

WRLFMD Quarterly Report October to December 2016

Reference Laboratory Contract Report

Foot-and-Mouth Disease





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1. Summary of samples tested and reported FMD outbreaks

1.1. Asia

Afghanistan

A batch of 27 samples were received on 13/09/2016. Fourteen were typed as **O** (n=10), **A** (n=1) or **Asia 1** (n=3). FMDV genome was detected in a further 10 samples and 3 were NVD. The type O viruses all belonged to **ME-SA/PanAsia-2^{ANT-10}** lineage; the type A to **ASIA/Iran-05^{FAR-11}**; and Asia 1 to **ASIA/Sindh-08** (see below).

Bhutan

A batch of 14 samples was received on 13th December. The typing and sequencing results are pending.

Mongolia

An outbreak of **FMD type A** occurred on 17/07/2016 in cattle at Muu Khoot, 6 Bag, Sumber soum, Govi-Sumber. VP1 sequencing was performed at the FGI-ARRIAH and comparisons at the WRLFMD showed the outbreaks to be caused by viruses belonging to the **A/ASIA/Sea-97** lineage (see below).

Myanmar

A batch of four samples was received on 14th October. No FMD virus could be isolated, but FMDV genome was detected by rRT-PCR in two of the samples. The VP1 coding region was successfully amplified for one sample (from Rakhine state) and the genotype confirmed as **O/ME-SA/Ind-2001d** as had previously been determined in the Regional Reference Laboratory in Pakchong, Thailand (see below).

People's Republic of China

In November, outbreaks of FMD type O were reported in two different provinces Jiangxi (in pigs) and Xinjiang (in cattle; near to the border with Kyrgyzstan). No genotyping has been reported.

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Russia

An outbreak of **FMD type Asia 1** was reported to have occurred on 16/10/2016 in cattle at Vyshmanovo, Sobinsky, Vladimirskaya Oblast (western Russia). Genotyping data was presented at the Annual Meeting of OIE/FAO Reference Laboratory Network in November 2016.

In November/December three outbreaks of **FMD type O** occurred in cattle and pigs in Zabaykal'skiy kray in the eastern part of the country close to Mongolia and China. VP1 sequencing was performed at the FGI-ARRIAH and comparisons undertaken by WRLFMD showed the outbreaks to be caused by viruses belonging to the **O/ME-SA/Ind-2001d** lineage (see below).

Saudi Arabia

An outbreak of **FMD type A** was reported to have occurred on 14/10/2016 in cattle and sheep at Alkharj, Alkharj, Ar Riyad. Three samples were submitted to the WRLFMD and **FMDV types A and O** were isolated. The two type A viruses belonged to the ASIA/G-VII lineage while the type O virus belonged to PanAsia-2^{ANT-10} (see below).

Thailand

A batch to 20 samples was received on 14th October. Nine were typed as **FMDV O**, five as **FMDV A** and in the remaining six FMDV genome was detected by rRT-PCR. All the **type O** viruses belonged to the **SEA/Mya-98** lineage and the **type A** viruses to the **ASIA/Sea-97** lineage (see below).

On the 10th November, the OIE Regional Reference Laboratory submitted two **FMDV O** VP1 sequences for genotyping. Analyses showed that they belonged to the **ME-SA/Ind-2001d** lineage. This is the fourth Southeast Asian country (the others being Myanmar, Laos and Vietnam) to have reported this lineage in the past year.

Vietnam

A batch of 35 samples was received on 20th December. The typing and sequencing results are pending.

1.2. Africa

Guinea-Bissau

On 5th October, FMD was reported in cattle in the Bafatá Region. Laboratory investigations at the Regional Reference Laboratory in Senegal suggested the

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involvement of multiple serotypes. **FMD SAT 1** and **SAT 2** viruses were detected in vesicular fluids while antibody assays suggested **serotypes O and A** may be involved. Confirmation of these findings is needed and genotyping of any virus isolates would be useful.

Mozambique

Two outbreaks of **FMD type SAT 2** were reported in cattle at the end of September and beginning of October in Gaza and Maputo, respectively. No genotyping has been reported.

Nigeria

A batch of 25 samples were received on the 19th October. Seventeen samples were typed as **FMDV O** and three as **FMDV SAT 1**. FMDV genome was detected in one sample and four were NVD. This is the first time SAT 1 has been confirmed in West Africa since 1981 when it was identified in Nigeria. One **FMD type O** virus was genotyped as WA and the other 16 as EA-3; the three **SAT 1** viruses were genetically distinct from all other SAT 1 sequences in the WRLFMD database and were assigned a new toptype number, X (see below).

Zambia

On 08/10/2016 an outbreak due to **FMD (untyped)** was reported at Kaka Veterinary Camp, Mbala, Northern Province.

Zimbabwe

Between 8th September and 25th October 2016, a further 13 outbreaks of **FMD type SAT 2** were reported in cattle in Matabeleland North (n=11) and Midlands (n=2) provinces. No genotyping has been reported.

1.3. South America

No new outbreaks of FMD were reported in the region.

1.4. Uncharacterised FMD viruses

A number of outbreaks have occurred where samples have not been sent to the WRLFMD. It is probable that the countries involved have performed their own genetic characterisation; however, through the OIE/FAO laboratory network we would also like to encourage the submission of samples (or complete VP1 sequences) to the WRLFMD.

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An up-to-date list and reports of FMD viruses characterised by sequencing can be found at the following website: http://www.wrlfmd.org/fmd_genotyping/2016.htm.

Results from samples or sequences received at WRLFMD (status of samples being tested) are shown in Table 1 and a complete list of clinical sample diagnostics made by the WRLFMD between October to December 2016 is shown in Annex 1 (Summary of Submissions). A record of all samples received by WRLFMD (October to December 2016) is shown in Annex 1 (Clinical Samples).

Table 1: Status of sequencing of samples or sequences received by the WRLFMD from October to December 2016 (* indicates samples carried over from the last quarter)

WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2016/00029	13/09/2016	Afghanistan	O	10	10	Completed*
			A	1	1	Completed*
			Asia 1	3	3	Completed*
WRLFMD/2016/00031	14/10/2016	Thailand	O	9	9	Completed
			A	5	5	Completed
WRLFMD/2016/00033	14/10/2016	Myanmar	O*	1	1	Completed
WRLFMD/2016/00034	19/10/2016	Nigeria	O	17	17	Completed
			SAT 1	3	3	Completed
WRLFMD/2016/00035	24/10/2016	Saudi Arabia	O	1	1	Completed
			A	2	2	Completed
WRLFMD/2016/00036	13/12/2016	Bhutan	Pending	14	-	Pending
WRLFMD/2016/00037	20/12/2016	Vietnam	Pending	35	-	Pending
WRLMEG/2016/00022	17/07/2016	Mongolia	A	-	3	Completed
WRLMEG/2016/00025	23/11/2016	Russia	O	-	2	Completed
Total				101	57	

*, received during the 3rd quarter of 2016

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2. Detailed Analysis

Key for maps and trees:

Serotype O
Serotype A
Serotype C
Serotype Asia-1
Serotype SAT 1
Serotype SAT 2
Serotype SAT 3
FMDV Genome Detected
No Virus Detected

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2.1. ASIA

Afghanistan

Batch: WRLFMD/2016/00029

Date received: 13/09/2016

No. of samples: 27

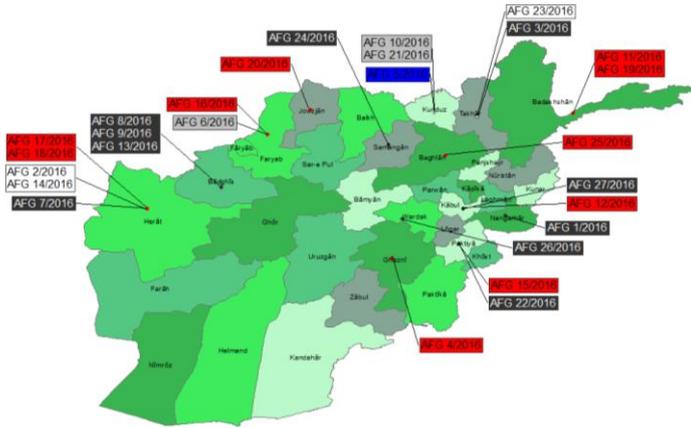
O (ME-SA/PanAsia-2^{ANT-10}): 10

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

Asia 1 (ASIA/Sindh-08): 3

FMDV-GD: 10

NVD: 3



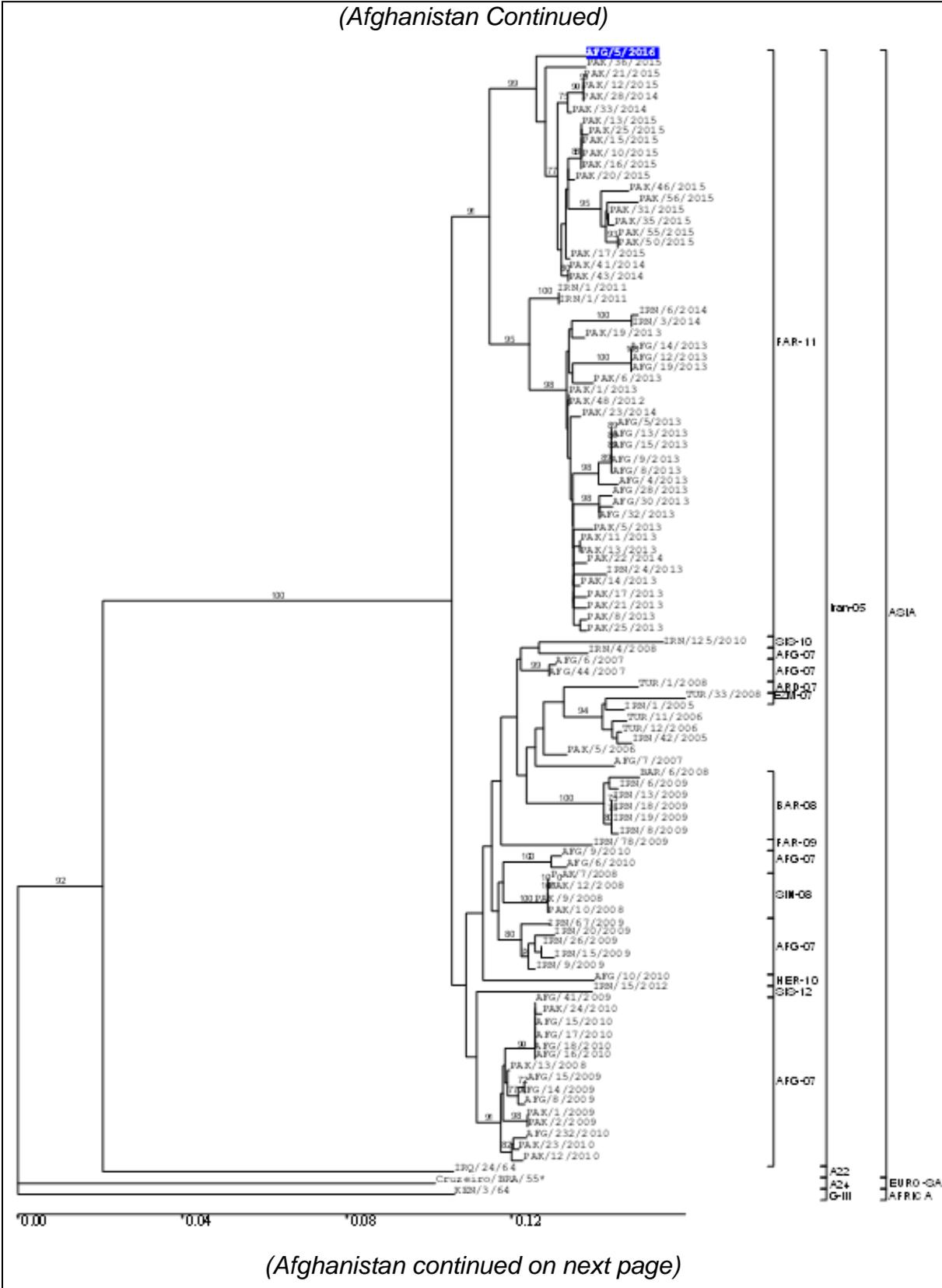
(Afghanistan continued on next page)

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(Afghanistan Continued)

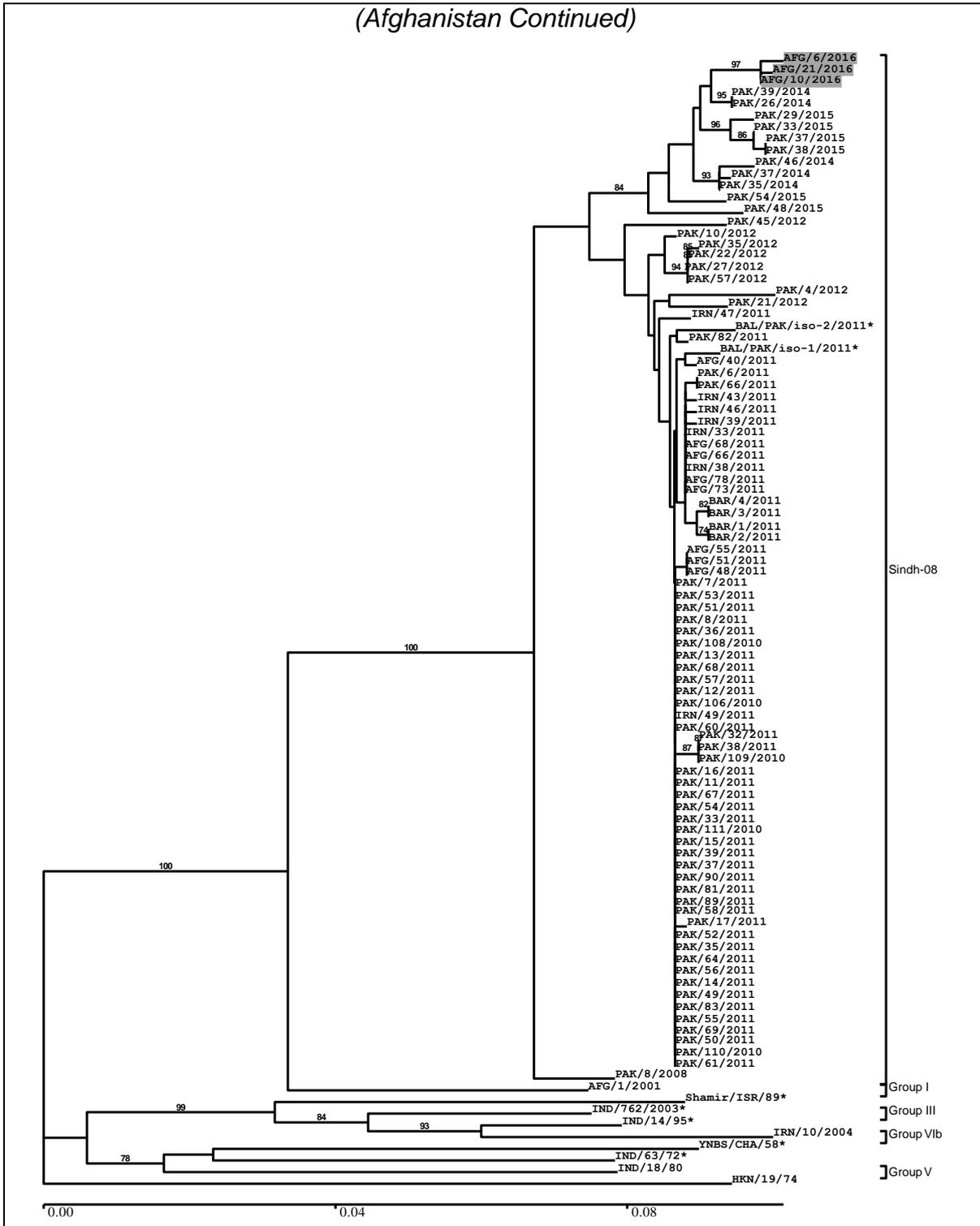


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(Afghanistan Continued)



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Myanmar

Batch:

WRLFMD/2016/00033

Date received:

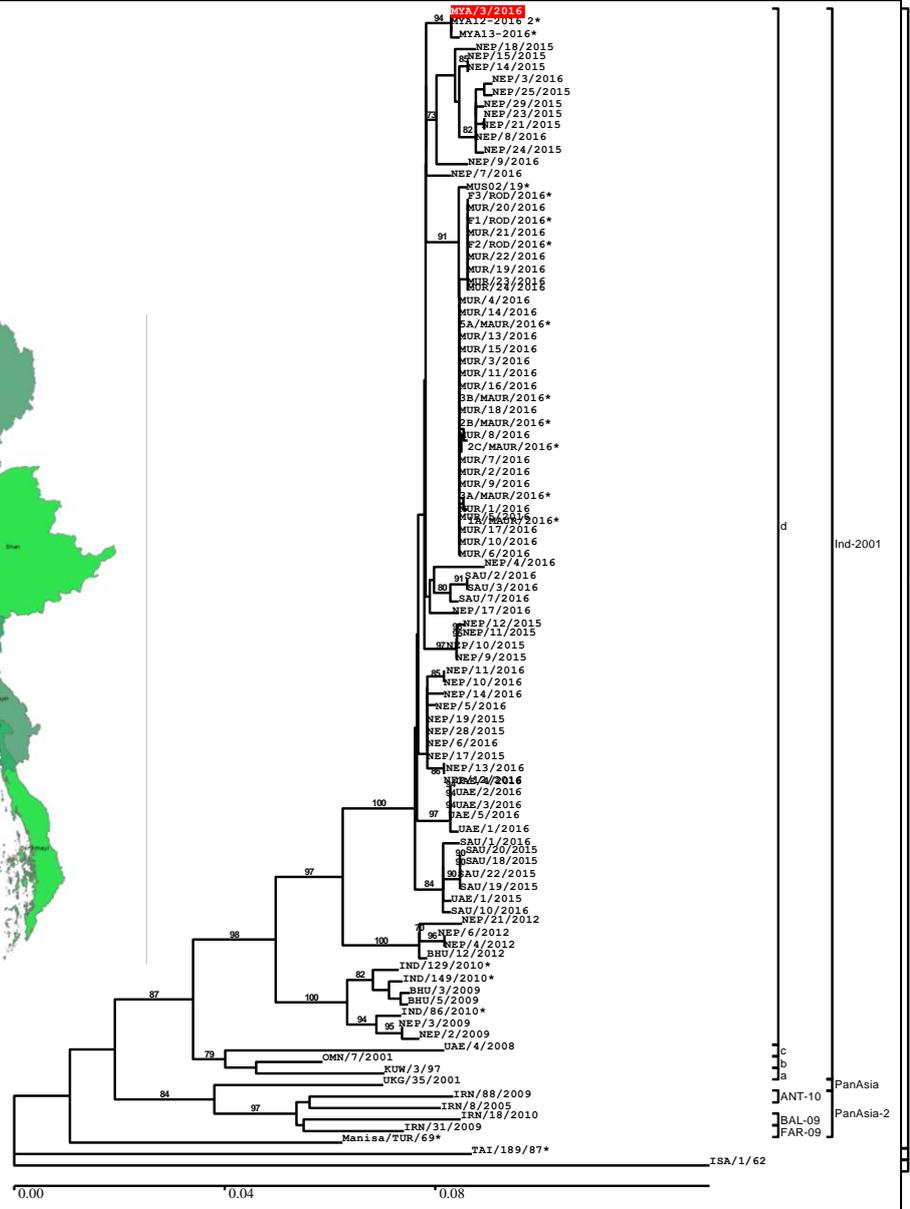
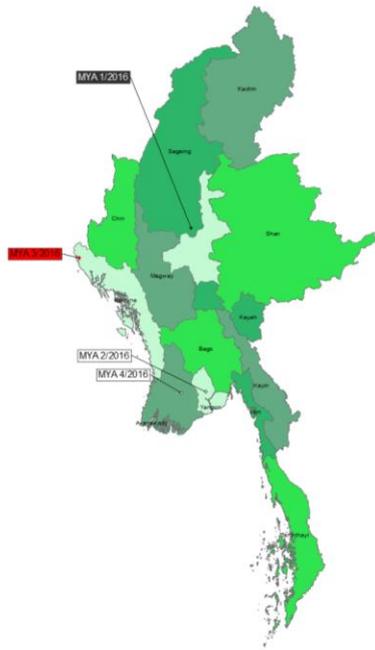
14/10/2016

No. of samples: 4

O (ME-SA/Ind-2001d): 1

FMDV-GD: 1

NVD: 2



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Russia

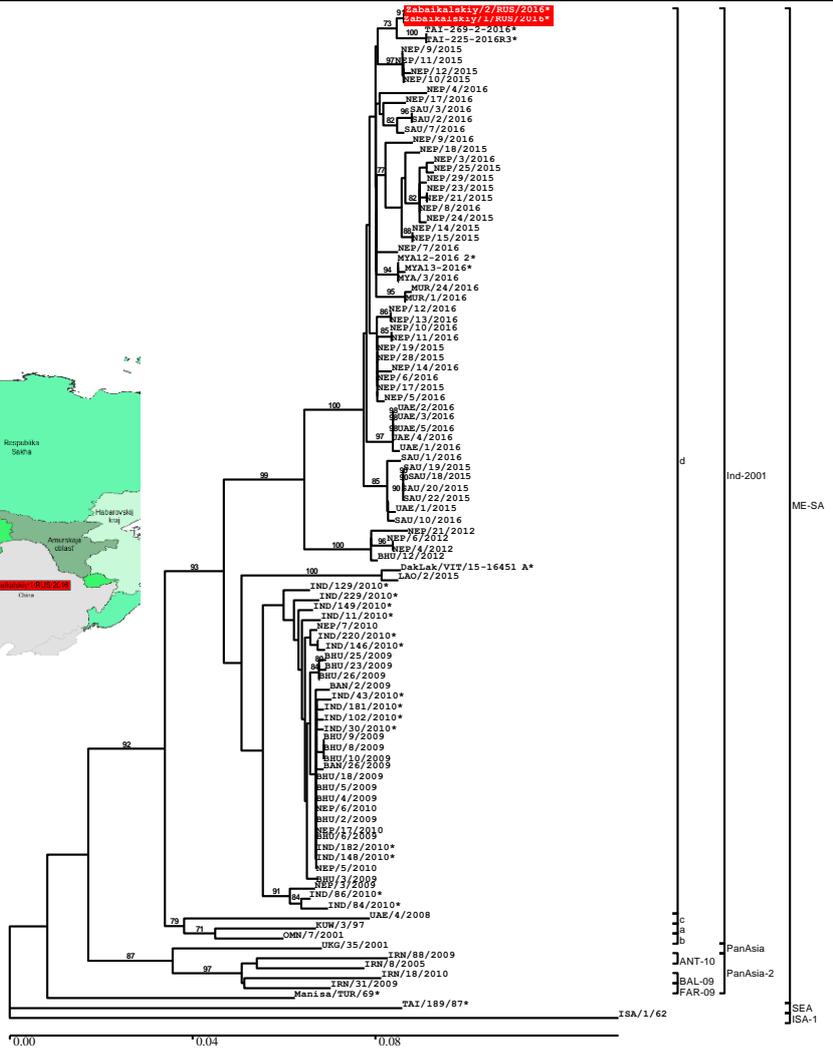
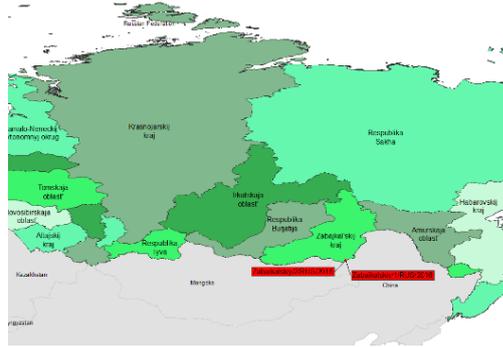
Batch: WRLMEG/2016/00025

Date received: 30/11/2016

No. of sequences: 2 (VP1)

O (ME-SA/Ind-2001d): 2

(Sequences submitted by FGI-ARRIAH)



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Saudi Arabia

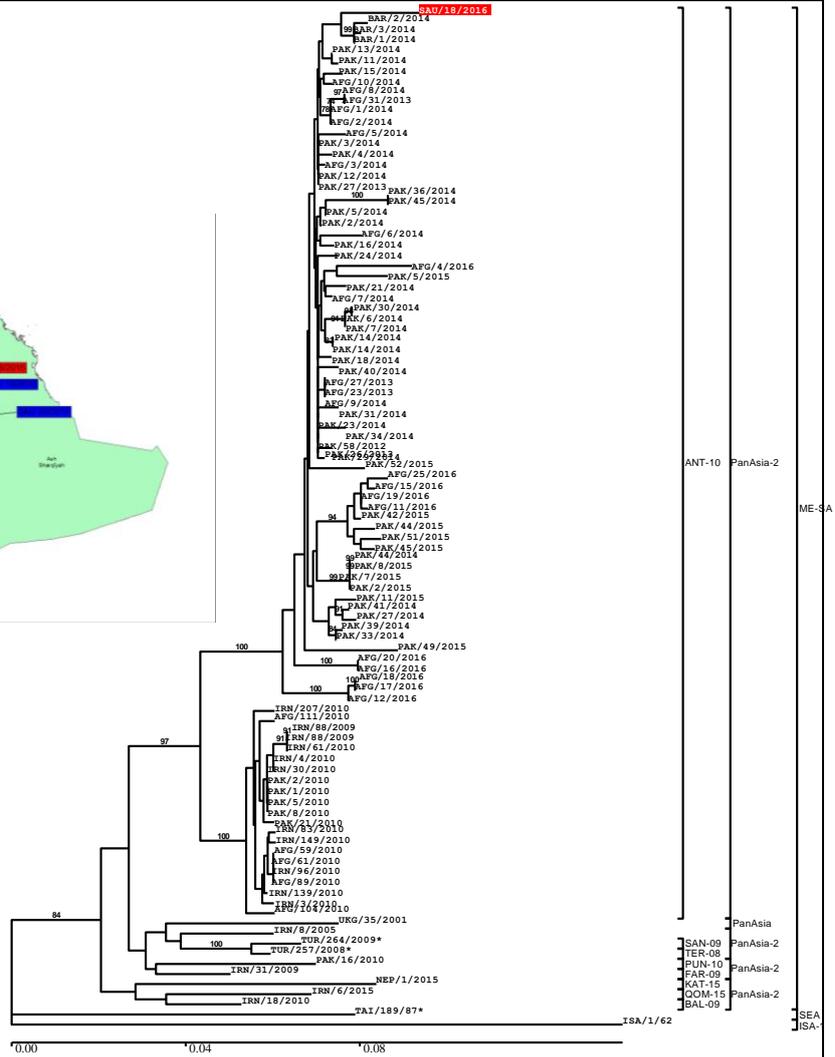
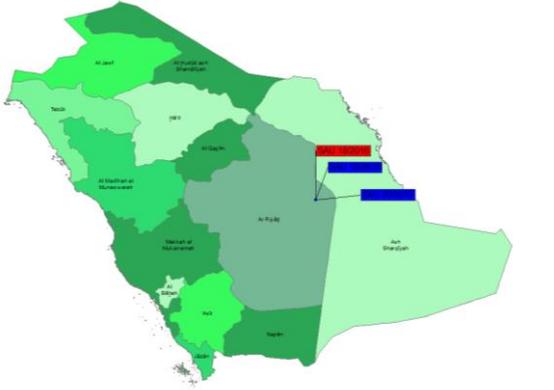
Batch: WRLFMD/2016/00035

Date received: 24/10/2016

No. of samples: 3

O (ME-SA/PanAsia-2^{ANT-10}): 1

A (ASIA/G-VII): 2



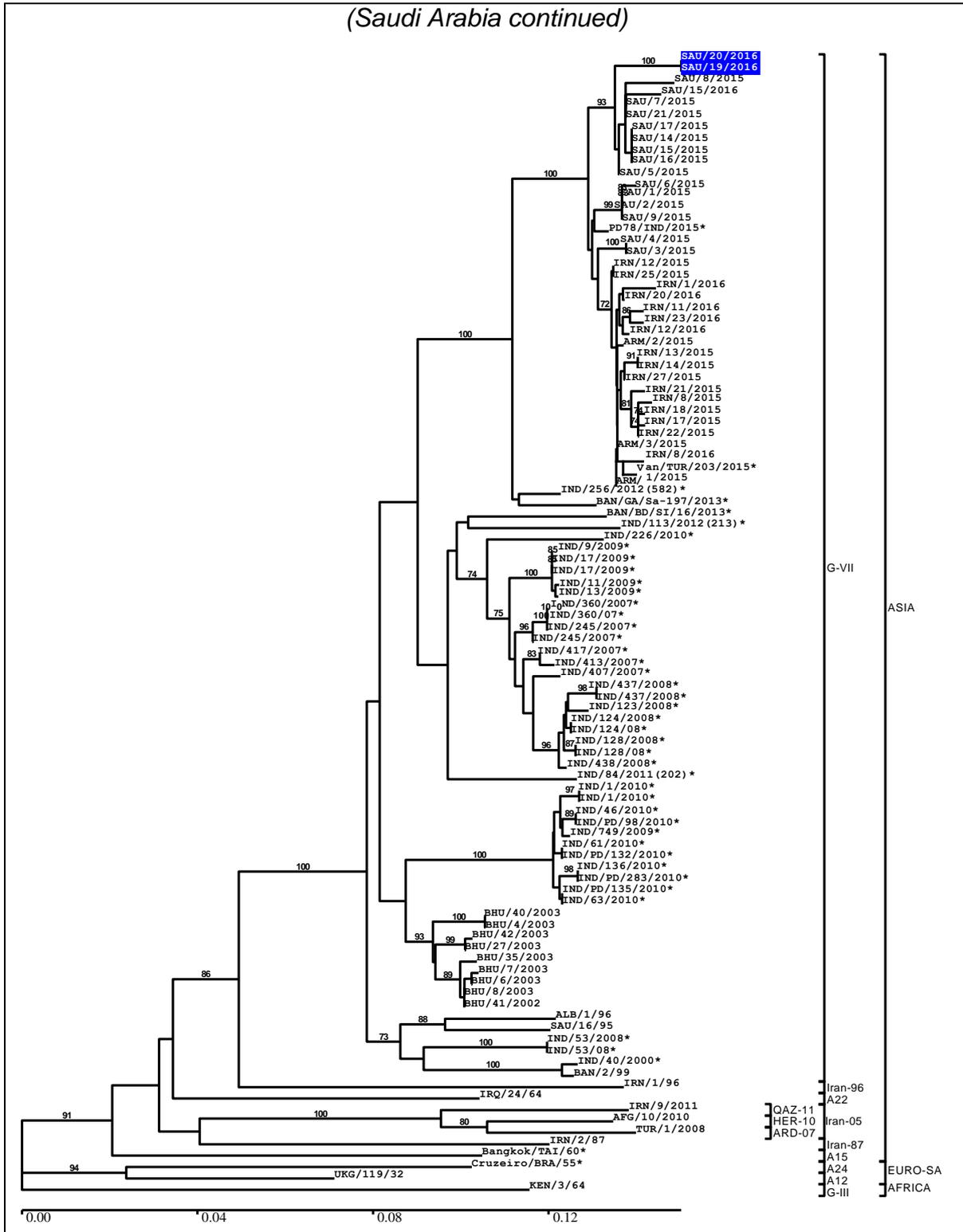
(Saudi Arabia continued on next page)

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(Saudi Arabia continued)



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Thailand

Batch: WRLFMD/2016/00031

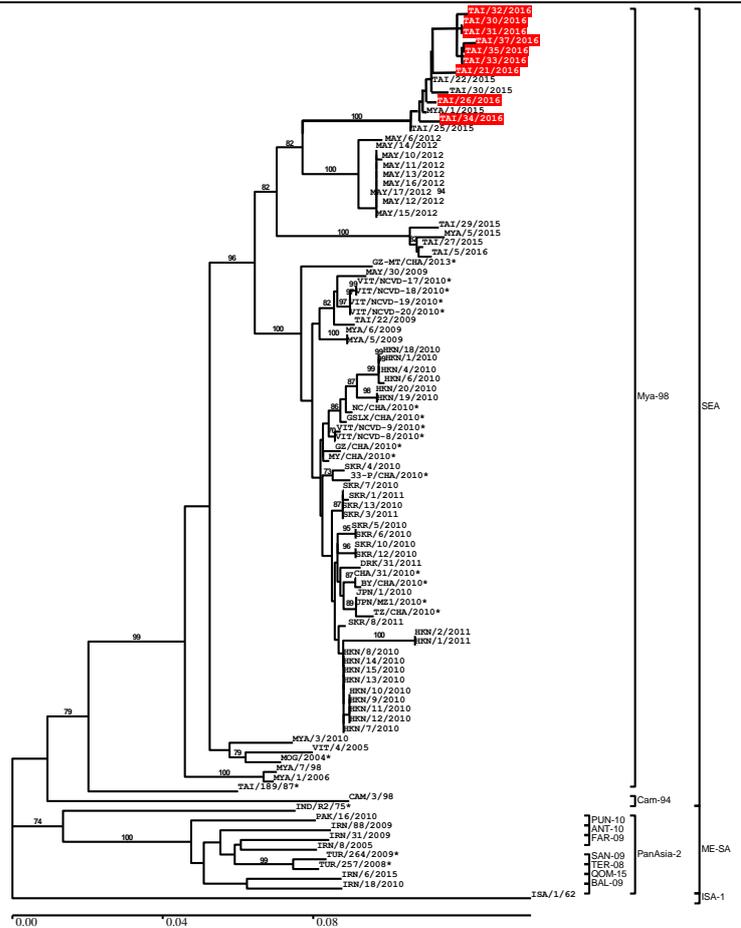
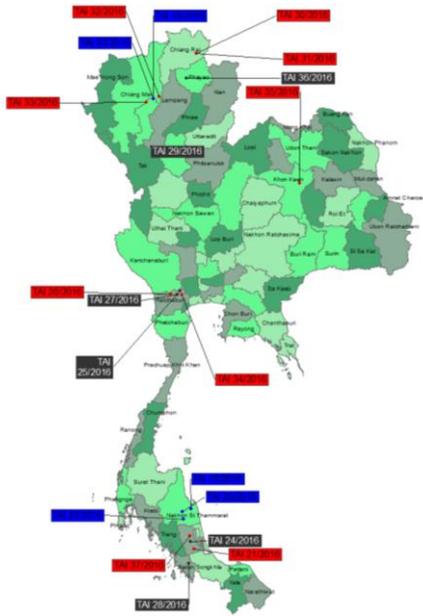
Date received: 14/10/2016

No. of samples: 20

O (SEA/Mya-98): 9

A (ASIA/Sea-97): 5

FMDV-GD: 6



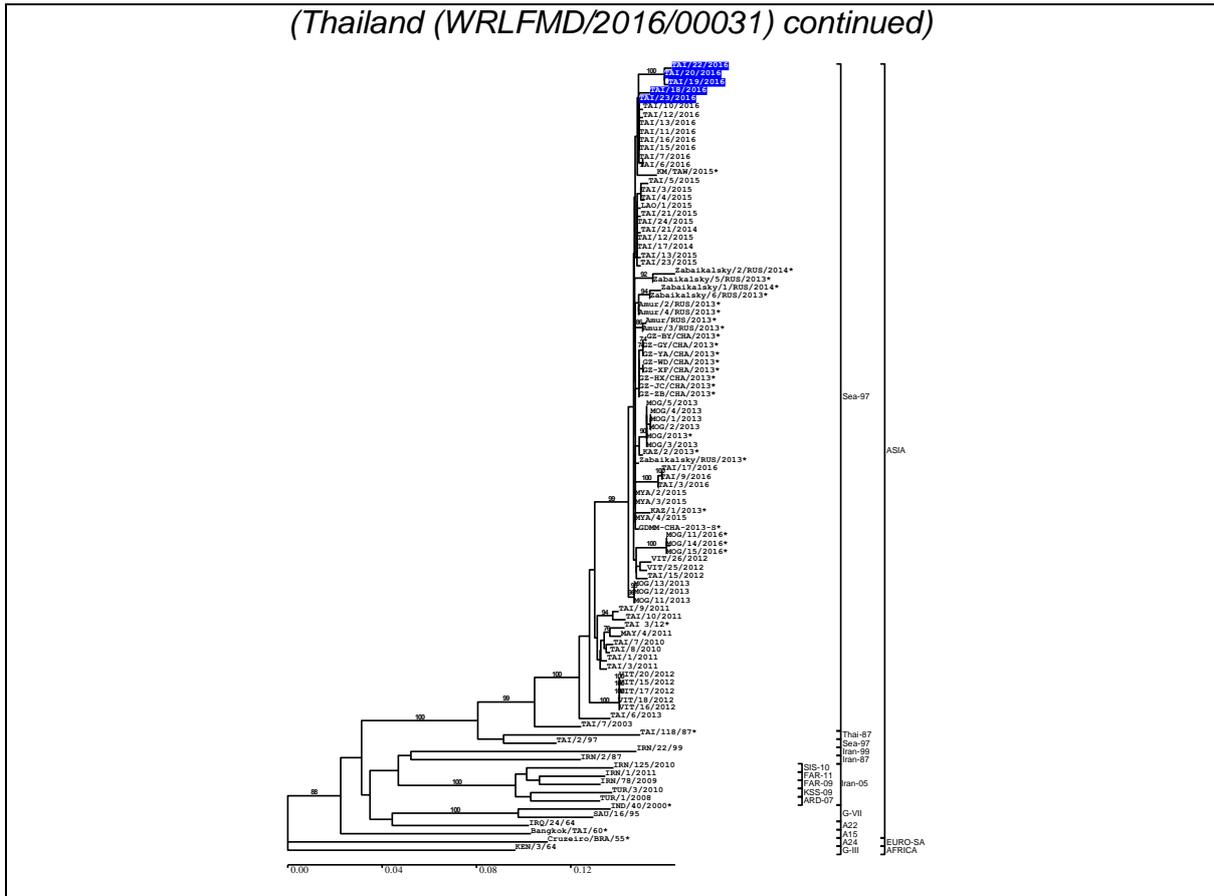
(Thailand (WRLFMD/2016/00031) Continued on next page)

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Thailand

Batch:

WRLMEG/2016/00023

Date received:

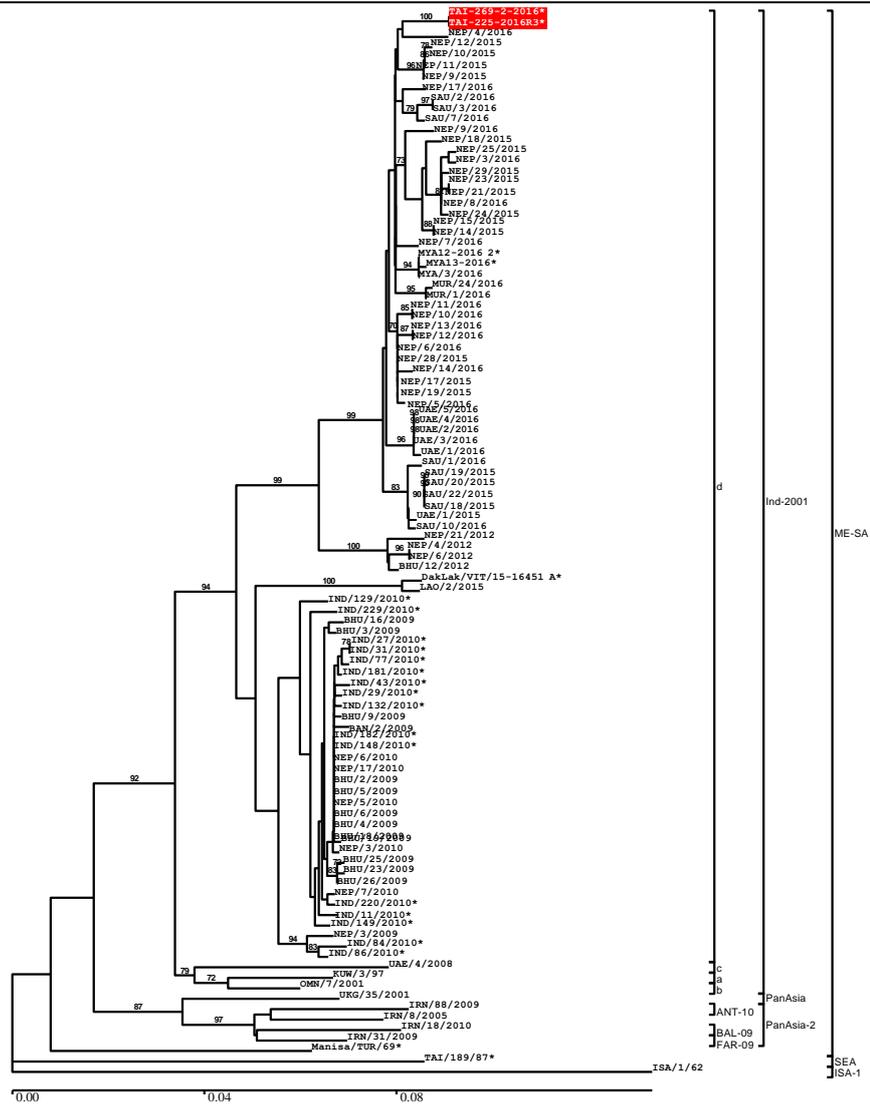
10/11/2016

No. of sequences: 2

O (ME_SA/Ind-2001d): 2

(Sequences submitted by
the OIE Regional
Reference Laboratory,
Pakchong, Thailand)

No locations given



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2.2. Africa

Nigeria

Batch:

WRLFMD/2016/00034

Date received: 19/10/2016

No. of samples: 25

O (EA-3): 16

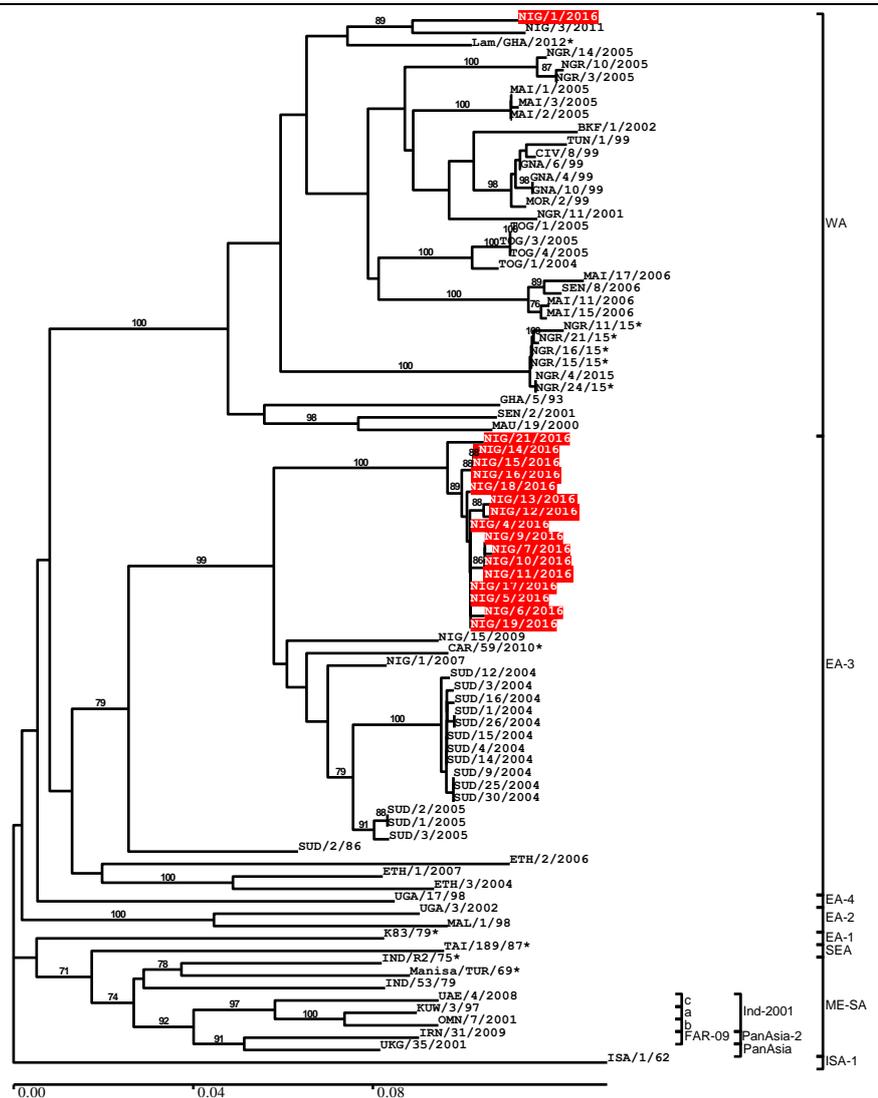
O (WA): 1

SAT 1 (X): 3

FMDV-GD: 1

NVD: 4

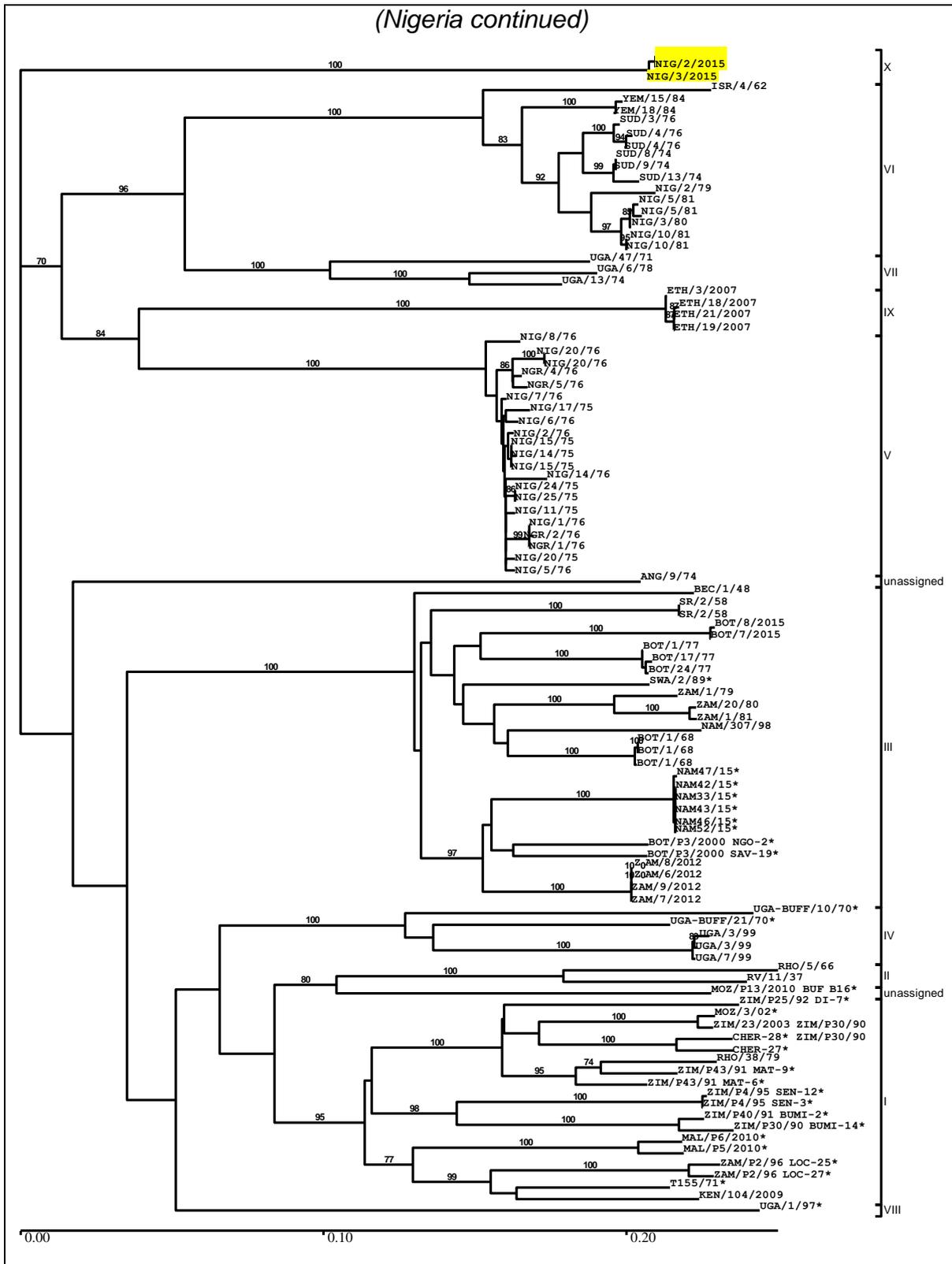
No locations were given.



(Nigeria continued on next page)

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3. Vaccine matching

During this reporting period vaccine matching has been undertaken for 26 FMD virus field strains (serotype O (n=17), serotype A (n=5), serotype Asia 1 (n=2) and serotype SAT 1 (n=2)).

For individual data see Annex 1, section 4.3 (Antigenic Characterisation).

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4. Annex 1

4.1. Summary of Submissions

Table 2: Summary of samples collected and received to WRLFMD (October to December 2016)

Country	N ^o of samples	Virus isolation in cell culture/ELISA								RT-PCR for FMD (or SVD)		
		FMD virus serotypes								No Virus Detected	virus (where appropriate)	
		O	A	C	SAT 1	SAT 2	SAT 3	ASIA-1	Positive		Negative	
BHUTAN	14	-	-	-	-	-	-	-	-	-	-	-
LAOS	6	-	-	-	-	-	-	-	-	-	-	-
MYANMAR	4	-	-	-	-	-	-	-	4	2	2	-
NIGERIA	25	17	-	-	3	-	-	-	5	19	6	-
SAUDI ARABIA	3	1	2	-	-	-	-	-	-	3	-	-
THAILAND	20	9	5	-	-	-	-	-	6	20	-	-
VIETNAM	35	-	-	-	-	-	-	-	-	-	-	-
TOTAL	107	27	7	-	3	-	-	-	15	44	8	-

Abbreviations used in table

VI / ELISA	FMD (or SVD) virus serotype identified following virus isolation in cell culture and antigen detection ELISA
FMD	Foot-and-mouth disease
SVD	Swine vesicular disease
NVD	No FMD, SVD or vesicular stomatitis virus detected
NT	Not tested
rRT-PCR	Real-time reverse transcription polymerase chain reaction for FMD (or SVD) viral genome

4.2. Clinical Samples

Table 3: Clinical sample diagnostics made by the WRLFMD® October to December 2016

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
BHUTAN	BHU 1/2015	CATTLE	14-Aug-15	Pending	Pending	Pending
	BHU 2/2015	CATTLE	15-Aug-15	Pending	Pending	Pending

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Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
	BHU 3/2015	CATTLE	22-Nov-15	Pending	Pending	Pending
	BHU 4/2015	CATTLE	26-Dec-15	Pending	Pending	Pending
	BHU 1/2016	CATTLE	15-Feb-16	Pending	Pending	Pending
	BHU 2/2016	CATTLE	15-Feb-16	Pending	Pending	Pending
	BHU 3/2016	CATTLE	15-Feb-16	Pending	Pending	Pending
	BHU 4/2016	CATTLE	17-Feb-16	Pending	Pending	Pending
	BHU 5/2016	CATTLE	08-Mar-16	Pending	Pending	Pending
	BHU 6/2016	CATTLE	24-Mar-16	Pending	Pending	Pending
	BHU 7/2016	CATTLE	04-Jun-16	Pending	Pending	Pending
	BHU 8/2016	CATTLE	04-Jun-16	Pending	Pending	Pending
	BUH 9/2016	CATTLE	04-Jun-16	Pending	Pending	Pending
BHU 10/2016	CATTLE	04-Jun-16	Pending	Pending	Pending	
MYANMAR	MYA 1/2016	CATTLE	29-Jun-16	NEG	POS	FMDVGD
	MYA 2/2016	CATTLE	29-Jun-16	NEG	NEG	NVD
	MYA 3/2016	CATTLE	29-Jun-16	NEG	POS	FMDVGD
	MYA 4/2016	CATTLE	29-Jun-16	NEG	NEG	NVD
NIGERIA	NIG 1/2015	BOVINE	02-Dec-15	SAT 1	POS	SAT 1
	NIG 2/2015	BOVINE	02-Dec-15	SAT 1	POS	SAT 1
	NIG 3/2015	BOVINE	02-Dec-15	SAT 1	POS	SAT 1
	NIG 1/2016	BOVINE	27-Jun-16	O	POS	O
	NIG 2/2016	BOVINE	09-Aug-16	NEG	NEG	NVD
	NIG 3/2016	BOVINE	09-Aug-16	NEG	NEG	NVD
	NIG 4/2016	BOVINE	19-Aug-16	O	NEG	O

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Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
	NIG 5/2016	BOVINE	19-Aug-16	O	POS	O
	NIG 6/2016	BOVINE	19-Aug-16	O	POS	O
	NIG 7/2016	OVINE	03-Sep-16	O	POS	O
	NIG 8/2016	BOVINE	03-Sep-16	NEG	POS	FMDVGD
	NIG 9/2016	BOVINE	03-Sep-16	O	NEG	O
	NIG 10/2016	BOVINE	03-Sep-16	O	POS	O
	NIG 11/2016	BOVINE	03-Sep-16	O	POS	O
	NIG 12/2016	BOVINE	09-Sep-16	O	POS	O
	NIG 13/2016	BOVINE	09-Sep-16	O	POS	O
	NIG 14/2016	BOVINE	13-Sep-16	O	POS	O
	NIG 15/2016	BOVINE	13-Sep-16	O	POS	O
	NIG 16/2016	BOVINE	13-Sep-16	O	POS	O
	NIG 17/2016	BOVINE	13-Sep-16	O	POS	O
	NIG 18/2016	BOVINE	13-Sep-16	O	POS	O
	NIG 19/2016	BOVINE	13-Sep-16	O	POS	O
	NIG 20/2016	BOVINE	23-Sep-16	NEG	NEG	NVD
	NIG 21/2016	BOVINE	30-Sep-16	O	POS	O
	NIG 22/2016	BOVINE	30-Sep-16	NEG	NEG	NVD
SAUDI ARABIA	SAU 18/2016	CATTLE	14-Oct-16	O	POS	O
	SAU 19/2016	CATTLE	14-Oct-16	A	POS	A
	SAU 20/2016	CATTLE	14-Oct-16	A	POS	A
THAILAND	TAI 18/2016	CATTLE	09-Mar-16	A	POS	A
	TAI 19/2016	CATTLE	18-Mar-16	A	POS	A

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Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
	TAI 20/2016	CATTLE	05-Apr-16	A	POS	A
	TAI 21/2016	CATTLE	11-Apr-16	O	POS	O
	TAI 22/2016	CATTLE	18-Apr-16	A	POS	A
	TAI 23/2016	CATTLE	18-Apr-16	A	POS	A
	TAI 24/2016	PIG	17-May-16	NEG	POS	FMDVGD
	TAI 25/2016	PIG	17-May-16	NEG	POS	FMDVGD
	TAI 26/2016	CATTLE	25-May-16	O	POS	O
	TAI 27/2016	CATTLE	08-Jun-16	NEG	POS	FMDVGD
	TAI 28/2016	CATTLE	21-Jul-16	NEG	POS	FMDVGD
	TAI 29/2016	CATTLE	29-Jul-16	NEG	POS	FMDVGD
	TAI 30/2016	CATTLE	29-Jul-16	O	POS	O
	TAI 31/2016	CATTLE	29-Jul-16	O	POS	O
	TAI 32/2016	CATTLE	29-Jul-16	O	POS	O
	TAI 33/2016	PIG	29-Jul-16	O	POS	O
	TAI 34/2016	CATTLE	02-Aug-16	O	POS	O
	TAI 35/2016	CATTLE	02-Aug-16	O	POS	O
	TAI 36/2016	CATTLE	09-Aug-16	NEG	POS	FMDVGD
	TAI 37/2016	CATTLE	11-Aug-16	O	POS	O
VIETNAM	VIT 5/2015	CATTLE	02-Jun-15	Pending	Pending	Pending
	VIT 6/2015	CATTLE	02-Jun-15	Pending	Pending	Pending
	VIT 7/2015	PIG	06-Jun-15	Pending	Pending	Pending
	VIT 8/2015	CATTLE	10-Jul-15	Pending	Pending	Pending
	VIT 9/2015	BUFFALO	14-Sep-15	Pending	Pending	Pending

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Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
	VIT 10/2015	CATTLE	14-Sep-15	Pending	Pending	Pending
	VIT 11/2015	PIG	16-Oct-15	Pending	Pending	Pending
	VIT 12/2015	CATTLE	28-Oct-15	Pending	Pending	Pending
	VIT 13/2015	CATTLE	28-Oct-15	Pending	Pending	Pending
	VIT 14/2015	BUFFALO	30-Oct-15	Pending	Pending	Pending
	VIT 15/2015	BUFFALO	10-Nov-15	Pending	Pending	Pending
	VIT 16/2015	CATTLE	24-Nov-15	Pending	Pending	Pending
	VIT 17/2015	PIG	01-Dec-15	Pending	Pending	Pending
	VIT 18/2015	CATTLE	02-Dec-15	Pending	Pending	Pending
	VIT 1/2016	BUFFALO	28-Jan-16	Pending	Pending	Pending
	VIT 2/2016	BUFFALO	16-Feb-16	Pending	Pending	Pending
	VIT 3/2016	CATTLE	29-Feb-16	Pending	Pending	Pending
	VIT 4/2016	PIG	11-Mar-16	Pending	Pending	Pending
	VIT 5/2016	CATTLE	11-Mar-16	Pending	Pending	Pending
	VIT 6/2016	BUFFALO	18-Mar-16	Pending	Pending	Pending
	VIT 7/2016	CATTLE	24-Mar-16	Pending	Pending	Pending
	VIT 8/2016	PIG	28-Mar-16	Pending	Pending	Pending
	VIT 9/2016	CATTLE	06-Apr-16	Pending	Pending	Pending
	VIT 10/2016	CATTLE	12-Apr-16	Pending	Pending	Pending
	VIT 11/2016	PIG	26-Apr-16	Pending	Pending	Pending
	VIT 12/2016	PIG	05-May-16	Pending	Pending	Pending
	VIT 13/2016	CATTLE	15-May-16	Pending	Pending	Pending
	VIT 14/2016	CATTLE	12-Jun-16	Pending	Pending	Pending

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Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
	VIT 15/2016	BUFFALO	03-Aug-16	Pending	Pending	Pending
	VIT 16/2016	PIG	09-Aug-16	Pending	Pending	Pending
	VIT 17/2016	CATTLE	25-Aug-16	Pending	Pending	Pending
	VIT 18/2016	CATTLE	27-Aug-16	Pending	Pending	Pending
	VIT 19/2016	CATTLE	21-Sep-16	Pending	Pending	Pending
	VIT 20/2016	CATTLE	23-Sep-16	Pending	Pending	Pending
	VIT 21/2016	CATTLE	01-Nov-16	Pending	Pending	Pending
TOTAL :		101				

Abbreviations used in table

FMD(V)	Foot-and-mouth disease (virus)
FMDV GD	Genome detected
FMDV NGD	Genome not detected (samples submitted in Trizol, only rRT-PCR carried out)
VI/ELISA	FMDV serotype identified following virus isolation in cell culture and antigen ELISA
rRT-PCR	Real-time reverse transcription polymerase chain reaction on epithelial suspension for FMD (or SVD) viral genome
NVD	No foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected
NT	Not tested

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4.3. Antigenic Characterisation

Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from October to December 2016.

Table 4: Vaccine matching studies for O FMDV by VNT

Strain	Serotype	Topotype	Strain	O 3039	O1 Manisa	O/TUR/5/09
AFG/04/2016	O	ME-SA	PanAsia-2 ^{ANT-10}	M	M	M
AFG/12/2016	O	ME-SA	PanAsia-2 ^{ANT-10}	M	M	M
AFG/15/2016	O	ME-SA	PanAsia-2 ^{ANT-10}	M	M	M
AFG/16/2016	O	ME-SA	PanAsia-2 ^{ANT-10}	M	M	M
MAY/1/2015	O	SEA	Mya-98	M	M	M
MAY/10/2016	O	SEA	Mya-98	M	M	M
MAY/17/2014	O	SEA	Mya-98	M	M	M
MAY/5/2016	O	SEA	Mya-98	M	M	M
MUR/06/2016	O	ME-SA	Ind-2001d	M	M	M
MUR/07/2016	O	ME-SA	Ind-2001d	M	M	M
NIG/01/2016	O	unknown	unknown	N	N	B
NIG/04/2016	O	unknown	unknown	N	N	B
NIG/12/2016	O	unknown	unknown	M	M	M
NIG/19/2016	O	unknown	unknown	M	M	M
SAU/18/2016	O	ME-SA	PanAsia-2 ^{ANT-10}	M	M	M
TAI/26/2016	O	SEA	Mya-98	M	N	B
TAI/37/2016	O	SEA	Mya-98	M	N	M

Table 5: Vaccine matching studies for A FMDV by VNT

Strain	Serotype	Topotype	Strain	A Iran-05	A/TUR/20/2006	A22 IRQ
AFG/5/2016	A	ASIA	Iran-05 ^{FAR-11}	N	N	N
MAY/15/2014	A	ASIA	Sea-97	N	N	M
SAU/19/2016	A	ASIA	G-VII	N	N	N
TAI/20/2016	A	ASIA	Sea-97	N	N	N
TAI/23/2016	A	ASIA	Sea-97	M	N	M

- A/MAY/15/2014 also matched against the vaccine virus A/MAY/97.
- A/SAU/19/2016 did not match against A/SAU/95
- A/AFG/5/2016 also matched against A/SAU/95

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Table 6: Vaccine matching studies for Asia 1 FMDV by VNT

Strain	Serotype	Topotype	Strain	Asia 1 Shamir
AFG/6/2016	ASIA 1	ASIA	Sindh-08	M
AFG/10/2016	ASIA 1	ASIA	Sindh-08	M

Table 7: Vaccine matching studies for SAT 1 FMDV by VNT

Strain	Serotype	Topotype	Strain	SAT 1/RHO/12/78
NIG/1/2015	SAT 1	X	-	N
NIG/2/2015	SAT 1	X	-	N

Abbreviations used in tables

M	<p>Vaccine Match</p> <p>$r_1 = \geq 0.3$. Suggests that there is a close relationship between field isolate and vaccine strain. A potent vaccine containing the vaccine strain is likely to confer protection.</p>
N	<p>No Vaccine Match</p> <p>$r_1 = < 0.3$. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect</p>
B	<p>Borderline</p> <p>Any r_1 values between 0.28 to 0.32</p>
NT	<p>Not tested against this vaccine</p>

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5. Annex 2

Recent FMD Publications (October to December 2016) cited by Web of Science (Pirbright Institute papers and authors are highlighted in **BOLD AND GREY**)

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6. Annex 3

RECOMMENDATIONS FROM WRLFMD® ON FMD VIRUS STRAINS TO BE INCLUDED IN FMDV ANTIGEN BANKS (FOR FMD-FREE COUNTRIES) December 2016

Note: Virus strains are NOT listed in order of importance

High Priority	A/ASIA/G-VII(G-18)* O Manisa O PanAsia-2 (or equivalent) O BFS or Campos A24 Cruzeiro Asia 1 Shamir A Iran-05 (or A TUR 06) A22 Iraq SAT 2 Saudi Arabia (or equivalent i.e. SAT 2 Eritrea)
Medium Priority	A Eritrea SAT 2 Zimbabwe SAT 1 South Africa A Malaysia 97 (or Thai equivalent such as A/Sakolnakorn/97) A Argentina 2001 O Taiwan 97 (pig-adapted strain or Philippine equivalent)
Low Priority	A Iran '96 A Iran '99 A Iran 87 or A Saudi Arabia 23/86 (or equivalent) A15 Bangkok related strain A87 Argentina related strain C Noville SAT 2 Kenya SAT 1 Kenya SAT 3 Zimbabwe

Note: Discussions are currently underway to adopt a risk-based approach for different FMD viral lineages to identify priority vaccines for use in Europe and other FMD-free settings.

*Recent *in vitro* data from WRLFMD for serotype A viruses from Saudi Arabia and Iran highlights an apparent gap in vaccine coverage. Work is urgently required to evaluate whether there is adequate *in vitro* match with Indian vaccine strains (A/IND/40/2000), or whether *in vivo* protection may be provided by high potency international vaccines.

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