WRLFMD Quarterly Report April to June 2017

Foot-and-Mouth Disease

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Department for Environment Food & Rural Affairs

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CONTENTS

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1. Summary of samples tested and reported FMD outbreaks

1.1. Asia

Cambodia

Samples were received on 23rd May 2017 from the OIE Regional Reference Laboratory (RRL) in Pakchong (Thailand). Virus isolation and typing results are pending.

Iran

Twenty four samples from cattle and sheep were received on 8th May 2017. They were collected between October 2016 and February 2017 in various locations. **FMDV type O** was isolated from nine samples and **type A** also from nine samples. VP1 sequencing showed that all nine **type O** viruses belonged to the ME-SA/PanAsia-2 lineage with eight belonging to the ANT-10 sub-lineage and one belonging to the QOM-15 sub-lineage (see below). Two of the **type A** viruses belonged to the ASIA/G-VII lineage and the other seven belonged to the Iran-05 lineage (with six belonging to the FAR-09 sublineage and one belonging to the FAR-11 sublineage) (see below); findings that indicate that multiple serotype A lineages (with different antigenic properties) are currently co-circulating in the region.

Israel

Two outbreaks of **FMD type A** were reported in cattle in the Hazafon (Northern) district on 1st May 2017 and 22nd May 2017. VP1 sequencing, performed at the Kimron Veterinary Institute, showed that the causative virus belonged to the ASIA/G-VII lineage (see below). Another outbreak, due to **FMD type O**, in cattle at Haifa was shown to be due to the EA-3 topotype and closely related to viruses present in the West Bank of the Palestinian Autonomous Territories (see below).

Mongolia

Between 2nd February and 11th April 2017, 13 outbreaks of **FMD type O** were reported in cattle, sheep and goats in four provinces (Sukhbaatar, Dornod, Khentii and Dornogovi) in the east of the country. A batch of 16 samples were received on the

08/05/2017 which had been collected between March 2015 and May 2017. These were typed as **FMDV type O** (two collected in 2015 and eight collected between January and April 2017) and **type A** (collected from cattle and sheep in September 2016). The **type O** viruses from 2015 belonged to SEA/Mya-98 and ME-SA/PanAsia lineages, while those from 2017 all belonged to the PanAsia lineage (see below). The **type A** viruses from 2016 belonged to the ASIA/Sea-97 lineage (see below).

Myanmar

An outbreak of **FMD type Asia 1** was reported in cattle in Rakhine State in January 2017. The last time this serotype was recorded in Myanmar was 2001. A sample received from the OIE RRL in Pakchong (Thailand) was typed as Asia 1 (although not virus could be isolated in cell cultures). VP1 sequencing of this sample, along with sequence received from the RRL, confirmed the presence of the Asia 1/G-VIII lineage showing the closest relationship to viruses from Bangladesh (see below). Additionally three samples, collected from cattle in January and April 2017 (Sagaing and Yangon regions), were typed as **FMD type O** and belonged to the ME-SA/Ind-2001d lineage (see below).

Laos

Two samples were received from the RRL on 23rd May 2017. They had been collected from cattle in January 2017 in Vientiane City and Champasak. Both were **FMDV type O** and belonged to the SEA/Mya-98 lineage (see below).

Palestinian Autonomous Territories

Four outbreaks of **FMD type O** were reported in cattle, sheep and goats in the West Bank between 1st May 2017 and 5th June 2017. VP1 sequencing, performed at the Kimron Veterinary Institute (Israel) showed the causal virus to belong to the EA-3 topotype (see below).

People's Republic of China

Two outbreaks of **FMD type O** have been reported in Guangdong province on 23rd March 2017 (pigs) and 15th May 2017 (cattle). Another outbreak of **FMD type O** was reported in cattle in the Xinjiang Autonomous region on 16th April 2017. Two outbreaks of **FMD type A** were also reported in cattle in Xinjiang on the 24th April 2017 and 28th April 2017 (these had previously been notified on 9th May within an OIE follow-up about foot-and-mouth disease serotype O). No genotyping has so far been reported.

Thailand

Twenty eight samples, collected between August 2016 and February 2017 from various locations, were received from the RRL. **FMDV type O** was identified in 18 and **type A** in 10. VP1 sequencing revealed all the type O viruses to belong to the SEA/Mya-98 lineage and all the type A viruses to the ASIA/Sea-97 lineage (se below).

1.2. Africa

Algeria

Three further outbreaks of **FMD type A** were reported in cattle at Medea and Bordj Bou Arreridj on 2nd April 2017 and Setif on 7th April 2017. The latter outbreak was originally thought to be caused by SAT 1, but laboratory investigations confirmed that only type A was present. Genotyping at IZSLER and the WRLFMD showed the virus to belong to genotype IV of the AFRICA topotype (see below).

Ethiopia

Two batches of samples were received, one on 11th April 2017 and the other on 15th May 2017.

The first batch were samples collected from cattle between February 2016 and March 2017 from various locations in Oromia Region and Addis Ababa. **FMD type O** viruses were isolated from 17 samples and VP1 sequencing showed that those collected in 2016 (n=13) all belonged to the EA-4 topotype while the four collected in 2017 belonged to the EA-3 topotype.

The second batch consisted of 54 samples (some original epithelium and other cell culture isolates) collected from cattle between January 2016 and April 2017 in the Oromia Region and Addis Ababa. **FMD type O** viruses were recovered from only 14 samples (six epithelium and eight cell culture passaged), while FMDV genome was detected in a further 19 samples and 21 were NVD. VP1 sequencing revealed all 14 viruses isolated belonged to the EA-4 topotype (all were from 2016).

South Africa

A further outbreak of **FMD type SAT 2** was reported in cattle on 24th March 2017 at Bushbuckridge, Mpumalanga. No genotyping has yet been reported. This outbreak is located in South Africa's FMD Protection Zone, which is not part of the FMD Free Zone and therefore does not affect South Africa's OIE recognised FMD free status.

Tunisia

Two outbreaks of **FMD type A** were reported in cattle in Bizerte on 24th April 2017. Local sequencing suggested a close relationship of the virus to the AFRICA/G-IV virus from Algeria. Analysis in one of the OIE Reference Laboratories is awaited.

Zambia

An outbreak of **FMD (untyped)** occurred in cattle in Mbala on 22nd March 2017. Further analyses are awaited.

Zimbabwe

Two outbreaks of **FMD type SAT 2** were reported in cattle on 22nd March 2017 and 17th May 2017. They occurred in Matabeleland North and Midlands provinces, respectively, and are a continuation of outbreaks which have occurred since June 2015. No genotyping has been reported.

1.3. South America

Colombia

An outbreak of FMD type O was reported in cattle at La Marota, Curipao, Tame, Arauca on 11th June 2017. This is the first FMD outbreak in Colombia since August 2009, and anywhere in the continent of South America since outbreaks in Venezuela were recognised in 2013. Genotyping results are awaited.

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.

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/2017.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 from April to June 2017 is shown in Annex 1 (Summary of

Submissions). A record of all samples received by WRLFMD (April to June 2017) is shown in Annex 1 (Clinical Samples).

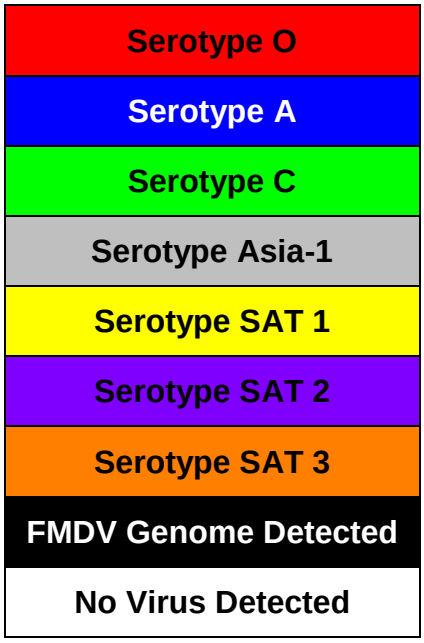
Table 1: Status of sequencing of samples or sequences received by the WRLFMD from April to June 2017 (* indicates samples carried over from the last quarter)

WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2017/00006	18/04/2017	Algeria	A	3	3	Completed
WRLFMD/2017/00007	11/04/2017	Ethiopia	O	17	17	Completed
WRLFMD/2017/00008	13/04/2017	Iran	O	9	9	Completed
WRLFMD/2017/00008	13/04/2017	Iran	A	9	9	Completed
WRLFMD/2017/00009	15/05/2017	Ethiopia	O	14	14	Completed
WRLFMD/2017/00010	08/05/2017	Mongolia	O	8	8	Completed
WRLFMD/2017/00010	08/05/2017	Mongolia	A	2	2	Completed
WRLFMD/2017/00011	23/05/2017	Thailand	O	18	18	Completed
WRLFMD/2017/00011	23/05/2017	Thailand	A	10	10	Completed
WRLFMD/2017/00012	23/05/2017	Myanmar	O	3	3	Completed
WRLFMD/2017/00012	23/05/2017	Myanmar	Asia 1*	1	1	Completed
WRLFMD/2017/00013	23/05/2017	Laos	O	2	2	Completed
WRLFMD/2017/00015	23/05/2017	Cambodia	Pending	-	-	Pending
			Total	**96**	**96**	

*, no virus isolated on cell culture

2. Detailed Analysis

Key for maps and trees:



2.1. ASIA

Iran

Batch: WRLFMD/2017/00008

Date received: 13/04/2017

No. of samples: 24

O (ME-SA/PanAsia-2/ANT-10): 8

O (ME-SA/PanAsia-2/QOM-15): 1

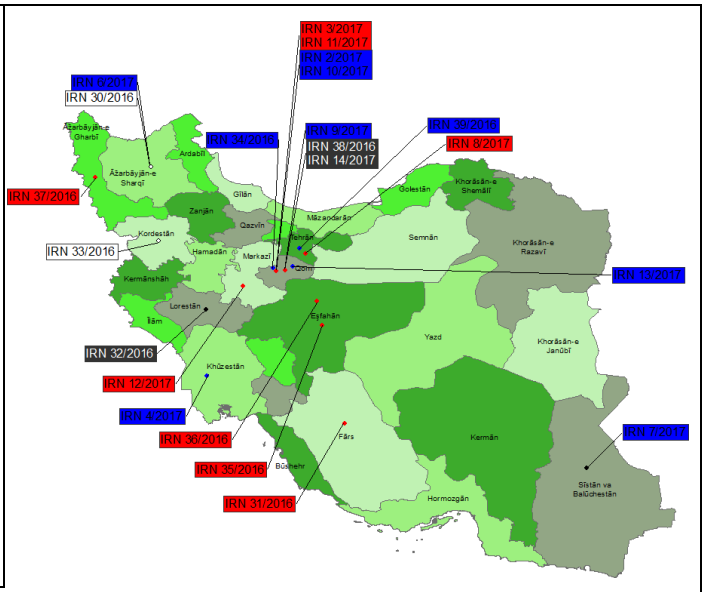
A (ASIA/G-VII): 2

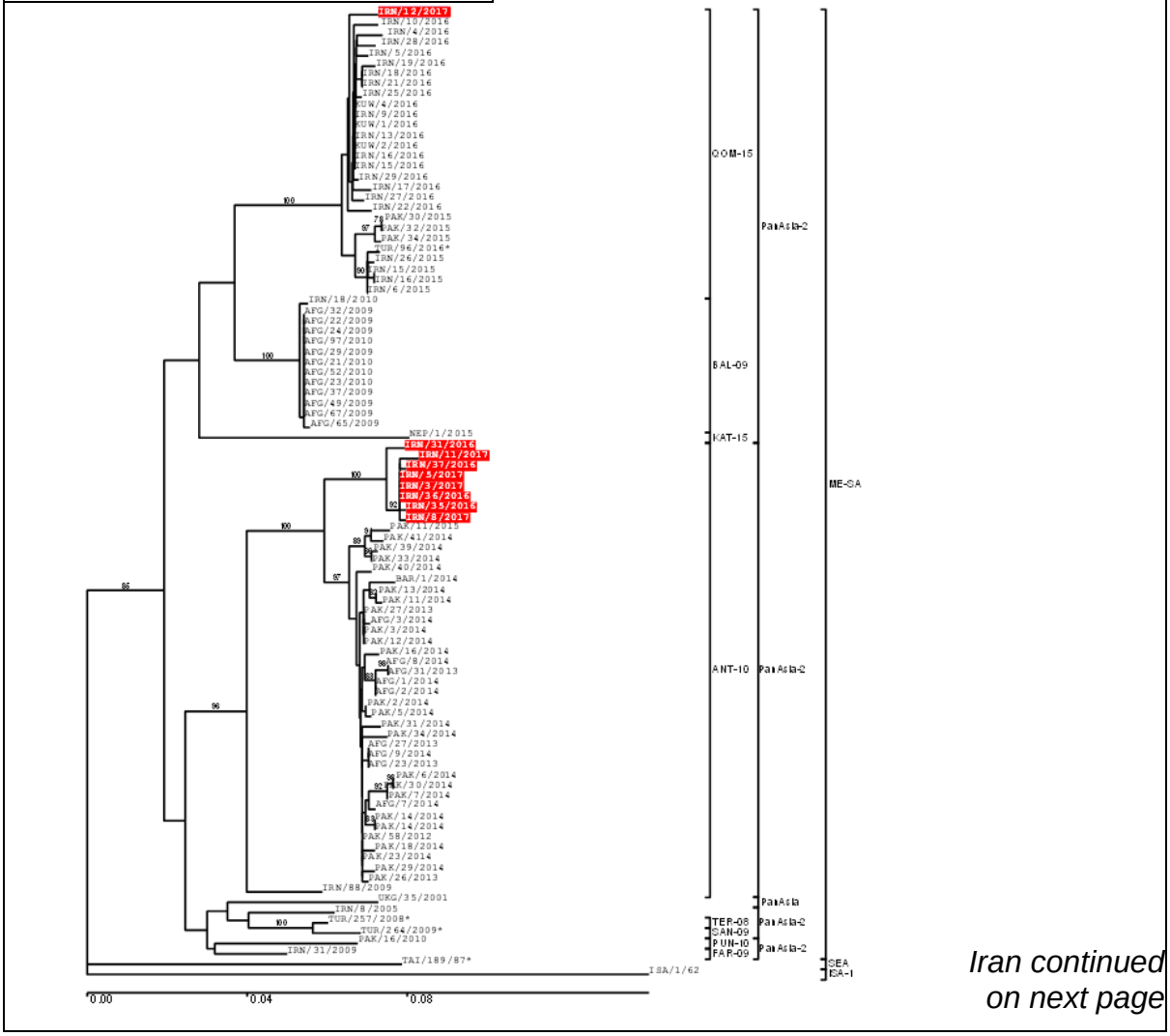
A (ASIA/Iran-05/FAR-09): 6

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

FMDV-GD: 4

NVD: 2





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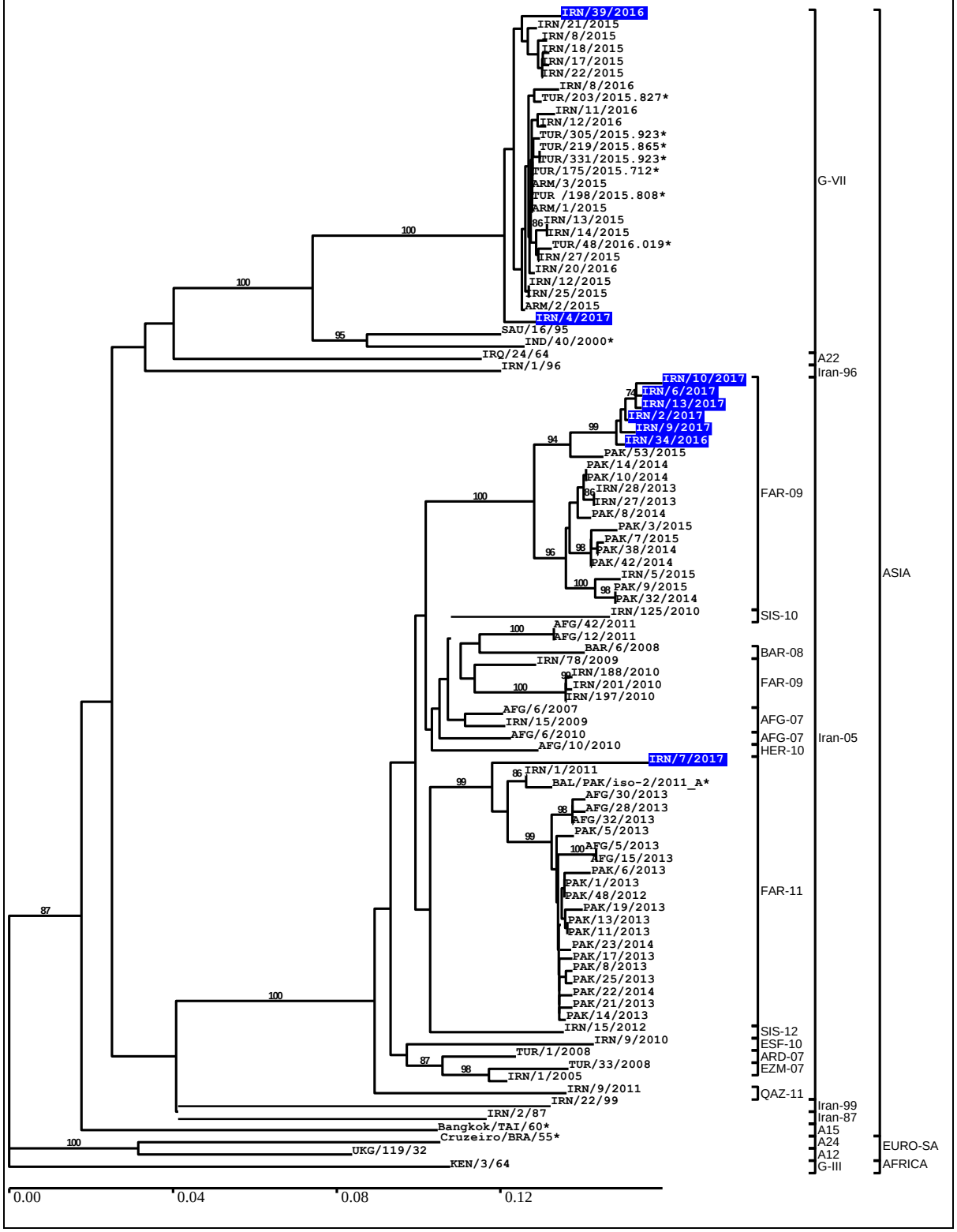

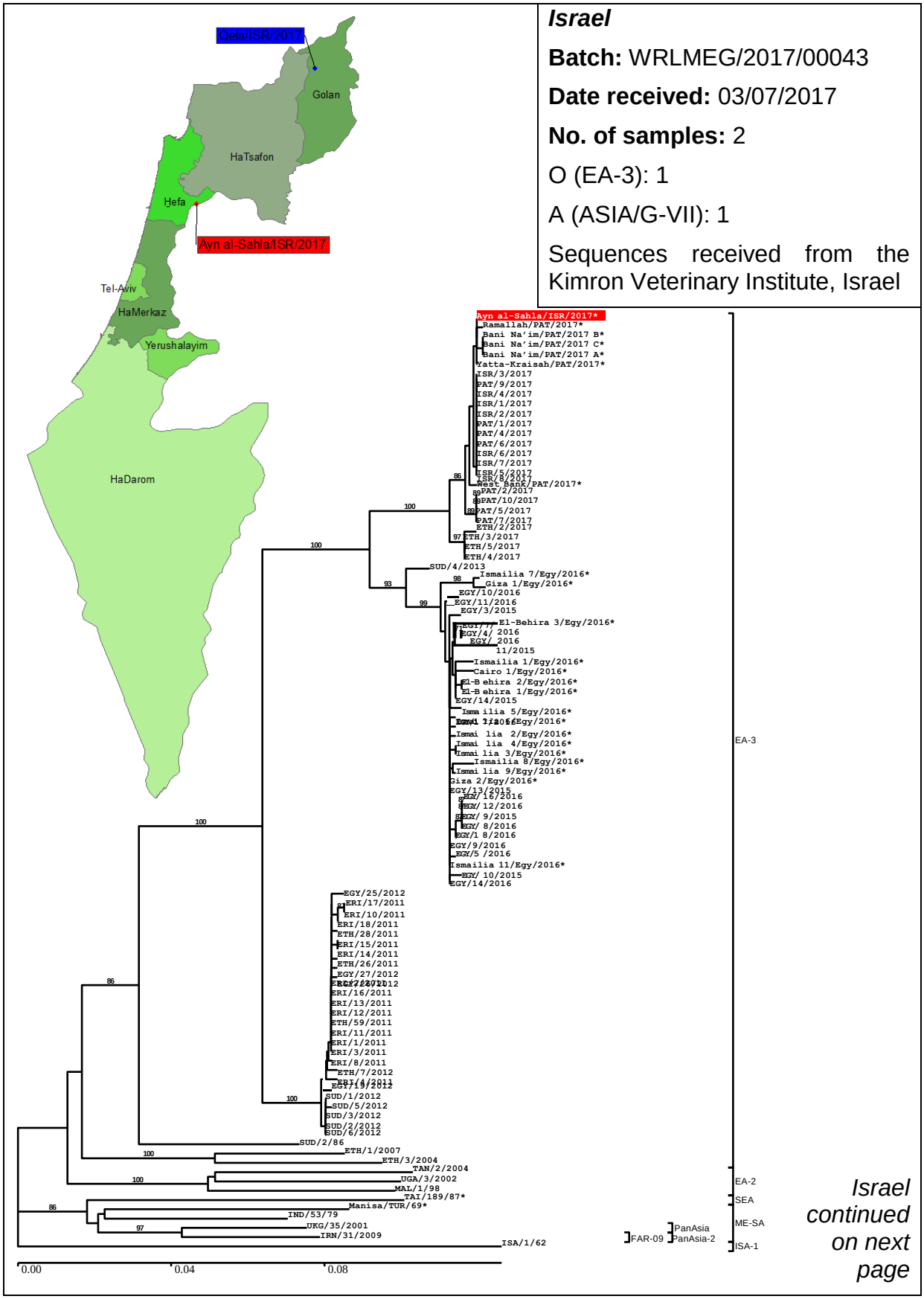

Israel

Batch: WRLMEG/2017/00043

Date received: 03/07/2017

No. of samples: 2

O (EA-3): 1

A (ASIA/G-VII): 1

Sequences received from the Kimron Veterinary Institute, Israel

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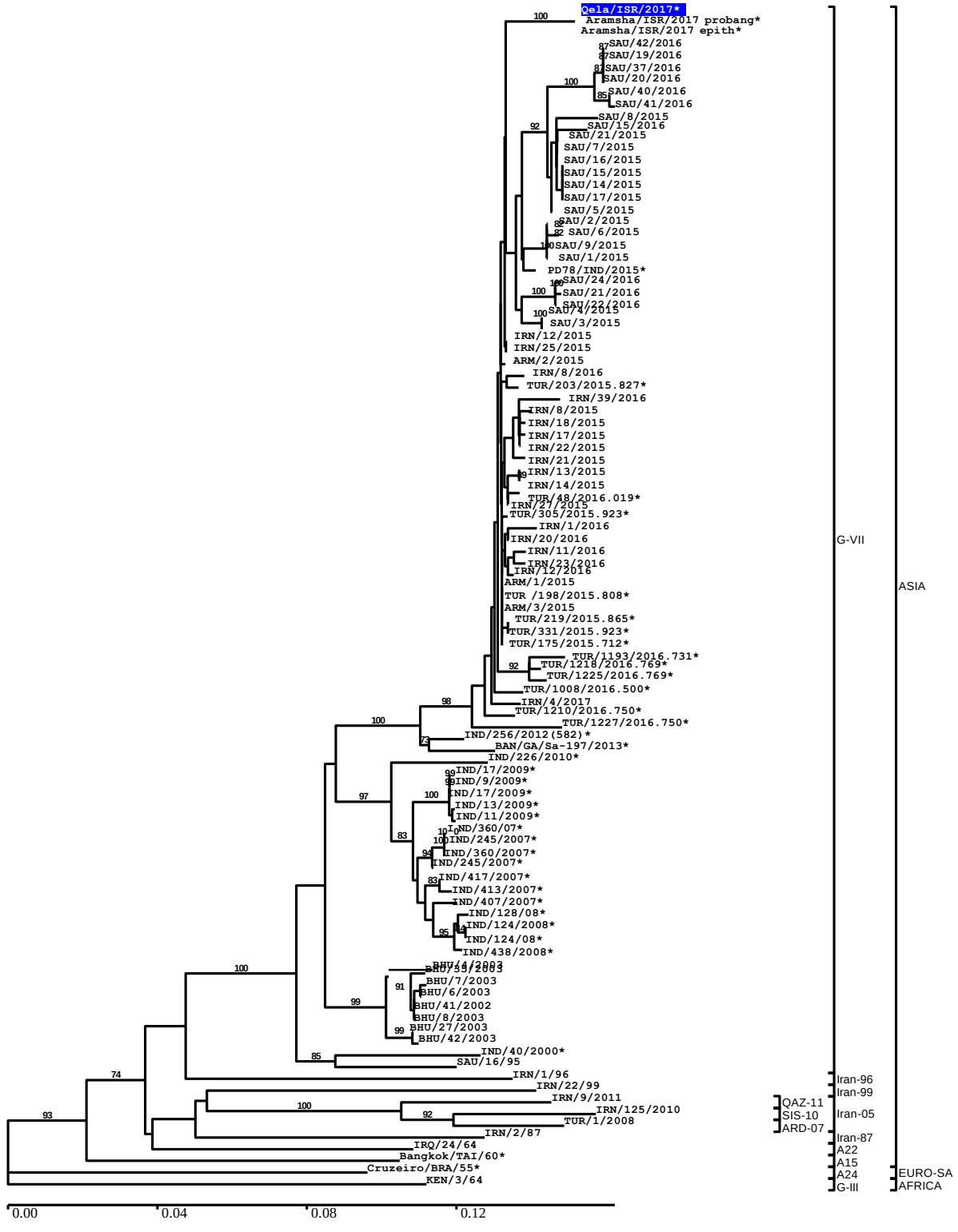
Israel continued



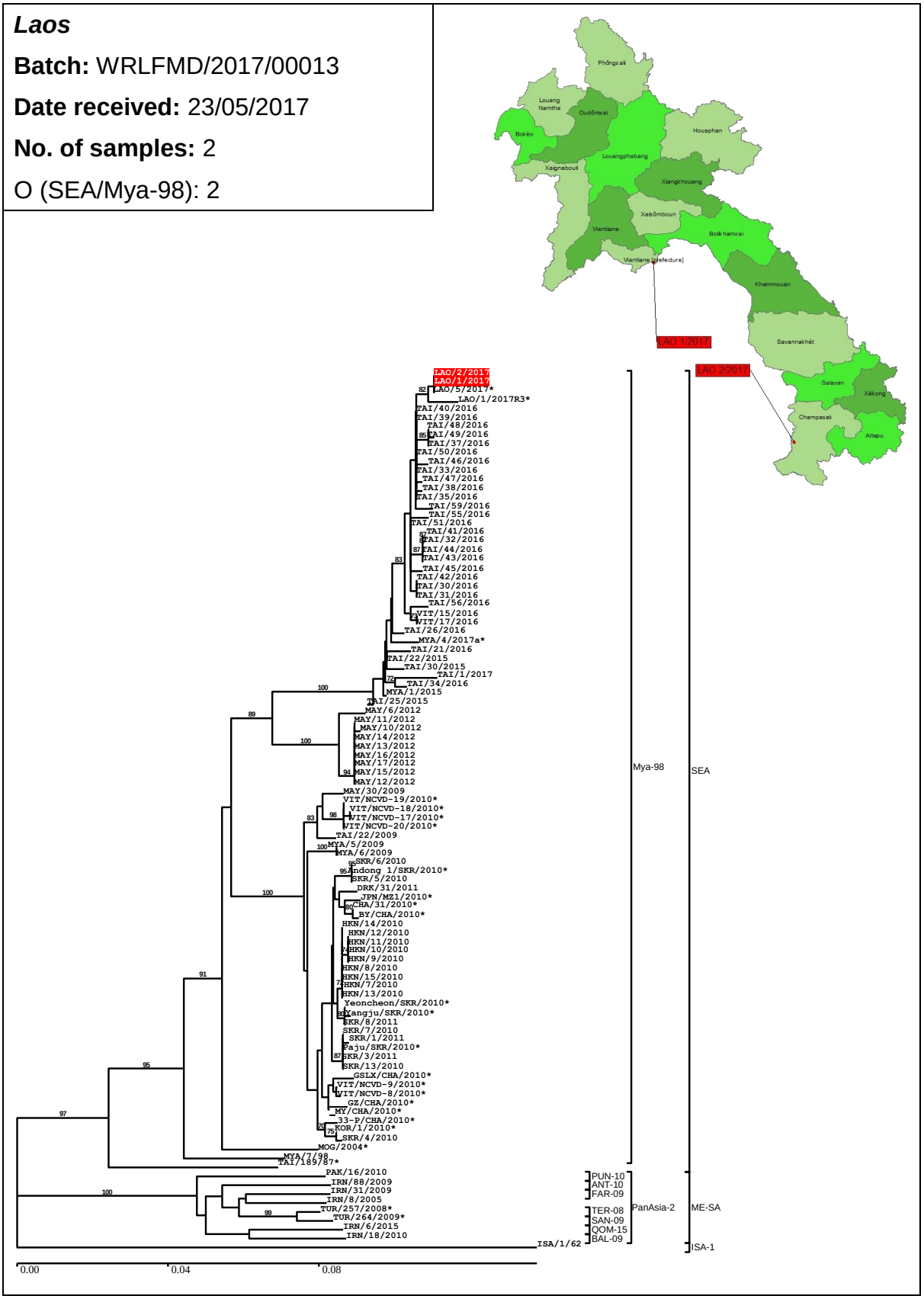
Laos

Batch: WRLFMD/2017/00013

Date received: 23/05/2017

No. of samples: 2

O (SEA/Mya-98): 2



Mongolia

Batch: WRLFMD/2017/00010

Date received: 08/05/2017

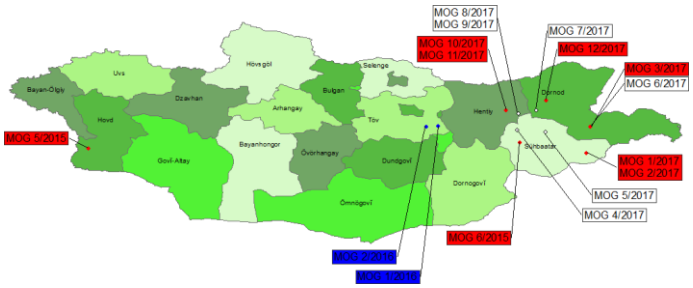
No. of samples: 16

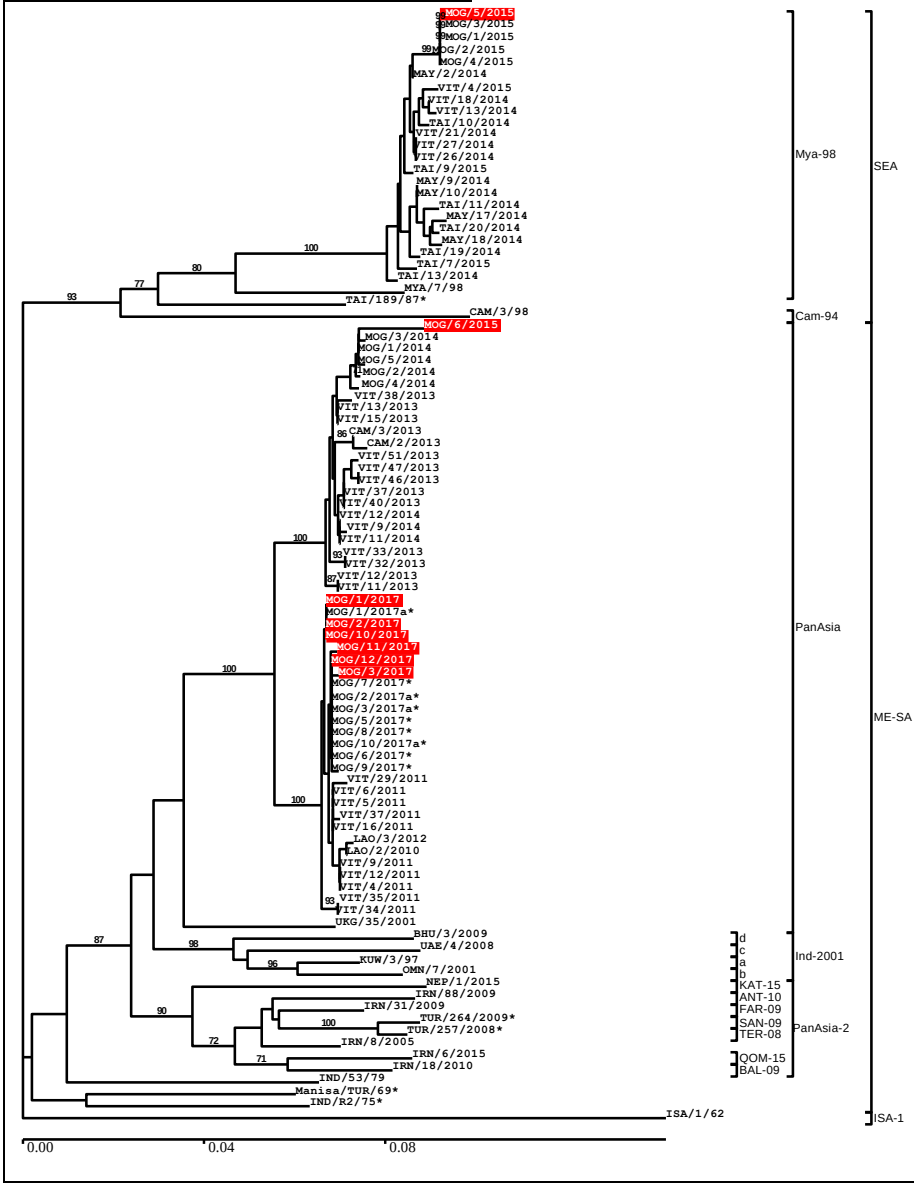
O (ME-SA/PanAsia): 7

O (SEA/Mya-98): 1

A (ASIA/Sea-97): 2

NVD: 6





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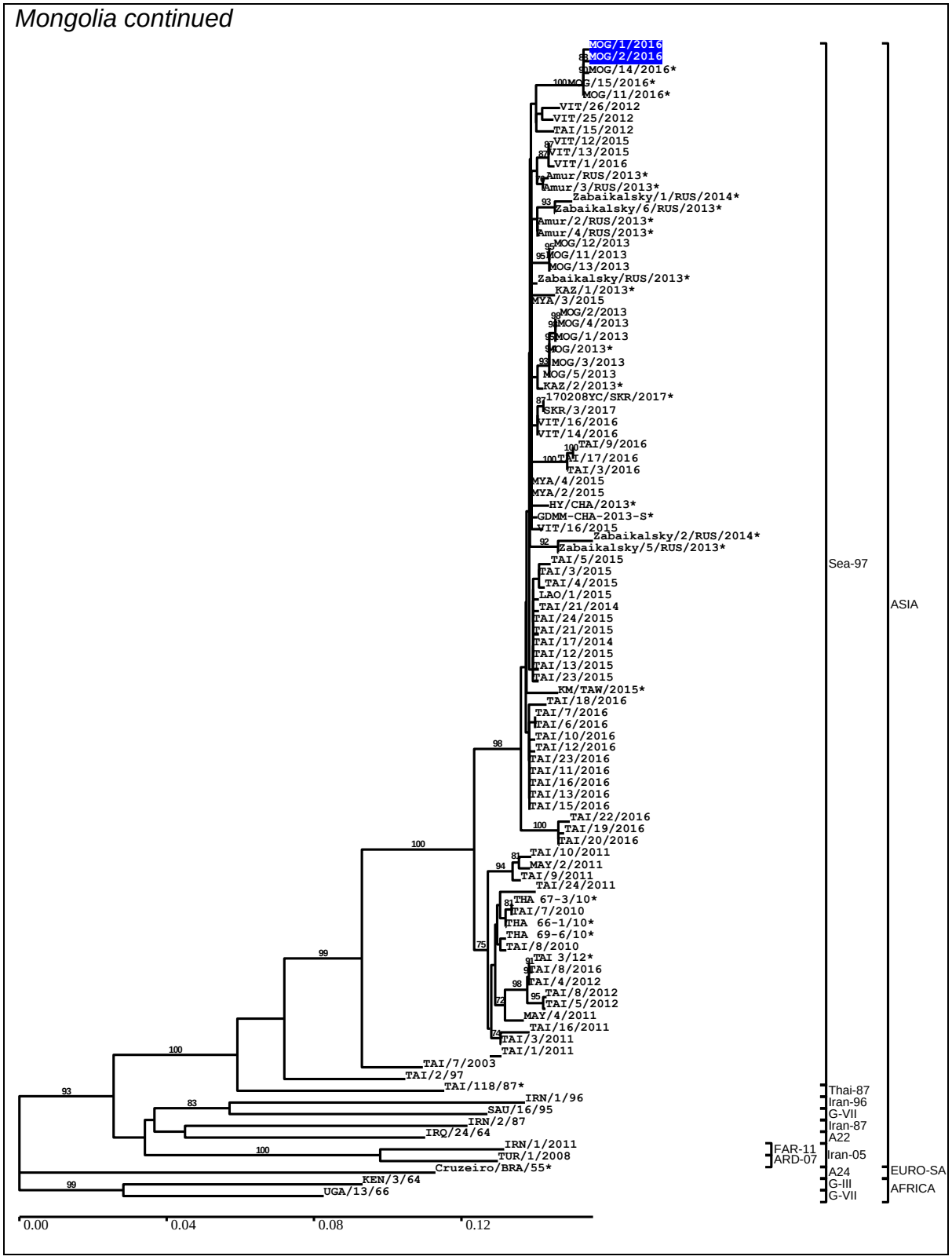
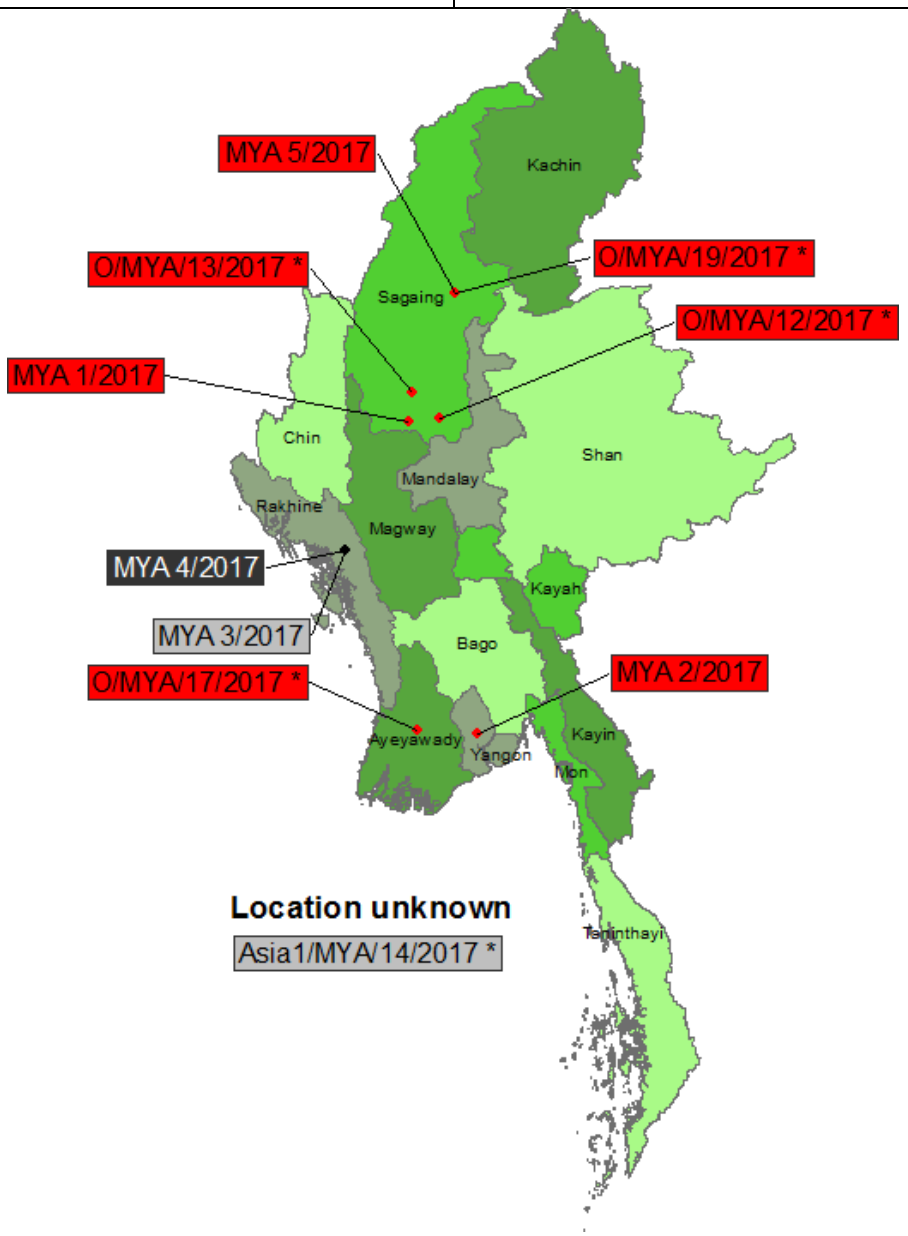


Myanmar **Batch:** WRLFMD/2017/00012 **Date received:** 23/05/2017 **No. of samples:** 5 O (ME-SA/Ind-2001d): 3 Asia 1 (ASIA/G-VIII): 1 FMDV-GD: 1	**Batch:** WRLMEG/2017/00034 **Date received:** 24/04/2017 **No. of sequence:** 5 O (ME-SA/Ind-2001d): 4 Asia 1 (ASIA/G-VIII): 1



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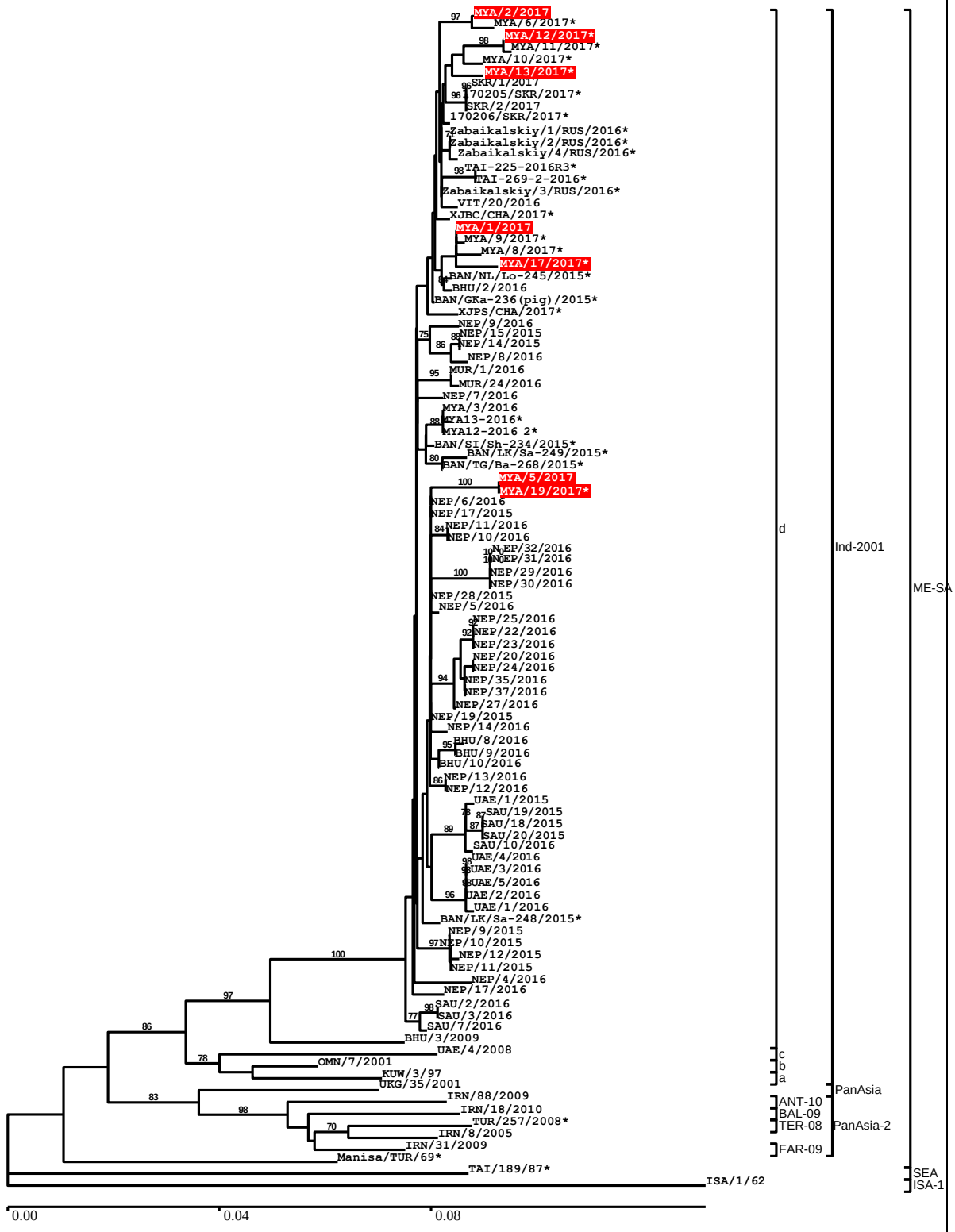

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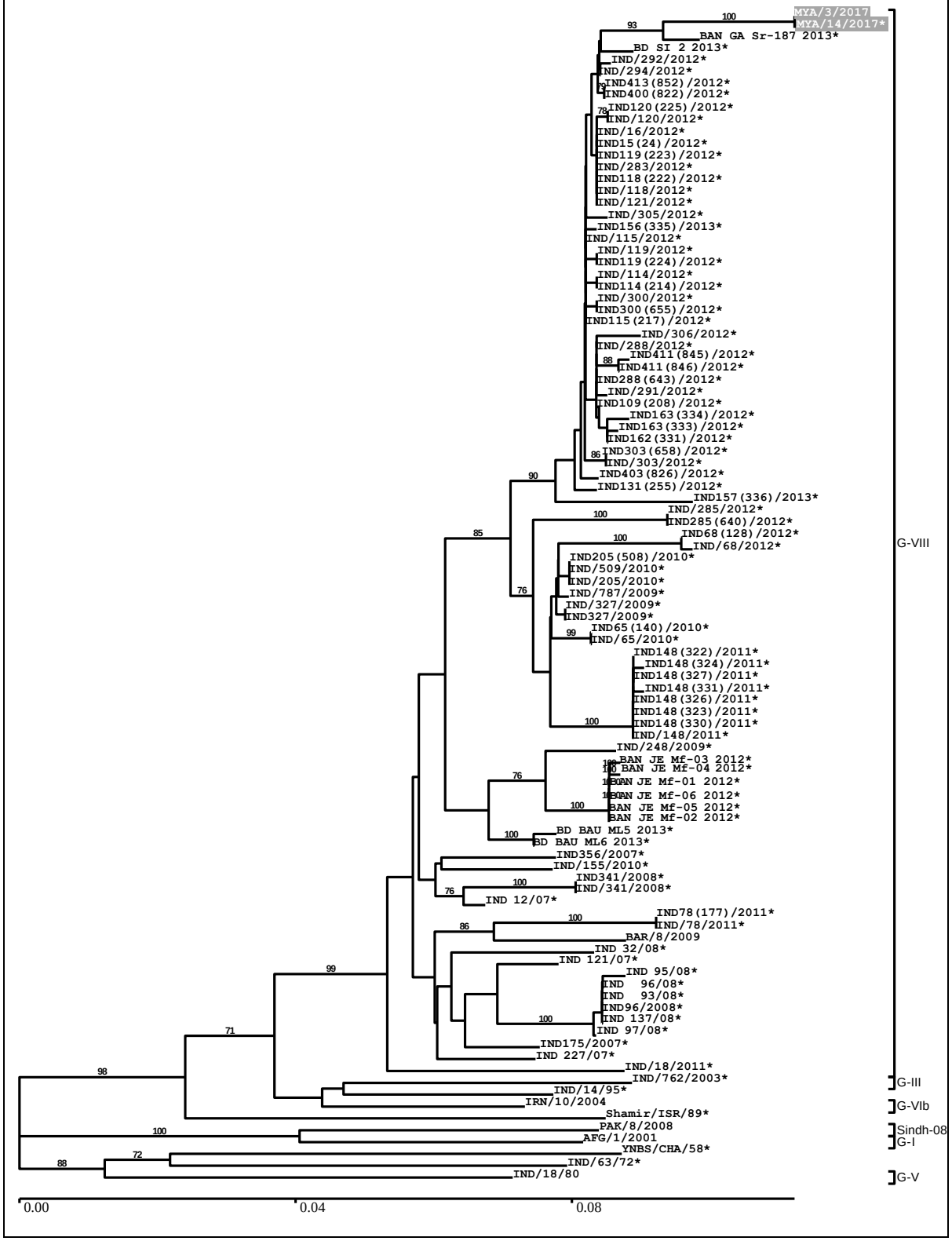
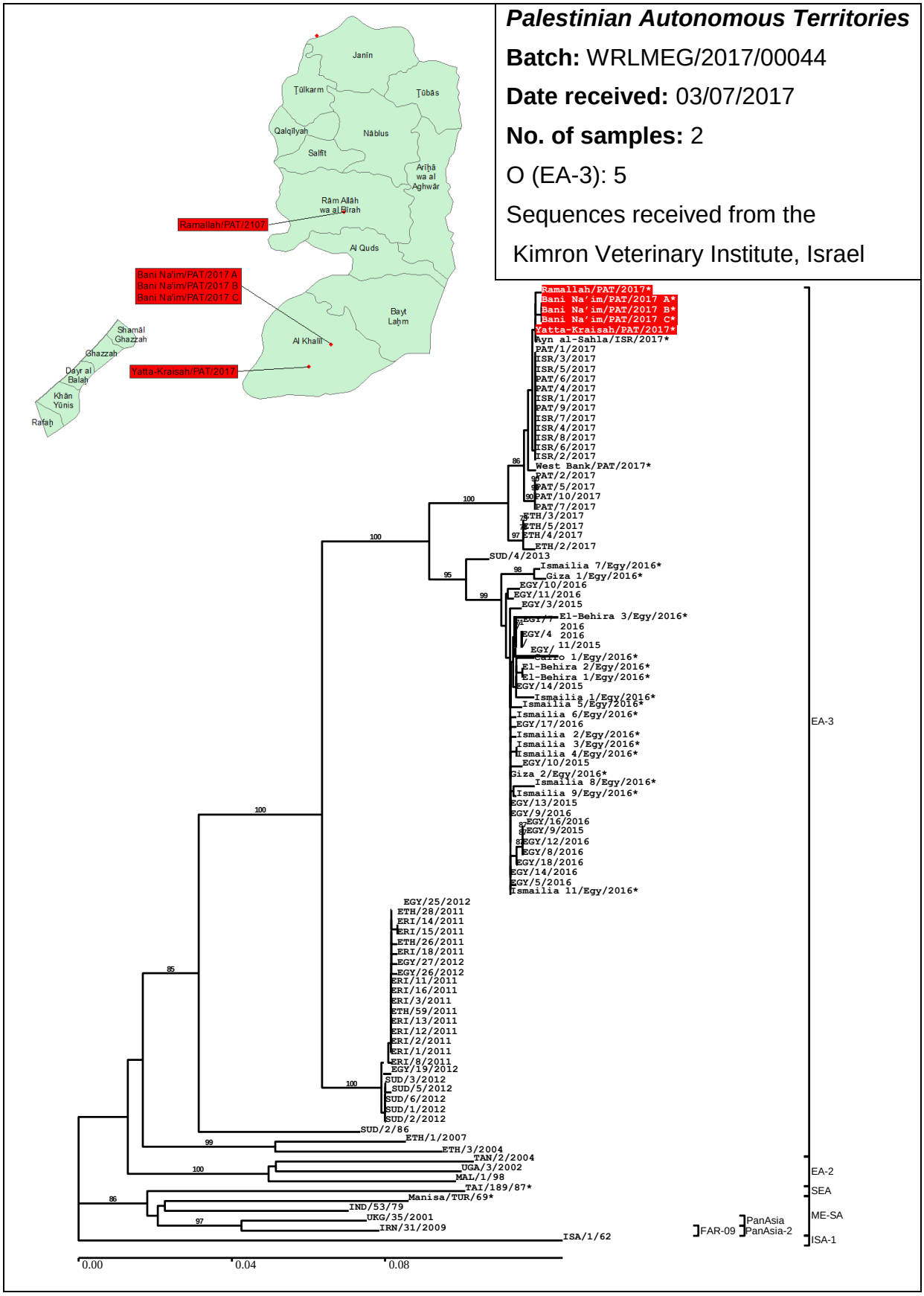
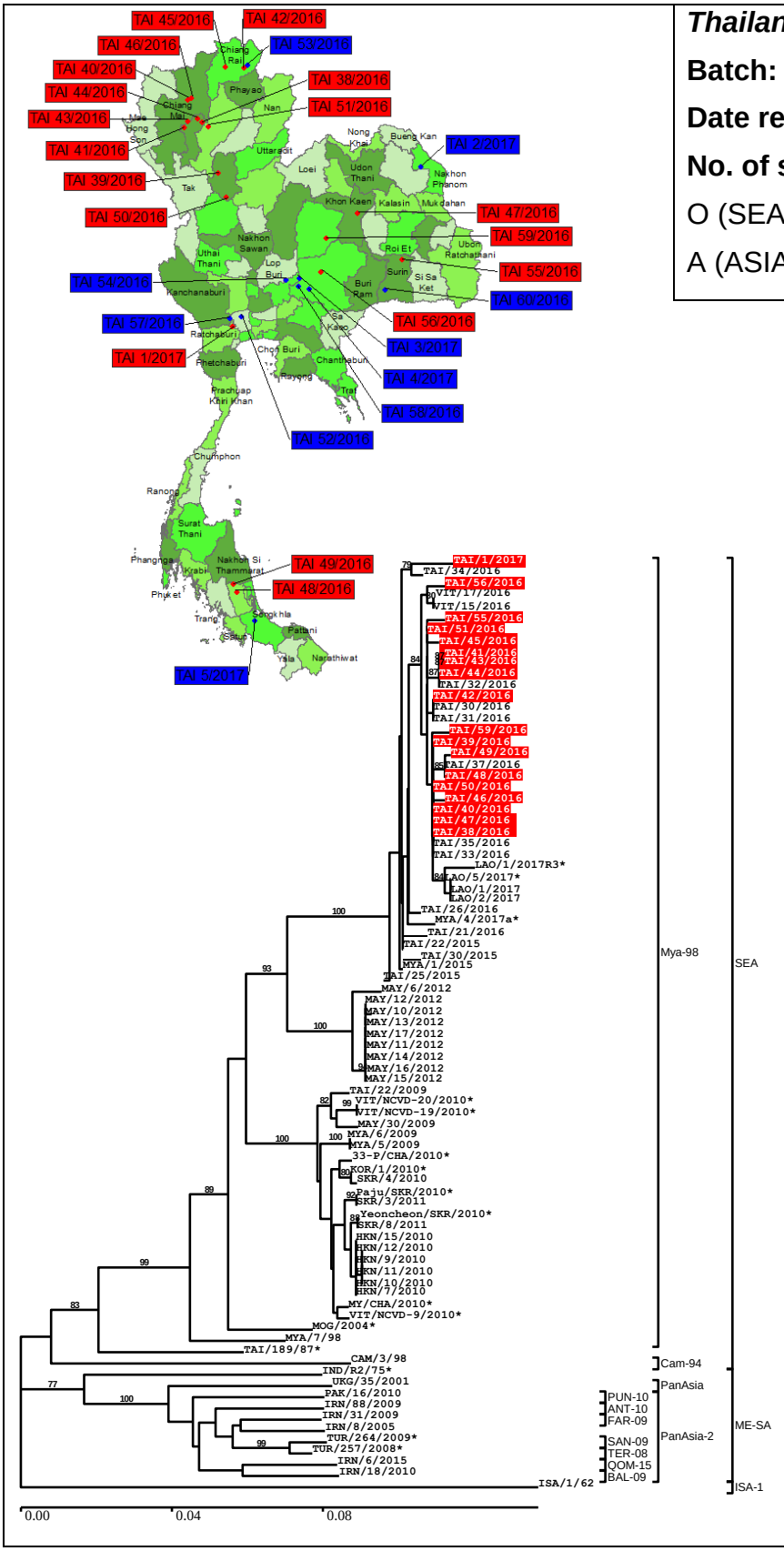






Thailand

Batch: WRLFMD/2017/00011

Date received: 23/05/2017

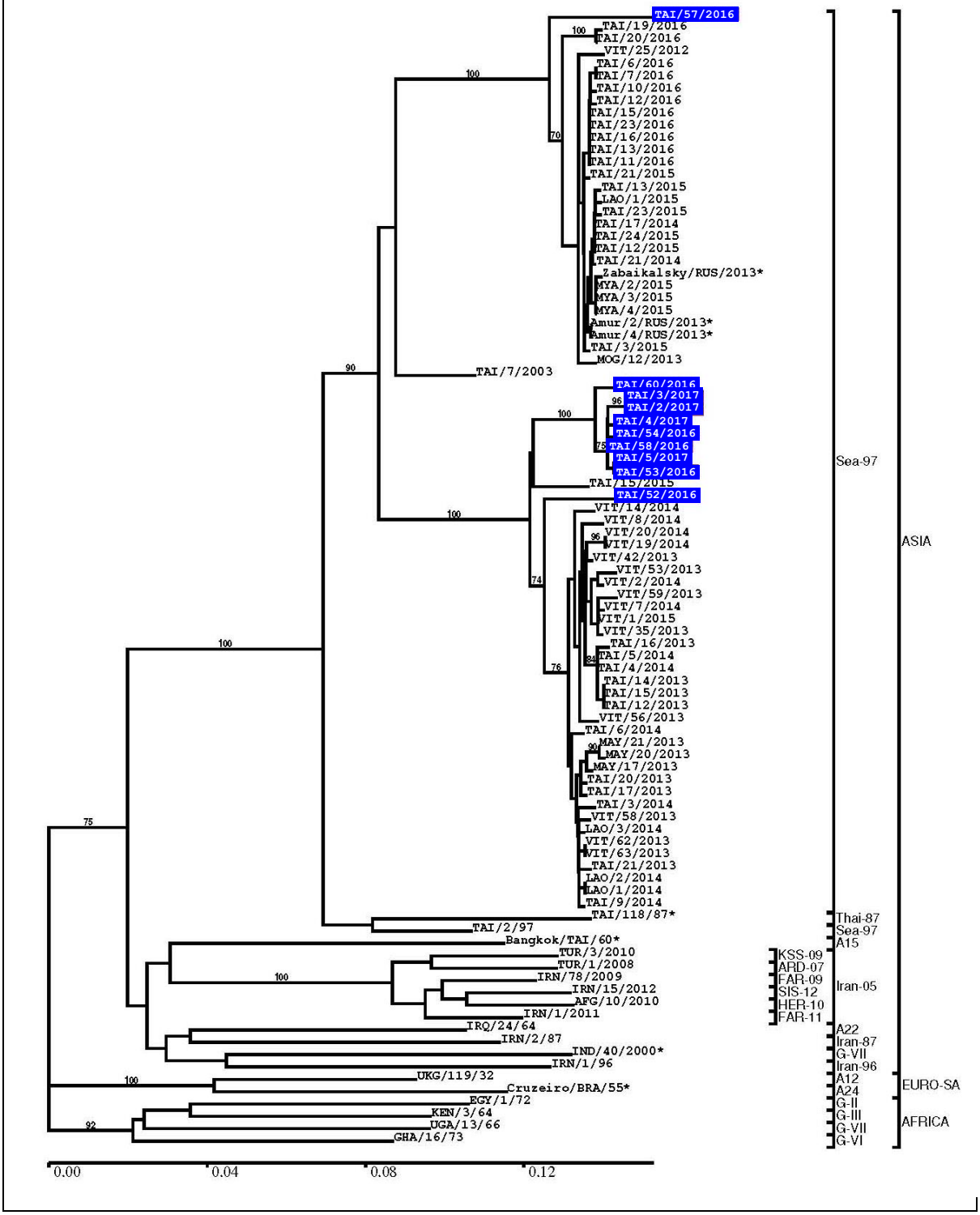
No. of samples: 28

O (SEA/Mya-98): 18

A (ASIA/Sea-97): 10

Thailand continued on next page

Thailand continued



2.2. AFRICA

Algeria

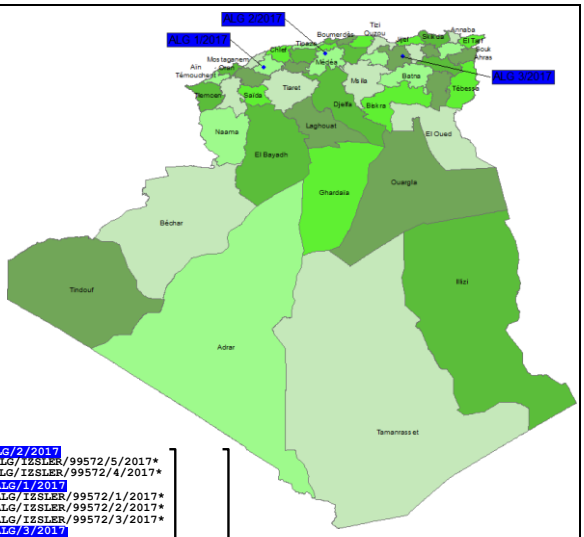
Batch: WRLFMD/2017/00006

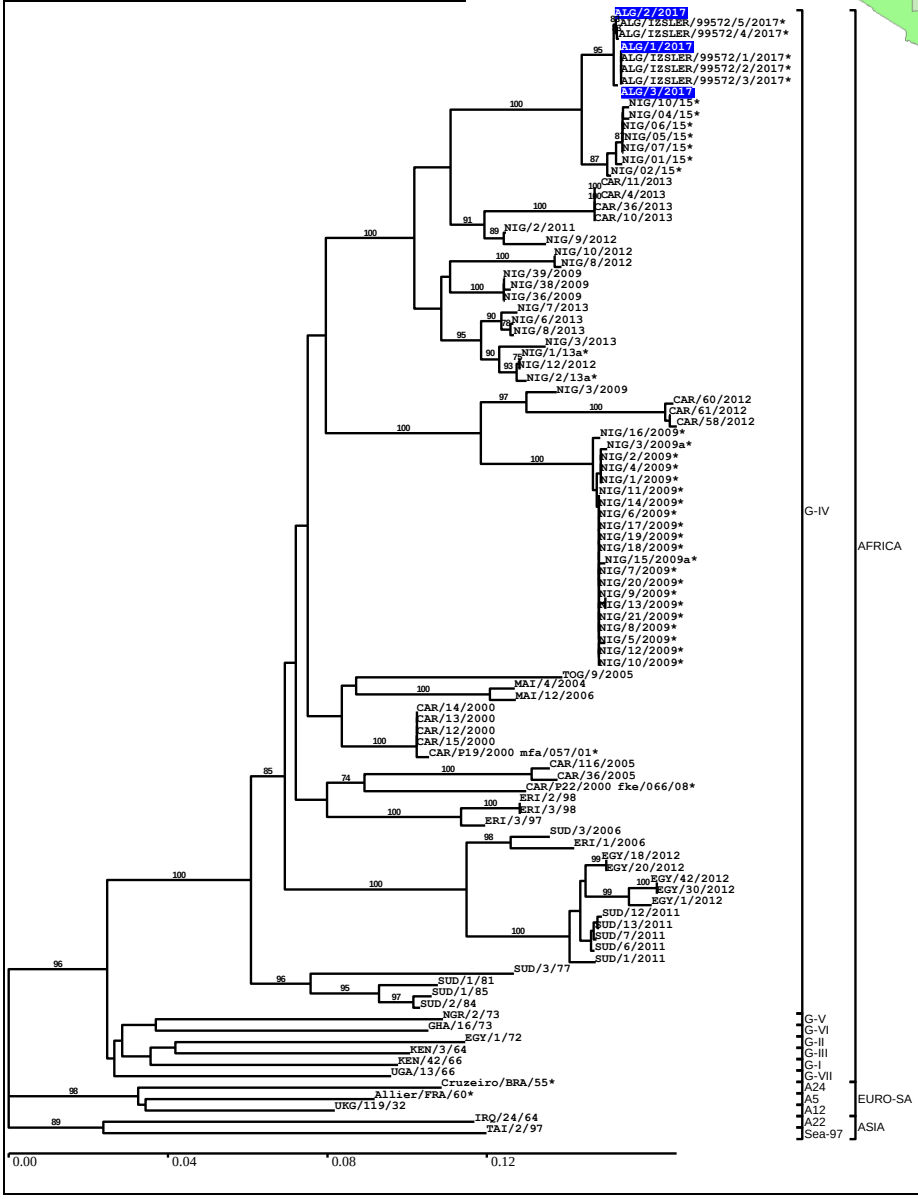
Date received: 18/04/2017

No. of samples: 3

A (AFRICA/G-IV): 3

** 5 sequences from the same locations as ALG 1/2017 and ALG 2/2017 for analysis were also received*





Ethiopia

Batch: WRLFMD/2017/00007

Date received: 11/04/2017

No. of samples: 27

O (EA-3): 4

O (EA-4): 13

FMDV-GD: 3

NVD: 7

Batch: WRLFMD/2017/00009

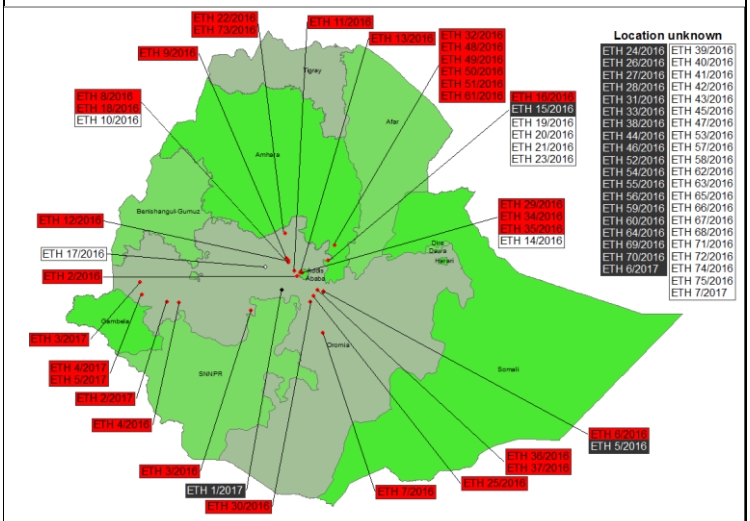
Date received: 15/05/2017

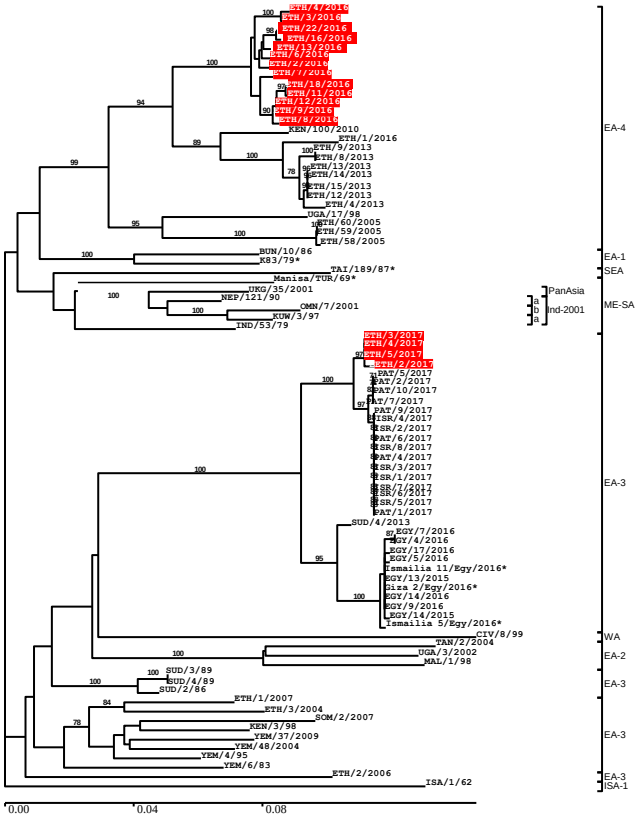
No. of samples: 54

O (EA-4): 14

FMDV-GD: 19

NVD: 21





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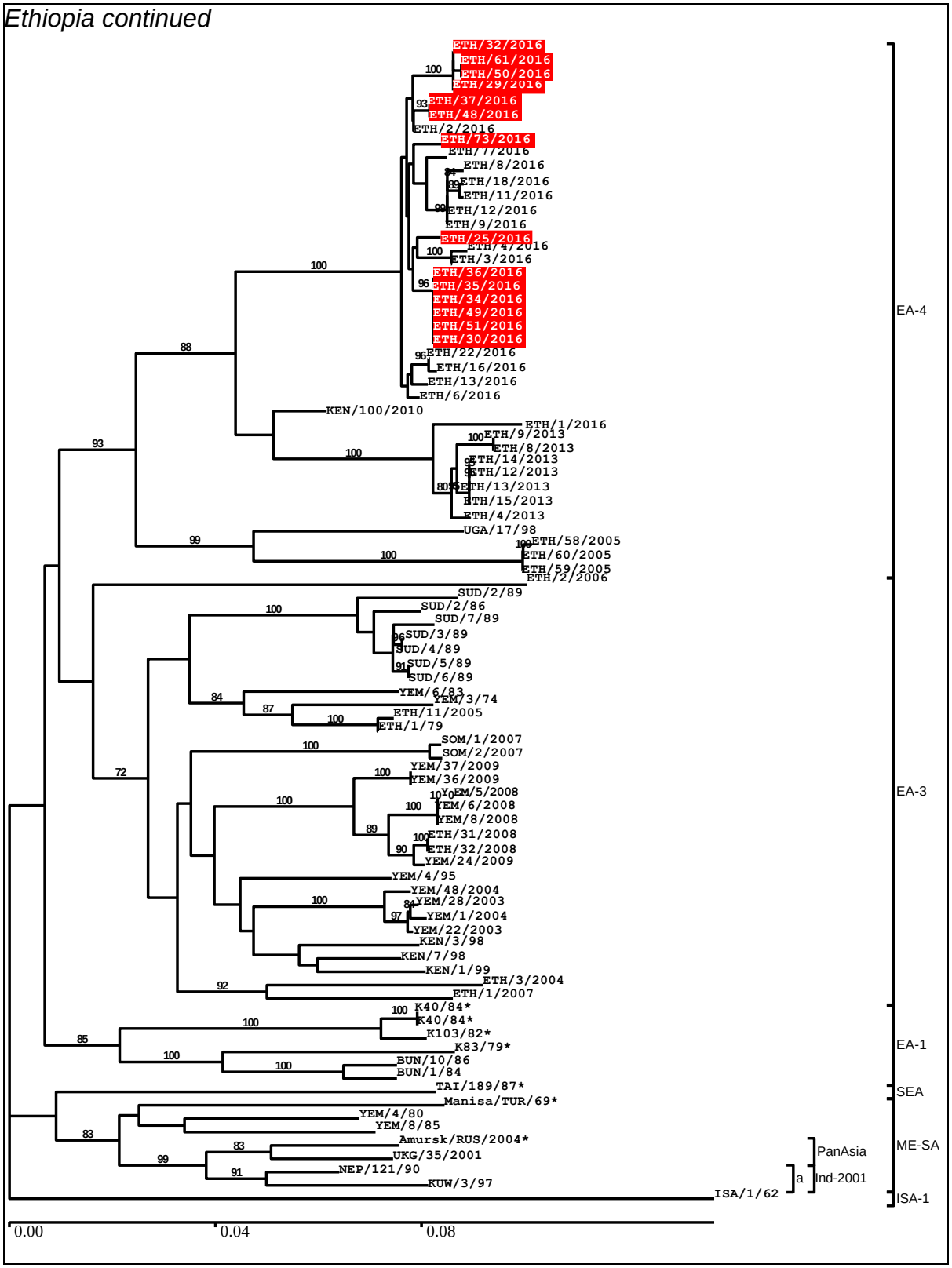

3. Vaccine matching

During this reporting period vaccine matching has been undertaken for 4 FMD virus field strains: serotype O (n=2) and serotype A (n=2). These are samples from Ethiopia and Iran.

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

4. Annex 1

4.1. Summary of Submissions

Table 2: Summary of samples collected and received to WRLFMD (April to June 2017)

Country	№ of samples	Virus isolation in cell culture/ELISA								RT-PCR for FMD (or SVD) virus (where appropriate)	
		FMD virus serotypes							No Virus Detected		
		O	A	C	SAT 1	SAT 2	SAT 3	ASIA -1		Positive	Negative
ALGERIA	3	-	3	-	-	-	-	-	-	3	-
CAMBODIA	4	-	-	-	-	-	-	-	-	-	-
ETHIOPIA	81	31	-	-	-	-	-	-	50	52	29
IRAN	24	9	9	-	-	-	-	-	6	22	2
LAOS	2	-	-	-	-	-	-	-	2	2	-
MONGOLIA	16	8	2	-	-	-	-	-	6	10	6
MYANMAR	5	3	-	-	-	-	-	-	2	5	-
THAILAND	28	18	10	-	-	-	-	-	-	28	-
TOTAL	**163**	**69**	**24**	**-**	**-**	**-**	**-**	**-**	**66**	**122**	**37**

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® April to June 2017

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		Final report
				VI/ELISA	RT-PCR	

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		Final report
				VI/ELISA	RT-PCR	
ALGERIA	ALG 1/2017	CATTLE	09-Apr-17	A	POS	A
	ALG 2/2017	CATTLE	09-Apr-17	A	POS	A
	ALG 3/2017	CATTLE	11-Apr-17	A	POS	A
CAMBODIA	CAM 1/2016	Awaiting information from sender	02-Dec-16	Pending	Pending	Pending
	CAM 2/2016	Awaiting information from sender	02-Dec-16	Pending	Pending	Pending
	CAM 3/2016	Awaiting information from sender	02-Dec-16	Pending	Pending	Pending
	CAM 4/2016	Awaiting information from sender	02-Dec-16	Pending	Pending	Pending
ETHIOPIA	ETH 2/2016	CATTLE	10-Feb-16	O	POS	O
	ETH 3/2016	CATTLE	23-Feb-16	O	NEG	O
	ETH 4/2016	CATTLE	04-Aug-16	O	POS	O
	ETH 5/2016	CATTLE	05-Aug-16	NEG	POS	FMDV GD
	ETH 6/2016	CATTLE	03-Sep-16	O	POS	O
	ETH 7/2016	CATTLE	05-Sep-16	O	POS	O
	ETH 8/2016	CATTLE	31-Oct-16	O	POS	O
	ETH 9/2016	CATTLE	31-Oct-16	NEG	NEG	NVD
	ETH 10/2016	CATTLE	31-Oct-16	O	POS	O
	ETH 11/2016	CATTLE	11-Nov-16	O	POS	O
	ETH 12/2016	CATTLE	11-Nov-16	O	POS	O
	ETH 13/2016	CATTLE	18-Nov-16	NEG	NEG	NVD
	ETH 14/2016	CATTLE	18-Nov-16	NEG	POS	FMDV GD
	ETH 15/2016	CATTLE	20-Nov-16	O	POS	O
	ETH 16/2016	CATTLE	27-Nov-16	NEG	NEG	NVD
	ETH 17/2016	CATTLE	29-Nov-16	O	POS	O
	ETH 18/2016	CATTLE	31-Nov-16	NEG	NEG	NVD
	ETH 19/2016	CATTLE	18-Dec-16	NEG	NEG	NVD
	ETH 20/2016	CATTLE	18-Dec-16	NEG	NEG	NVD
	ETH 21/2016	CATTLE	18-Dec-16	O	POS	O
	ETH 22/2016	CATTLE	27-Dec-16	NEG	NEG	NVD
	ETH 23/2016	CATTLE	31-Dec-16	NEG	POS	FMDV GD
	ETH 24/2016	BOVINE	03-Jan-16	NEG	POS	FMDV GD
	ETH 25/2016	BOVINE	03-Jan-16	O	POS	O
	ETH 26/2016	BOVINE	27-Jan-16	NEG	POS	FMDV GD
	ETH 27/2016	BOVINE	27-Jan-16	NEG	POS	FMDV GD
	ETH 28/2016	BOVINE	03-Mar-16	NEG	POS	FMDV GD
	ETH 29/2016	BOVINE	03-Mar-16	O	POS	O
	ETH 30/2016	BOVINE	16-Mar-16	O	POS	O
	ETH 31/2016	BOVINE	16-Mar-16	NEG	POS	FMDV GD
	ETH 32/2016	BOVINE	12-Apr-16	O	POS	O
	ETH 33/2016	BOVINE	12-Apr-16	NEG	POS	FMDV GD
	ETH 34/2016	BOVINE	27-Jun-16	O	POS	O
	ETH 35/2016	BOVINE	27-Jun-16	O	POS	O
	ETH 36/2016	BOVINE	08-Aug-16	O	POS	O
	ETH 37/2016	BOVINE	08-Aug-16	O	POS	O
	ETH 38/2016	BOVINE	11-Aug-16	NEG	POS	FMDV GD
	ETH 39/2016	BOVINE	11-Aug-16	NEG	NEG	NVD
	ETH 40/2016	BOVINE	12-Sep-16	NEG	NEG	NVD
	ETH 41/2016	BOVINE	12-Sep-16	NEG	NEG	NVD
	ETH 42/2016	BOVINE	02-Oct-16	NEG	NEG	NVD
	ETH 43/2016	BOVINE	02-Oct-16	NEG	NEG	NVD
	ETH 44/2016	BOVINE	12-Oct-16	NEG	POS	FMDV GD

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		Final report
				VI/ELISA	RT-PCR	
	ETH 45/2016	BOVINE	12-Oct-16	NEG	NEG	NVD
	ETH 46/2016	BOVINE	12-Oct-16	NEG	POS	FMDV GD
	ETH 47/2016	BOVINE	12-Oct-16	NEG	NEG	NVD
	ETH 48/2016	BOVINE	13-Oct-16	O	POS	O
	ETH 49/2016	BOVINE	13-Oct-16	O	POS	O
	ETH 50/2016	BOVINE	21-Oct-16	O	POS	O
	ETH 51/2016	BOVINE	21-Oct-16	O	POS	O
	ETH 52/2016	BOVINE	28-Oct-16	NEG	POS	FMDV GD
	ETH 53/2016	BOVINE	28-Oct-16	NEG	NEG	NVD
	ETH 54/2016	BOVINE	28-Oct-16	NEG	POS	FMDV GD
	ETH 55/2016	BOVINE	28-Oct-16	NEG	POS	FMDV GD
	ETH 56/2016	BOVINE	11-Nov-16	NEG	POS	FMDV GD
	ETH 57/2016	BOVINE	11-Nov-16	NEG	NEG	NVD
	ETH 58/2016	BOVINE	11-Nov-16	NEG	NEG	NVD
	ETH 59/2016	BOVINE	11-Nov-16	NEG	POS	FMDV GD
	ETH 60/2016	BOVINE	23-Nov-16	NEG	POS	FMDV GD
	ETH 61/2016	BOVINE	23-Nov-16	O	POS	O
	ETH 62/2016	BOVINE	13-Dec-16	NEG	NEG	NVD
	ETH 63/2016	BOVINE	13-Dec-16	NEG	NEG	NVD
	ETH 64/2016	BOVINE	18-Dec-16	NEG	POS	FMDV GD
	ETH 65/2016	BOVINE	18-Dec-16	NEG	NEG	NVD
	ETH 66/2016	BOVINE	19-Dec-16	NEG	NEG	NVD
	ETH 67/2016	BOVINE	19-Dec-16	NEG	NEG	NVD
	ETH 68/2016	BOVINE	19-Dec-16	NEG	NEG	NVD
	ETH 69/2016	BOVINE	19-Dec-16	NEG	POS	FMDV GD
	ETH 70/2016	BOVINE	20-Dec-16	NEG	POS	FMDV GD
	ETH 71/2016	BOVINE	20-Dec-16	NEG	NEG	NVD
	ETH 72/2016	BOVINE	20-Dec-16	NEG	NEG	NVD
	ETH 73/2016	BOVINE	20-Dec-16	O	POS	O
	ETH 74/2016	BOVINE	27-Dec-16	NEG	NEG	NVD
	ETH 75/2016	BOVINE	27-Dec-16	NEG	NEG	NVD
	ETH 1/2017	CATTLE	18-Mar-17	O	POS	O
	ETH 2/2017	CATTLE	18-Mar-17	O	POS	O
	ETH 3/2017	CATTLE	18-Mar-17	O	POS	O
	ETH 4/2017	CATTLE	18-Mar-17	O	POS	O
	ETH 5/2017	CATTLE	18-Mar-17	O	POS	O
	ETH 6/2017	BOVINE	01-Apr-17	NEG	POS	FMDV GD
	ETH 7/2017	BOVINE	01-Apr-17	NEG	NEG	NVD
	IRN 30/2016	SHEEP	21-Oct-16	NEG	NEG	NVD
	IRN 31/2016	CATTLE	14-Nov-16	O	POS	O
	IRN 32/2016	CATTLE	28-Nov-16	NEG	POS	FMDV GD
	IRN 33/2016	SHEEP	30-Nov-16	NEG	NEG	NVD
	IRN 34/2016	CATTLE	06-Dec-16	A	POS	A
	IRN 35/2016	CATTLE	14-Dec-16	O	POS	O
	IRN 36/2016	SHEEP	22-Dec-16	O	POS	O
IRAN	IRN 37/2016	CATTLE	24-Dec-16	O	POS	O
	IRN 38/2016	SHEEP	26-Dec-16	NEG	POS	FMDV GD
	IRN 39/2016	CATTLE	30-Dec-16	A	POS	A
	IRN 1/2017	CATTLE	01-Jan-17	NEG	POS	FMDV GD
	IRN 2/2017	CATTLE	07-Jan-17	A	POS	A
	IRN 3/2017	SHEEP	07-Jan-17	O	POS	O
	IRN 4/2017	CATTLE	11-Jan-17	A	POS	A
	IRN 5/2017	CATTLE	12-Jan-17	O	POS	O

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		Final report
				VI/ELISA	RT-PCR	
	IRN 6/2017	SHEEP	25-Jan-17	A	POS	A
	IRN 7/2017	CATTLE	31-Jan-17	A	POS	A
	IRN 8/2017	CATTLE	02-Feb-17	O	POS	O
	IRN 9/2017	CATTLE	15-Feb-17	A	POS	A
	IRN 10/2017	CATTLE	20-Feb-17	A	POS	A
	IRN 11/2017	CATTLE	20-Feb-17	O	POS	O
	IRN 12/2017	CATTLE	23-Feb-17	O	POS	O
	IRN 13/2017	SHEEP	25-Feb-17	A	POS	A
	IRN 14/2017	CATTLE	25-Feb-17	NEG	POS	FMDV GD
LAOS	LAO 1/2017	CATTLE	30-Jan-17	NEG	POS	FMDV GD
	LAO 2/2017	CATTLE	30-Jan-17	NEG	POS	FMDV GD
	MOG 5/2015	CATTLE	03-Mar-15	O	POS	O
	MOG 6/2015	CATTLE	12-May-15	O	POS	O
	MOG 1/2016	CATTLE	29-Aug-16	A	POS	A
	MOG 2/2016	SHEEP	20-Sep-16	A	POS	A
	MOG 1/2017	CATTLE	28-Jan-17	O	POS	O
	MOG 2/2017	CATTLE	28-Jan-17	O	POS	O
	MOG 3/2017	CATTLE	31-Jan-17	O	POS	O
MONGOLIA	MOG 4/2017	CATTLE	09-Feb-17	NEG	NEG	NVD
	MOG 5/2017	CATTLE	20-Feb-17	NEG	NEG	NVD
	MOG 6/2017	CATTLE	20-Feb-17	NEG	NEG	NVD
	MOG 7/2017	CATTLE	20-Feb-17	NEG	NEG	NVD
	MOG 8/2017	CATTLE	23-Feb-17	NEG	NEG	NVD
	MOG 9/2017	CATTLE	23-Feb-17	NEG	NEG	NVD
	MOG 10/2017	CATTLE	23-Mar-17	O	POS	O
	MOG 11/2017	CATTLE	23-Mar-17	O	POS	O
	MOG 12/2017	CATTLE	03-Apr-17	O	POS	O
	MYA 1/2017	CATTLE	27-Jan-17	O	POS	O
	MYA 2/2017	CATTLE	27-Jan-17	O	POS	O
MYANMAR	MYA 3/2017	CATTLE	08-Apr-17	NEG	POS	FMDV GD
	MYA 4/2017	CATTLE	08-Apr-17	NEG	POS	FMDV GD
	MYA 5/2017	CATTLE	08-Apr-17	O	POS	O
	TAI 38/2016	CATTLE	03-Aug-16	O	POS	O
	TAI 39/2016	CATTLE	03-Aug-16	O	POS	O
	TAI 40/2016	CATTLE	09-Aug-16	O	POS	O
	TAI 41/2016	CATTLE	09-Aug-16	O	POS	O
	TAI 42/2016	CATTLE	09-Aug-16	O	POS	O
	TAI 43/2016	CATTLE	09-Aug-16	O	POS	O
	TAI 44/2016	CATTLE	09-Aug-16	O	POS	O
	TAI 45/2016	CATTLE	15-Aug-16	O	POS	O
	TAI 46/2016	CATTLE	22-Aug-16	O	POS	O
THAILAND	TAI 47/2016	CATTLE	26-Aug-16	O	POS	O
	TAI 48/2016	CATTLE	29-Aug-16	O	POS	O
	TAI 49/2016	CATTLE	01-Sep-16	O	POS	O
	TAI 50/2016	CATTLE	02-Sep-16	O	POS	O
	TAI 51/2016	CATTLE	02-Sep-16	O	POS	O
	TAI 52/2016	CATTLE	04-Nov-16	A	POS	A
	TAI 53/2016	CATTLE	08-Nov-16	A	POS	A
	TAI 54/2016	CATTLE	11-Nov-16	A	POS	A
	TAI 55/2016	CATTLE	28-Nov-16	O	POS	O
	TAI 56/2016	CATTLE	29-Nov-16	O	POS	O

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		Final report
				VI/ELISA	RT-PCR	
	TAI 57/2016	CATTLE	29-Nov-16	A	POS	A
	TAI 58/2016	CATTLE	30-Nov-16	A	POS	A
	TAI 59/2016	CATTLE	30-Nov-16	O	POS	O
	TAI 60/2016	CATTLE	30-Nov-16	A	POS	A
	TAI 1/2017	SWINE	10-Jan-17	O	POS	O
	TAI 2/2017	CATTLE	11-Jan-17	A	POS	A
	TAI 3/2017	CATTLE	13-Jan-17	A	POS	A
	TAI 4/2017	CATTLE	19-Jan-17	A	POS	A
	TAI 5/2017	CATTLE	03-Feb-17	A	POS	A

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

4.3. Antigenic Characterisation

Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from April to June 2017.

Table 4: Vaccine matching studies for O FMDV by VNT

Strain	Serotype	Topotype	Strain	O 3039	O1 Manisa	O/TUR/5/2009
ETH/2/2017	O	EA-3	n/d	N	N	Y
ETH/11/2016	O	EA-4	n/d	N	N	Y

Table 5: Vaccine matching studies for A FMDV by VNT

Strain	Serotype	Topotype	Strain	A/IRN/05	A/TUR/20/06	A22 IRAQ	A TUR 11	A TUR 14	A CRUZ BVS
ALG/2/2017	A	AFRICA	G-IV	N	N	B	n/d	n/d	N
ALG/3/2017	A	AFRICA	G-IV	N	N	B	n/d	n/d	N

Abbreviations used in tables

M	Vaccine Match *r_1 = ≥ 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.*
N	No Vaccine Match *r_1 = < 0.3. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect*
B	Borderline *Any r_1 values between 0.28 to 0.32*
NT	Not tested against this vaccine

5. Annex 2

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

1. Abd El-Rahim, I.H.A., A.H. Asghar, A.M. Mohamed, and S.M. Fat'hi (2016). The impact of importation of live ruminants on the epizootiology of Foot and mouth disease in Saudi Arabia. *Revue scientifique et technique (International Office of Epizootics)*, **35**(3): 769-778.
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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)

June 2017:

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)* Asia 1 Shamir A Iran-05 *(or A TUR 06)* A22 Iraq A24 Cruzeiro O BFS or Campos SAT 2 Saudi Arabia *(or equivalent i.e. SAT 2 Eritrea)*
Medium Priority	A Eritrea-98 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 vaccines supplied by international manufacturers for this viral lineage.