WRLFMD Quarterly Report October to December 2015

Reference Laboratory Contract Report

Foot-and-Mouth Disease

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Department for Environment Food & Rural Affairs

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1. Global Summary

1.1. Africa

Botswana
Two samples, collected in June 2015 from cattle at Kasane, Chobe, were received from the BVI. They were typed as **SAT 1** and genotyped as **topotype III (WZ)**.

Morocco
Between 23/10/2015 and 11/11/2015, FMD **type O** was reported in cattle at six locations in the Casablanca-Settat region. FMD **type O** viruses were isolated from three samples received in November. They were genotyped as ME-SA/Ind-2001d and were most closely related to viruses from outbreaks in Algeria and Tunisia.

Mozambique
A single FMD **type SAT 2** virus was isolated from one of two samples (collected from cattle in May 2015) received from the BVI. It was genotyped as **topotype I**.

Namibia
On virus isolate and five epithelium samples (collected in May 2015) were received from the BVI. **FMDV type SAT 1** (**topotype III**) was identified in the virus isolate, but it was very closely related to the reference/vaccine strain SAT1/BOT/1/77, so may be a laboratory contaminant. **FMDV type SAT 2** was isolated from the five samples and genotyped as **topotype III**.

Niger
A single **FMD type O** virus was isolated from four sampled received from the BVI. Genotyping will be reported later.

South Africa
A single outbreak of **FMD SAT 3** was reported to have occurred in cattle at Thulamela, Limpopo on 08/12/2015. No genotyping has so far been reported. The outbreak occurred in cattle at one dip tank within South Africa's FMD protection zone and therefore has no effect on South Africa's FMD free status.

Sudan
A batch of 37 samples was received in December and results are pending.

Zambia
An outbreak of FMD **type SAT 3** has occurred for the first time in Zambia in October 2015. Cattle were affected at Lupuka, Shangombo, Western province, close to the border with Angola where the Longa-Mavinga National Park is located. Sequences of two viruses received from the BVI show the causative agent to belong to **topotype II (WZ)** and not to be closely related (>11% nt difference in VP1) to any other SAT 3 sequence in the WRLFMD database.

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Zimbabwe
Between 20/08/2015 and 01/10/2015, 14 outbreaks of FMD were reported in cattle in the Midlands, Mashonaland West, Matabeleland North, Matabeleland South and Masvingo Provinces. Eight were identified as **type SAT 2**, but the others were reported as untyped.
A single FMD **type SAT 2** virus was isolated from three samples received from the BVI. It was genotyped as topotype II.
Nineteen samples, collected from cattle in Midlands, Matabeland North, Masvingo and Manicaland provinces between April and August 2015, were also submitted directly from Zimbabwe. FMD **types SAT 1**, **SAT 2** or, in one case, a mixture of **SAT 1** and **SAT 2** were isolated. Genotyping revealed the presence of either SAT 1 topotype II or SAT 2 topotype II; however, in the case of one of the SAT 2 isolates and the mixed isolate, sequencing proved to be difficult, probably due of mixed virus infections.

1.2. Asia

Cambodia
Five FMDV isolates were received from the RRL at Pakchong. Typing/genotyping identified **O/ME-SA/PanAsia** in two samples and **A/ASIA/Sea-97** in the other two and one was NVD. Although FMDV Asia 1 was suspected in two of the samples, no evidence of the presence of this serotype could be found.

Hong Kong SAR
FMD type O was isolated from six samples from pigs collected in Hong Kong in September and November 2015. Genotyping revealed all to belong to the **CATHAY topotype**.

Iran
A batch of 27 samples was received from Iran. The typing/genotype results of 25 of these are pending, however, in two samples **FMD type A** was identified. Genotyping of the two virus isolates (collected from cattle in Qom province in August and September 2015) revealed the introduction into the country of a new virus strain, currently known as **G-VII** (sometimes also called G-18) belonging to the **ASIA topotype**. Closely related viruses are normally found in the Indian subcontinent, but have recently been identified in Saudi Arabia and eastern Turkey (see elsewhere in this report).

Israel
Two outbreaks of **FMD type O** we reported in pigs and cattle during November 2015 in the Hazafon (Northern) district. No genotyping has been reported.

Laos
Four **FMD type O** virus isolates were received from the RRL at Pakchong. Genotyping revealed them to belong to the O/ME-SA/Ind-2001d lineage. This is the first report of this lineage in Southeast Asia.

Mongolia
In October 2015, an outbreak of **FMD type O** occurred in cattle, sheep and goats in Toshin sub-district, Altai district, Bayan-Ölgii province (in a small valley surrounded by high mountains located at the western edge of Mongolia). No genotyping has been reported.

Myanmar
Five FMDV isolates were received from the RRL at Pakchong. The original samples had been collected from cattle in Mandalay State in October 2015. Three were identified as **FMDV type A/ASIA/Sea-97** and two as **type O/SEA/Mya-98**.

Pakistan
A batch of 35 samples was received in December and results are pending.

Saudi Arabia
Outbreaks of FMD were reported on two farms in the Riyadh area in September and October 2015. **FMDV type A** was isolated from samples received from the two farms and also a third farm in the same area. Genotyping identified the virus responsible as **A/ASIA/G-VII** (also known as G18), closely related to viruses from the Indian sub-continent and to viruses from recent outbreaks in Iran and Turkey (see elsewhere in this report).

Thailand
A batch of 21 virus isolates was received from the RRL in Pakchong. Typing/genotyping is pending.

Turkey
Twenty-eight samples, which had been collected from cattle between August 2014 and May 2015, were received from the FMDI-Ankara. FMD viruses were isolated from 25 of the samples; four were typed/genotyped as **O/ME-SA/PanAsia-2^{FAR-09}**, 14 as **A/ASIA/Iran-05^{SIS-10}** and five as **Asia 1/ASIA/Sindh-08**; however, a further two Asia 1 viruses lay slightly outside the Sindh-08 lineage and were left unclassified.
Three outbreaks of **FMD type A** were reported in Van, Bitlis amd Amasya provinces during September and October 2015. A single VP1 sequence (from a virus isolate from Van province) was received from the FMDI-Ankara and phylogenetic analysis showed it was **A/ASIA/G-VII** closely related to viruses from the Indian subcontinent and from recent outbreaks in Saudi Arabia and Iran.

1.3. South America

No outbreaks reported

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 characterisatio11n; 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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Armenia

FMDV type A/ASIA/G-VII has been reported to have begun on 23/12/2015 in Armavir, Arazap, Armenia in cattle and pigs. Genotyping was performed by FGI-ARRIAH. These outbreaks provide further evidence of the rapid spread of this lineage in West EurAsia.

Republic of Korea (South Korea)

FMDV type O/SEA/Mya-98 has been reported in pigs at Gimje, Jeonbuk on 11/01/2016. Sequencing was performed at the Animal and Plant Quarantine Agency and analysed at 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/2015.htm.

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2. Summary of samples

Summary of samples collected and received by WRLFMD® (October to December 2015)

Country	Nº of samples	Virus isolation in cell culture/ELISA								rRT-PCR for FMD (or SVD) virus (where appropriate)	
		FMD virus serotypes							NVD		
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1		Positive	Negative
CAMBODIA	5	2	2	-	-	-	-	-	1	4	1
HONG KONG, SAR OF PRC	7	6	-	-	-	-	-	-	1	7	-
IRAN	27	-	2	-	-	-	-	-	-	2	-
LAOS	4	4	-	-	-	-	-	-	-	4	-
MOROCCO	3	3	-	-	-	-	-	-	-	2	1
MYANMAR	5	2	3	-	-	-	-	-	-	5	-
PAKISTAN	35	-	-	-	-	-	-	-	-	-	-
SUDAN	37	-	-	-	-	-	-	-	-	-	-
THAILAND	21	-	-	-	-	-	-	-	-	-	-
SAUDI ARABIA	4	-	4	-	-	-	-	-	-	4	-
TOTAL	148	17	11	-	-	-	-	-	2	28	2

Sample results pending from previous report:

TURKEY	28	4	14	-	-	-	-	7	3	25	3
ZIMBABWE[1]	19	-	-	-	5	13	-	-	2	15	4
TOTAL	47	4	14	-	5	13	-	7	5	40	7

[1] One sample from Zimbabwe had a mixed serotype of SAT 1 and SAT 2.

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

3. Virology Results

Detailed virology results for clinical samples tested by the WRLFMD® (October to December 2015)

Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI / ELISA	*rRT-PCR*	*Final report*
CAMBODIA	CAM 1/2015	PIG	14-Sep-15	O	POS	O
	CAM 2/2015	CATTLE	14-Sep-15	A	POS	A
	CAM 3/2015	PIG	14-Sep-15	O	POS	O
	CAM 4/2015	CATTLE	14-Sep-15	NEG	NEG	NVD
	CAM 5/2015	CATTLE	14-Sep-15	A	POS	A
HONG KONG, SAR OF PRC	HKN 5/2015	PORCINE	18-Sep-15	O	POS	O
	HKN 6/2015	PORCINE	18-Sep-15	O	POS	O
	HKN 7/2015	PORCINE	18-Sep-15	O	POS	O
	HKN 8/2015	PIG	07-Nov-15	O	POS	O
	HKN 9/2015	PIG	07-Nov-15	O	POS	O
	HKN 10/2015	PIG	07-Nov-15	O	POS	O
	HKN 11/2015	PIG	13-Nov-15	NEG	POS	FMDV GD
IRAN	IRN 1/2015	CATTLE	24-Apr-15	Pending	Pending	Pending
	IRN 2/2015	CATTLE	28-Apr-15	Pending	Pending	Pending
	IRN 3/2015	CATTLE	28-Apr-15	Pending	Pending	Pending
	IRN 4/2015	CATTLE	08-May-15	Pending	Pending	Pending
	IRN 5/2015	CATTLE	25-May-15	Pending	Pending	Pending
	IRN 6/2015	CATTLE	15-Jun-15	Pending	Pending	Pending
	IRN 7/2015	CATTLE	16-Aug-15	Pending	Pending	Pending
	IRN 8/2015	CATTLE	30-Aug-15	A	POS	A
	IRN 9/2015	CATTLE	12-Sep-15	Pending	Pending	Pending
	IRN 10/2015	CATTLE	12-Sep-15	Pending	Pending	Pending
	IRN 11/2015	CATTLE	14-Sep-15	Pending	Pending	Pending
	IRN 12/2015	CATTLE	26-Sep-15	A	POS	A
	IRN 13/2015	CATTLE	28-Sep-15	Pending	Pending	Pending
	IRN 14/2015	CATTLE	28-Sep-15	Pending	Pending	Pending
	IRN 15/2015	CATTLE	01-Oct-15	Pending	Pending	Pending
	IRN 16/2015	CATTLE	01-Oct-15	Pending	Pending	Pending
	IRN 17/2015	CATTLE	09-Oct-15	Pending	Pending	Pending
	IRN 18/2015	CATTLE	10-Oct-15	Pending	Pending	Pending
	IRN 19/2015	CATTLE	15-Oct-15	Pending	Pending	Pending
	IRN 20/2015	CATTLE	23-Oct-15	Pending	Pending	Pending
	IRN 21/2015	CATTLE	24-Oct-15	Pending	Pending	Pending
	IRN 22/2015	CATTLE	24-Oct-15	Pending	Pending	Pending
	IRN 23/2015	CATTLE	25-Oct-15	Pending	Pending	Pending
	IRN 24/2015	CATTLE	26-Oct-15	Pending	Pending	Pending

Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI / ELISA	*rRT-PCR*	*Final report*
	IRN 25/2015	CATTLE	28-Oct-15	Pending	Pending	Pending
	IRN 26/2015	SHEEP	03-Nov-15	Pending	Pending	Pending
	IRN 27/2015	CATTLE	08-Nov-15	Pending	Pending	Pending
LAOS	LAO 2/2015	NOT KNOWN	10-Jun-15	O	POS	O
	LAO 3/2015	NOT KNOWN	10-Jun-15	O	POS	O
	LAO 4/2015	NOT KNOWN	10-Jun-15	O	POS	O
	LAO 5/2015	NOT KNOWN	10-Jun-15	O	POS	O
MOROCCO	MOR 1/2015	BOVINE	28-Oct-15	O	POS	O
	MOR 2/2015	BOVINE	28-Oct-15	O	NEG	O
	MOR 3/2015	BOVINE	28-Oct-15	O	POS	O
MYANMAR	MYA 1/2015	BOVINE	29-Oct-15	O	POS	O
	MYA 2/2015	BOVINE	29-Oct-15	A	POS	A
	MYA 3/2015	BOVINE	29-Oct-15	A	POS	A
	MYA 4/2015	BOVINE	29-Oct-15	A	POS	A
	MYA 5/2015	BOVINE	29-Oct-15	O	POS	O
PAKISTAN	PAK 22/2015	BUFFALO	03-Apr-15	Pending	Pending	Pending
	PAK 23/2015	BUFFALO	13-May-15	Pending	Pending	Pending
	PAK 24/2015	CATTLE	01-Jun-15	Pending	Pending	Pending
	PAK 25/2015	CATTLE	05-Jun-15	Pending	Pending	Pending
	PAK 26/2015	BUFFALO	02-Jul-15	Pending	Pending	Pending
	PAK 27/2015	BUFFALO	15-Jul-15	Pending	Pending	Pending
	PAK 28/2015	CATTLE	01-Aug-15	Pending	Pending	Pending
	PAK 29/2015	BUFFALO	27-Aug-15	Pending	Pending	Pending
	PAK 30/2015	BUFFALO	29-Aug-15	Pending	Pending	Pending
	PAK 31/2015	BUFFALO	31-Aug-15	Pending	Pending	Pending
	PAK 32/2015	CATTLE	01-Sep-15	Pending	Pending	Pending
	PAK 33/2015	BUFFALO	05-Sep-15	Pending	Pending	Pending
	PAK 34/2015	CATTLE	16-Sep-15	Pending	Pending	Pending
	PAK 35/2015	CATTLE	16-Sep-15	Pending	Pending	Pending
	PAK 36/2015	CATTLE	19-Sep-15	Pending	Pending	Pending
	PAK 37/2015	CATTLE	22-Sep-15	Pending	Pending	Pending
	PAK 38/2015	CATTLE	23-Sep-15	Pending	Pending	Pending
	PAK 39/2015	CATTLE	05-Oct-15	Pending	Pending	Pending
	PAK 40/2015	CATTLE	05-Oct-15	Pending	Pending	Pending
	PAK 41/2015	CATTLE	05-Oct-15	Pending	Pending	Pending
	PAK 42/2015	CATTLE	05-Oct-15	Pending	Pending	Pending
	PAK 43/2015	CATTLE	08-Oct-15	Pending	Pending	Pending
	PAK 44/2015	CATTLE	09-Oct-15	Pending	Pending	Pending
	PAK 45/2015	CATTLE	14-Oct-15	Pending	Pending	Pending

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Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI / ELISA	*rRT-PCR*	*Final report*
	PAK 46/2015	BUFFALO	16-Oct-15	Pending	Pending	Pending
	PAK 47/2015	CATTLE	18-Oct-15	Pending	Pending	Pending
	PAK 48/2015	CATTLE	19-Oct-15	Pending	Pending	Pending
	PAK 49/2015	BUFFALO	21-Oct-15	Pending	Pending	Pending
	PAK 50/2015	BUFFALO	21-Oct-15	Pending	Pending	Pending
	PAK 51/2015	BUFFALO	28-Oct-15	Pending	Pending	Pending
	PAK 52/2015	CATTLE	01-Nov-15	Pending	Pending	Pending
	PAK 53/2015	CATTLE	03-Nov-15	Pending	Pending	Pending
	PAK 54/2015	BUFFALO	06-Nov-15	Pending	Pending	Pending
	PAK 55/2015	CATTLE	12-Nov-15	Pending	Pending	Pending
	PAK 56/2015	CATTLE	04-Dec-15	Pending	Pending	Pending
SAUDI ARABIA	SAU 3/2015	CATTLE	09-Oct-15	A	POS	A
	SAU 4/2015	CATTLE	09-Oct-15	A	POS	A
	SAU 5/2015	CATTLE	16-Oct-15	A	POS	A
	SAU 6/2015	CATTLE	21-Oct-15	A	POS	A
SUDAN	SUD 1/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 2/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 3/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 4/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 5/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 6/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 7/2012	CATTLE	01-Feb-12	Pending	Pending	Pending
	SUD 1/2013	CATTLE	19-Feb-13	Pending	Pending	Pending
	SUD 2/2013	CATTLE	19-Feb-13	Pending	Pending	Pending
	SUD 3/2013	CATTLE	16-Apr-13	Pending	Pending	Pending
	SUD 4/2013	CATTLE	30-Dec-13	Pending	Pending	Pending
	SUD 5/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 6/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 7/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 8/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 9/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 10/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 11/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 12/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 13/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	SUD 1/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 2/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 3/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 4/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 5/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 6/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 7/2014	CATTLE	01-Jan-14	Pending	Pending	Pending

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Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI / ELISA	*rRT-PCR*	*Final report*
	SUD 8/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 9/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 10/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 11/2014	CATTLE	01-Jan-14	Pending	Pending	Pending
	SUD 12/2014	CATTLE	03-Jan-14	Pending	Pending	Pending
	SUD 13/2014	CATTLE	03-Jan-14	Pending	Pending	Pending
	SUD 14/2014	CATTLE	04-Jan-14	Pending	Pending	Pending
	SUD 15/2014	CATTLE	05-Jan-14	Pending	Pending	Pending
	SUD 16/2014	CATTLE	05-Jan-14	Pending	Pending	Pending
	SUD 17/2014	CATTLE	05-Jan-14	Pending	Pending	Pending
THAILAND	TAI 9/2015	CATTLE	27-Feb-15	Pending	Pending	Pending
	TAI 10/2015	PIG	03-Mar-15	Pending	Pending	Pending
	TAI 11/2015	CATTLE (DAIRY)	17-Mar-15	Pending	Pending	Pending
	TAI 12/2015	PIG	07-Apr-15	Pending	Pending	Pending
	TAI 13/2015	CATTLE (DAIRY)	30-Apr-15	Pending	Pending	Pending
	TAI 14/2015	CATTLE (DAIRY)	11-May-15	Pending	Pending	Pending
	TAI 15/2015	CATTLE (DAIRY)	11-May-15	Pending	Pending	Pending
	TAI 16/2015	CATTLE (DAIRY)	20-May-15	Pending	Pending	Pending
	TAI 17/2015	CATTLE (DAIRY)	04-Jun-15	Pending	Pending	Pending
	TAI 18/2015	BUFFALO	28-Jul-15	Pending	Pending	Pending
	TAI 19/2015	CATTLE	26-Aug-15	Pending	Pending	Pending
	TAI 20/2015	CATTLE	28-Aug-15	Pending	Pending	Pending
	TAI 21/2015	CATTLE (DAIRY)	04-Sep-15	Pending	Pending	Pending
	TAI 22/2015	BUFFALO	08-Sep-15	Pending	Pending	Pending
	TAI 23/2015	CATTLE	10-Sep-15	Pending	Pending	Pending
	TAI 24/2015	CATTLE (DAIRY)	11-Sep-15	Pending	Pending	Pending
	TAI 25/2015	CATTLE	14-Sep-15	Pending	Pending	Pending
	TAI 26/2015	CATTLE	22-Sep-15	Pending	Pending	Pending
	TAI 27/2015	CATTLE	28-Sep-15	Pending	Pending	Pending
	TAI 28/2015	CATTLE	08-Oct-15	Pending	Pending	Pending
	TAI 29/2015	CATTLE	09-Oct-15	Pending	Pending	Pending
	TOTAL:	148				

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Carried over from previous quarterly report:

Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI / ELISA	*rRT-PCR*	*Final report*
TURKEY	TUR 31/2014	CATTLE	04-Aug-14	A	POS	A
	TUR 32/2014	CATTLE	22-Aug-14	NEG	POS	FMDV GD
	TUR 33/2014	CATTLE	03-Sep-14	O	POS	O
	TUR 34/2014	CATTLE	04-Sep-14	O	POS	O
	TUR 35/2014	CATTLE	01-Oct-14	A	POS	A
	TUR 36/2014	CATTLE	21-Oct-14	A	POS	A
	TUR 37/2014	CATTLE	24-Oct-14	ASIA-1	POS	ASIA-1
	TUR 38/2014	CATTLE	02-Dec-14	A	POS	A
	TUR 39/2014	CATTLE	03-Dec-14	ASIA-1	POS	ASIA-1
	TUR 40/2014	CATTLE	09-Dec-14	A	POS	A
	TUR 41/2014	CATTLE	03-Feb-14	A	POS	A
	TUR 1/2015	CATTLE	29-Jan-15	ASIA-1	POS	ASIA-1
	TUR 2/2015	CATTLE	10-Feb-15	A	POS	A
	TUR 3/2015	CATTLE	16-Feb-15	A	POS	A
	TUR 4/2015	CATTLE	17-Feb-15	NEG	NEG	NVD
	TUR 5/2015	CATTLE	18-Feb-15	A	NEG	A
	TUR 6/2015	CATTLE	23-Feb-15	ASIA-1	POS	ASIA-1
	TUR 7/2015	CATTLE	02-Mar-15	A	POS	A
	TUR 8/2015	CATTLE	26-Mar-15	ASIA-1	POS	ASIA-1
	TUR 9/2015	SHEEP	27-Mar-15	O	POS	O
	TUR 10/2015	CATTLE	27-Mar-15	A	POS	A
	TUR 11/2015	CATTLE	30-Mar-15	ASIA-1	POS	ASIA-1
	TUR 12/2015	CATTLE	01-Apr-15	A	POS	A
	TUR 13/2015	CATTLE	14-Apr-15	A	POS	A
	TUR 14/2015	CATTLE	14-Mar-15	NEG	NEG	NVD
	TUR 15/2015	CATTLE	30-Apr-15	A	POS	A
	TUR 16/2015	CATTLE	13-May-15	O	POS	O
	TUR 17/2015	CATTLE	13-May-15	ASIA-1	POS	ASIA-1
ZIMBABWE	ZIM 4/2015	BOVINE	07-Apr-15	SAT 2	POS	SAT 2
	ZIM 5/2015	BOVINE	03-Jun-15	SAT 2	NEG	SAT 2
	ZIM 6/2015	BOVINE	06-Jun-15	SAT 2	NEG	SAT 2
	ZIM 7/2015	BOVINE	09-Jun-15	SAT 1, SAT 2	NEG	SAT 1, SAT 2
	ZIM 8/2015	BOVINE	18-Jun-15	SAT 2	NEG	SAT 2
	ZIM 9/2015	BOVINE	18-Jun-15	SAT 2	POS	SAT 2
	ZIM 10/2015	BOVINE	20-Jun-15	SAT 1	POS	SAT 1
	ZIM 11/2015	BOVINE	23-Jun-15	SAT 2	POS	SAT 2
	ZIM 12/2015	BOVINE	01-Jul-15	NEG	POS	FMDV GD
	ZIM 13/2015	BOVINE	07-Jul-15	SAT 2	POS	SAT 2
	ZIM 14/2015	BOVINE	14-Jul-15	SAT 1	POS	SAT 1
	ZIM 15/2015	BOVINE	17-Jul-15	SAT 2	POS	SAT 2

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	ZIM 16/2015	BOVINE	20-Jul-15	SAT 2	POS	SAT 2
	ZIM 17/2015	BOVINE	07-Aug-15	SAT 1	POS	SAT 1
	ZIM 18/2015	BOVINE	07-Aug-15	NEG	POS	FMDV GD
	ZIM 19/2015	BOVINE	07-Aug-15	SAT 1	POS	SAT 1
	ZIM 20/2015	BOVINE	12-Aug-15	SAT 2	POS	SAT 2
	ZIM 21/2015	BOVINE	12-Aug-15	SAT 2	POS	SAT 2
	ZIM 22/2015	BOVINE	18-Aug-15	SAT 2	POS	SAT 2
	TOTAL:	**47**				

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. Detailed Sequence Analysis

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/2015.htm.

Results from samples received at WRLFMD (status of samples being tested) are shown in the table 4-1 and a summary of all samples received by WRLFMD for this period is shown in chapter 2. A complete list of clinical sample diagnostics made by the WRLFMD between October to December 2015 is shown in chapter 3.

Table 4-1: Status of sequencing of samples received by the WRLFMD from October to December 2015 (*) indicates samples carried over from the last quarter)

WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2015/00015	12/08/2015	Turkey	O	4	4	Completed
			A	14	14	Completed
			Asia 1	7	7	Completed
WRLFMD/2015/00019	13/08/2015	Botswana	SAT 1	2	2	Completed
WRLFMD/2015/00020	13/08/2015	Namibia	SAT 1	1	1	Completed
			SAT 2	5	5	Completed
WRLFMD/2015/00022	13/08/2015	Zimbabwe	SAT 2	1	1	Completed
WRLFMD/2015/00023	13/08/2015	Mozambique	SAT 2	1	1	Completed
WRLFMD/2015/00024	13/08/2015	Niger	O	1	1	Completed
WRLFMD/2015/00025	15/09/2015	Saudi Arabia	A	2	2	Completed
WRLFMD/2015/00026	07/10/2015	Hong Kong SAR	O	3	3	Completed
WRLFMD/2015/00036	02/12/2015	Hong Kong SAR	O	3	3	Completed
WRLFMD/2015/00027	03/09/2015	Zimbabwe	SAT 1	4	4	Completed
			SAT 2	12	11	Completed
			SAT 1 + SAT 2	1	0	Completed
WRLFMD/2015/00028	19/10/2015	Saudi Arabia	A	2	2	Completed
WRLFMD/2015/00029	23/10/2015	Saudi Arabia	A	2	2	Completed
WRLFMD/2015/00030	12/11/2015	Morocco	O	3	3	Completed
WRLFMD/2015/00031	20/11/2015	Iran	A	2	2	Completed
			Pending	25	0	Pending
WRLFMD/2015/00032	26/11/2015	Thailand	Pending	21	0	Pending
WRLFMD/2015/00033	26/11/2015	Cambodia	O	2	2	Completed
			A	2	2	Completed
WRLFMD/2015/00034	26/11/2015	Laos	O	4	4	Completed
WRLFMD/2015/00035	26/11/2015	Myanmar	O	2	2	Completed
			A	3	3	Completed
WRLFMD/2015/00036	02/12/2015	Hong Kong SAR	O	3	3	Completed
WRLFMD/2015/00037	17/12/2015	Pakistan	Pending	35	0	Pending
WRLFMD/2015/00038	03/12/2015	Sudan	Pending	37	0	Pending
				204	84	

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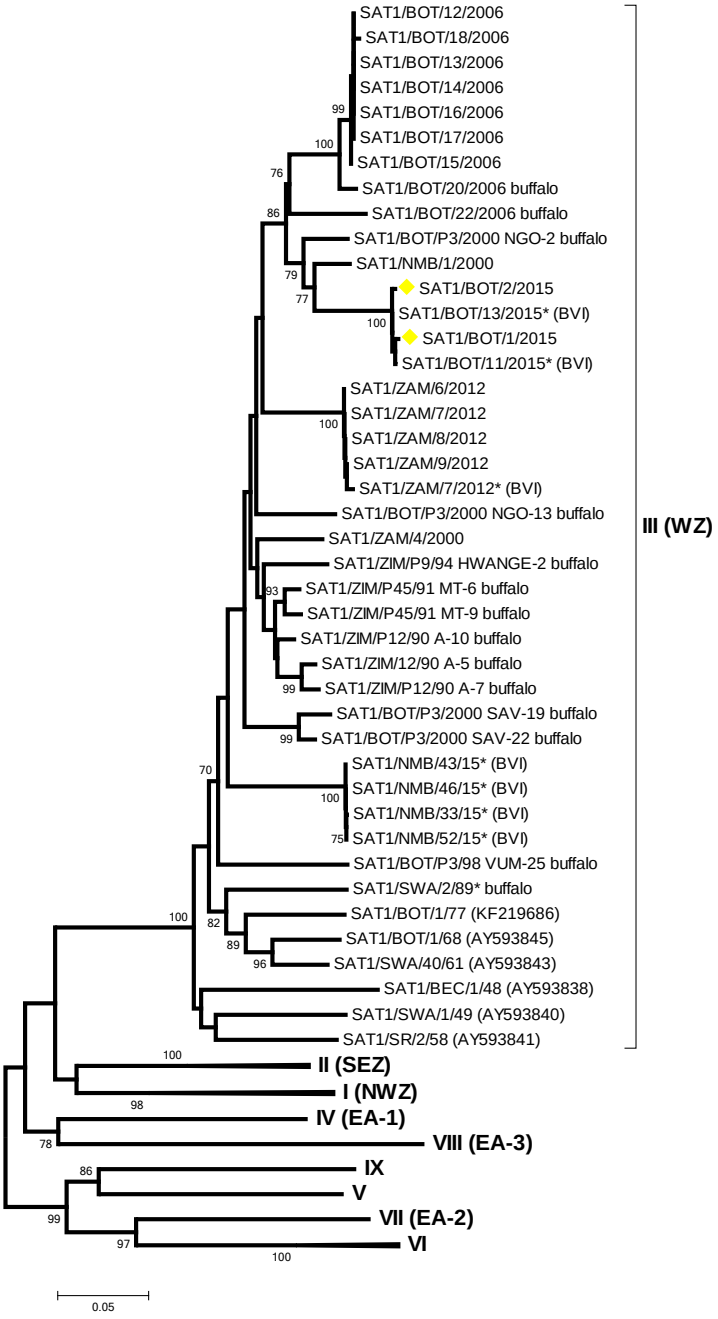
Africa:

Botswana
WRLFMD/2015/00019
Date sequence received: 13/08/2015
No. of samples: 2
SAT 1 (III): 2



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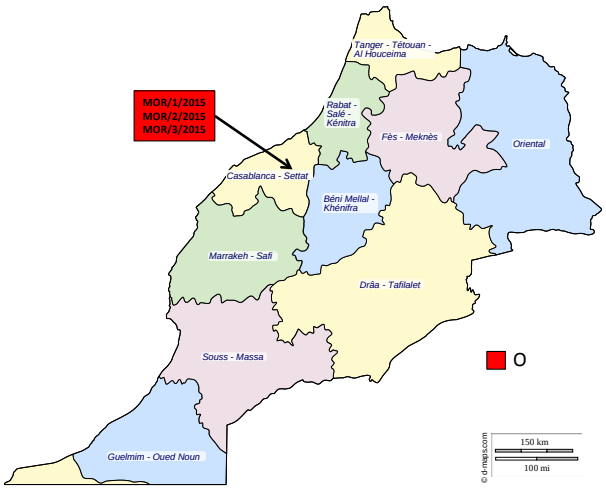
Morocco

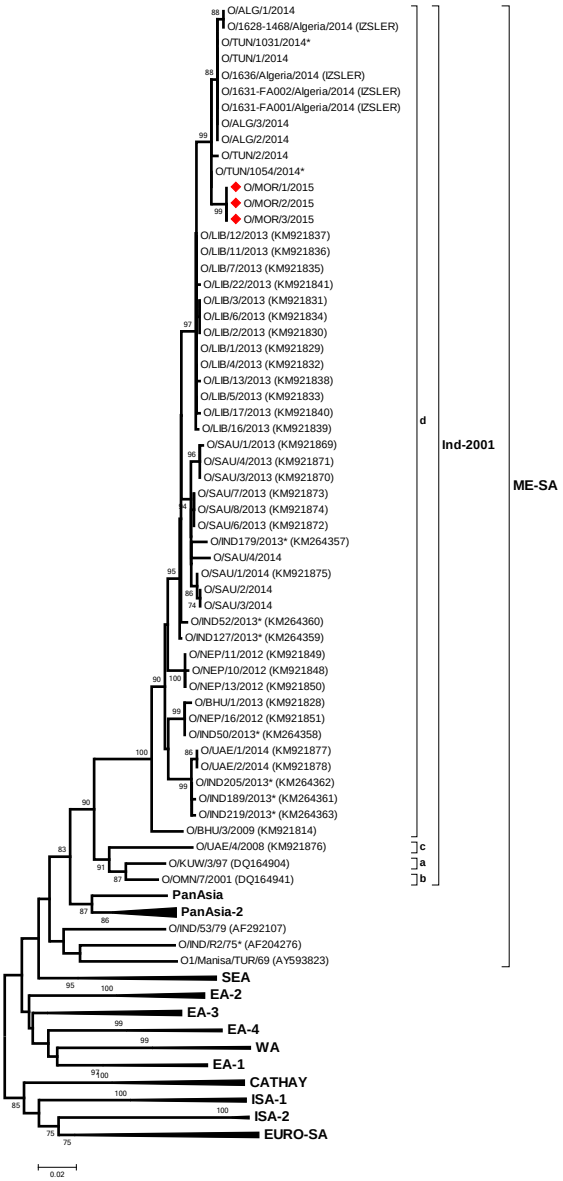
WRLFMD/2015/00030

Date sequence received: 12/11/2015

No. of samples: 3

O (ME-SA/Ind-2001d): 3





NB: A full genome sequence for FMDV O/MOR/1/2015 has been generated and deposited in GenBank under accession no. KU291242

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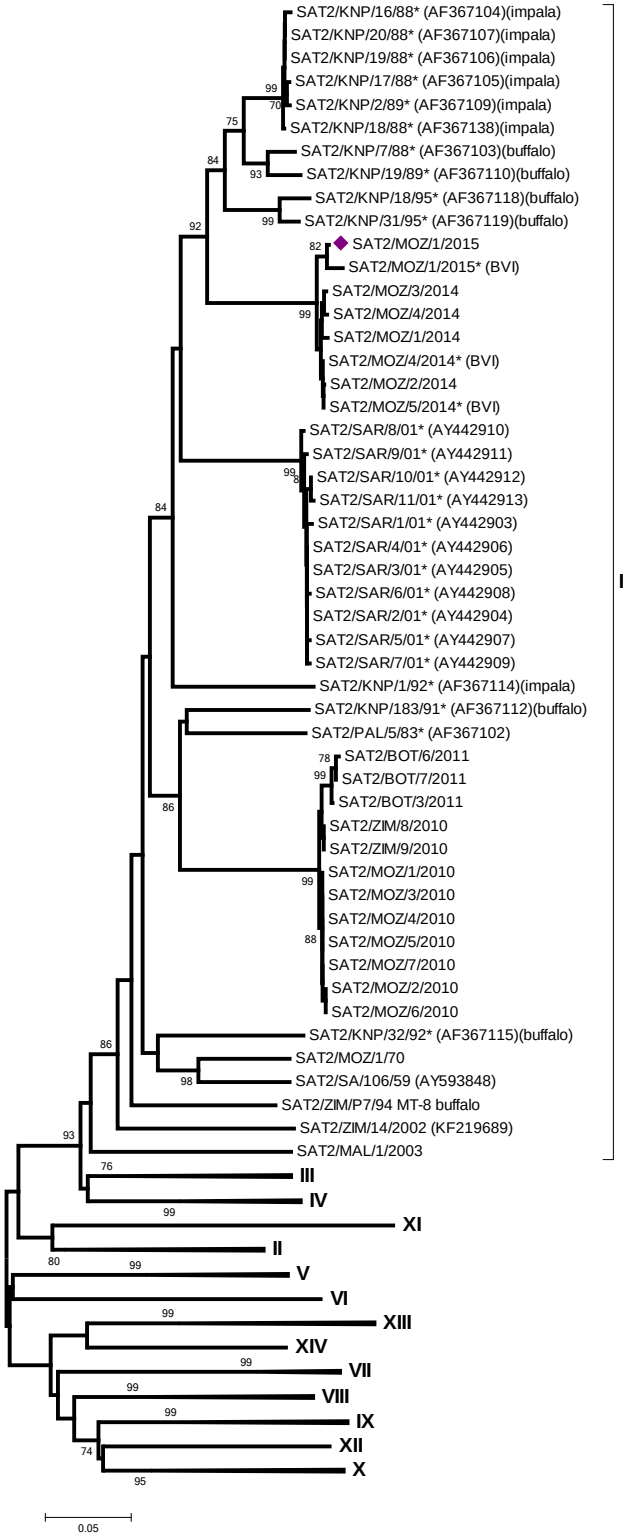
Mozambique
WRLFMD/2015/00023
Date sequence received: 13/08/2015
No. of samples:
SAT 2 (I): 1
NVD: 1

No locations given.



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Namibia

WRLFMD/2015/00020

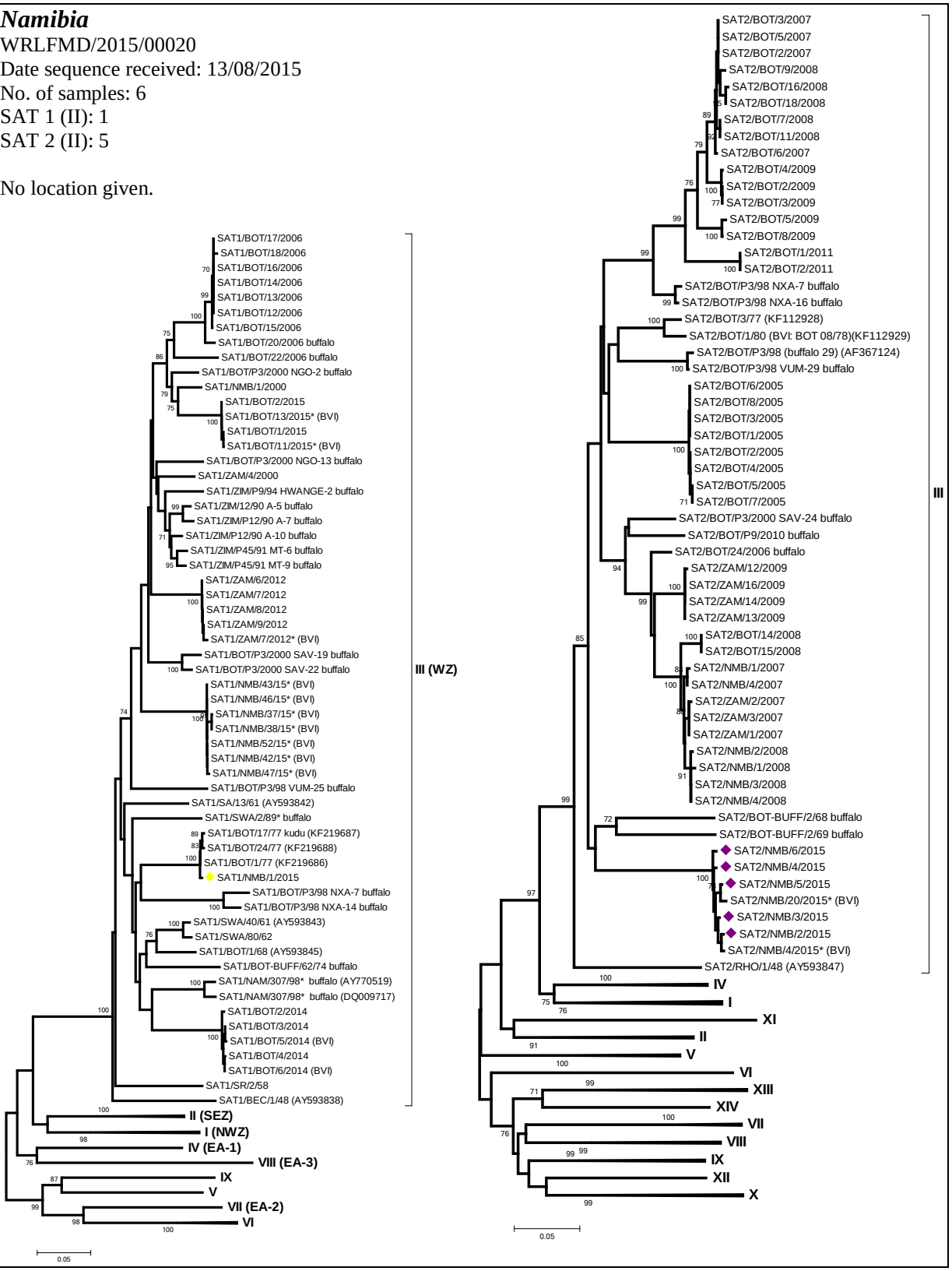
Date sequence received: 13/08/2015

No. of samples: 6

SAT 1 (II): 1

SAT 2 (II): 5

No location given.



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Zambia

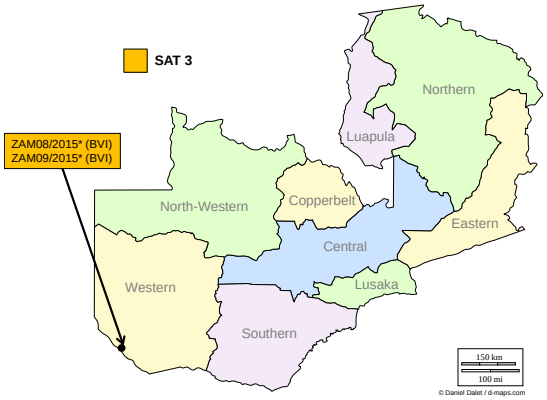
WRLMEG/2015/00020

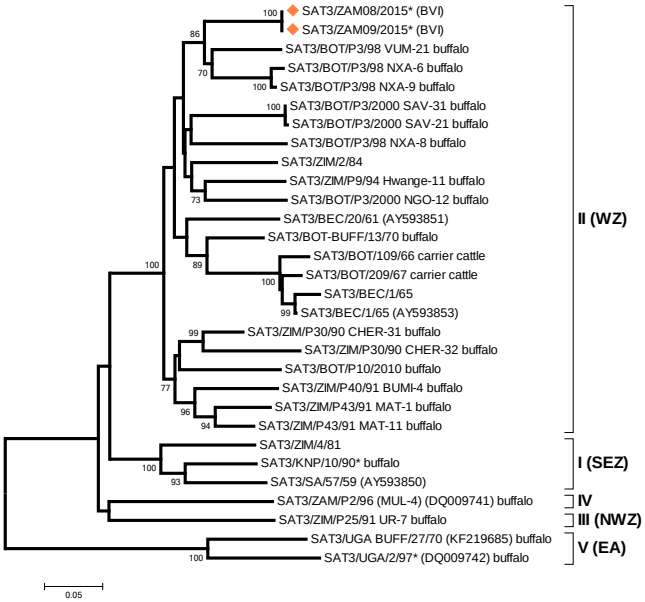
Date sequence received: 11/11/2015

No. of sequences: 2

SAT 3 (II): 2

VP1 sequences from the BVI





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Zimbabwe

WRLFMD/2015/00027

Date sequence received: 03/09/2015

No. of samples: 19

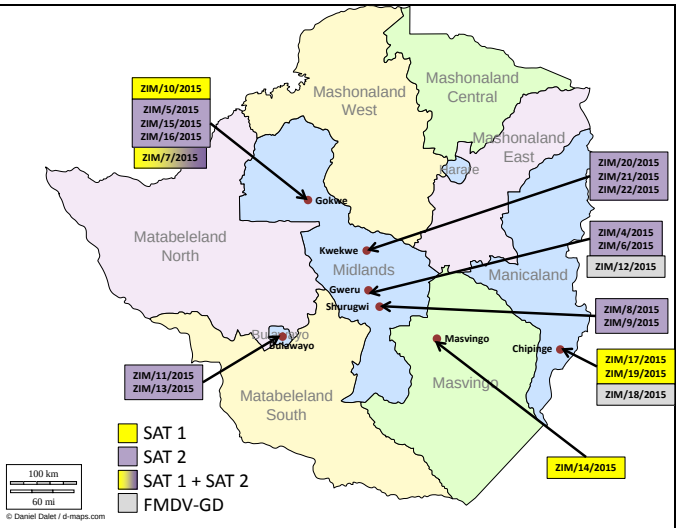
SAT 1 (II): 4

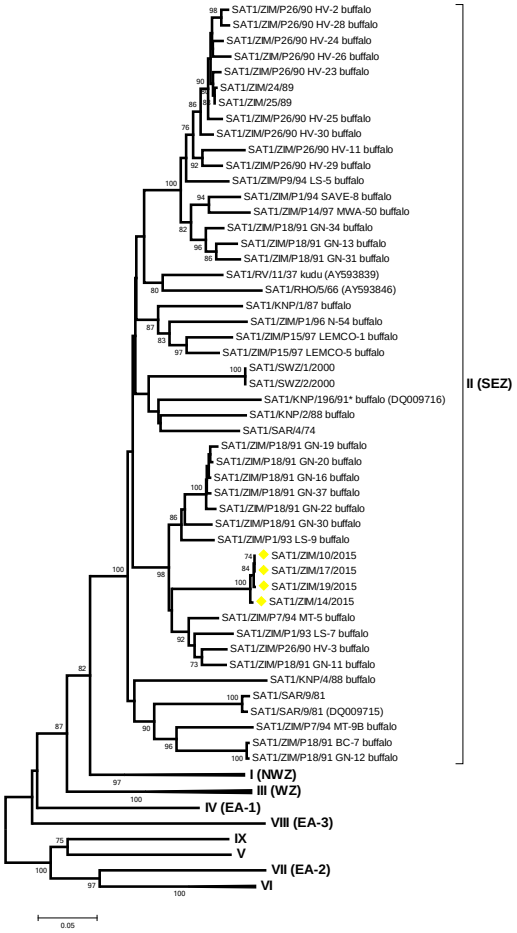
SAT 2 (II): 11

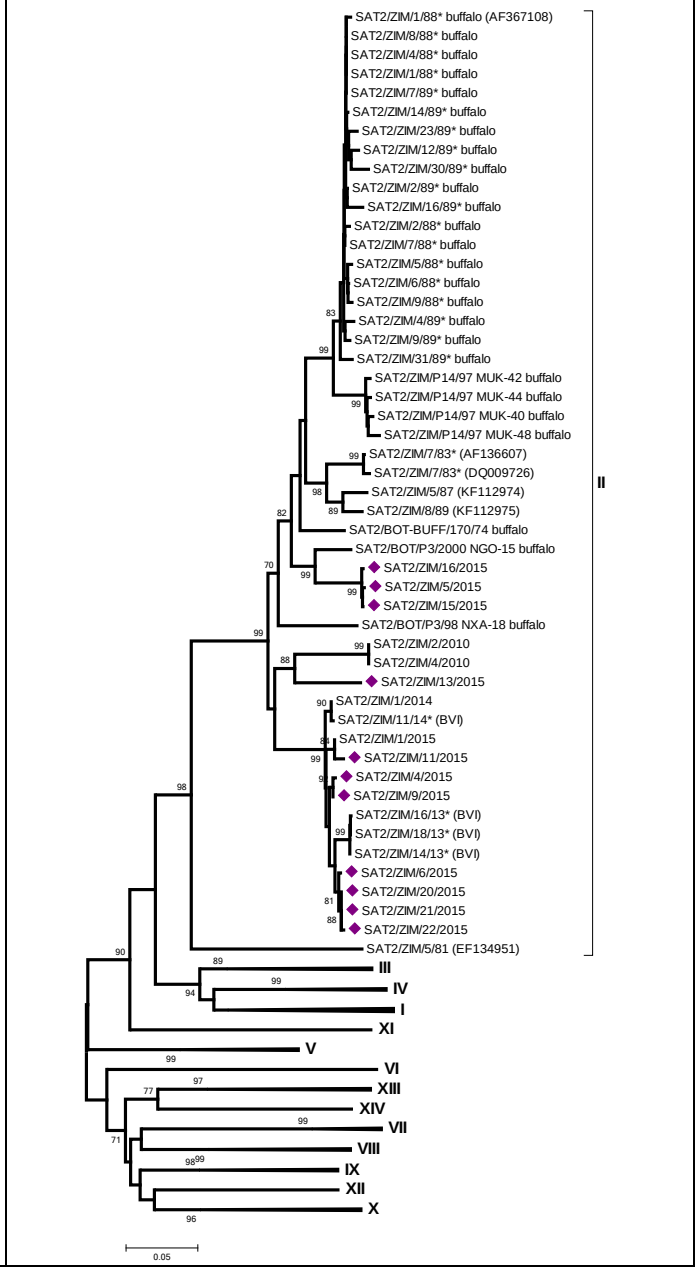
SAT 2 (no seq): 1

SAT 1 + SAT 2 (no seq): 1

FMDV-GD: 2







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Asia:

Cambodia

WRLFMD/2015/00033

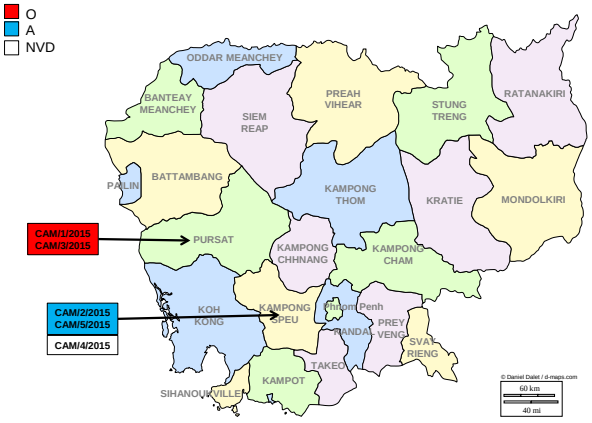
Date sequence received: 26/11/2015

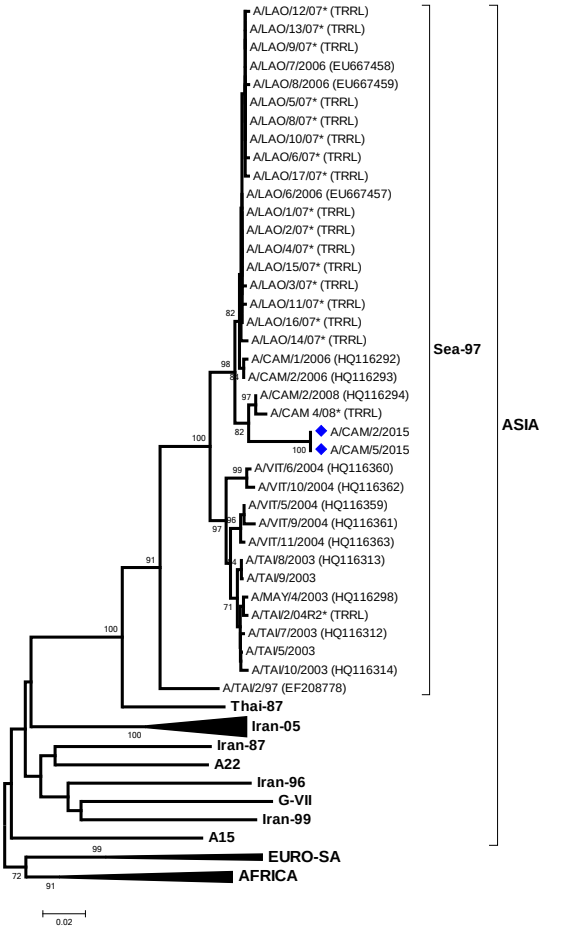
No. of samples:

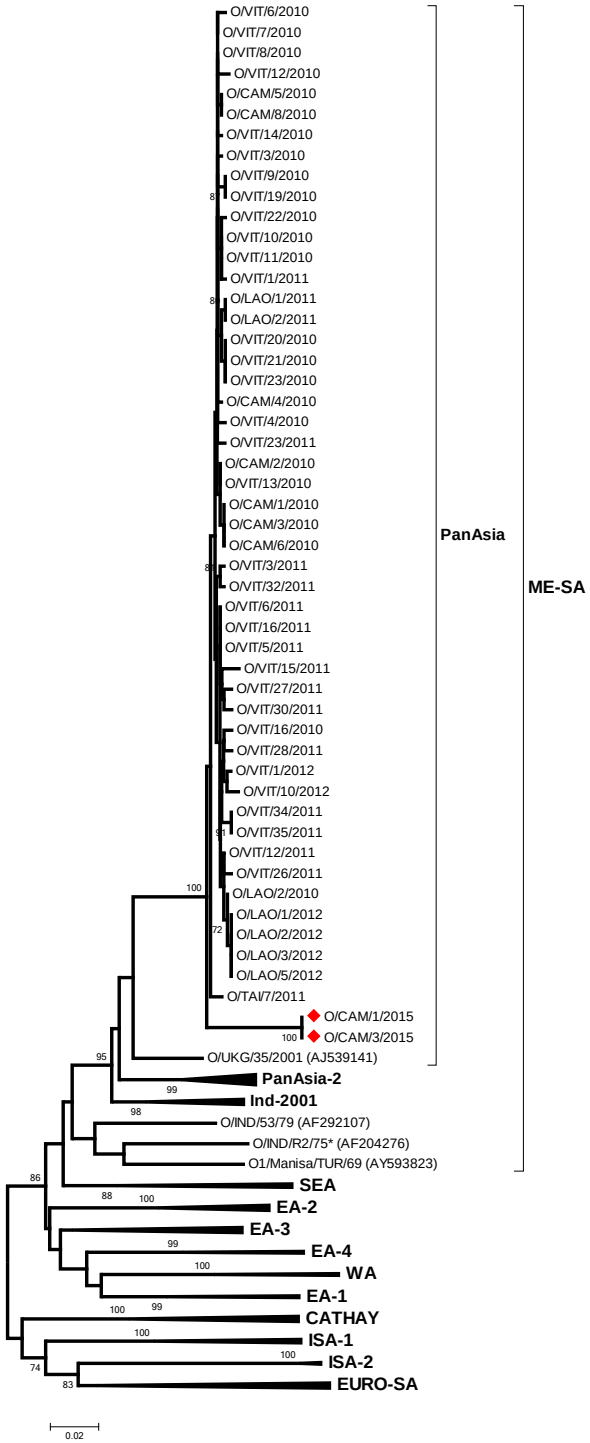
O (ME-SA/PanAsia): 2

A (ASIA/Sea-97): 2

NVD: 1







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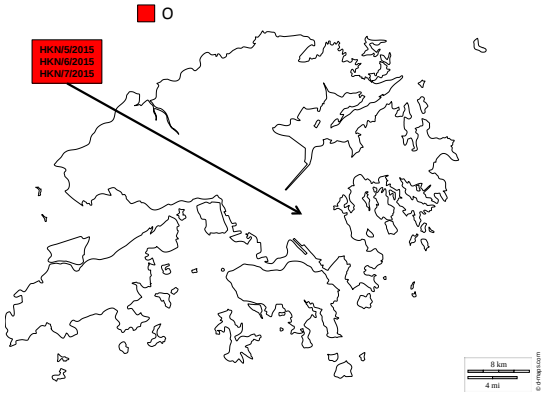
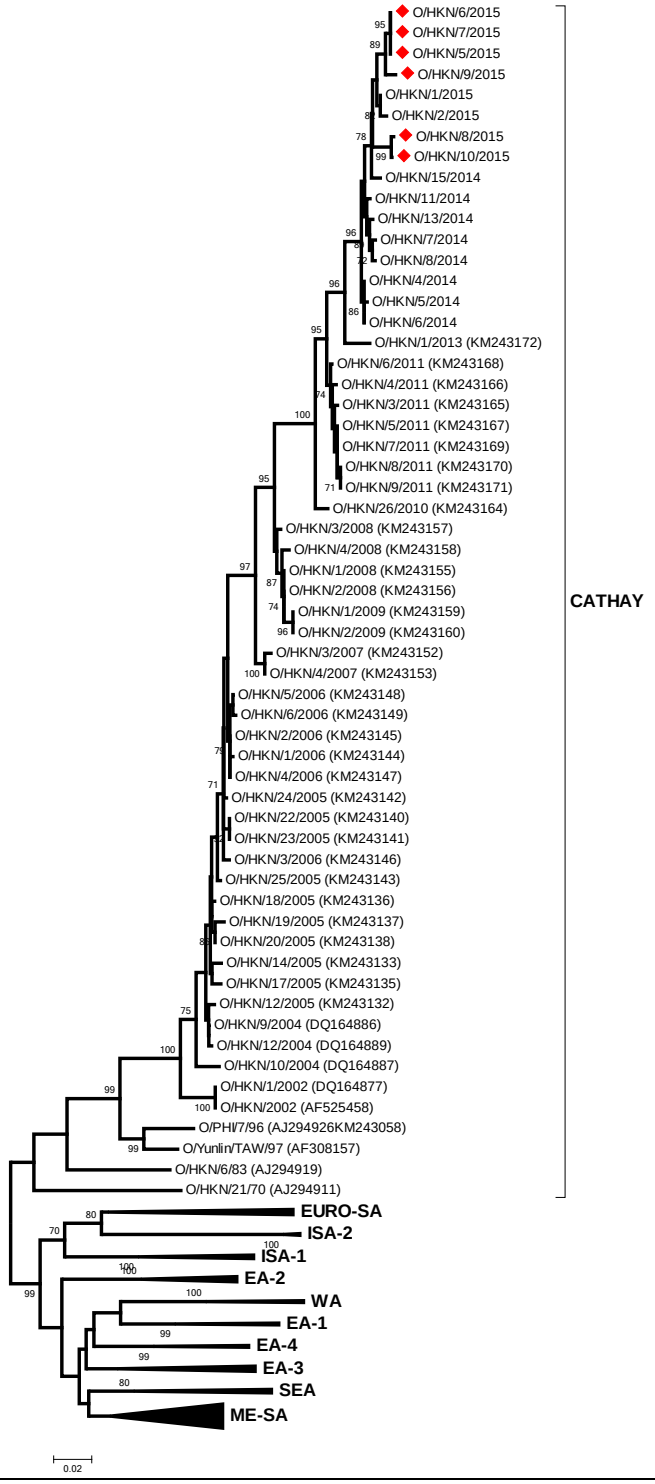
Hong Kong SAR

WRLFMD/2015/00026 & 36
Date sequence received: 07/10/2015 & 02/12/2015
No. of samples: 6
O (CATHAY): 6
FMDV-GD: 1

No locations were given for samples in batch 36.





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Iran

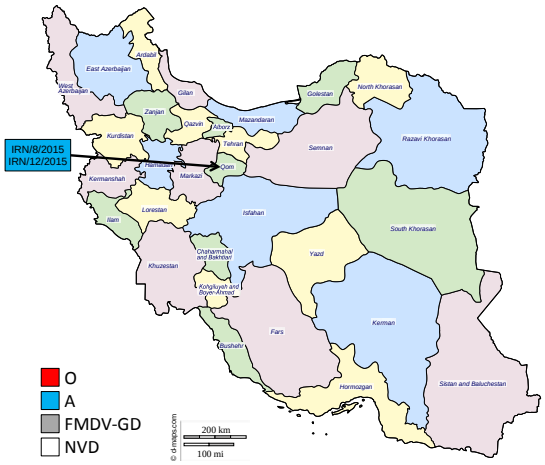
WRLFMD/2015/00031

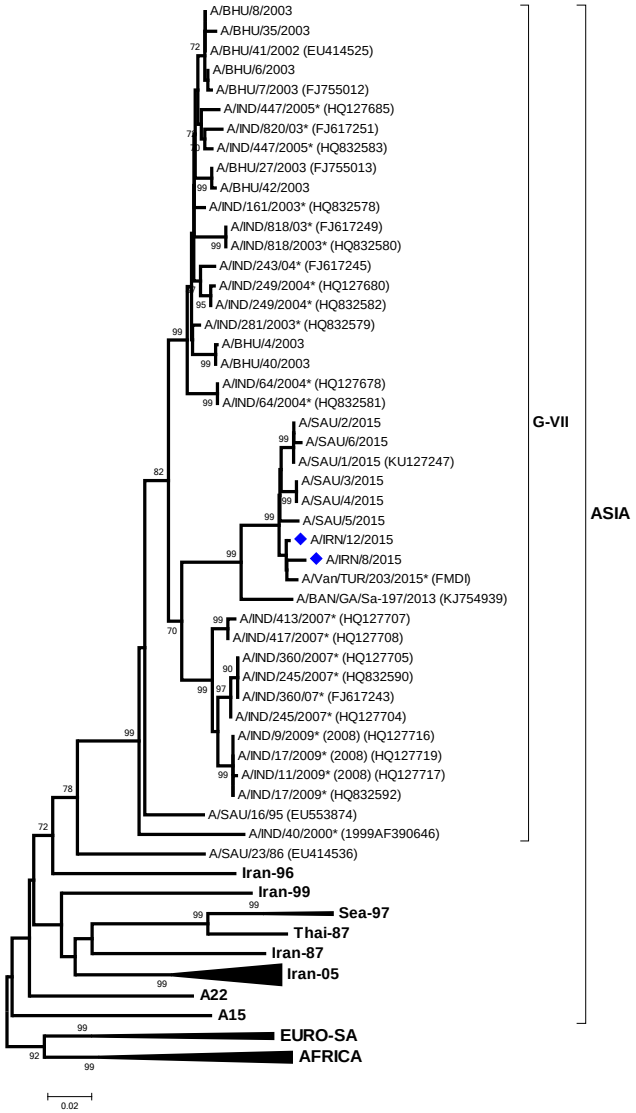
Date sequence received: 20/11/2015

No. of samples: 27

A (ASIA/G-VII): 2

Pending: 25





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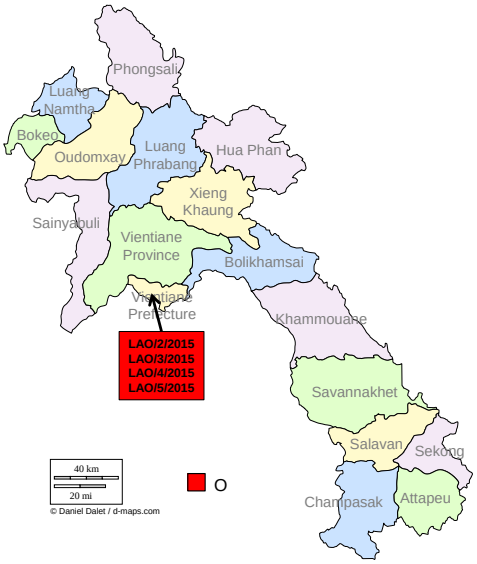
Laos (Lao PDR)

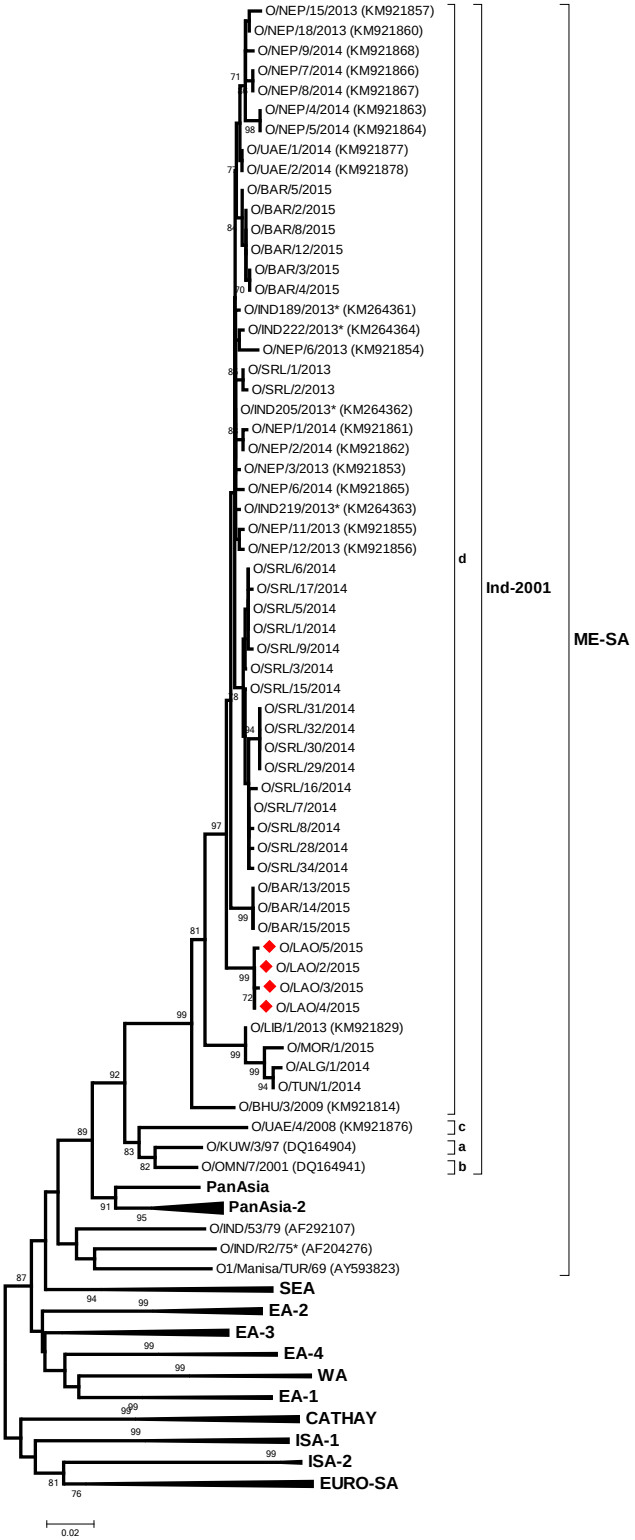
WRLFMD/2015/00034

Date sequence received: 26/11/2015

No. of samples: 3

O (ME-SA/Ind-2001d): 3





NB: This is a new introduction of the O/ME-SA/Ind-2001 lineage into Southeast Asia.

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Myanmar

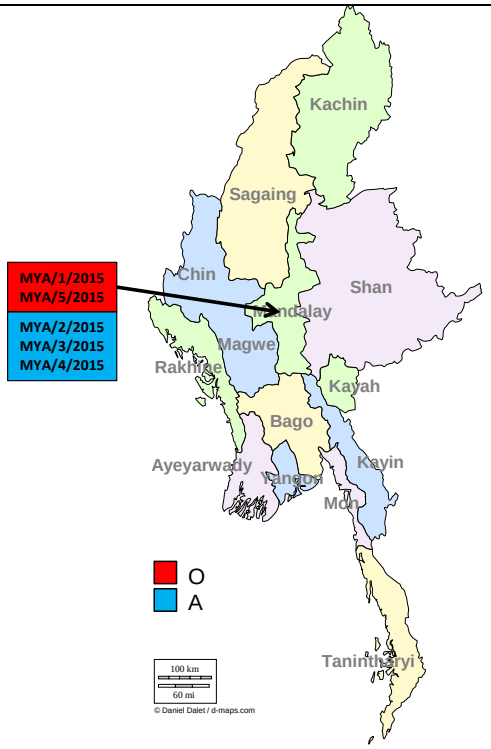
WRLFMD/2015/00035

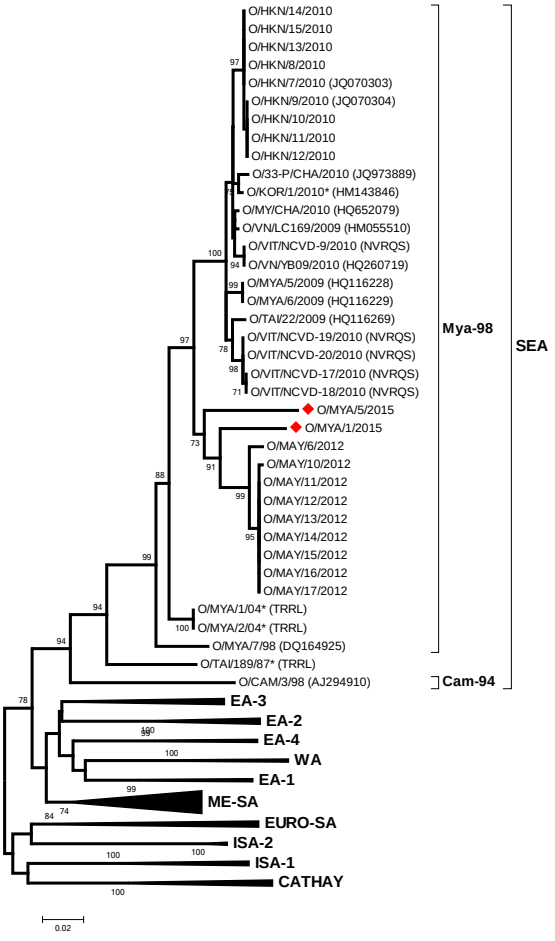
Date sequence received: 26/11/2015

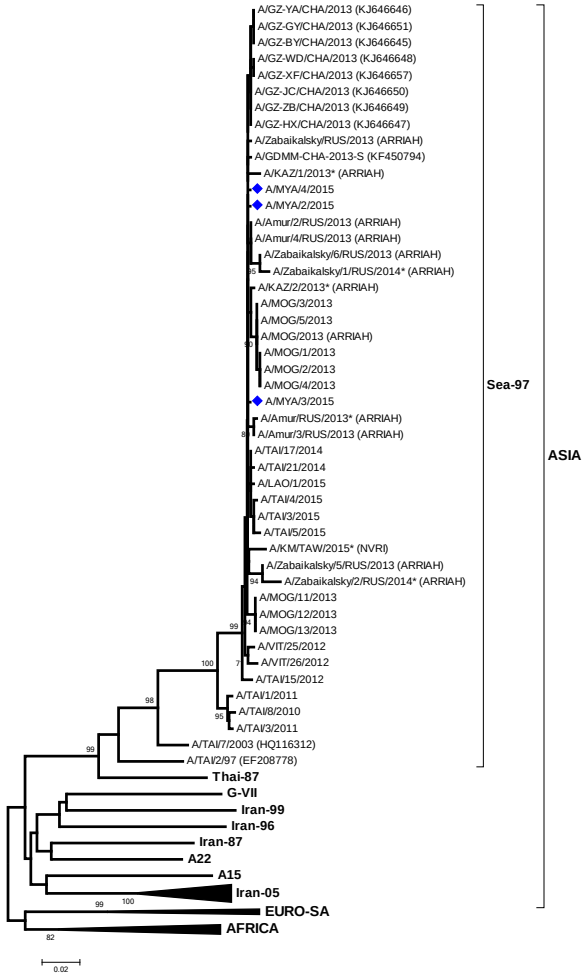
No. of samples:

O (SEA/Mya-98): 2

A (ASIA/Sea-97): 3







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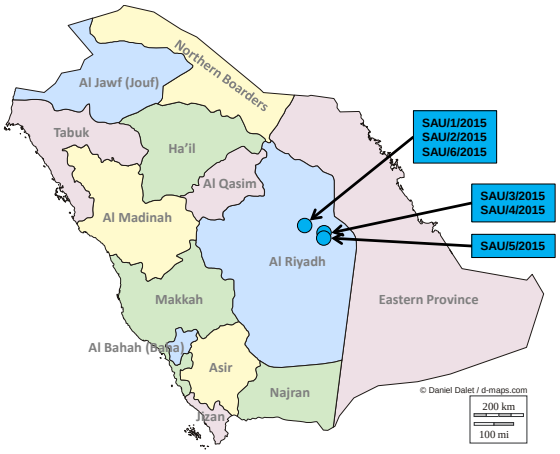
Saudi Arabia

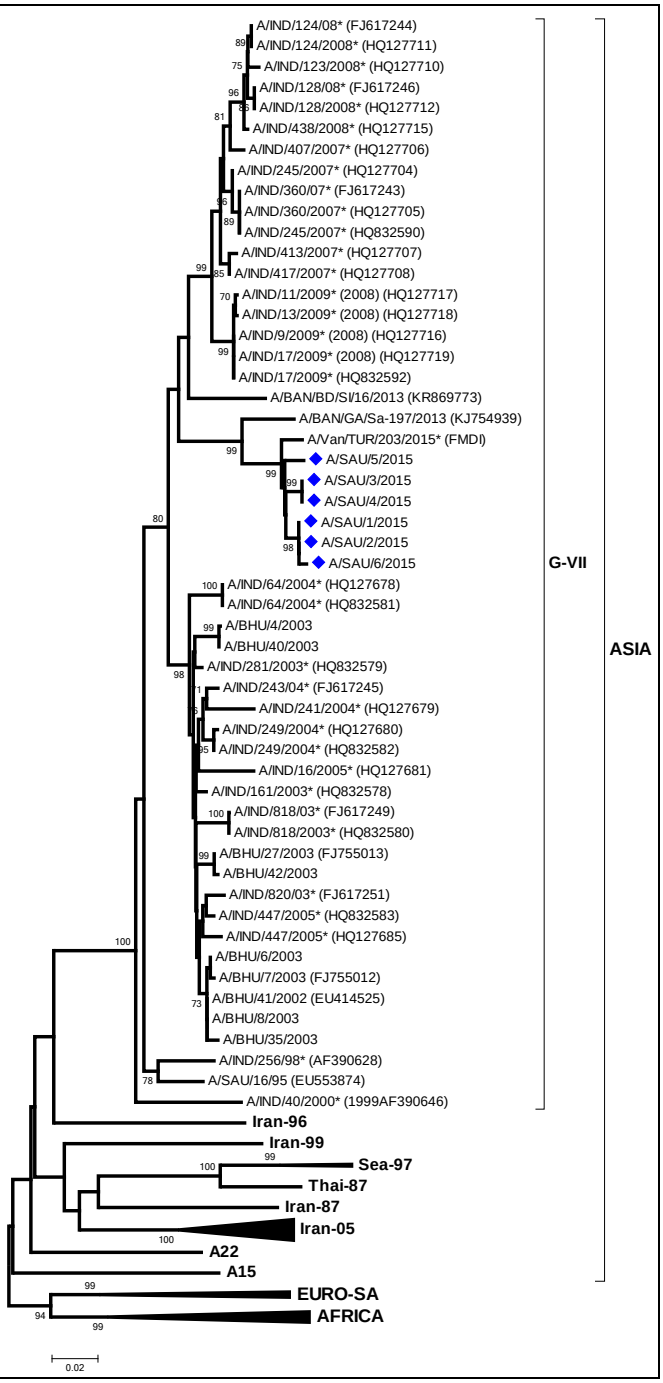
WRLFMD/2015/00028 & 29

Date sequence received: 19/10/2015 & 23/10/2015

No. of samples: 6

A (ASIA/G-VII): 6





NB: A full genome sequence for FMDV A/SAU/1/2015 has been generated and deposited in GenBank under accession no. KU127247.

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Turkey

WRLFMD/2015/00015

Date sequence received: 12/08/2015

No. of samples:

O (ME-SA/PanAsia-2^{FAR-09}): 4

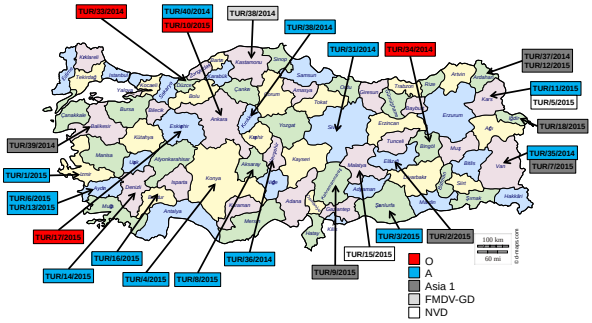
A (ASIA/Iran-05^{SIS-10}): 14

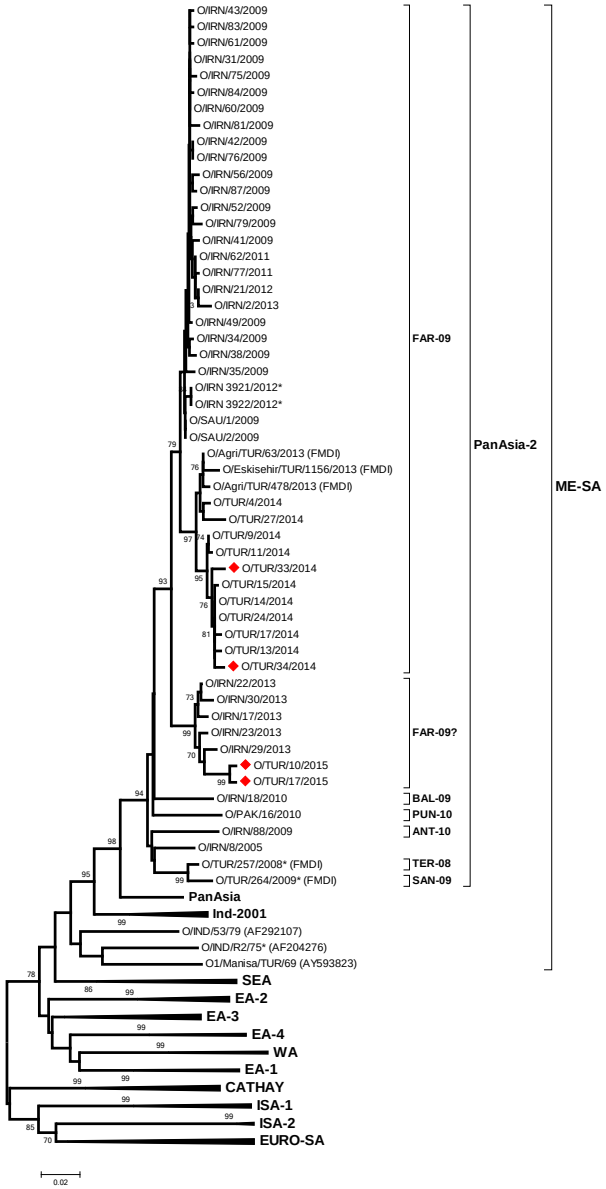
Asia 1 (ASIA/Sindh-08): 5

Asia 1 (ASIA/unassigned): 2

FMDV-GD: 1

NVD: 2





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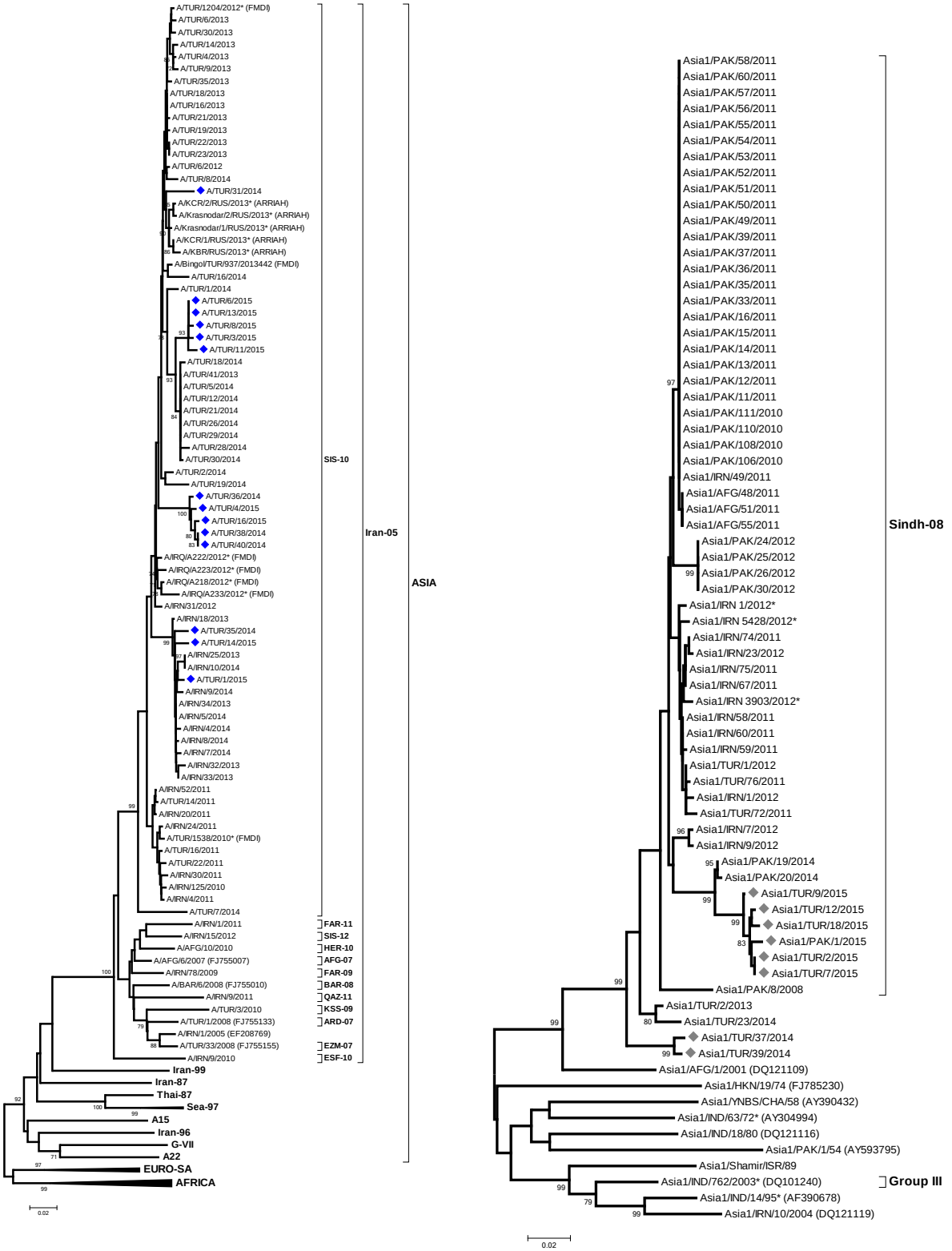
Turkey (continued)



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5. Vaccine matching

Antigenic characterisation of FMD field isolates by vaccine matching by 2dm VNT from October to December 2015.

Table 1: Serotype O

Sample		Vaccine Strain			
Field Virus Reference	**Topotype**	**O 3039**	**O Manisa**	**O/TUR/5/09**	**O/Russia/00**
O/MOR/1/2015	O/ME-SA/ Ind-2001	M	N	M	NT
O/MOR/2/2015	O/ME-SA/ Ind-2001	M	B	M	NT
O/HKN/1/2015	O/CATHAY	Previously Reported			M
O/HKN/2/2015	O/CATHAY				M

Table 2: Serotype A

Sample		Vaccine strain							
Reference	**Topotype**	**A Iran 2005**	**A IRN 87**	**A IRN 96**	**A IRN 99**	**A MAY 97**	**A SAU 95**	**A TUR 20/06**	**A22 IRQ**
A/SAU/1/2015	A/ASIA	N	N	N	N	N	N	N	N
A/SAU/2/2015	A/ASIA	N	N	N	N	N	N	N	N
A/IRN/12/2015	A/ASIA	N	NT	NT	NT	N	N	N	N
A/IRN/8/2015	A/ASIA	N	NT	NT	NT	N	N	N	N

Table 3: Serotype SAT 1

Sample		Vaccine strain
Reference	**Topotype**	**SAT105 RHO**
SAT 1/BOT/1/2015	SAT 1/III (WZ)	M
SAT 1/BOT/2/2015	SAT 1/III (WZ)	M

Abbreviations used in tables:

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

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6. Vaccine strain recommendations

RECOMMENDATIONS FROM WRLFMD® ON FMD VIRUS STRAINS TO BE INCLUDED IN FMDV ANTIGEN BANKS (FOR FMD-FREE COUNTRIES) – December 2015

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

NB: 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.

*In-vitro data from WRLFMD for serotype A viruses recently collected from Saudi Arabia and Iran highlights an apparent gap in vaccine coverage. Work is urgently required to evalute 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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7. Recent FMD publications

*Recent FMD Publications (July-September 2015) cited by Web of Science (Papers from The Pirbright Institute are highlighted in **BOLD AND GREY**)*

1. Ashfaq, M., A. Razzaq, H. Shamsheer ul, and G. Muhammad (2015). Economic analysis of dairy animal diseases in Punjab: a case study of Faisalabad district. *JAPS, Journal of Animal and Plant Sciences*, **25**(5): 1482-1495.
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