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

July–September 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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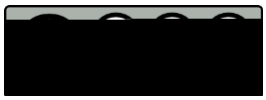


CONTENTS

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
LVRI	The National Reference Laboratory for FMD, The Lanzhou Veterinary Research Institute, Chinese Academy of Agricultural Sciences
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

A warm welcome to the third issue of the foot-and-mouth disease (FMD) Quarterly Report. In common with the previous issue, samples submitted to the World Reference Laboratory for Foot-and-Mouth Disease (WRLFMD) during this reporting period (April to June 2020) remain very low. Although it is perhaps inevitable that the international activities of FMD reference laboratories have been impacted by COVID-19, at Pirbright our experience is that air-freight shipments can still be arranged - if they are carefully planned, in advance! We are very happy to be contacted to help address any problems that scientists are experiencing to send samples to WRLFMD for analyses.

In this report, we describe results for foot-and-mouth disease virus (FMDV)-positive samples submitted from Viet Nam, where three different serotype O lineages were detected (O/ME-SA/Ind-2001e, O/ME-SA/PanAsia and O/SEA/Mya-98). Sequence data submitted from Turkey (from GenBank) and Zambia (from SSARRL for FMD, Botswana) were also analysed. In addition to three phylogenetic trees presented in this report that reconstruct the spread of the A/ASIA/G-VII lineage in Turkey during 2015-17, more recent data (received in October from the ŞAP FMD Institute, Ankara) highlights a new introduction of the O/ME-SA/PanAsia-2ANT-10 lineage into the country (for the first time since 2017). Elsewhere, there have been reports to the World Organisation for Animal Health (OIE) of outbreaks in South Africa (serotype SAT 2), Libya (serotype A), Rwanda (Kayonza; where serotype SAT 2 has been detected by serology), Mozambique (untyped), and southern Malawi (initially reported as untyped – but now typed as SAT 2 by SSARRL, Botswana). Despite the technical challenges of connecting to virtual platforms (via SKYPE, Zoom etc...), a number of international FMD meetings have been scheduled including the National Coordinators of South-East Asia and China FMD campaign (SEACFMD) during July and the Southern Africa in collaboration with the Southern African Development Community (SADC) FMD Roadmap meeting in November. In December, the Annual meeting of the OIE/Food and Agriculture Organization of the United Nations (FAO) FMD Laboratory Network and the Open Session of the European Commission for the Control of Foot-and-Mouth Disease (EuFMD) will also be held in a virtual-remote format. Finally, I take this opportunity to let FMD colleagues know that WRLFMD and EuFMD will be running an v-learning training course the covers FMD diagnostics starting in November. This course is designed for personnel working in national FMD laboratories and further details are provided in Annex 4 of this report.

Don King, Pirbright October 2020

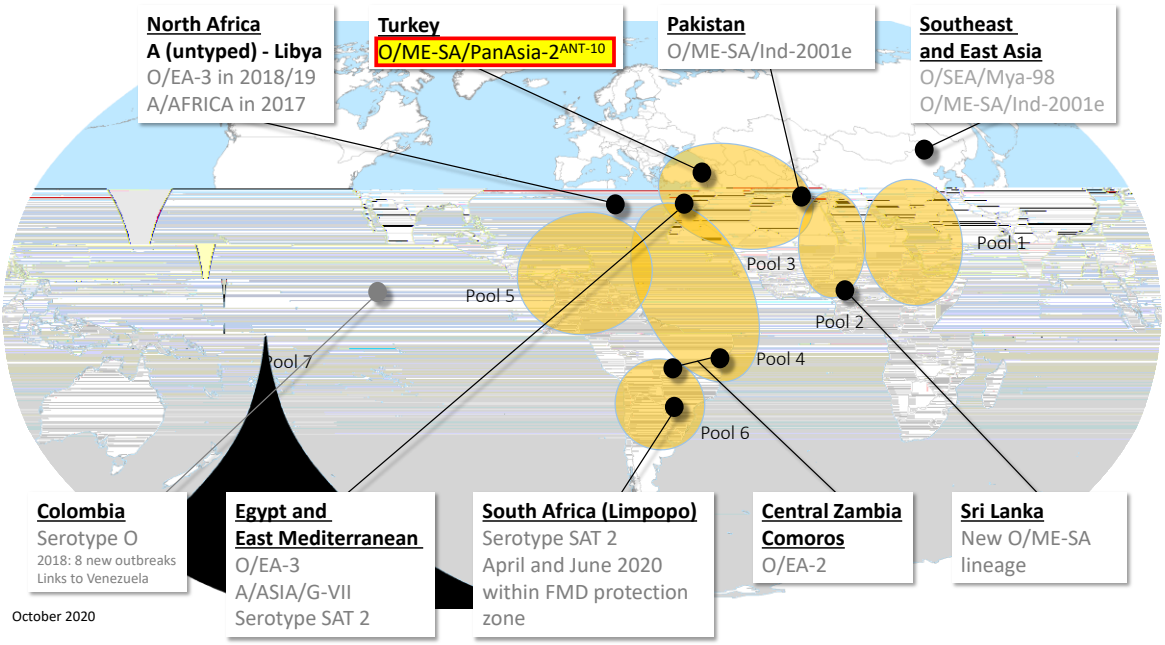


Figure 1: Recent headline events (reported during July to September 2020) with endemic pools highlighted in orange. Source: WRLFMD. Map conforms to the United Nations World Map, February 2020.

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.

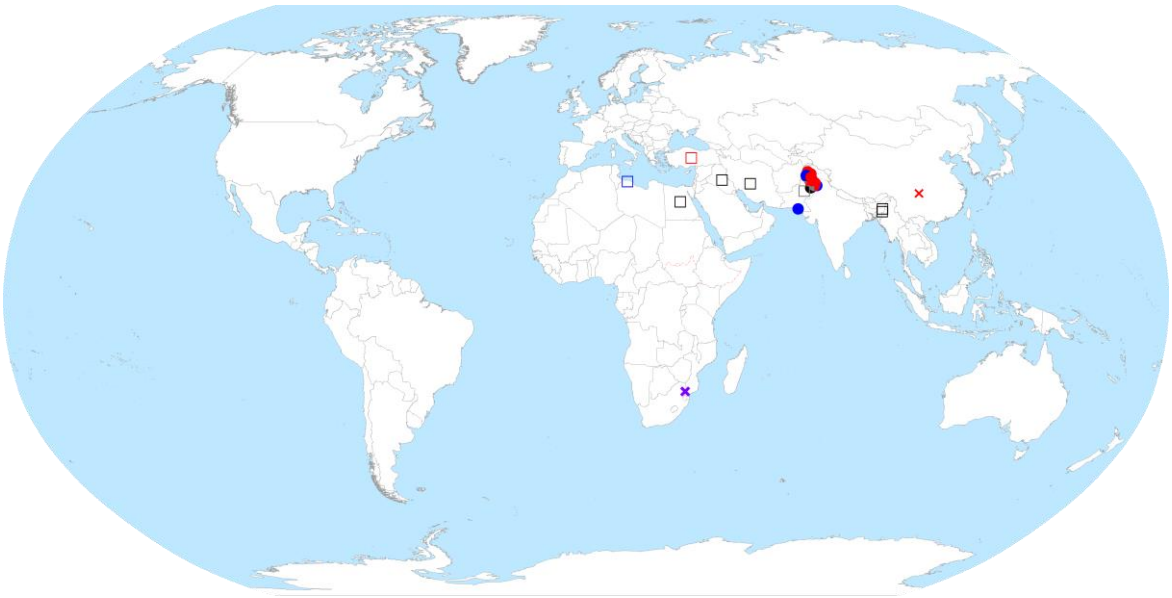
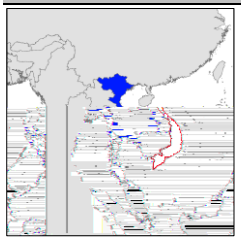


Figure 1: Samples tested by WRLFMD or reported in this quarter. ● indicates samples analysed; × indicates new outbreaks reported to the OIE, but where results to define the genotype have not been reported; □ indicates reports of FMD from other sources. Shape colours define the serotype detected ●O; ●A; ●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.

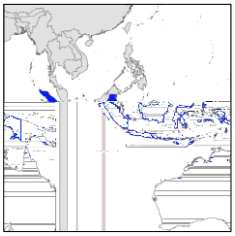
3.2. Pool 1 (Southeast Asia/Central Asia/East Asia)

The Socialist Republic of Viet Nam



On the 11 June 2020, a batch of 39 samples (collected between February 2019 and February 2020 from cattle, water buffalo and pigs in various locations across the country) was received by the WRLFMD. **FMD type O** virus was isolated from 29 of the samples, while seven were FMDV-GD and three were NVD. VP1 genotyping identified 21 ME-SA/Ind-2001e, two ME-SA/PanAsia and five SEA/Mya-98, while one sample contained both ME-SA/Ind-2001e and SEA/Mya-98.

The Republic of Indonesia



On 21 July 2020, two serum samples, collected from pigs at the Pig Kapuk Slaughterhouse, Jakarta on 01 May 2019, were received. Vesicular exanthema of swine (caused by a calicivirus) had been suspected. Samples were tested at WRLFMD by rRT-PCR with negative results for FMDV, SVDV and vesicular exanthema of swine virus.

3.3. Pool 2 (South Asia)

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

3.4. Pool 3 (West Eurasia and Middle East)

The Republic of Turkey

On 24 August 2020, 56 FMD type A virus VP1 sequences were received from the FMDI-Ankara. The sequences originated from samples collected from cattle in 2015, 2016 and 2017 (no locations were given). Genotyping showed that all belonged to topotype ASIA, lineage G-VII. Phylogenetic trees separated by each year are presented in this report.

Tuncer-Göktuna *et al.*, 2020

3.5. Pool 4 (North and Eastern Africa)

State of Libya

Four outbreaks of **FMD type A** were reported in sheep at Qasabana Ghashir, Biir Althawthuh, Tarabulus on 06 September 2020.

OIE Immediate notification & Follow-up reports

The Republic of Rwanda

An outbreak of **FMD type SAT 2** was reported in cattle in various locations of Kayonza District, Eastern Province on 22 June 2020. No genotyping results are available.

OIE Immediate notification & Follow-up reports

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 Malawi

An outbreak of FMD (untyped) was reported in cattle at Kasokeza, Maperera Dip tank, Chikwawa, Southern Region on 07 August 2020. No genotyping results are available.

OIE Immediate notification & Follow-up reports

The Republic of Mozambique

An outbreak of FMD (untyped) was reported in cattle at Sabão, Magude Sede, Magude, Maputo on 10 August 2020. No genotyping results are available.

OIE Immediate notification & Follow-up reports

The Republic of South Africa

A further outbreak of FMD type SAT 2 was reported in cattle at Bushbuckridge, Mpumalanga on 30 April 2020. No genotyping results are available.

OIE Immediate notification & Follow-up reports

The Republic of Zambia

On the 28 July 2020, a single **FMD type O** VP1 sequence was received from the BVI. The sequence was derived from a sample collected from cattle in Nalolo district, Western Province on 14 January 2020. Genotyping showed it belonged to the EA-2 topotype.

3.8. Pool 7 (South America)

No new outbreaks of FMD were reported in South America.

3.9. Extent of global surveillance

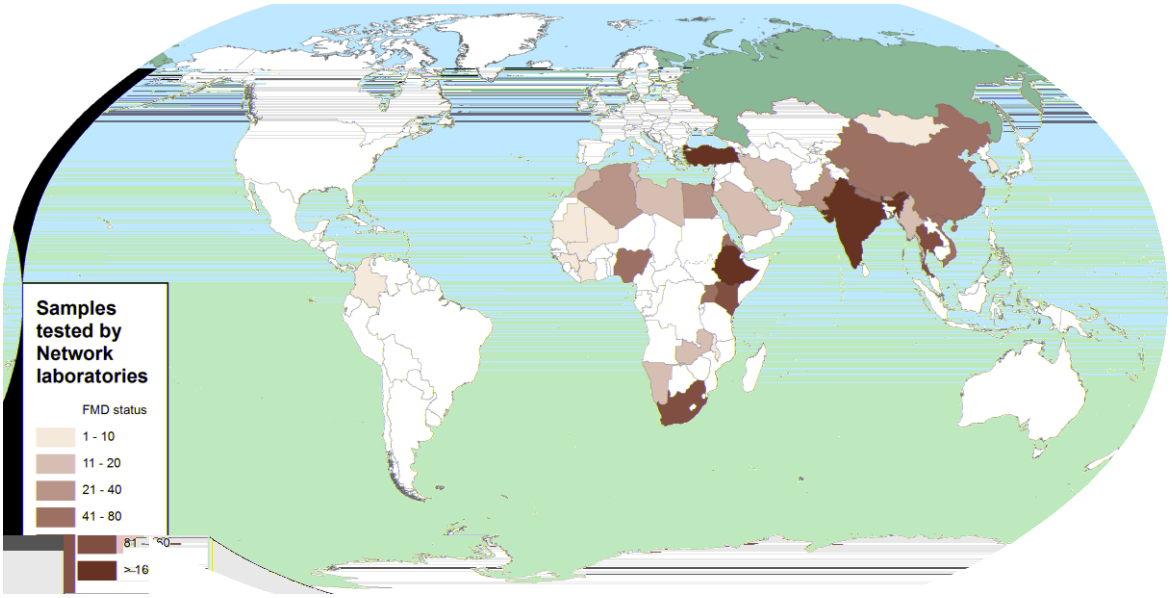


Figure 2: Samples received during 2019 from FMD outbreaks (routine surveillance that is undertaken in countries that are FMD-free without vaccination is not shown). Data from presentations given at the OIE/FAO Reference laboratory Network annual meeting (https://www.foot-and-mouth.org/Ref-Lab-Network/Network-Annual-Meeting)

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

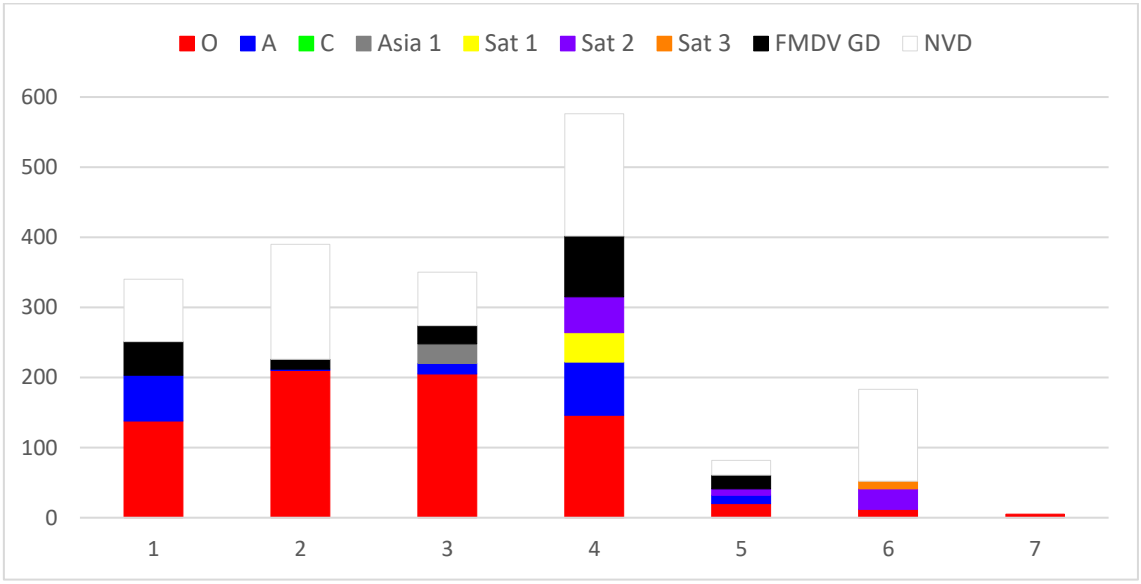


Figure 4: Representation of different FMDV serotypes detected in samples tested from the FMD endemic pools by the OIE/FAO FMD Laboratory Network during 2019 (draft data) (NVD = no virus detected; GD = genome detected)
Source: OIE/FAO FMD Laboratory Network, 2019 (draft data).

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 July to September 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 July to September 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/2020/00003*	11/06/2020	Viet Nam	pending	29	30†	Completed
			Total	**29**	**30**	

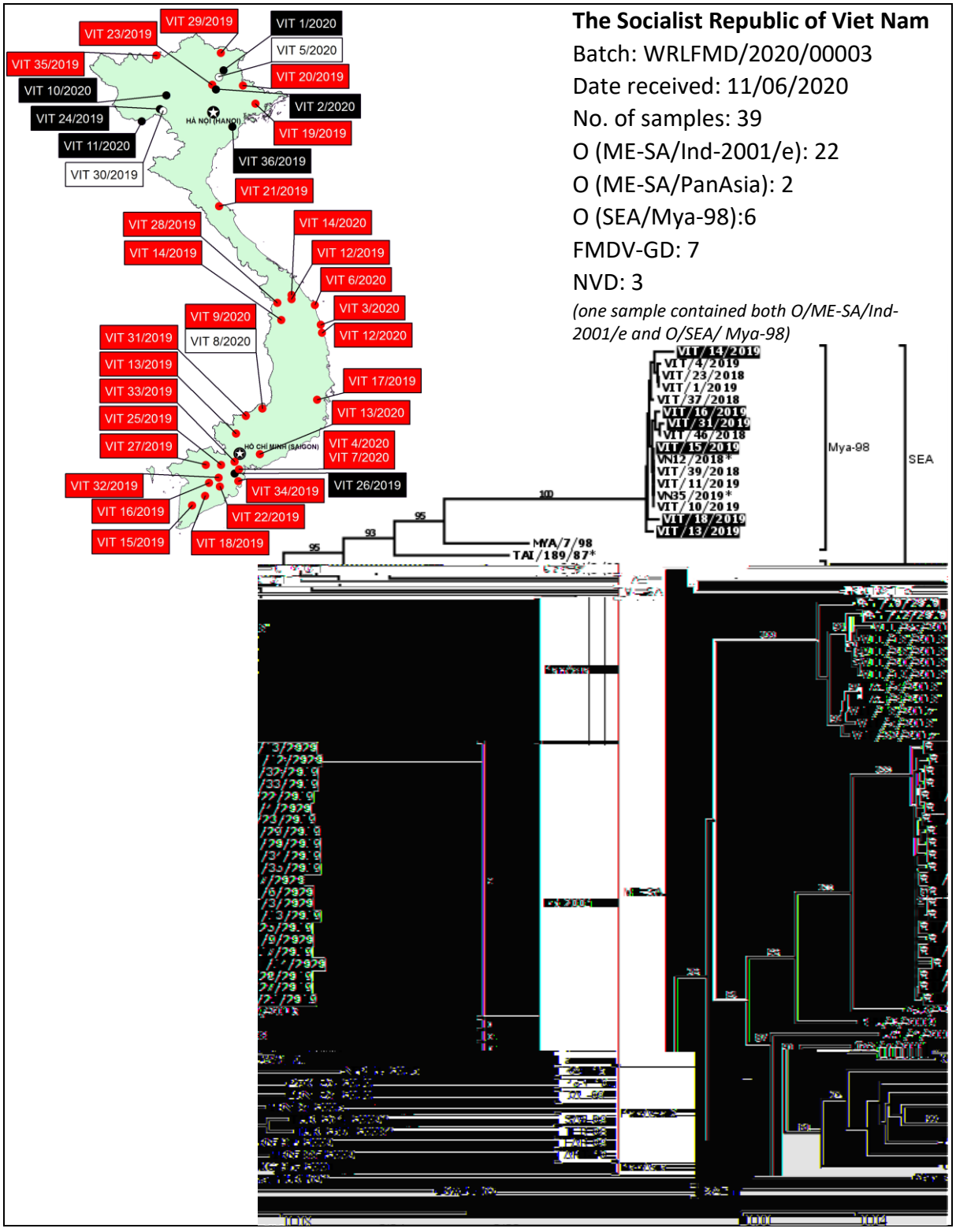
† two different sequences were obtained from one sample.

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

WRLFMD Batch No.	Date received	Country	Serotype	Date Collected	No. of sequences	Submitting laboratory
WRLMEG/2020/00022	28/07/2020	Zambia	O	14/01/2020	1	BVI
WRLMEG/2020/00023	24/08/2020	Turkey	A	2015	13	FMDI
WRLMEG/2020/00024	24/08/2020	Turkey	A	2016	13	FMDI
WRLMEG/2020/00025	24/08/2020	Turkey	A	2017	30	FMDI
				Total	**57**	

4. Detailed analysis

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



The Socialist Republic of Viet Nam
Batch: WRLFMD/2020/00003
Date received: 11/06/2020
No. of samples: 39
O (ME-SA/Ind-2001/e): 22
O (ME-SA/PanAsia): 2
O (SEA/Mya-98):6
FMDV-GD: 7
NVD: 3
(one sample contained both O/ME-SA/Ind-2001/e and O/SEA/ Mya-98)

4.2. Pool 3 (West Eurasia and Middle East)

The Republic of Turkey

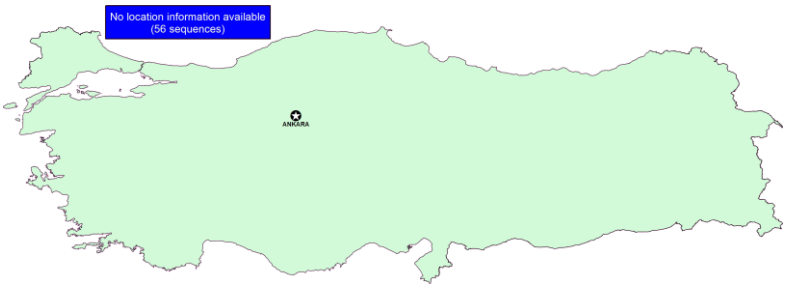
Batch: WRLMEG/2020/00023
WRLMEG/2020/00024
WRLMEG/2020/00025

Date received: 24/08/2020

Tuncer-Göktuna *et al.*, 2020

No. of sequences: 56

Data for 2015:



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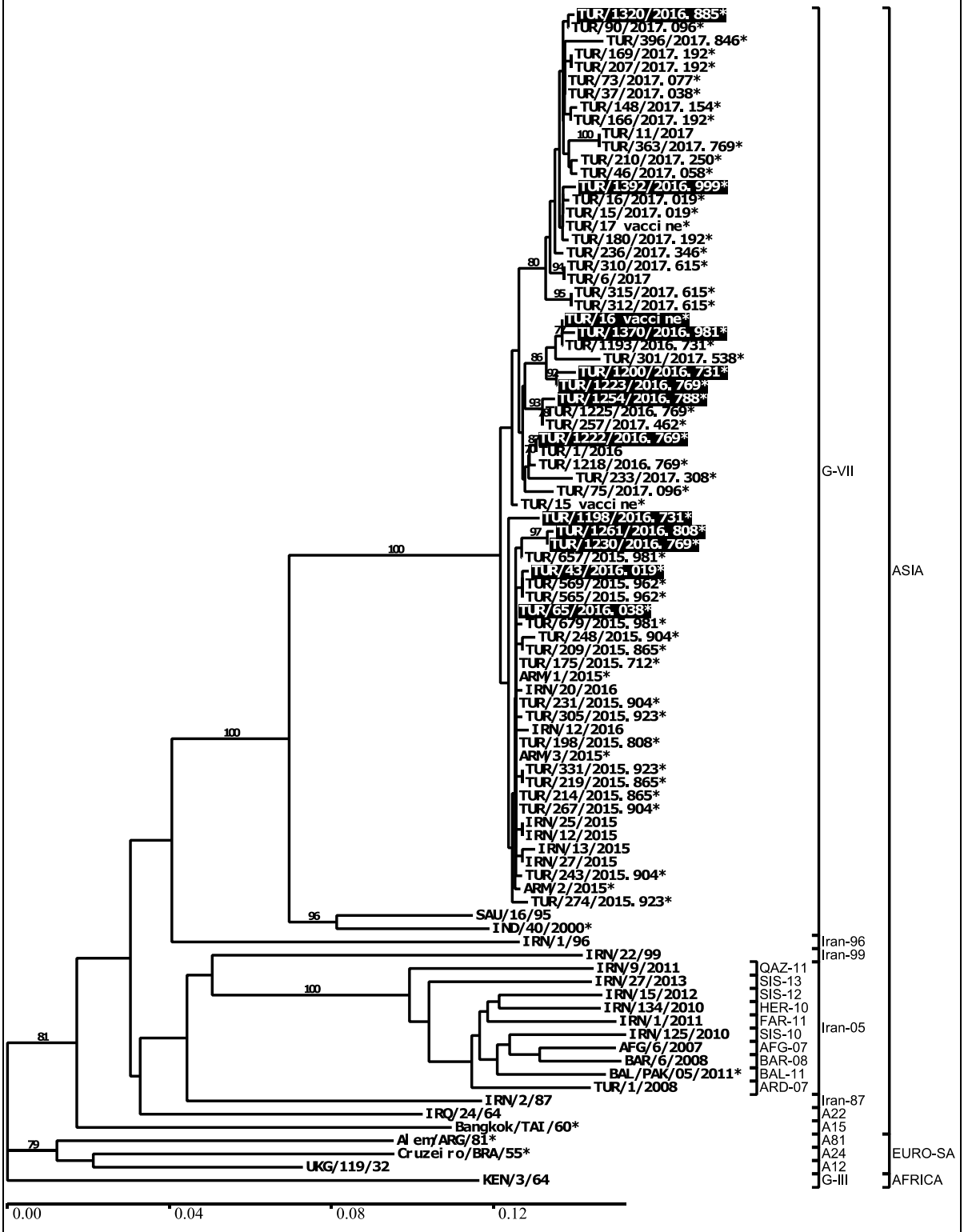
Turkey Continued
Data for 2016



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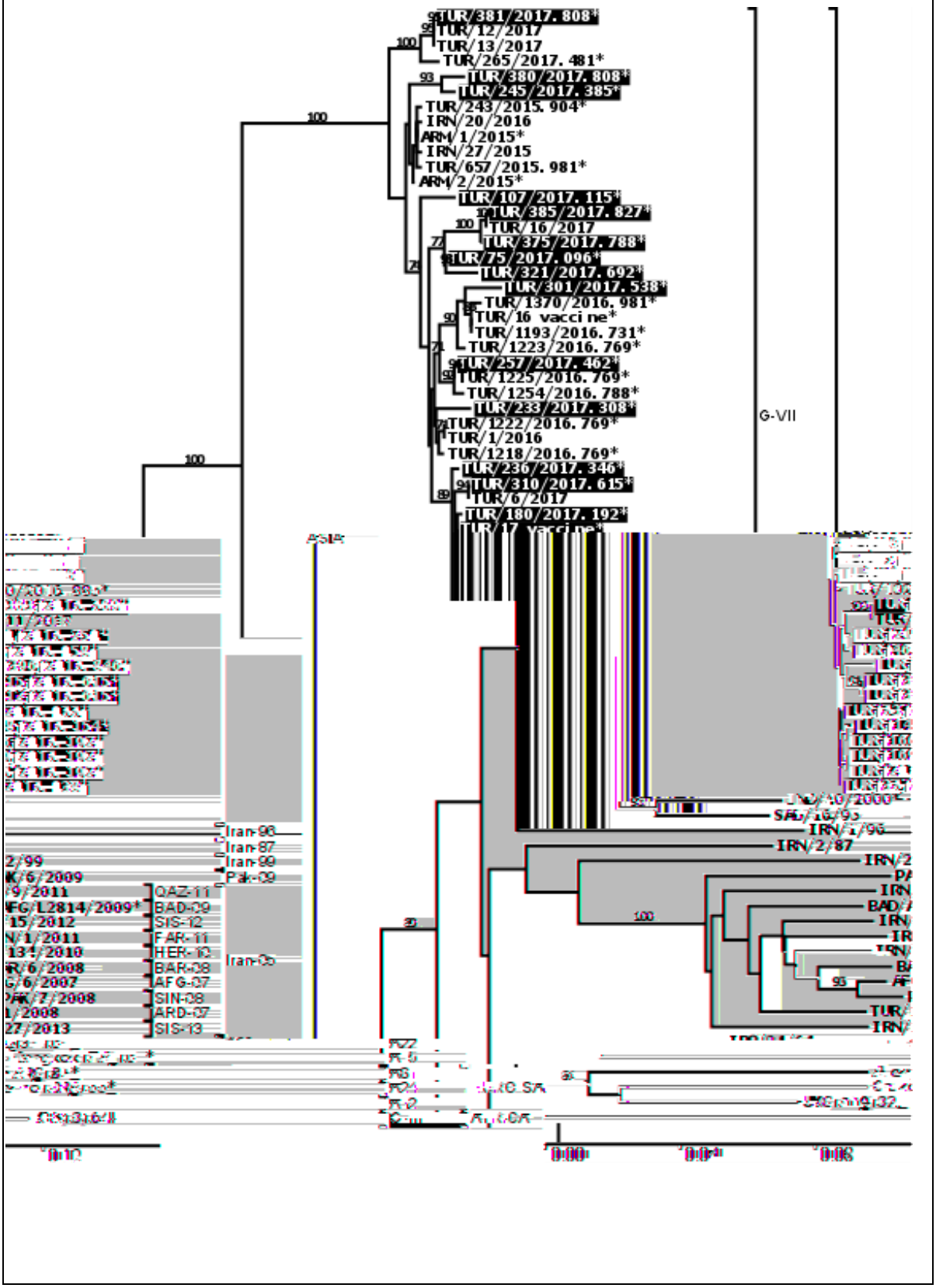
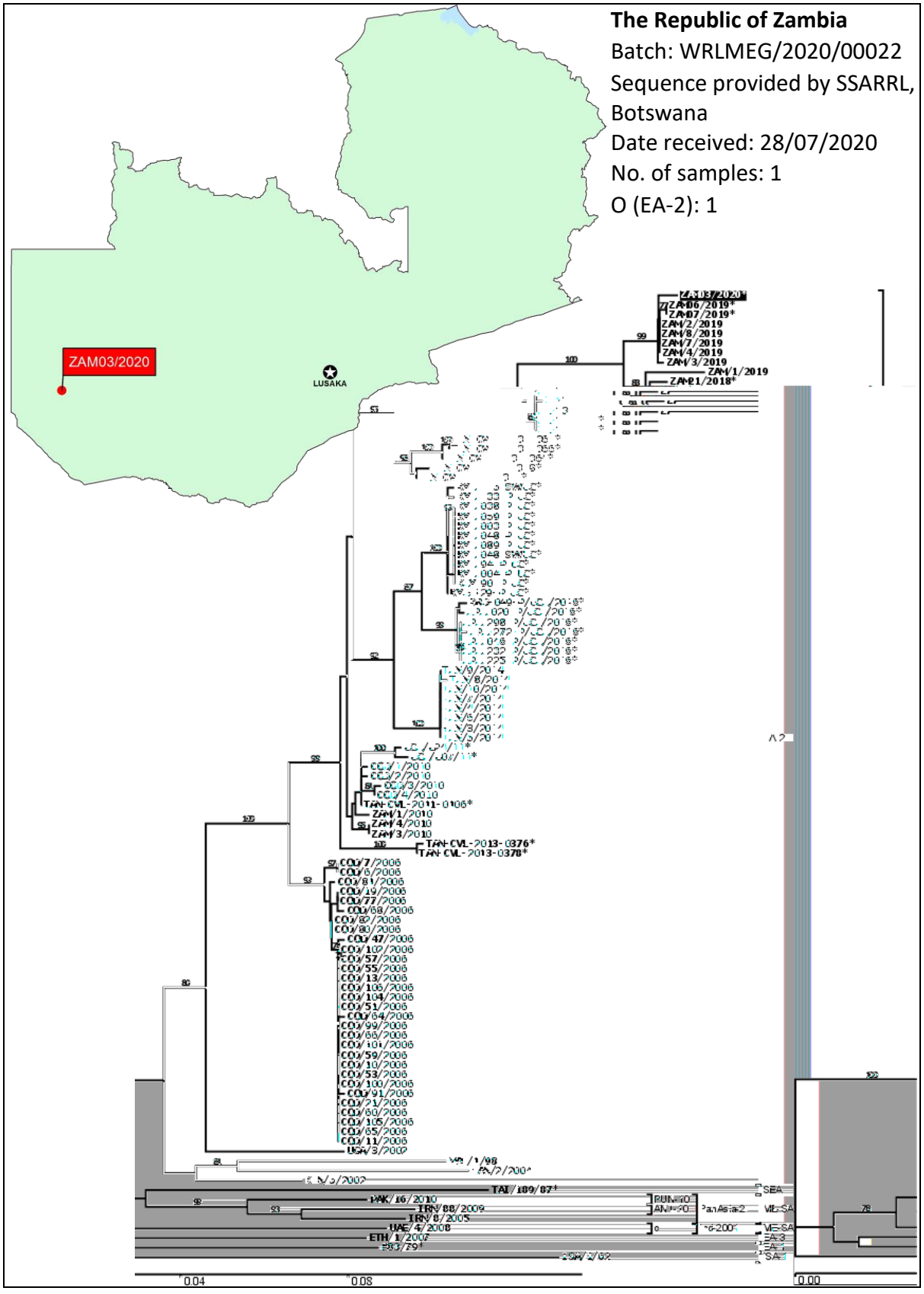
Turkey continued
Data for 2017:



4.3. Pool 6 (Southern Africa)



The Republic of Zambia
Batch: WRLMEG/2020/00022
Sequence provided by SSARRL, Botswana
Date received: 28/07/2020
No. of samples: 1
O (EA-2): 1

4.4. Vaccine matching

Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from July to September 2020.

NOTES:

1. Vaccine efficacy is influenced by vaccine potency, antigenic match and vaccination regime. Therefore, it is possible that a less than perfect antigenic match of a particular antigen may be compensated by using a high potency vaccine 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 doses 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
Pakistan	2	4	-	2	-	-	-
Viet Nam	5	-	-	-	-	-	-
Total	**7**	**4**	**0**	**2**	**0**	**0**	**0**

Abbreviations used in tables

For each field isolate the r1 value is shown followed by the heterologous neutralisation titre (r1-value / titre). The r1 values shown below, represent the one-way serological match between vaccine strain and field isolate, calculated from the comparative reactivity of antisera raised against the vaccine in question. Heterologous neutralisation titres for vaccine sera with the field isolates are included as an indicator of cross-protection.

M	**Vaccine Match** *r_1 = ≥ 0.3 - suggests that there is a close antigenic relationship between field isolate and vaccine strain. A potent vaccine containing the vaccine strain is likely to confer protection.*
N	**No Vaccine Match** *r_1 = < 0.3* - suggest that the field isolate is antigenically different to the vaccine strain. Where there is no alternative, the use of this vaccine should carefully consider vaccine potency, the possibility to use additional booster doses and monitoring of vaccinated animals for heterologous responses.
NT	**Not tested against this vaccine**

NOTE: A "0" in the neutralisation columns indicates that for that particular field virus no neutralisation was observed at a virus dose of a 100 $TCID_{50}$.

NOTE: This report includes the source of the vaccine virus and bovine vaccinal serum. Vaccines from different manufactures may perform differently and caution should be taken when comparing the data.

Table 5: Vaccine matching studies for O FMDV by VNT (*VIT/13/2019 contains both SEA/Mya-98 and ME-SA/Ind-2001e) –

Strain	Serotype O		O 3039 Boehringer Ingelheim		O_1 Manisa Boehringer Ingelheim		O/TUR/5/2009 Merck Animal Health	
	Topotype	*Lineage*	*R_1*	*Titre*	*R_1*	*Titre*	*R_1*	*Titre*
PAK 46/2019	ME-SA	Ind-2001	0.37	1.54	0.4	1.94	0.54	1.84
VIT/13/2020	ME-SA	Ind-2001	0.46	1.64	0.48	1.98	0.71	1.98
VIT/19/2019	ME-SA	PanAsia	0.6	1.76	0.59	2.07	0.87	2.07
PAK 3/2020	ME-SA	PanAsia-2	0.55	1.71	0.4	1.94	0.98	2.10
VIT/13/2019*	SEA ME-SA	Mya-98 Ind-2001	0.36	1.52	0.19	1.58	0.34	1.71
VIT/15/2019	SEA	Mya-98	0.26	1.40	0.23	1.66	0.39	1.72
VIT/31/2019	SEA	Mya-98	0.37	1.51	0.25	1.68	0.37	1.80

Table 6: Vaccine matching studies for A FMDV by VNT

Strain	Serotype A		A/IRN/05 Boehringer Ingelheim		A/TUR/20/06 Merck Animal Health		A22/IRQ Boehringer Ingelheim	
	Topotype	*Lineage*	R_1	*Titre*	R_1	*Titre*	R_1	*Titre*
PAK/30/2016	ASIA	Iran-05	0.60	2.23	0.50	1.58	0.47	2.00
PAK/73/2019	ASIA	Iran-05	0.93	2.45	0.23	1.25	0.68	2.16
PAK/01/2020	ASIA	Iran-05	0.14	1.64	0.17	1.11	0.37	1.90
PAK/02/2020	ASIA	Iran-05	0.07	1.30	0.00	0.00	0.09	1.26

Table 7: Vaccine matching studies for Asia-1 FMDV by VNT

Strain	Serotype Asia-1		Shamir Boehringer Ingelheim	
	Topotype	*Lineage*	R_1	*Titre*
PAK/32/2016	Sindh-08		0.18	1.72
PAK/75/2019	Sindh-08		0.50	2.16

Annex 1: Sample data

Summary of submissions

Table 8: Summary of samples collected and received to WRLFMD (July to September 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*
The Republic of Indonesia	2	-	-	-	-	-	-	-	-	0	2
The Socialist Republic of Viet Nam*	39	19	-	-	-	-	-	-	20	36	3
TOTAL	**41**	**19**	**0**	**0**	**0**	**0**	**0**	**9**	**20**	**36**	**5**

* Batch received in previous quarter

† Batch received for vesicular exanthema of swine virus (VESV) testing. These samples were also tested for FMDV.

Clinical samples

Table 9: Clinical sample diagnostics made by the WRLFMD® July to September 2020

Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				VI/ELISA	RT-PCR	Final report
The Republic of Indonesia	21 Jul. 2020	28 Jul. 2020	ISA 1/2019	Pig	01/05/2019	Not Tested	NEG	FMDV NGD
			ISA 2/2019	Pig	01/05/2019	Not Tested	NEG	FMDV NGD
The Socialist Republic of Viet Nam	11 Jun. 2020	3 Jul. 2020	VIT 12/2019	Pig	26/02/2019	O	POS	O
			VIT 13/2019	Pig	27/02/2019	O	POS	O
			VIT 14/2019	Pig	15/03/2019	NEG	POS	FMDV GD
			VIT 15/2019	Pig	19/03/2019	O	POS	O
			VIT 16/2019	Pig	31/03/2019	NEG	POS	FMDV GD
			VIT 17/2019	Pig	20/05/2019	O	POS	O
			VIT 18/2019	Pig	26/07/2019	NEG	POS	FMDV GD
			VIT 19/2019	Buffalo	28/08/2019	O	POS	O
			VIT 20/2019	Buffalo	11/11/2019	O	POS	O
			VIT 21/2019	Cattle	12/11/2019	NEG	POS	FMDV GD
			VIT 22/2019	Cattle	16/11/2019	NEG	POS	FMDV GD
			VIT 23/2019	Buffalo	19/11/2019	NEG	POS	FMDV GD
			VIT 24/2019	Buffalo	24/11/2019	NEG	POS	FMDV GD
			VIT 25/2019	Pig	26/11/2019	O	POS	O
			VIT 26/2019	Cattle	26/11/2019	NEG	POS	FMDV GD

Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				VI/ELISA	RT-PCR	Final report
			VIT 27/2019	Cattle	28/11/2019	O	POS	O
			VIT 28/2019	Buffalo	30/11/2019	O	POS	O
			VIT 29/2019	Buffalo	03/12/2019	O	POS	O
			VIT 30/2019	Buffalo	04/12/2019	NEG	NEG	NVD
			VIT 31/2019	Cattle	08/12/2019	O	POS	O
			VIT 32/2019	Cattle	11/12/2019	O	POS	O
			VIT 33/2019	Cattle	16/12/2019	NEG	POS	FMDV GD
			VIT 34/2019	Cattle	19/12/2019	NEG	POS	FMDV GD
			VIT 35/2019	Cattle	25/12/2019	NEG	POS	FMDV GD
			VIT 36/2019	Cattle	30/12/2019	NEG	POS	FMDV GD
			VIT 1/2020	Buffalo	07/01/2020	NEG	POS	FMDV GD
			VIT 2/2020	Buffalo	07/01/2020	NEG	POS	FMDV GD
			VIT 3/2020	Cattle	15/01/2020	O	POS	O
			VIT 4/2020	Cattle	20/01/2020	O	POS	O
			VIT 5/2020	Buffalo	20/01/2020	NEG	NEG	NVD
			VIT 6/2020	Cattle	22/01/2020	O	POS	O
			VIT 7/2020	Pig	29/01/2020	O	POS	O
			VIT 8/2020	Cattle	31/01/2020	NEG	NEG	NVD
			VIT 9/2020	Cattle	31/01/2020	O	POS	O
			VIT 10/2020	Cattle	06/02/2020	NEG	POS	FMDV GD
			VIT 11/2020	Cattle	11/02/2020	NEG	POS	FMDV GD
			VIT 12/2020	Cattle	19/02/2020	O	POS	O
			VIT 13/2020	Cattle	25/02/2020	O	POS	O
			VIT 14/2020	Cattle	27/02/2020	NEG	POS	FMDV GD
TOTAL					**41**			

Annex 2: FMD publications

Recent FMD Publications (July to September 2020) cited by Web of Science.

1. **Abu-Elnaga, H.I., S.A. Rizk, H.M. Daoud, A.A. Mohamed, W. Mossad, M.A. Gamil, A.F. Soudy, & L.I. El-Shehawy**. Comparative nucleotide sequencing of the VP1 capsid gene of recent isolates of Foot-and-mouth disease virus serotype O from Egypt. Archives of Virology: 8. DOI: 10.1007/s00705-020-04708-1.
2. **Al Amin, M., M.R. Ali, A. Ul Alam, M.A. Siddique, M.M. Rahaman, M. Sultana, & M.A. Hossain**. Complete genome sequence of a potential *Foot-and-mouth disease virus* serotype O vaccine strain from Bangladesh. *Archives of Virology*: 4. DOI: 10.1007/s00705-020-04711-6.
3. **Al Amin, M., M.R. Ali, M.R. Islam, A. Ul Alam, D.K. Shill, M.S. Rahman, M.A. Siddique, M. Sultana, & M.A. Hossain** (2020). Development and serology based efficacy assessment of a trivalent foot-and-mouth disease vaccine. *Vaccine*, 38(32): 4970-4978. DOI: 10.1016/j.vaccine.2020.05.079.
4. **Aman, E., W. Molla, Z. Gebreegizabher, & W.T. Jemberu** (2020). Spatial and temporal distribution of foot-and-mouth disease outbreaks in Amhara region of Ethiopia in the period 1999 to 2016. *BMC Veterinary Research*, 16(1): 8. DOI: 10.1186/s12917-020-02411-6.
5. **Armson, B., S. Gubbins, V. Mioulet, I.A. Qasim, D.P. King, & N.A. Lyons** (2020). Foot-and-mouth disease surveillance using pooled milk on a large-scale dairy farm in an endemic setting. *Frontiers in Veterinary Science*, 7: 11. DOI: 10.3389/fvets.2020.00264.
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9. **Canas-Arranz, R., P. de Leon, M. Forner, S. Defaus, M.J. Bustos, E. Torres, D. Andreu, E. Blanco, & F. Sobrino** (2020). Immunogenicity of a dendrimer B2T peptide harboring a T-cell epitope from FMDV non-structural protein 3D. *Frontiers in Veterinary Science*, 7: 10. DOI: 10.3389/fvets.2020.00498.
10. **Caridi, F., S. Lopez-Arguello, A. Rodriguez-Huete, E. Torres, M.J. Bustos, R. Canas-Arranz, M.A. Martin-Acebes, M.G. Mateu, & F. Sobrino** (2020). Negatively charged amino acids at the foot-and-mouth disease virus capsid reduce the virion-destabilizing effect of viral RNA at acidic pH. *Scientific Reports*, 10(1): 8. DOI: 10.1038/s41598-020-58414-8.
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20. **Gomez, F., J. Prieto, J. Galvis, F. Moreno, & J. Vargas**, *Identification of Super-Spreaders of Foot-and-mouth disease in the cattle transportation network: The 2018 outbreak case in Cesar (Colombia)*. Proceedings of 2019 Ieee 4th World Conference on Complex Systems, ed. M. Essaaidi and M. Nemiche. 2019, New York: Ieee. 159-164.
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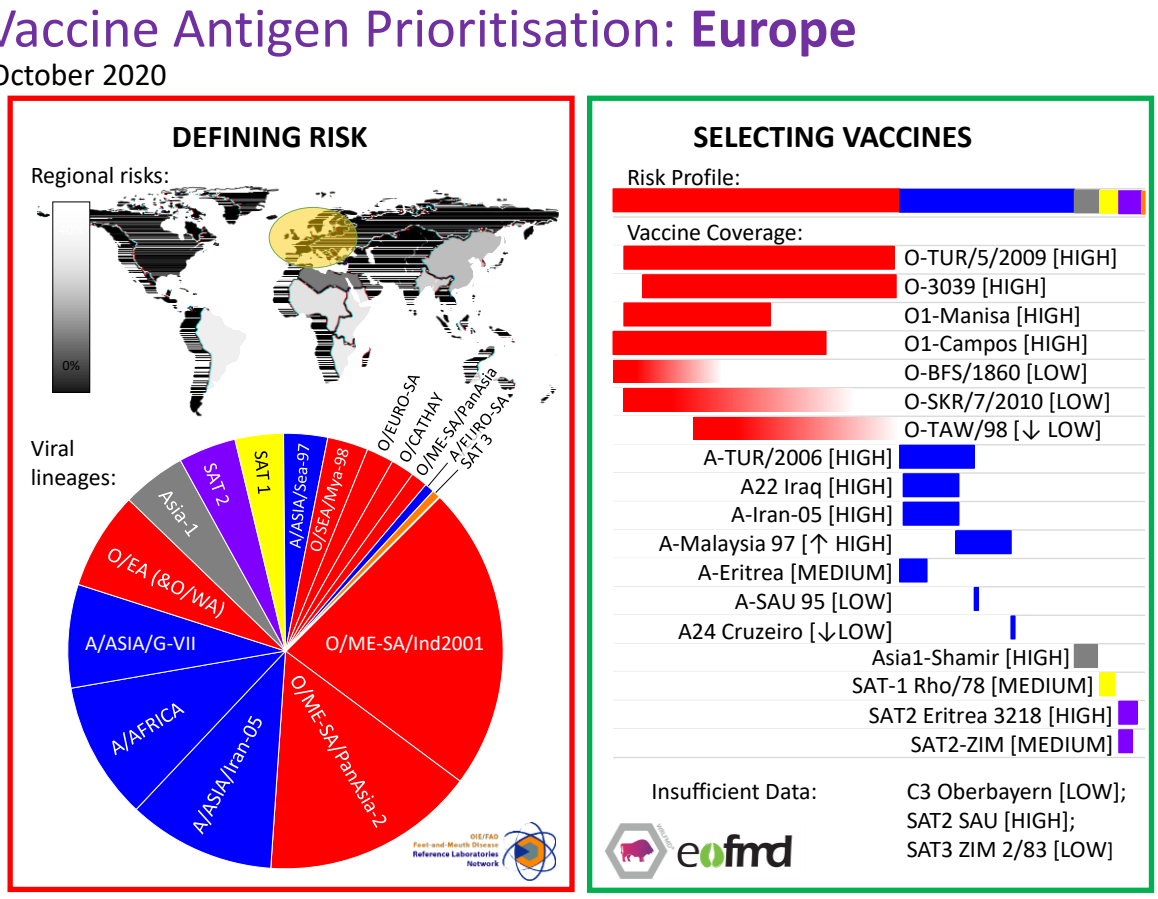
Annex 3: Vaccine recommendations

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.



NB: Analyses uses best available data, however there are gaps in surveillance and vaccine coverage data

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"

Held virtually in 4 sessions, beginning on 8 Dec 2020. There is no cost for registration. Plan to join us!

The OS20 will be organized in virtual sessions focused on animal mobility for FAST risk mapping (8 Dec), addressing risk change and forecast (10 Dec), vaccine security and critical resources for emergency management (15 Dec), and resilience to long-term FAST crises (17 Dec).

Detailed information is available at: 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: V-learning course on FMD diagnostics:

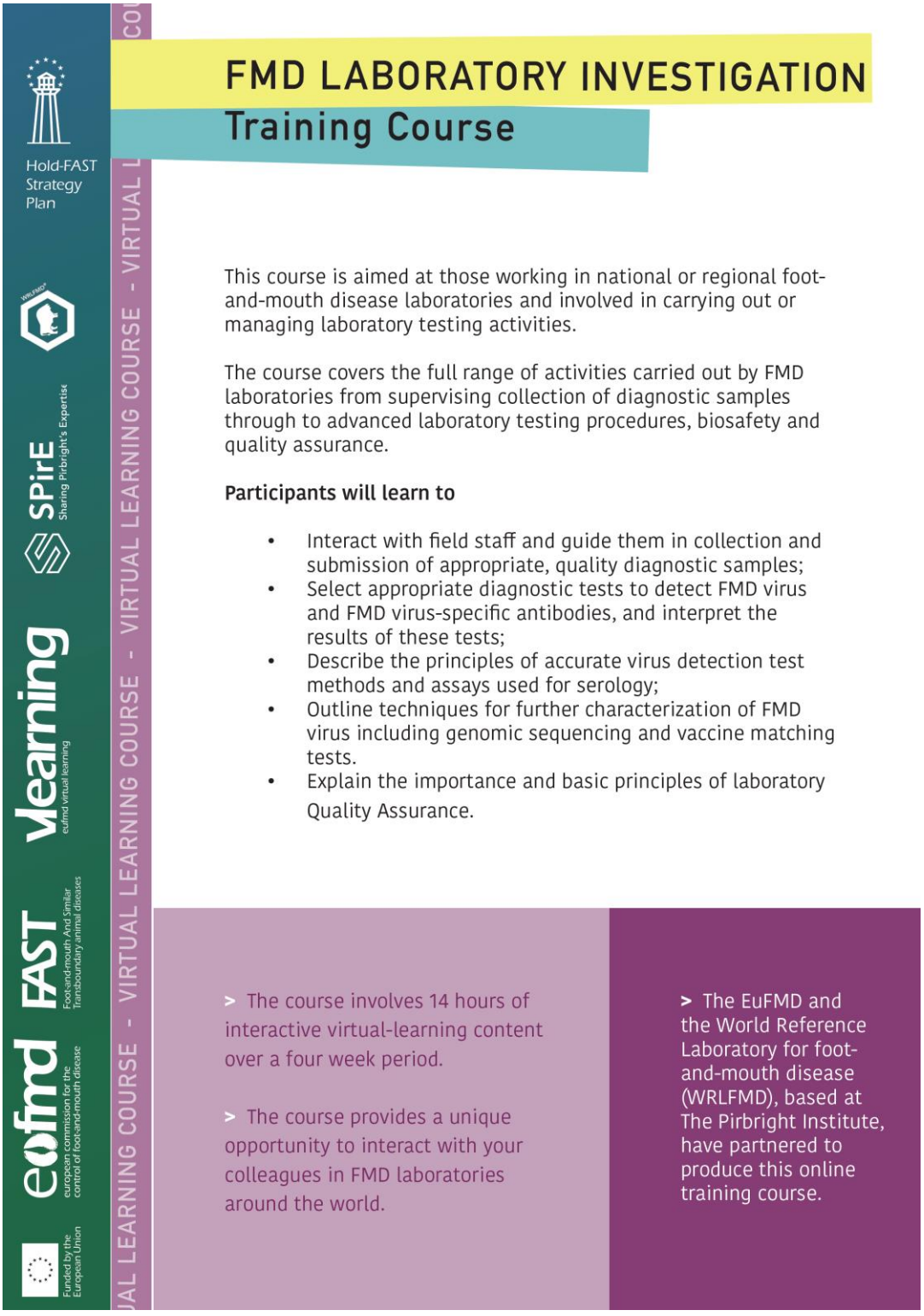
  The 2020 edition of the **online FMD Laboratory Investigation Training Course** will take place in **November.** It has been developed by the FMD World Reference Laboratory at the Pirbright Institute, working in partnership with the European Commission for the Control of Foot-and-Mouth Disease, Food and Agriculture Organization of the United Nations. The course is designed for personnel working in national FMD laboratories and will provide training on:
    - leading effective sample collection;
    - procedures and interpretation of diagnostic tests for FMD virus and antibodies to FMD virus;
    - advanced techniques for further characterization of FMD virus including sequencing and vaccine matching tests;
    - submission of samples to reference laboratories;
    - key principles of biosecurity and biosafety measures to be carried out in an FMD laboratory.

  The training will be conducted in **English**. It is a tutored online course and participants will interact with Pirbright and EuFMD experts during two live webinars and an online discussion forum. The course involves **14 hours of study over a four-week period**, starting on 5 November 2020. Please find attached full details.

Places are available for self-registration on this course. Kindly note that there are limited number of places for this training and the selection of candidates will be made at the sole discretion of the EuFMD team. Participation in this training course is free of charge. Please note **that participants must be working in a laboratory involved in FMD diagnostics to take the course.**

Click here to complete the application form.

The deadline for nominations and applications is **28 October 2020.**



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 third GF-TADs FMD Roadmap Meeting (RMM) for Southern Africa will be held virtually on the 2 to the 5 of November 2020 in collaboration with the Southern African Development Community (SADC) Secretariat.

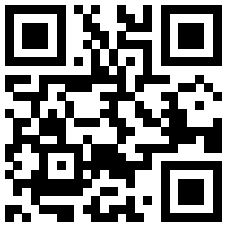
The first virtual meetings with the regional advisory groups (RAG) from Middle East (ME) and South Asian Association for Regional Cooperation (SAARC) will be held on the 18 November and 2 December respectively, in collaboration with the GF-TADs FMD WG partners.

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	12
Panels shipped	31

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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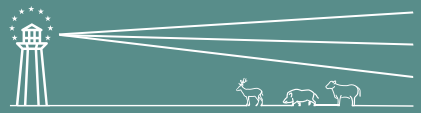

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Hold-FAST tools

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.