME-SA Ind2001	20	80	6	10				
O EA or O WA			3	55	55	70		
O EURO-SA								80
O CATHAY	10.5							
A ASIA Sea-97	25							
A ASIA Iran-05	0		25.5					
A ASIA G-VII		16	17.5					
A AFRICA				25	22	15		
A EURO-SA								20
Asia-1	1.5	4	12.5					
SAT 1				0	8	5	27	
SAT 2			0.5	10	14	10	57	
SAT 3					1		16	
C								

A number of outbreaks have occurred where samples have not been sent to the WRLFMD or other laboratories in the OIE/FAO FMD Laboratory Network. An up-to-date list and reports of FMD viruses characterised by sequencing can be found at the following website: http://www.wrlfmd.org/country-reports/country-reports-2020.

Results from samples or sequences received at WRLFMD (status of samples being tested) are shown in Table 2 and a complete list of clinical sample diagnostics made by the WRLFMD from April to June 2020 is shown in Annex 1 (Summary of Submissions). A record of all samples received by WRLFMD is shown in Annex 1 (Clinical Samples).

Table 2: Status of sequencing of samples or sequences received by the WRLFMD from April to June 2020 (* indicates a batch carried over from the previous quarter).

WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2020/00002*	16/03/2020	Pakistan	O	29	29	completed
			A	5	5	completed
			Asia 1	8	8	completed
			O & Asia 1	1	2	
WRLFMD/2020/00003	11/06/2020	Vietnam	pending	39	-	pending
			Total	**50**	**44**	

Table 3: VP1 sequences submitted by other FMD Network laboratories to the WRLFMD from April to June 2020 (* indicates sequences retrieved from GenBank).

WRLFMD Batch No.	Date received	Country	Serotype	Date Collected	No. of sequences	Submitting laboratory
-	-	-	-	-	-	-
				Total	**0**	

4. Detailed analysis

Key for maps and trees

Result of analysis	Symbol	
Serotype O	●	UKG 99/9999
Serotype A	●	UKG 99/9999
Serotype C	●	UKG 99/9999
Serotype Asia-1	●	UKG 99/9999
Serotype SAT 1	●	UKG 99/9999
Serotype SAT 2	●	UKG 99/9999
Serotype SAT 3	●	UKG 99/9999
FMDV Genome Detected (FMD GD)	●	UKG 99/9999
No Virus Detected (NVD)	○	UKG 99/9999

4.1. Pool 3 (West Eurasia and Middle East)

Islamic Republic of Pakistan

Batch: WRLFMD/2020/00002

Date received: 16/03/2020

No. of samples: 50

O (ME-SA/Ind-2001/e): 19

O (ME-SA/PanAsia-2^{ANT-10}): 11

A (ASIA/Iran-05): 3

A (ASIA/Iran-05^{FAR-11}): 1

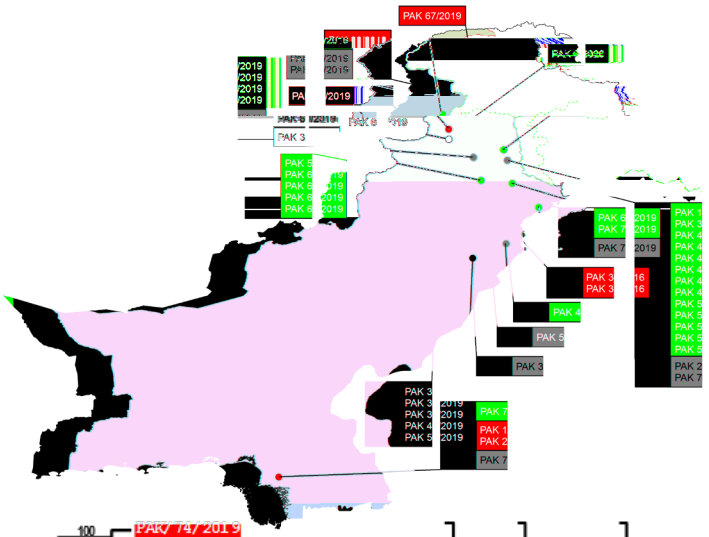
A (ASIA/Iran-05^{SIS-13}): 1

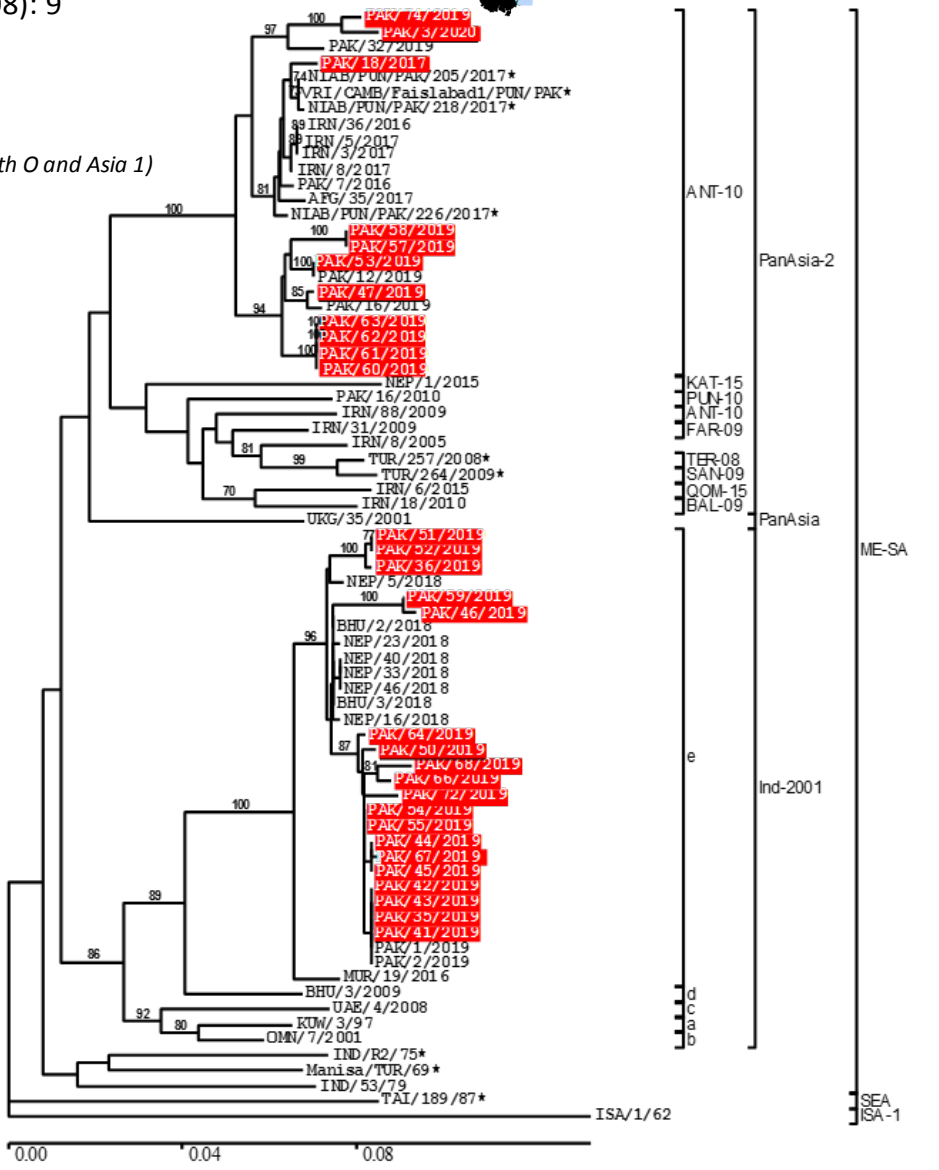
Asia1 (ASIA/Sindh-08): 9

FMDV-GD: 6

NVD: 1

(one sample contained both O and Asia 1)





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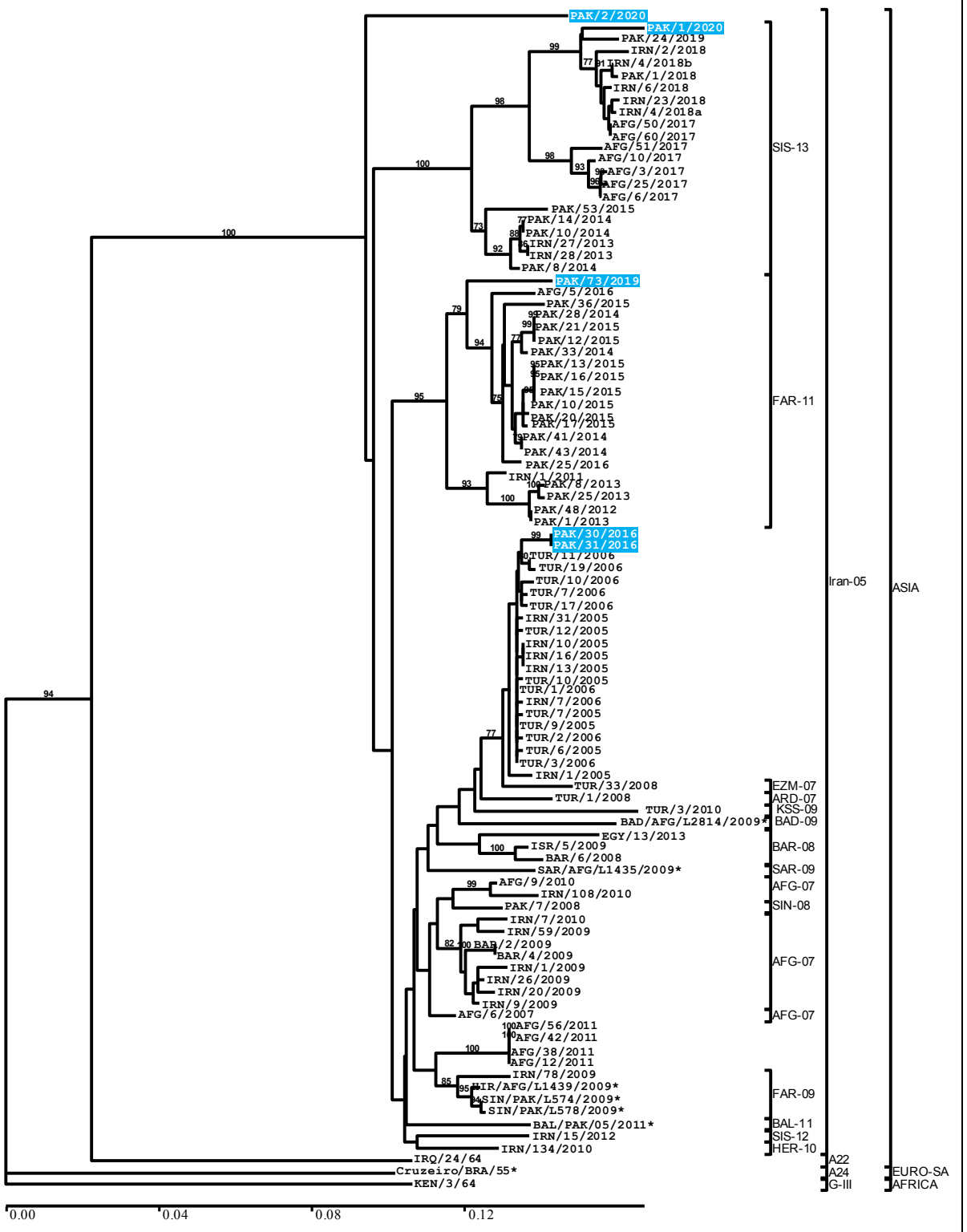

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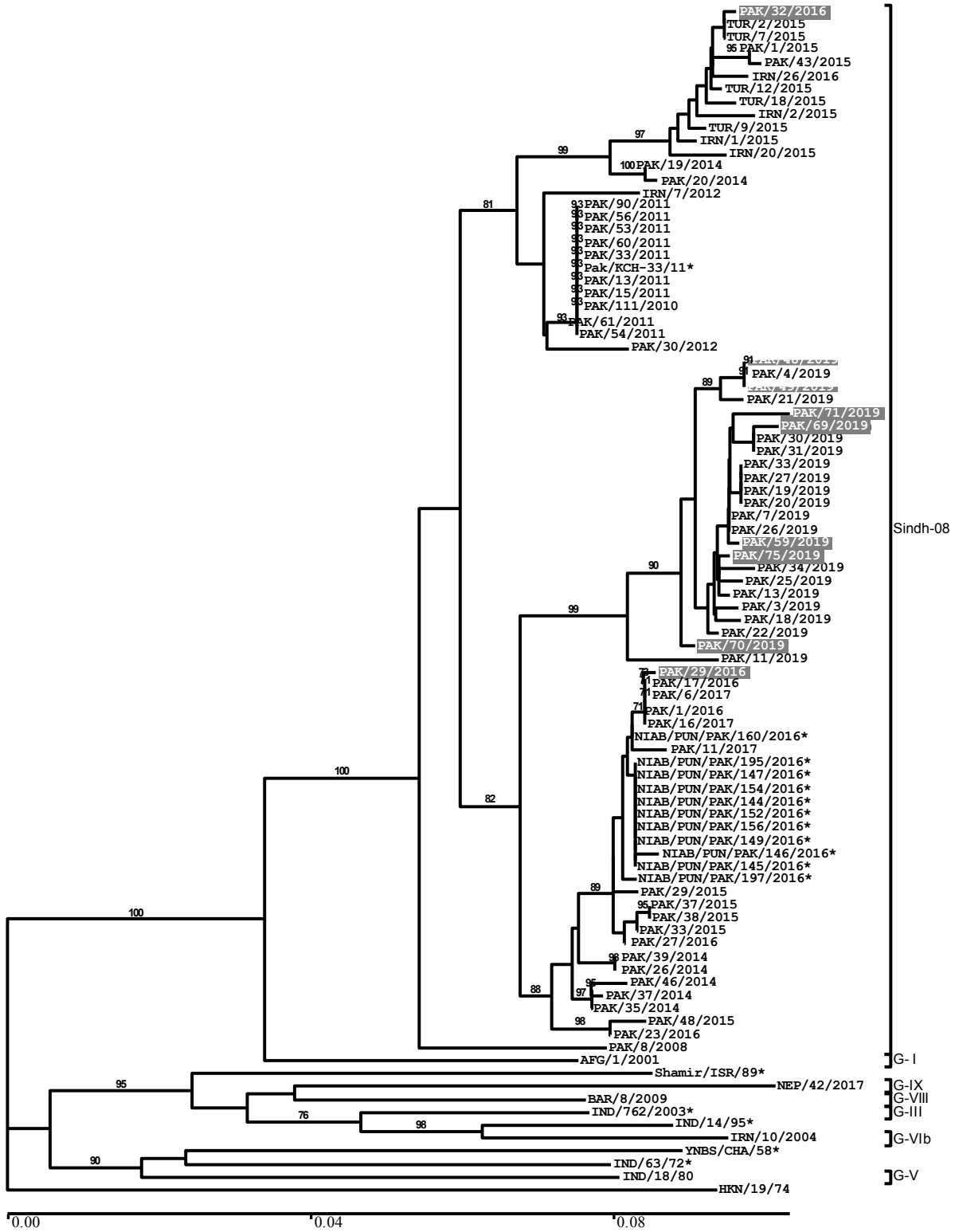

4.2. Vaccine matching

Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from April to June 2020. During this reporting period no vaccine matching has taken place.

NOTES:

1. Vaccine efficacy is influenced by vaccine potency, antigenic match and vaccination regime. Therefore, it is possible that a poor antigenic match may be compensated by high potency vaccines and by administering more than one vaccine dose at suitable intervals. Thus, a vaccine with a weak antigenic match to a field isolate, as determined by serology, may nevertheless afford some protection if it is of sufficiently high potency and is administered under a regime to maximise host antibody responses (Brehm, 2008).
2. Vaccine matching data generated in this report only considers antibody responses in cattle after a single vaccination (typically 21 days after vaccination). The long-term performance of FMD vaccines after a second or multiple dose of vaccine should be monitored using post-vaccination serological testing.

Table 4: Summary of samples tested by vaccine matching

Serotype	O	A	C	Asia-1	SAT 1	SAT 2	SAT 3
-	-	-	-	-	-	-	-
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Annex 1: Sample data

Summary of submissions

Table 5: Summary of samples collected and received to WRLFMD (April to June 2020)

Country	Nº of samples	Virus isolation in cell culture/ELISA								RT-PCR for FMD	
		FMD virus serotypes							No Virus Detected		
		O	*A*	*C*	*SAT 1*	*SAT 2*	*SAT 3*	*ASIA-1*		*Positive*	*Negative*
Pakistan†	50	30	5	-	-	-	-	9	7	49	1
Vietnam	39										
TOTAL	**50**	**30**	**5**	**0**	**0**	**0**	**0**	**9**	**7**	**49**	**1**

† One sample tested positive for both serotypes O and Asia-1

Clinical samples

Table 6: Clinical sample diagnostics made by the WRLFMD® April to June 2020

Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				VI/ELISA	RT-PCR	Final report
Pakistan	16 Mar. 2020	25 Jun. 2020	PAK 29/2016	Cattle	24/03/2016	Asia-1	POS	Asia-1
			PAK 30/2016	Cattle	13/08/2016	A	POS	A
			PAK 31/2016	Cattle	31/10/2016	A	POS	A
			PAK 32/2016	Cattle	09/12/2016	Asia-1	POS	Asia-1
			PAK 18/2017	Cattle	28/11/2017	O	POS	O
			PAK 3/2018	Buffalo	24/03/2018	NEG	NEG	NVD
			PAK 35/2019	Cattle	02/01/2019	O	POS	O
			PAK 36/2019	Cattle	08/01/2019	O	POS	O
			PAK 37/2019	Buffalo	08/01/2019	NEG	POS	FMDV GD
			PAK 38/2019	Cattle	16/01/2019	NEG	POS	FMDV GD
			PAK 39/2019	Cattle	16/01/2019	NEG	POS	FMDV GD
			PAK 40/2019	Cattle	16/01/2019	NEG	POS	FMDV GD
			PAK 41/2019	Cattle	16/01/2019	O	POS	O
			PAK 42/2019	Cattle	16/01/2019	O	POS	O
			PAK 43/2019	Cattle	16/01/2019	O	POS	O
			PAK 44/2019	Cattle	16/01/2019	O	POS	O
			PAK 45/2019	Cattle	16/01/2019	O	POS	O
			PAK 46/2019	Cattle	19/01/2019	O	POS	O
			PAK 47/2019	Cattle	24/01/2019	O	POS	O
			PAK 48/2019	Buffalo	24/01/2019	Asia-1	POS	Asia-1
			PAK 49/2019	Cattle	24/01/2019	Asia-1	POS	Asia-1

Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				VI/ELISA	RT-PCR	Final report
			PAK 50/2019	Cattle	04/02/2019	O	POS	O
			PAK 51/2019	Cattle	04/02/2019	O	POS	O
			PAK 52/2019	Cattle	04/02/2019	O	POS	O
			PAK 53/2019	Buffalo	06/02/2019	O	POS	O
			PAK 54/2019	Buffalo	06/02/2019	O	POS	O
			PAK 55/2019	Cattle	06/02/2019	O	POS	O
			PAK 56/2019	Buffalo	14/02/2019	NEG	POS	FMDV GD
			PAK 57/2019	Cattle	26/02/2019	O	POS	O
			PAK 58/2019	Cattle	26/02/2019	O	POS	O
			PAK 59/2019	Buffalo	26/02/2019	O, Asia-1	POS	O, Asia-1
			PAK 60/2019	Cattle	01/03/2019	O	POS	O
			PAK 61/2019	Cattle	01/03/2019	O	POS	O
			PAK 62/2019	Buffalo	01/03/2019	O	POS	O
			PAK 63/2019	Cattle	01/03/2019	O	POS	O
			PAK 64/2019	Cattle	08/03/2019	O	POS	O
			PAK 65/2019	Cattle	13/03/2019	NEG	POS	FMDV GD
			PAK 66/2019	Cattle	13/03/2019	O	POS	O
			PAK 67/2019	Cattle	19/03/2019	O	POS	O
			PAK 68/2019	Buffalo	17/04/2019	O	POS	O
			PAK 69/2019	Cattle	17/04/2019	Asia-1	POS	Asia-1
			PAK 70/2019	Buffalo	29/04/2019	Asia-1	POS	Asia-1
			PAK 71/2019	Cattle	15/05/2019	Asia-1	POS	Asia-1
			PAK 72/2019	Cattle	25/06/2019	O	POS	O
			PAK 73/2019	Cattle	23/07/2019	A	POS	A
			PAK 74/2019	Buffalo	13/11/2019	O	POS	O
			PAK 75/2019	Cattle	18/12/2019	Asia-1	POS	Asia-1
			PAK 1/2020	Cattle	25/01/2020	A	POS	A
			PAK 2/2020	Cattle	27/01/2020	A	POS	A
			PAK 3/2020	Cattle	24/02/2020	O	POS	O
TOTAL					**50**			

Annex 2: FMD publications

Recent FMD Publications (April to June 2020) cited by Web of Science.

1. **Alhaji, N.B., J. Amin, M.B. Aliyu, B. Mohammad, O.O. Babalobi, Y. Wungak, & I.A. Odetokun** (2020). Economic impact assessment of foot-and-mouth disease burden and control in pastoral local dairy cattle production systems in Northern Nigeria: A cross-sectional survey. *Preventive Veterinary Medicine*, 177: 7. DOI: 10.1016/j.prevetmed.2020.104974.
2. **Arjkumpa, O., C. Sansamur, P. Sutthipankul, C. Inchaisri, K.N. Lampang, A. Charoenpanyanet, & V. Punyapornwithaya** (2020). Spatiotemporal analyses of foot and mouth disease outbreaks in cattle farms in Chiang Mai and Lamphun, Thailand. *BMC Veterinary Research*, 16(1): 13. DOI: 10.1186/s12917-020-02392-6.
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4. **Bath, C., M. Scott, P.M. Sharma, R.B. Gurung, Y. Phuentshok, S. Pefanis, A. Colling, N.S. Balasubramanian, S.M. Firestone, S. Ungvanijban, J. Ratthanophart, J. Allen, G. Rawlin, M. Fegan, & B. Rodoni** (2020). Further development of a reverse-transcription loop-mediated isothermal amplification (RT-LAMP) assay for the detection of *Foot-and-mouth disease virus* and validation in the field with use of an internal positive control. *Transboundary and Emerging Diseases*: 13. DOI: 10.1111/tbed.13589.
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8. **Bertram, M.R., R.M. Palinski, S.J. Pauszek, E.J. Hartwig, G.R. Smoliga, J.K. Biswal, R. Ranjan, S. Subramaniam, J.K. Mohapatra, B. Das, I.H. Fish, B. Pattnaik, L.L. Rodriguez, & J. Arzt** (2020). Genome sequences of seven *Foot-and-mouth disease virus* isolates reveal diversity in the O/ME-SA/Ind2001 lineage in India between 1997 and 2009. *Microbiology Resource Announcements*, 9(16): 3. DOI: 10.1128/mra.00287-20.
9. **Bertram, M.R., S. Yadav, C. Stenfeldt, A. Delgado, & J. Arzt** (2020). Extinction dynamics of the *Foot-and-mouth disease virus* carrier state under natural conditions. *Frontiers in Veterinary Science*, 7: 14. DOI: 10.3389/fvets.2020.00276.
10. **Bjornham, O., R. Sigg, & J. Burman** (2020). Multilevel model for airborne transmission of foot-and-mouth disease applied to Swedish livestock. *Plos One*, 15(5): 31. DOI: 10.1371/journal.pone.0232489.
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14. **Elmenofy, W., I. Mohamed, L. El-Gaied, R. Salem, G. Osman, & M. Ibrahim** (2020). Expression of 1B capsid protein of *Foot-and-mouth disease virus* (FMDV) using baculovirus expression system and its validation in detecting SAT 2-specific antisera. *Peerj*, 8: 15. DOI: 10.7717/peerj.8946.
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36. **Song, Y.M., Y.L. Yang, X. Lin, X.N. Li, X. Zhang, G.H. Ma, Z.G. Su, & S.P. Zhang** (2020). *In situ* and sensitive stability study of emulsion and aluminum adjuvanted inactivated *Foot-and-mouth disease virus* vaccine by differential scanning fluorimetry analysis. *Vaccine*, 38(14): 2904-2912. DOI: 10.1016/j.vaccine.2020.02.068.
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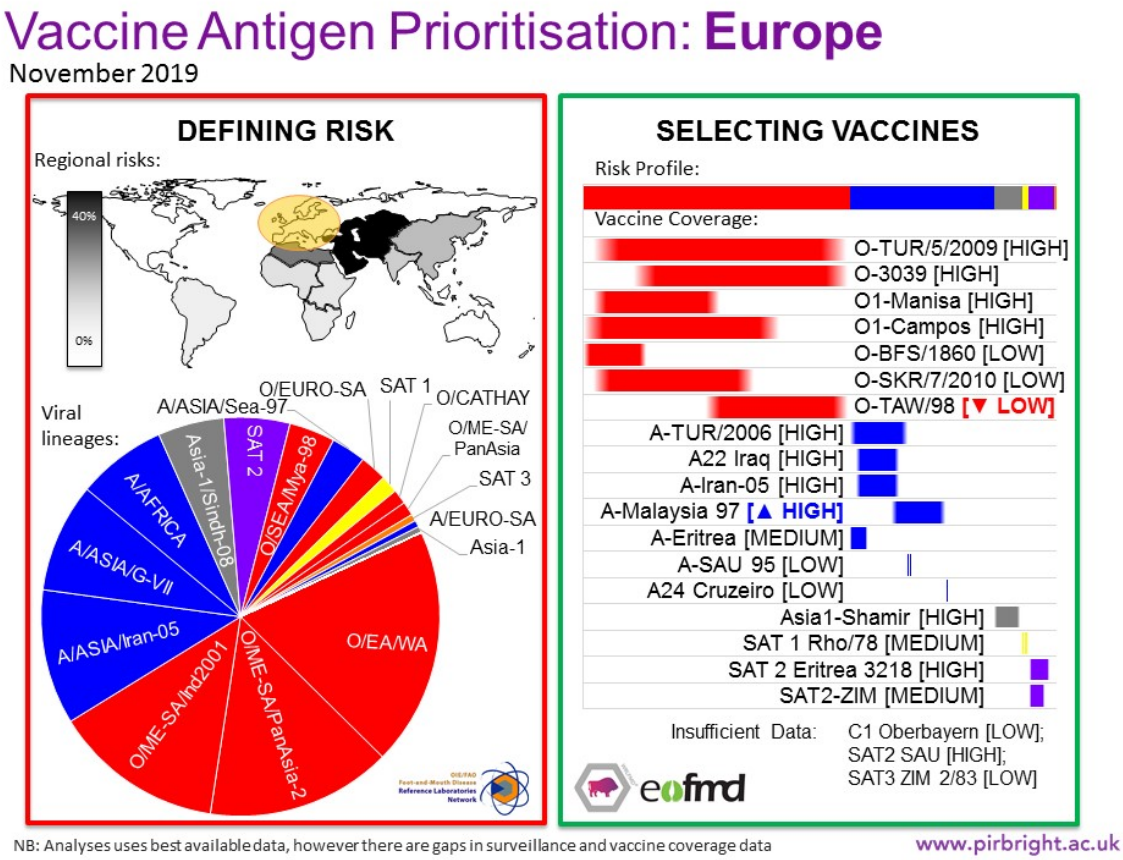
46. **Zhao, R., G.Y. Jia, Y.Z. Yu, B.C. Song, C. Hu, & L.Y. Wu** (2020). Regulating activity of polysaccharides from *Portulaca oleracea L.* on dendritic cells of mice immunized against foot-and-mouth disease. *Pakistan Veterinary Journal*, 40(1): 7-12. DOI: 10.29261/pakvetj/2018.126.

Annex 3: Vaccine recommendations

This report provides recommendations of FMDV vaccines to be included in antigen banks. These outputs are generated with a new tool (called PRAGMATIST) that has been developed in partnership between WRLFMD and EuFMD. These analyses accommodate the latest epidemiological data collected by the OIE FAO FMD Laboratory Network regarding FMDV lineages that are present in different *source regions* (see Table 1 in Section 3.9, above), as well as available *in vitro, in vivo* and field data to score the ability of vaccines to protect against these FMDV lineages.



Please contact WRLFMD or EuFMD for assistance to tailor these outputs to other geographical regions. NB: Vaccine-coverage data presented is based on available data and may under-represent the true performance of individual vaccines.

Annex 4: Brief round-up of EuFMD and WRLFMD activities

Open Session of the EuFMD OS20

"Livelihoods @ risk in a FASTer world"

Due to travel restrictions related to COVID-19 the OS20 will not be held in Marseille as previously announced but will be conducted in virtual format.

Detailed information will be soon available on the following website: https://www.eufmd.info/os20faster

Courses

- EuFMD's open access online courses provide convenient self-paced training which you may study anytime, anywhere, free of charge. There are currently 4 courses in English and 1 in Arabic:
    - Introduction to Foot-and-Mouth Disease
    - What is the Progressive Control Pathway?
    - Public Private Partnerships in the Veterinary Domain
    - Introduction to the Progressive Control Pathway

  https://eufmdlearning.works/mod/page/view.php?id=13130
- The WRLFMD residential training course on FMD diagnostics (https://www.pirbright.ac.uk/instructor-led-training/diagnosis-foot-and-mouth-disease) scheduled for May 2020 has been postponed.
- November 2020: E-learning course on FMD diagnostics:

Podcasts

We have a constantly updated series of short podcasts relating to the FAST world, available here: http://www.fao.org/eufmd/resources/podcasts/en/

Meetings

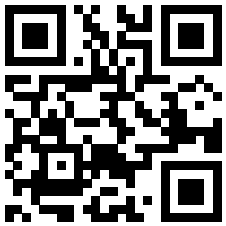
The FMD Roadmap Meetings (RMMs) originally planned in 2020 in Eastern Africa, in South Asia in collaboration with the South Asian Association for Regional Cooperation (SAARC) Secretariat, and in Southern Africa in collaboration with the Southern African Development Community (SADC) Secretariat were postponed due to the current global SARS-CoV-2 pandemic. Plans are now underway to hold these virtually in late 2020 and early 2021.

Proficiency test scheme organised by WRLFMD

Sample panels for the Phase XXXII exercise are ready for dispatch and are beginning shipped to international laboratories as flights begin to resume after the COVID-19 crisis (see table below for a summary of the current status of the exercise).

Status	Number of Labs
Invitations	72
Responses	51
Declined to take part	3
Paperwork in progress	19
Panels shipped	28

We will write to inform participating laboratories about any other changes that may be required to accommodate these events, and please feel free to contact WRLFMD if you have any questions.



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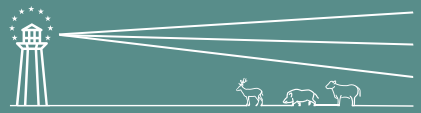

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Hold-FAST tools

GET PREPARED, E-learning, FMD-PCP, EuFMDiS, Pragmatist, Impact Risk Calculator, Virtual Learning Center, SMS Disease reporting, Global Vaccine Security, Outbreak Investigation app, PCP-Support Officers, PCP Self-Evaluation tool, AESOP, Telegram, Whatssap, Quarterly Global Reports, Real Time Traning.

EuFMD Committees

Executive Committee, Standing Technical Committee, Special Committee for Surveillance and Applied Research (SCSAR), Special Committee on Biorisk Management (SCBRM), Tripartite Groups.

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