



WRLFMD Quarterly Report October-December 2014

Reference Laboratory Contract Report

Foot-and-Mouth Disease



Summary of samples tested and reported FMD outbreaks

ASIA

Bahrain

Three samples were received by the WRLFMD from the Northern Governorate of Bahrain, collected from cattle during October 2014. Viruses isolated from all three samples were identified as FMD type O virus. Genotyping showed them to belong to the ME-SA topotype, PanAsia-2^{ANT-10} lineage (see below).

Hong Kong SAR, P.R. China

Two samples submitted to the WRLFMD from Sheung Shui, New Territories, collected from pigs on 25th November 2014. One was found to contain FMD type O virus but only FMDV genome could be detected in the other. Genotyping showed the former to belong to the CATHAY topotype and to be closely related to viruses present in Hong Kong SAR since 2010 (see below).

People's Republic of China

Two outbreaks due to FMD type A were reported on 08/10/2014 and 15/12/2014 at Shannan, Tibet and Lasa, Tibet, respectively, both in cattle. On 18/11/2014 a single outbreak of FMD type O was reported in pigs in Dongdai, JiangSu Province. No genotyping has been reported for any of these outbreaks.

Republic of Korea (South Korea)

In December three outbreaks of FMD type O were reported in pigs in Chungcheongbuk-do (two outbreaks) and Chungcheongnam-do (one outbreak). VP1 sequencing at the Animal and Plant Quarantine Agency (ROK) showed that the virus from the first outbreak belonged to the SEA topotype, Mya-98 lineage (see below). The results of 10 samples received by the WRLFMD on 22nd December 2014 are pending.

Vietnam

Thirty two samples were submitted to the WRLFMD. These had been collected from cattle, water buffalo and pigs between December 2013 and July 2014. FMD type O virus was isolated from 12 samples, type A from 13 samples and FMDV genome was detected by real-time RT-PCR in the remaining seven samples. VP1 genotyping revealed seven of the type O viruses belonged to the ME-SA topotype, PanAsia lineage and five to the SEA topotype, Mya-98 lineages. All the type A viruses belonged to the ASIA topotype, Sea-97 lineage (see below).

AFRICA

Algeria

Two outbreaks of FMD type O were reported to have occurred in cattle in late September 2014 in the M'Sila and Ain Defla provinces.

Botswana

On 27/10/2014 an outbreak due to FMD type SAT 1 was reported in cattle at Tjaa crush, Tubu, Gumare, Ngamiland. No genotyping has been reported. Four samples were received



from the BVI collected from cattle on 26/06/2014 at Mohembo East, Shakawe, Ngamiland. FMD type SAT 1 was identified in three samples and genotyping showed them to belong to topotype III (WZ) (see below).

Six samples were received from the BVI collected from cattle between February and June 2013 in the Maun area of Ngamiland. FMD type SAT 2 was identified in two of these (from 20/02/2013). VP1 genotyping showed these to belong to topotype III (see below).

Egypt

Twenty eight samples were received by the WRLFMD from cattle and water buffalo collected in various locations in the country between May 2012 and October 2014. FMD type O was isolated from nine samples collected between April and October 2014 and VP1 genotyping showed them all to belong to the EA-3 topotype (see below). FMD type A was isolated from four samples; one collected in May 2012 and two in March 2013 and one in May 2014. VP1 genotyping showed the virus from 2012 to belong to the AFRICA topotype, G-IV lineage while to other three viruses belonged to the ASIA topotype, Iran-05^{BAR-08} lineage (see below). FMD type SAT 2 was isolated from two samples collected in May 2012 and April 2014. VP1 genotype showed them to belong to topotype VII, the former falling within the Ghb-12 lineage and the latter in the Alx-12 lineage (see below).

Ethiopia

Sixteen samples were received by the WRLFMD. Half were sera collected from sheep and half tissue suspensions from samples collected from cattle. No virus was detected in any of the sheep sera. FMDV genome was detected in seven of the tissue suspensions, but no viruses could be typed by ELISA or isolated in cell cultures. RT-PCR amplification of the VP1-coding region was successful in two samples (ETH/6/2014 and ETH/10/2014), although only a faint band was present in the latter sample. Both samples were identified as FMD type O. Phylogenetic analysis of ETH/6/2014 showed it to belong to the EA-3 topotype; insufficient sequence data was obtained to conclusively identify the genotype of ETH/10/2014.

Mali

A partial VP1 sequence was received to WRLFMD from RRLSSA - BVI (Botswana) for a virus collected during 2014. Phylogenetic analysis showed that this sequence was derived from a SAT 2 serotype FMD virus (within topotype VII) most closely related to FMD viruses previously recovered from Nigeria in 2012.

Mozambique

Four samples were received from the BVI (Botswana) collected from outbreaks in cattle in Maputo on 24/07/2014. All were identified as FMD type SAT 2. VP1 genotyping showed them to belong to topotype I as previously described by the BVI (see below).

Namibia

On 01/12/2014 an outbreak due to FMD type SAT 2 was reported at in cattle at Linyati, Caprivi. Genotyping by the BVI (two VP1 sequences were received on 11/12/2014) showed viruses from Kikiya Crush, East Caprivi to belong to topotype III (see below).

South Africa

Two outbreaks of FMD type SAT 2 were reported to have occurred in June 2014 in cattle in Bushbuckridge, Mpumalanga within South Africa's FMD protection zone where routine



vaccination is practised. There have been a number of outbreaks in this area since August 2013.

Tunisia

Sixteen new outbreaks of FMD type O were reported to have occurred between June and September 2014 in cattle, sheep and goats in eight provinces (Ariana, Beja, Ben Arous, Jendouba, Kasserine, Mannouba, Nabeul and Zaghouan).

Zimbabwe

Thirteen samples were received from the BVI which had been collected from cattle between July 2010 and September 2014 at various locations. FMD type SAT 2 was isolated from six of the samples, three from 2010 and three from 2014. VP1 genotyping showed five of these to belong to toptype I (at least two distinct unnamed lineages), but one sample from Mwenezi District, Masvingo Province (collected in May 2014) belonged to toptype II (see below).

SOUTH AMERICA

No new outbreaks of FMD were reported in the region.

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/2014.htm.



Results from samples received at WRLFMD (status of samples being tested) are shown in Table 1 (below) and a complete list of clinical sample diagnostics made by the WRLFMD between October and December 2014 is shown in Table 2 (Annex 1). A record of all samples received by WRLFMD (October and December 2014) is shown in Table 3 (Annex 1).

Table 1: Status of sequencing of samples received by the WRLFMD from October to December 2014.

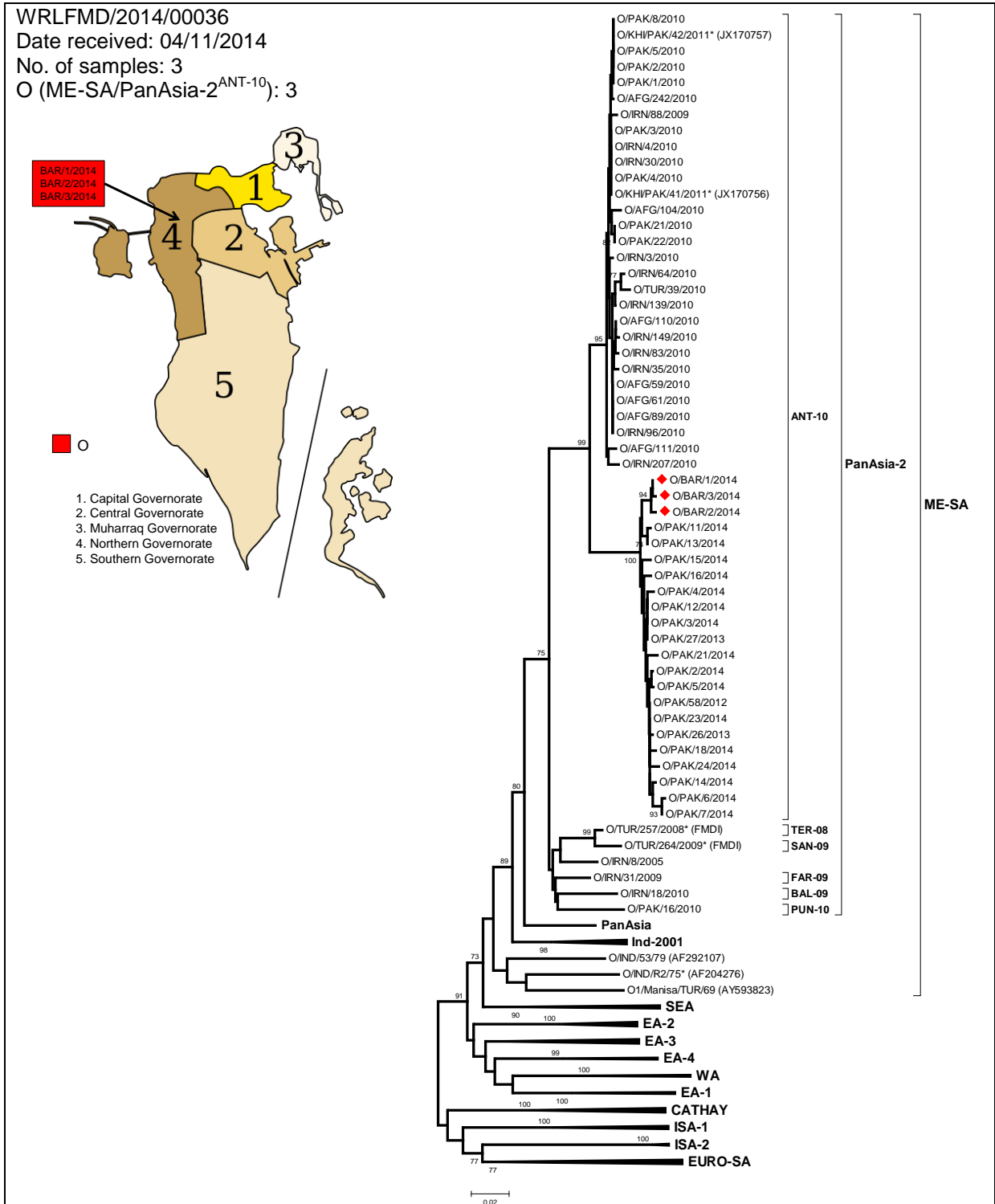
WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2014/0031	13-Oct-14	Botswana	SAT 1	3	3	Completed
WRLFMD/2014/0031	13-Oct-14	Botswana	SAT 2	2	2	Completed
WRLFMD/2014/0032	13-Oct-14	Mozambique	SAT 2	4	4	Completed
WRLFMD/2014/0033	13-Oct-14	Zimbabwe	SAT 2	6	6	Completed
WRLFMD/2014/0035	28-Oct-14	Vietnam	A	13	13	Completed
WRLFMD/2014/0035	28-Oct-14	Vietnam	O	12	12	Completed
WRLFMD/2014/0036	4-Nov-14	Bahrain	O	3	3	Completed
WRLFMD/2014/0037	4-Nov-14	Egypt	A	4	4	Completed
WRLFMD/2014/0037	4-Nov-14	Egypt	O	9	9	Completed
WRLFMD/2014/0037	4-Nov-14	Egypt	SAT 2	2	2	Completed
WRLFMD/2014/0038	27-Nov-14	Ethiopia	O	2	2	Completed
WRLFMD/2014/0039	11-Dec-14	Hong Kong SAR	O	1	1	Completed
WRLFMD/2014/0040	22-Dec-14	South Korea	Pending	10		Pending
				71	61	

During this reporting period, additional sequences were received to WRLFMD via RRLSSA-BVI (Botswana) for samples collected in Namibia and Mali.



Detailed Analysis
ASIA

Figure 1: Bahrain

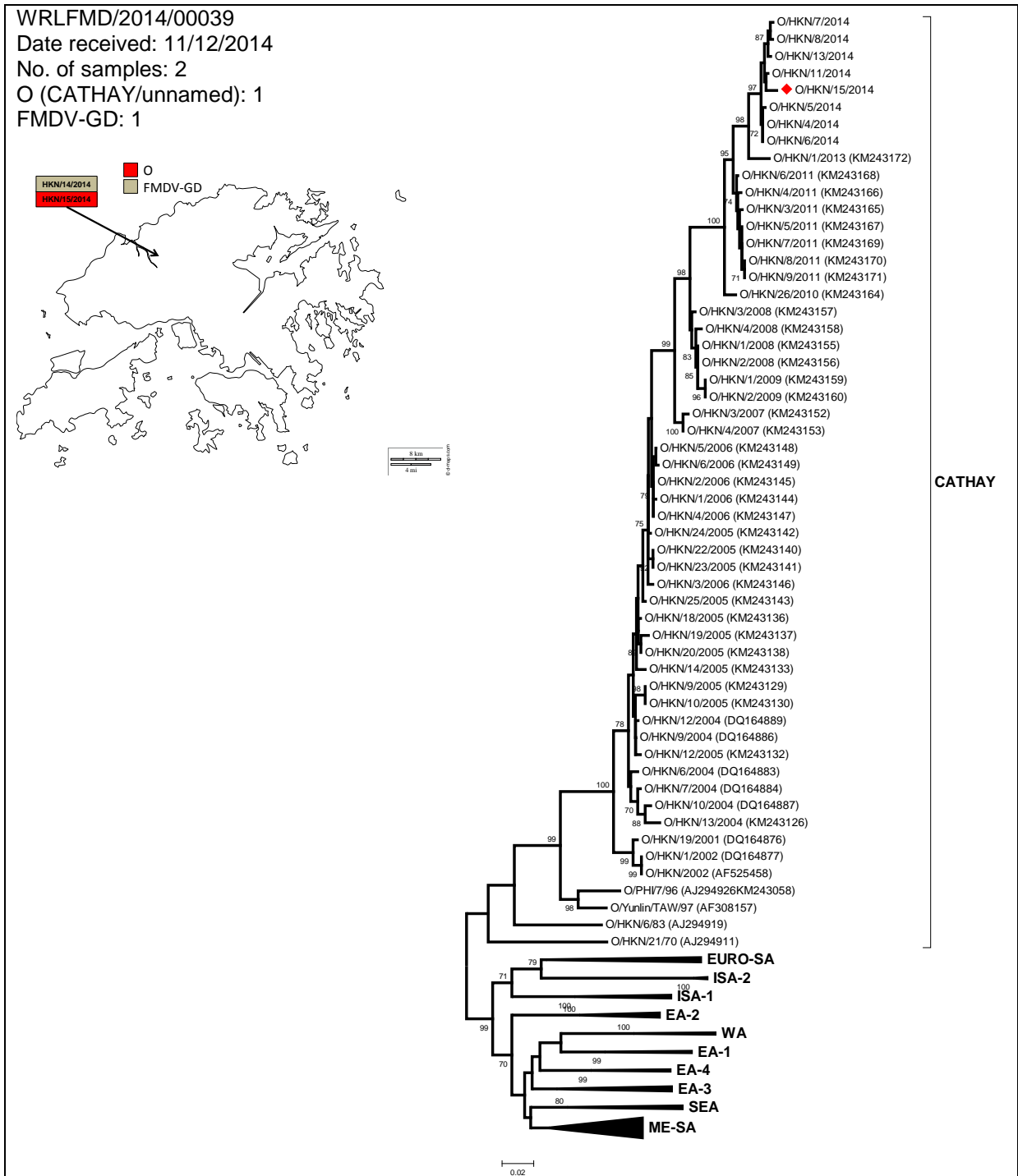


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Figure 2: Hong Kong SAR



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Figure 3: Republic of Korea (South Korea)

WRLMEG/2014/00038
 VP1 sequence received from Animal and
 Plant Quarantine Agency
 Date received: 04/12/2014
 No. of sequences: 1
 O (SEA/Mya-98): 1

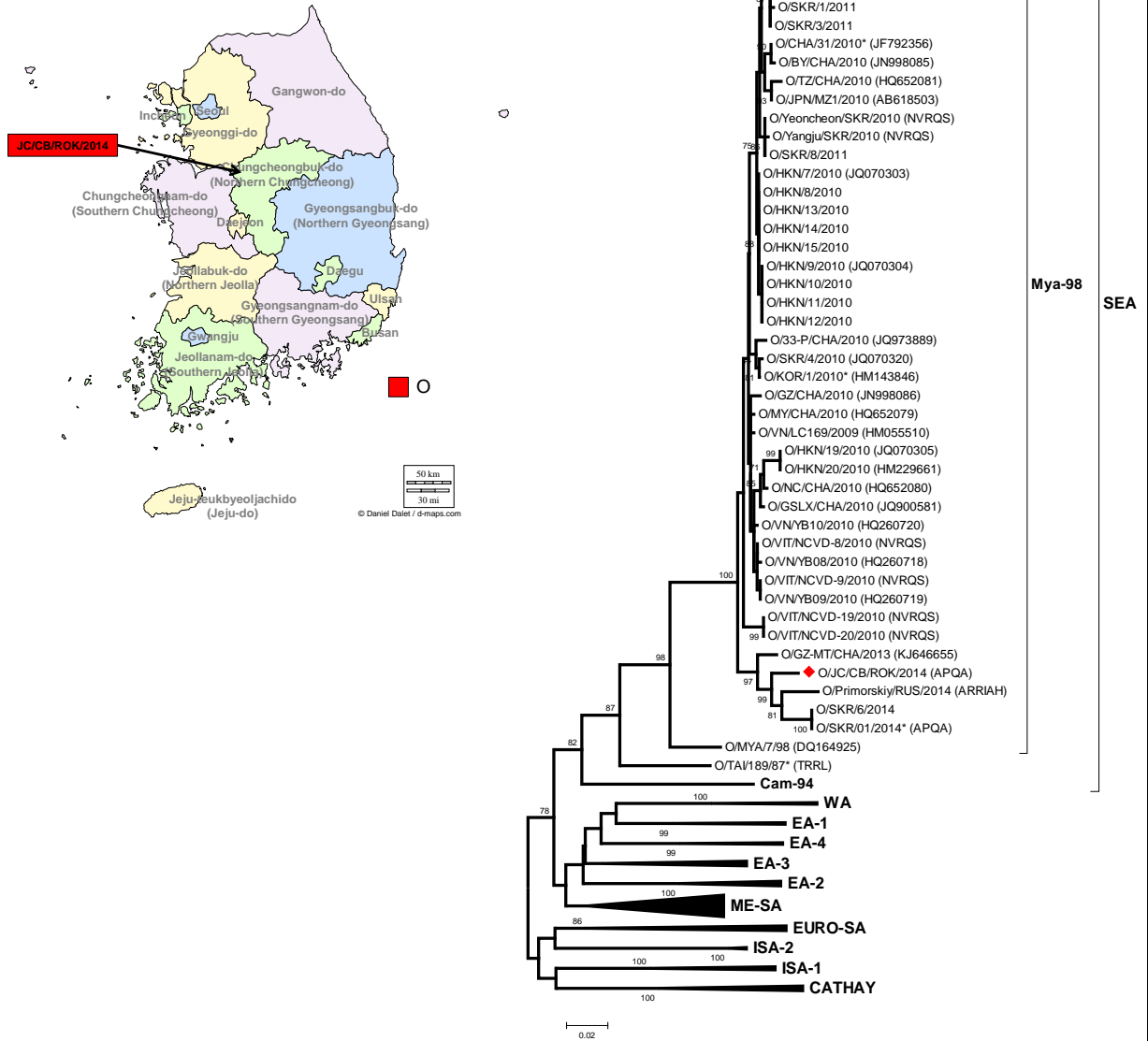




Figure 4: Vietnam

WRLFMD/2014/00035

Date received: 28/10/2014

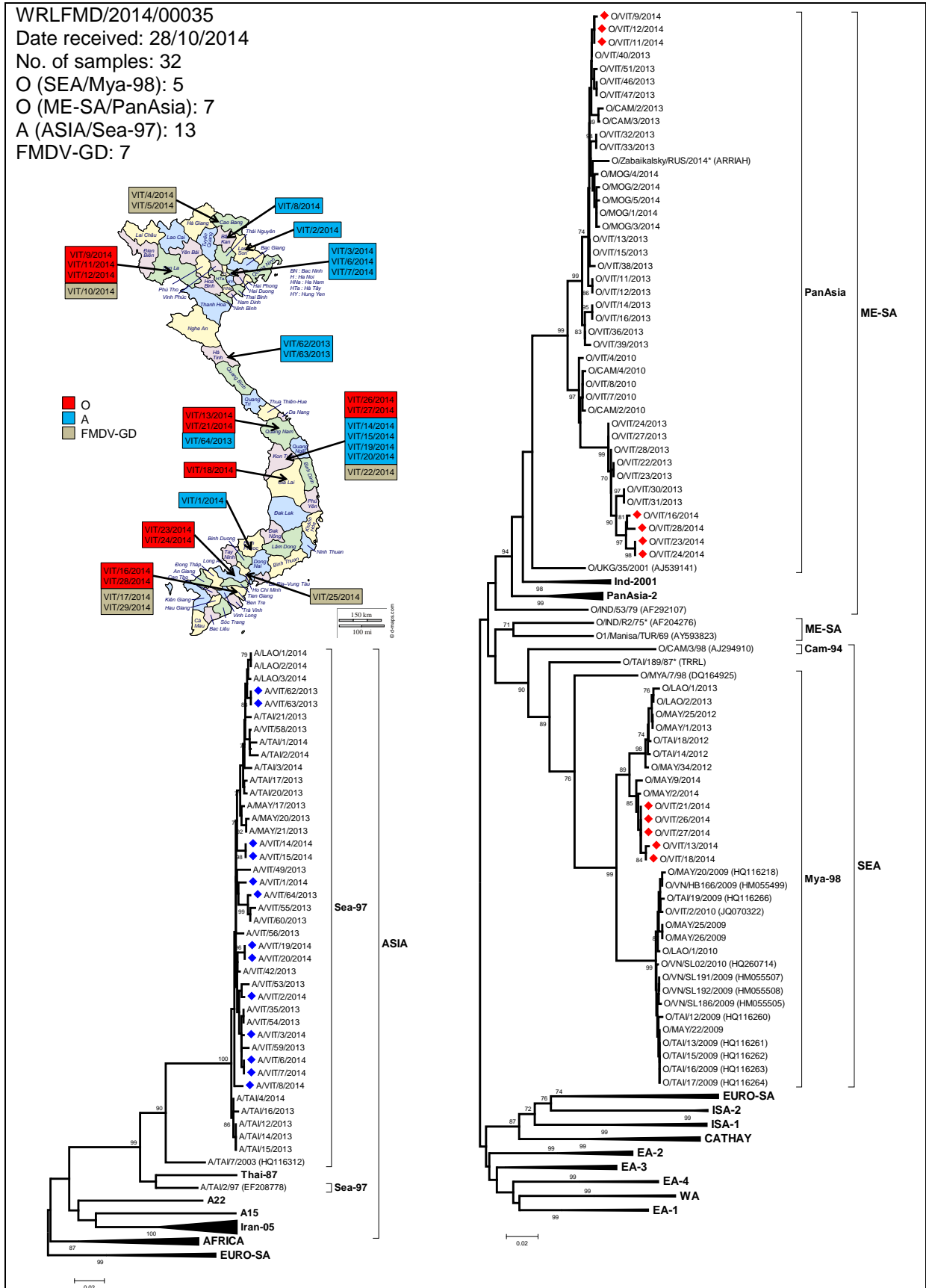
No. of samples: 32

O (SEA/Mya-98): 5

O (ME-SA/PanAsia): 7

A (ASIA/Sea-97): 13

FMDV-GD: 7



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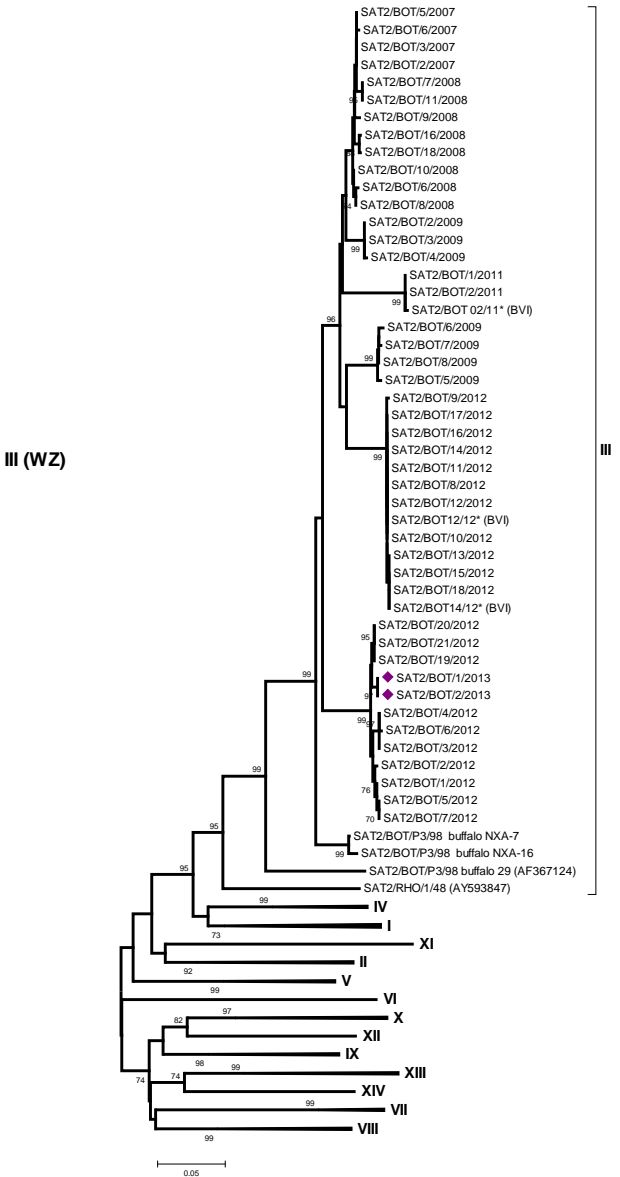
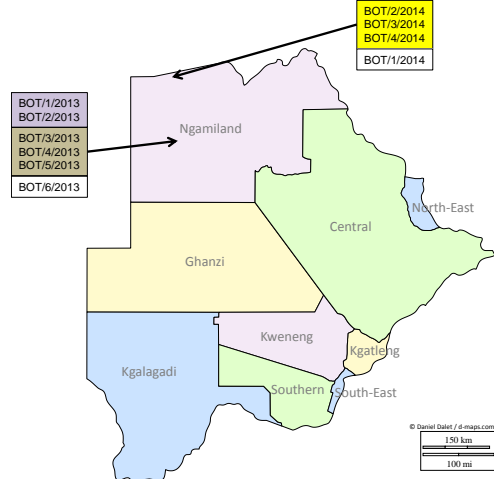
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AFRICA

Figure 5: Botswana

WRLFMD/2014/00031
 Date received: 13/10/2014
 No. of samples: 10
 SAT 1 (III-WZ): 3
 SAT 2 (III): 2
 FMDV-GD: 3
 NVD: 2



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Figure 6a: Egypt

WRLFMD/2014/00037

Date received: 04/11/2014

No. of samples: 28

O (EA-3): 9

A (AFRICA/G-IV): 1

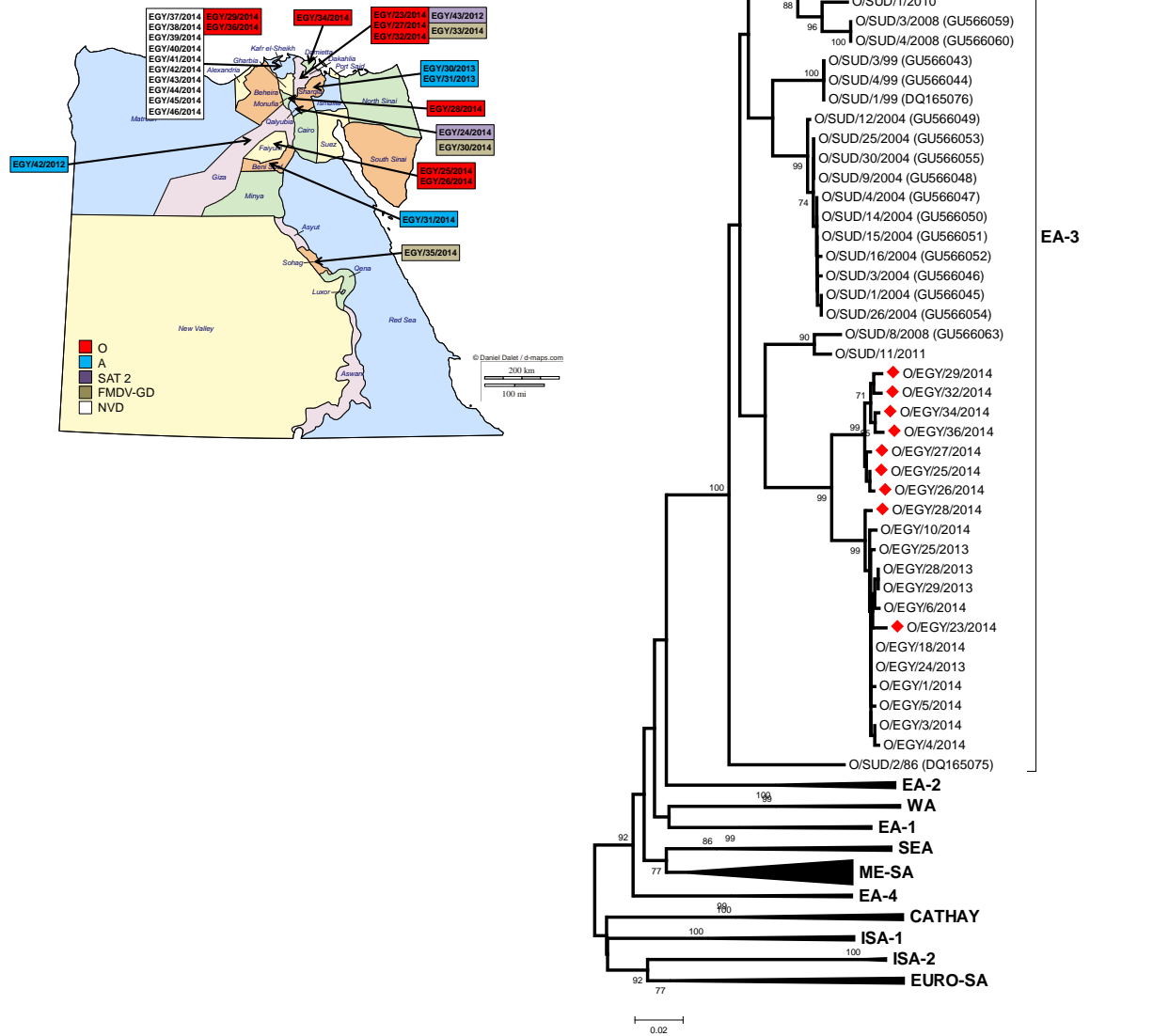
A (Iran-05^{BAR-08}): 3

SAT 2 (VII/ Ghb-12): 1

SAT 2 (VII/Aix-12): 1

FMDV-GD: 3

No FMDV GD: 10



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Figure 6b: Egypt (continued)

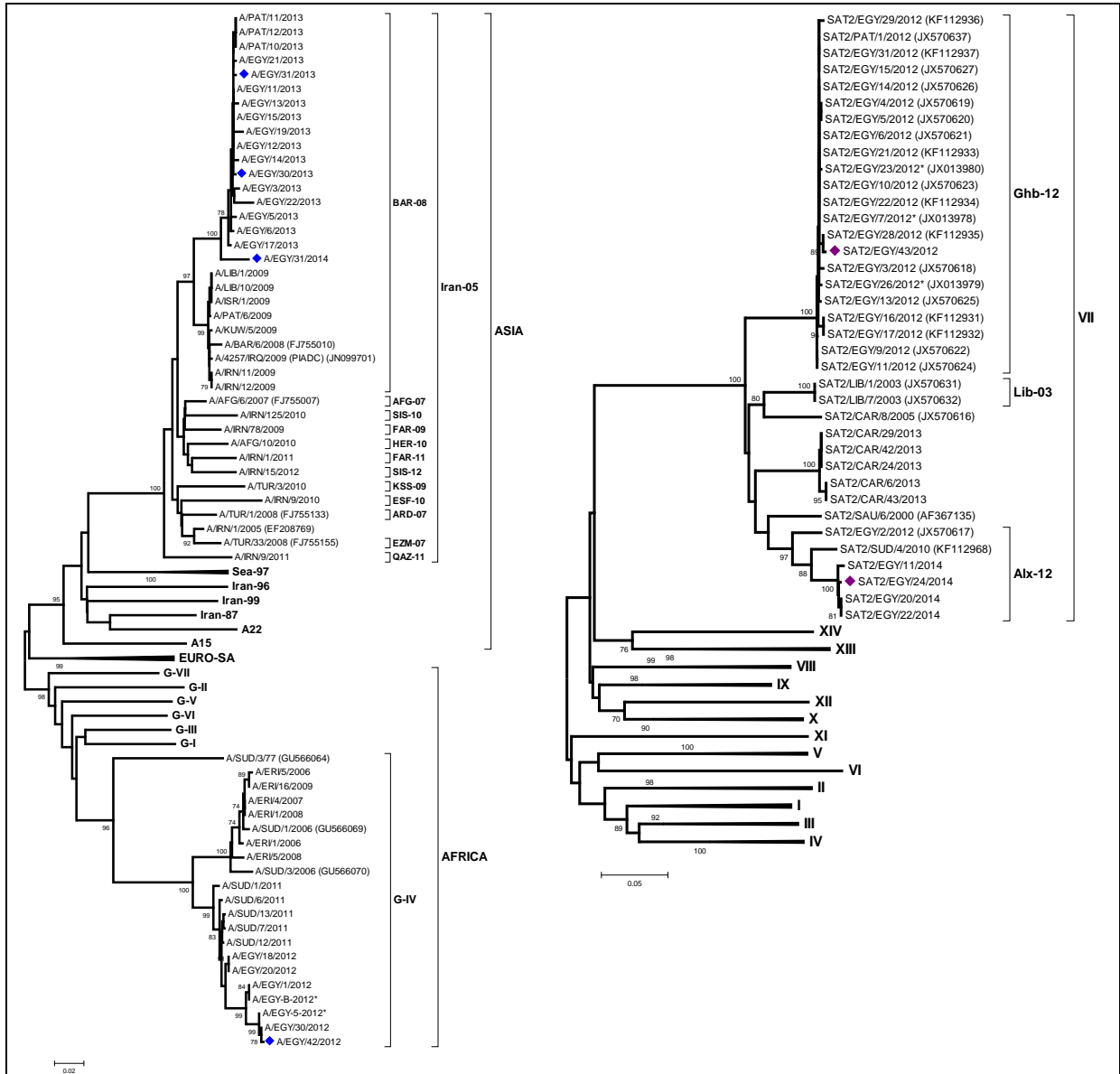




Figure 7: Ethiopia

WRLFMD/2014/00038

Date received: 27/11/2014

No. of samples: 16

O (genome only) (EA-3): 2

FMDV-GD: 5

NVD: 9

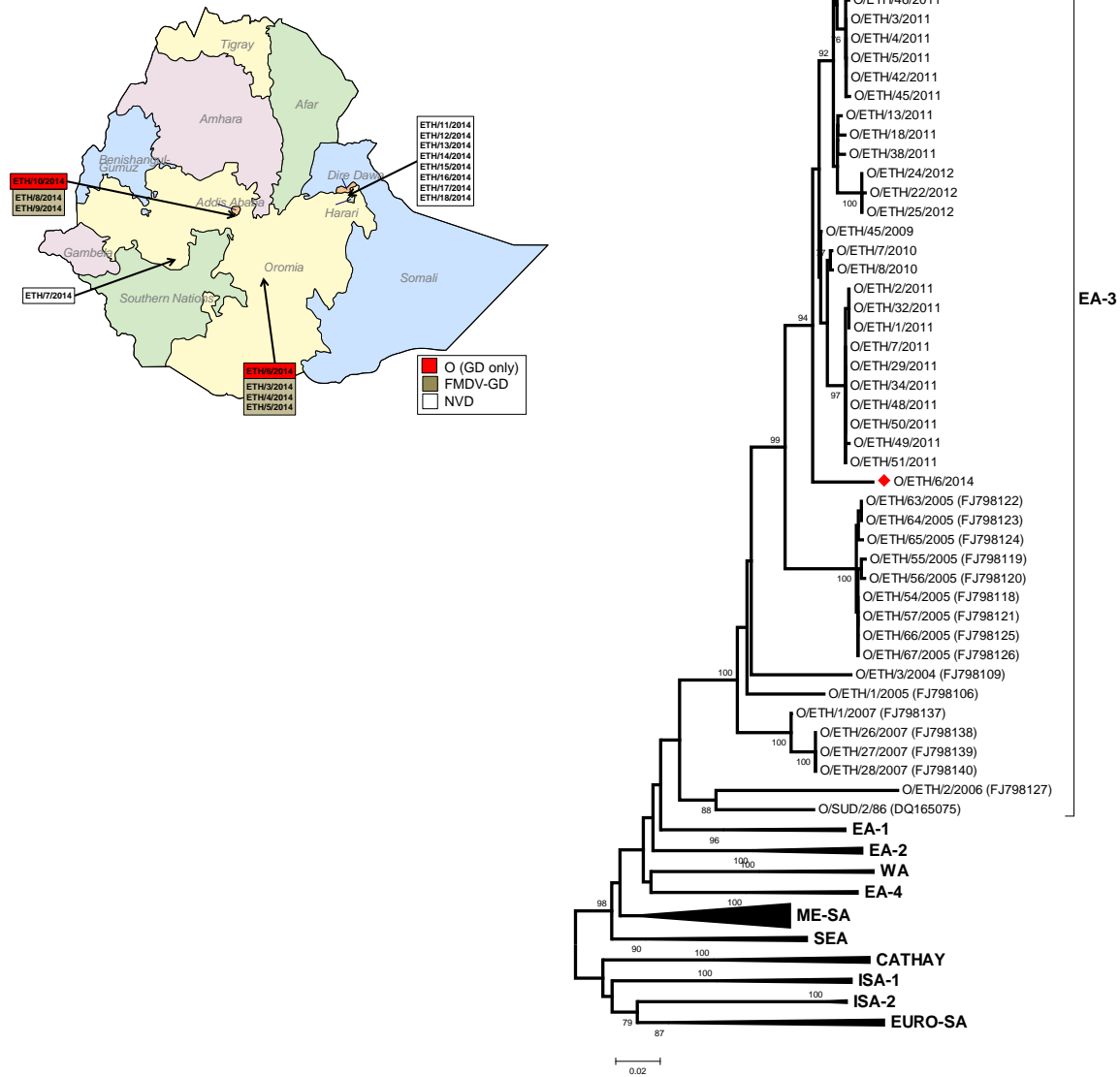
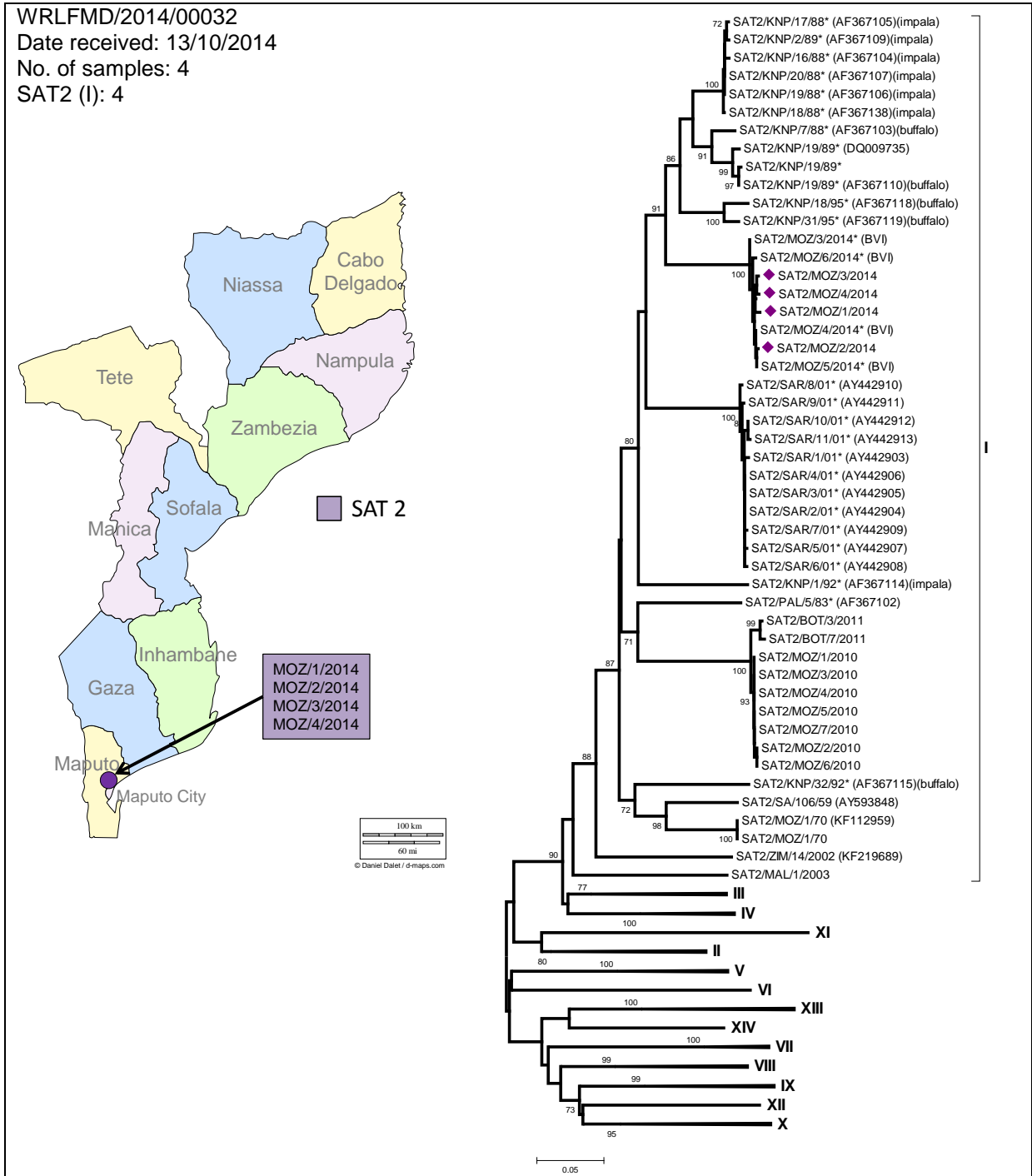




Figure 8: Mozambique



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Figure 9: Namibia

WRLMEG/2014/00039

VP1 sequences received from the BVI,
Botswana

Date received: 11/12/2014

No. of sequences: 2

SAT2 (III): 2

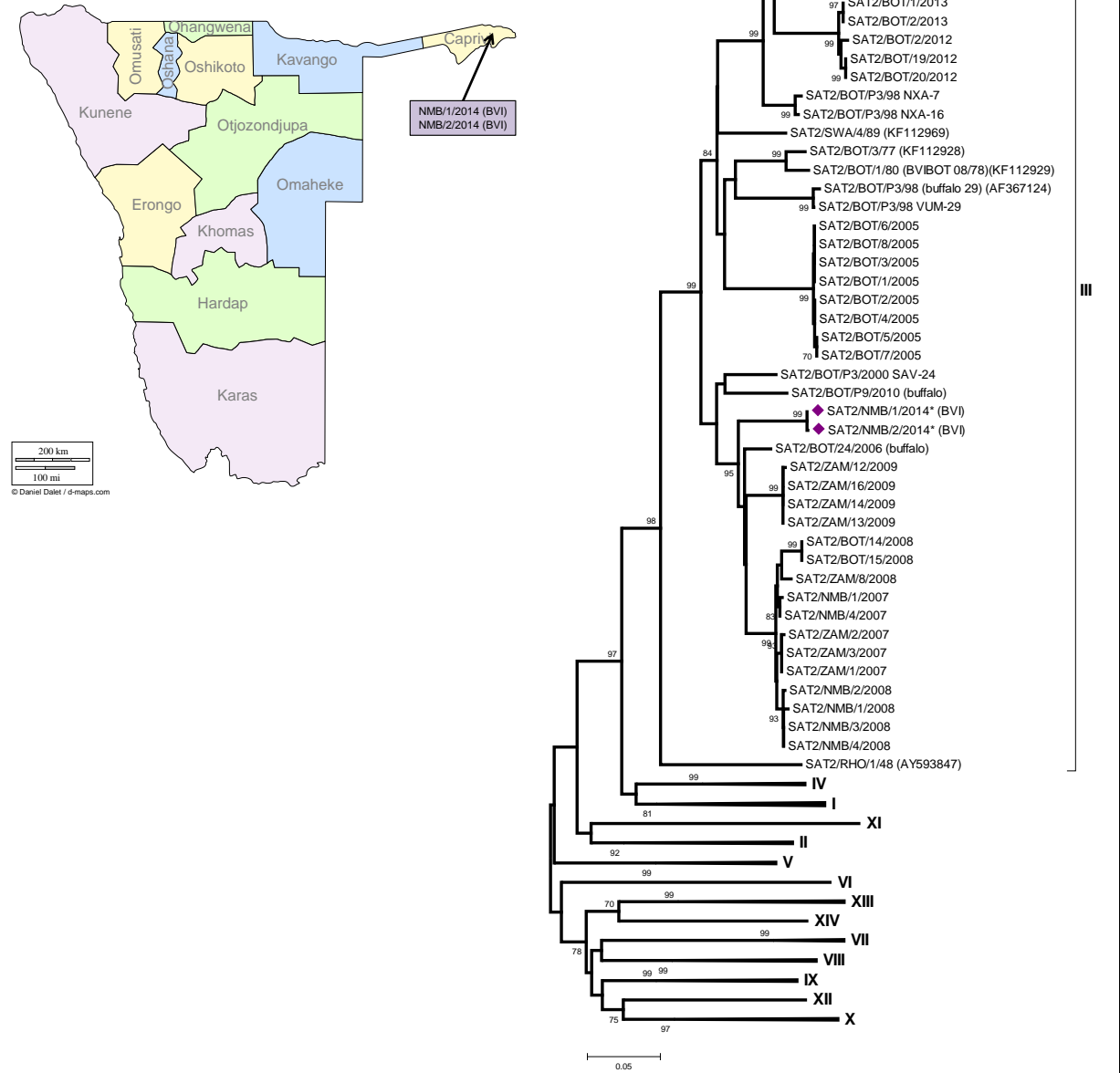




Figure 10: Zimbabwe

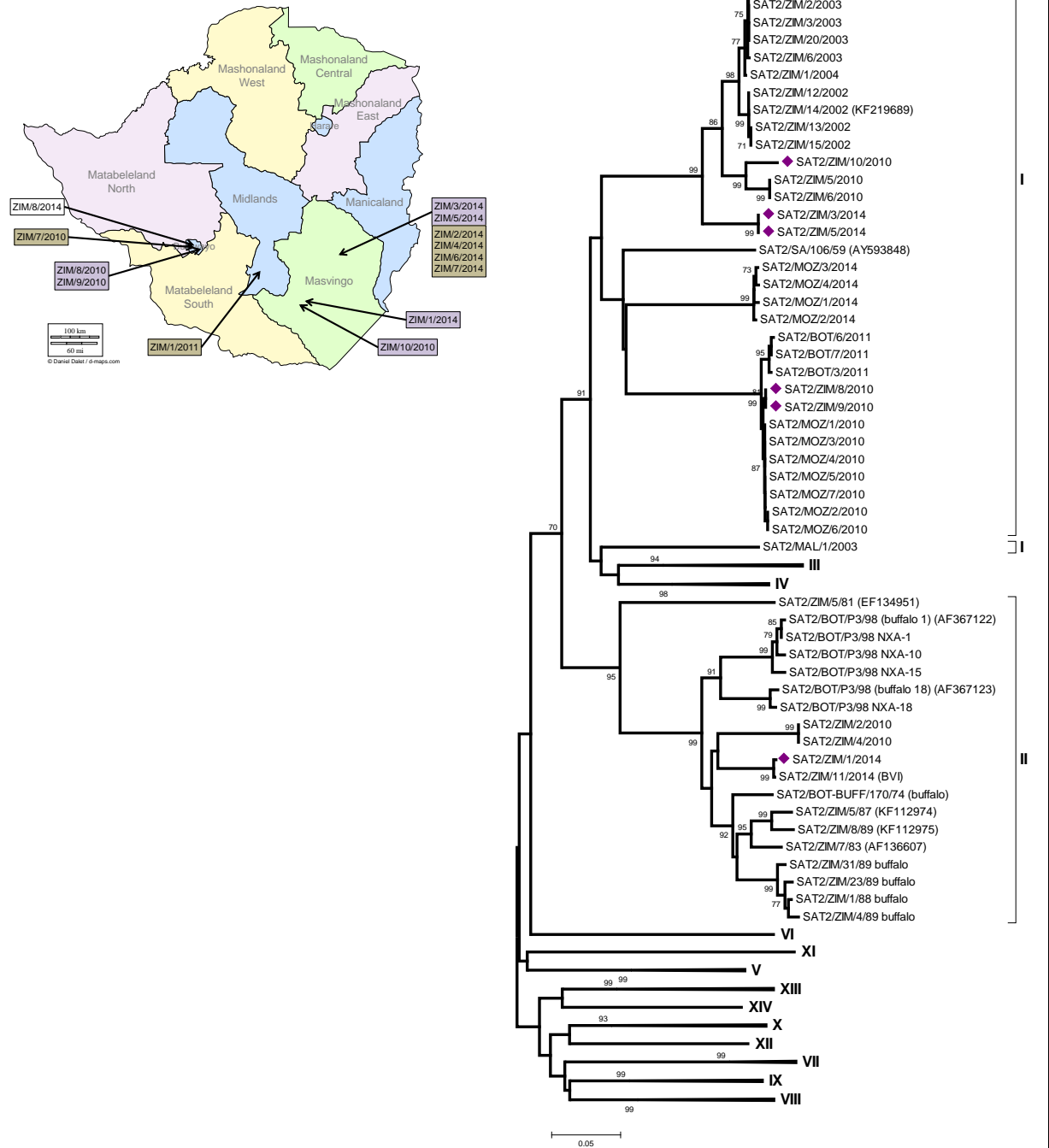
WRLFMD/2014/00033

Date received: 13/10/2014

No. of samples:

SAT 2 (I): 5

SAT 2 (II): 1



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Vaccine matching

For individual data see Table 4 (Annex 1).

Serotype O

Two serotype O/ME-SA/Ind-2001 isolates were tested from the batch of samples received from Sri Lanka. These were both a vaccine match to O 3039 and O TAW/98. However only one strain was a vaccine match with O/TUR/5/2009 (the other was borderline) and neither of these two isolates generated a positive matching result against O BFS and O Manisa.

Two further serotype isolates from Malaysia (MAY/2/2014 and MAY 3/2014) from the SEA toptotype were tested and were both matched to O 3039. One isolate (MAY/3/2014) also matched O Manisa, O TAW/98 and O/TUR/5/09 antigens, while the other (MAY/2/2014) generated borderline values for O Manisa and O TAW/98 and a poor in-vitro match for O/TUR/5/2009.

Serotype A

Three field viruses from Malaysia and two field viruses from Cameroon were tested by VNT against serotype A. For Malaysia the isolates gave a good vaccine match to A22 IRQ, A MAY/97 and A TUR/06; however, one isolate (MAY/23/2013) did not match against A TUR/06.

For Cameroon there was a good match against A TUR/06 and there was a poor vaccine match against A22 IRQ.

All five serotype A strains did not match in this in-vitro test against A IRN/05

Serotype SAT 2

One sample from Cameroon was tested against SAT 2 ERI and SAT 2 ZIM by VNT. Both of these vaccine viruses were a match against this field isolate.



Annex 1

Table 2: Clinical sample diagnostics made by the WRLFMD® between October-December 2014

Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
BAHRAIN	BAR 1/2014	CATTLE	16-Oct-14	O	POS	O
	BAR 2/2014	CATTLE	16-Oct-14	O	POS	O
	BAR 3/2014	CATTLE	27-Oct-14	O	POS	O
EGYPT	EGY 42/2012	CATTLE	20-May-12	A	POS	A
	EGY 43/2012	CATTLE	21-May-12	SAT 2	POS	SAT 2
	EGY 30/2013	CATTLE	20-Mar-13	NEG	POS	FMDV GD
	EGY 31/2013	CATTLE	20-Mar-13	NEG	POS	FMDV GD
	EGY 23/2014	CATTLE	07-Apr-14	O	POS	O
	EGY 24/2014	CATTLE	17-Apr-14	SAT 2	POS	SAT 2
	EGY 25/2014	CATTLE	22-Apr-14	O	POS	O
	EGY 26/2014	CATTLE	22-Apr-14	O	POS	O
	EGY 27/2014	CATTLE	05-May-14	O	POS	O
	EGY 28/2014	CATTLE	06-May-14	O	POS	O
	EGY 29/2014	CATTLE	09-May-14	O	POS	O
	EGY 30/2014	CATTLE	17-May-14	NEG	POS	FMDV GD
	EGY 31/2014	CATTLE	28-May-14	A	POS	A
	EGY 32/2014	BUFFALO	14-Jun-14	O	POS	O
	EGY 33/2014	BUFFALO	14-Jun-14	NEG	POS	FMDV GD
	EGY 34/2014	CATTLE	18-Aug-14	O	POS	O
	EGY 35/2014	BUFFALO	08-Sep-14	NEG	POS	FMDV GD
	EGY 36/2014	CATTLE	09-Oct-14	O	POS	O
	EGY 37/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 38/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 39/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 40/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 41/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 42/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 43/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
	EGY 44/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD
EGY 45/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD	
EGY 46/2014	CATTLE	11-Oct-14	NT	NEG	FMDV NGD	
ETHIOPIA	ETH 3/2014	BOVINE	13-Feb-14	NEG	POS	FMDV GD
	ETH 4/2014	BOVINE	13-Feb-14	NEG	POS	FMDV GD
	ETH 5/2014	BOVINE	13-Feb-14	NEG	POS	FMDV GD
	ETH 6/2014	BOVINE	13-Feb-14	NEG	POS	FMDV GD
	ETH 7/2014	BOVINE	07-Sep-14	NEG	NEG	NVD
	ETH 8/2014	BOVINE	07-Oct-14	NEG	POS	FMDV GD
	ETH 9/2014	BOVINE	07-Oct-14	NEG	POS	FMDV GD
	ETH 10/2014	BOVINE	07-Oct-14	NEG	POS	FMDV GD
	ETH 11/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	ETH 12/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	ETH 13/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	ETH 14/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	ETH 15/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	ETH 16/2014	OVINE	29-Oct-14	NEG	NEG	NVD

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Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
HONG KONG	ETH 17/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	ETH 18/2014	OVINE	29-Oct-14	NEG	NEG	NVD
	HKN 14/2014	PIG	25-Nov-14	NEG	POS	FMDV GD
	HKN 15/2014	PIG	25-Nov-14	O	POS	O
SOUTH KOREA	SKR 11/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 12/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 13/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 14/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 15/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 16/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 17/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 18/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 19/2014	PIG	03-Dec-14	Pending	Pending	Pending
	SKR 20/2014	PIG	03-Dec-14	Pending	Pending	Pending
VIETNAM	VIT 62/2013	CATTLE	17-Dec-13	A	POS	A
	VIT 63/2013	CATTLE	17-Dec-13	A	POS	A
	VIT 64/2013	CATTLE	21-Dec-13	A	POS	A
	VIT 1/2014	CATTLE	20-Jan-14	A	POS	A
	VIT 2/2014	BUFFALO	24-Apr-14	A	POS	A
	VIT 3/2014	CATTLE	24-Apr-14	A	POS	A
	VIT 4/2014	BUFFALO	24-Apr-14	NEG	POS	FMDV GD
	VIT 5/2014	BUFFALO	24-Apr-14	NEG	POS	FMDV GD
	VIT 6/2014	PIG	24-Apr-14	A	POS	A
	VIT 7/2014	PIG	24-Apr-14	A	POS	A
	VIT 8/2014	CATTLE	24-Apr-14	A	POS	A
	VIT 9/2014	CATTLE	24-Apr-14	O	POS	O
	VIT 10/2014	CATTLE	24-Apr-14	NEG	POS	FMDV GD
	VIT 11/2014	CATTLE	24-Apr-14	O	POS	O
	VIT 12/2014	CATTLE	24-Apr-14	O	POS	O
	VIT 13/2014	CATTLE	26-Apr-14	O	POS	O
	VIT 14/2014	CATTLE	26-Apr-14	A	POS	A
	VIT 15/2014	CATTLE	26-Apr-14	A	POS	A
	VIT 16/2014	PIG	30-Apr-14	O	POS	O
	VIT 17/2014	CATTLE	19-May-14	NEG	POS	FMDV GD
	VIT 18/2014	CATTLE	19-May-14	O	POS	O
	VIT 19/2014	CATTLE	05-Jun-14	A	POS	A
	VIT 20/2014	CATTLE	05-Jun-14	A	POS	A
	VIT 21/2014	CATTLE	20-Jun-14	O	POS	O
	VIT 22/2014	CATTLE	09-Jul-14	NEG	POS	FMDV GD
	VIT 23/2014	PIG	10-Jul-14	O	POS	O
	VIT 24/2014	PIG	10-Jul-14	O	POS	O
	VIT 25/2014	CATTLE	16-Jul-14	NEG	POS	FMDV GD
	VIT 26/2014	CATTLE	17-Jul-14	O	POS	O
	VIT 27/2014	CATTLE	17-Jul-14	O	POS	O
	VIT 28/2014	PIG	24-Jul-14	O	POS	O
	VIT 29/2014	PIG	24-Jul-14	NEG	POS	FMDV GD
TOTAL:		91				

Sample results pending from previous report

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Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
SRI LANKA	SRL 18/2014	BOVINE	02-Mar-14	NEG	POS	FMDV GD
	SRL 19/2014	BOVINE	04-Apr-14	NEG	POS	FMDV GD
	SRL 20/2014	BOVINE	06-Apr-14	NEG	POS	FMDV GD
	SRL 21/2014	BOVINE	06-Apr-14	NEG	POS	FMDV GD
	SRL 22/2014	BOVINE	18-Jun-14	NEG	POS	FMDV GD
	SRL 23/2014	BOVINE	10-Jul-14	NEG	POS	FMDV GD
	SRL 24/2014	BOVINE	14-Jul-14	NEG	POS	FMDV GD
	SRL 25/2014	BOVINE	14-Jul-14	NEG	POS	FMDV GD
	SRL 26/2014	BOVINE	16-Jul-14	NEG	POS	FMDV GD
	SRL 27/2014	BOVINE	05-Aug-14	O	POS	O
	SRL 28/2014	BOVINE	01-Sep-14	O	POS	O
	SRL 29/2014	BUFFALO	10-Sep-14	O	POS	O
	SRL 30/2014	BUFFALO	10-Sep-14	O	POS	O
	SRL 31/2014	BUFFALO	10-Sep-14	O	POS	O
	SRL 32/2014	BUFFALO	10-Sep-14	O	POS	O
	SRL 33/2014	BOVINE	11-Sep-14	NEG	POS	FMDV GD
	SRL 34/2014	BOVINE	15-Sep-14	O	POS	O
	SRL 35/2014	BOVINE	18-Sep-14	O	POS	O
TOTAL:		18				

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
RT-PCR	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



Table 3: Summary of samples collected and received to WRLFMD (October-December 2014)

Country	N ^o of samples	Virus isolation in cell culture/ELISA								RT-PCR for FMD (or SVD) virus (where appropriate)	
		FMD virus serotypes							NVD	Positive	Negative
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1			
BAHRAIN	3	3	-	-	-	-	-	-	-	3	-
EGYPT	28	9	2	-	-	2	-	-	15	18	10
ETHIOPIA	16	-	-	-	-	-	-	-	16	7	9
HONG KONG	2	1	-	-	-	-	-	-	1	2	-
SOUTH KOREA	10	-	-	-	-	-	-	-	-	-	-
VIETNAM	32	12	13	-	-	-	-	-	7	32	-
TOTAL	91	25	15	-	-	2	-	-	39	62	19

Sample results pending from previous report

SRI LANKA	18	8	-	-	-	-	-	-	10	18	-
TOTAL	18	8	-	-	-	-	-	-	10	18	-

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
RT-PCR	reverse transcription polymerase chain reaction for FMD (or SVD) viral genome



Table 4: Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from October to December 2014

Vaccine Matching Studies for Serotype O FMDV by VNT

Sample Reference	O 3039	O BFS	O Manisa	O TAW/98	O TUR/5/09
O/SRL/28/2014	M	N	N	M	M
O/SRL/30/2014	M	N	N	M	Borderline
O/MAY/2/2014	M	NT	Borderline	Borderline	N
O/MAY/3/2014	M	NT	M	M	M

Vaccine Matching Studies for Serotype A FMDV by VNT

Sample Reference	A IRN/05	A22 IRQ	A MAY/97	A TUR/06
A/MAY/12/2013	N	M	M	M
A/MAY/20/2013	N	M	M	M
A/MAY/23/2013	N	M	M	N
A/CAR/4/2013	N	N	NT	M
A/CAR/10/2013	N	N	NT	M

Vaccine Matching Studies for Serotype SAT 2 FMDV by VNT

Sample Reference	SAT 2 ERI	SAT 2 ZIM
SAT 2/CAR/16/2013	M	M

Abbreviations used in table:

M	Vaccine Match- $r_1 = \geq 0.3$. 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.
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
Borderline	Any r_1 values between 0.28 to 0.32
NT	Not tested against this vaccine



Annex 2

Recent FMD Publications (October-December 2014) cited by Web of Science (Pirbright Institute papers and authors are highlighted in **BOLD**)

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Annex 3

RECOMMENDATIONS FROM WRLFMD® ON FMD VIRUS STRAINS TO BE INCLUDED IN FMDV ANTIGEN BANKS – December 2014

Note: Virus strains are NOT listed in order of importance

High Priority	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/NPT/TAI/86) 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: new risk-based priorities for FMD-free countries are currently being discussed.