WRLFMD

WRLFMD Quarterly Report October-December 2010

Reference Laboratory Contract Report

1/25/2011
WRLFMD

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FAO/OIE Reference Laboratory Contract Report[1,2]
October-December 2010

Foot-and-Mouth Disease

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[2] Copies of all the individual reports cited herein can be obtained from Dr. Jef Hammond, IAH-Pirbright, jef.hammond@bbsrc.ac.uk.

Summary

ASIA

Afghanistan, Iran, Pakistan and Turkey

The O-PanAsia-2 and A-Iran-05 lineages continue to dominate in these countries. The PanAsia-2 lineage has been subdivided into six sub-lineages named BAL-09, YAZ-09, FAR-09, SAN-09, ANT-10 and PUN-10. During 2010, the ANT-10 sub-lineage appeared to have become the dominant type O sub-lineage in Afghanistan, Iran, Pakistan and Turkey.

P.R. China

A single outbreak of FMDV type O occurred in cattle on 04/10/2010 at Lage village, Dengqen, Qamdo, Tibet, bringing the total number of outbreaks to 18. No information concerning the genotyping of virus from this outbreak is yet available.

Mongolia

Three VP1 sequences were received from FGI-ARRIAH on the 16/11/2010. Analysis of these sequences showed them to be closely related to sequences determined from viruses previously isolated at the WRLFMD, i.e. FMDV O SEA topotype, Mya-98 lineage (see below).

Myanmar

On the 10 September 2010, a single outbreak of FMD was detected in cattle at Kun Thee Pin, Maungdaw, Maungdaw, Rakhine State very close to the border with Bangladesh. It was typed as FMDV A, the first occurrence of this serotype in Myanmar since 1978. A VP1 sequence was generated from cDNA amplified from RNA submitted by the Thailand Regional Reference Laboratory (Pakchong), but no virus was isolated in cell culture. Phylogenetic analysis revealed that the virus was not related to type A viruses from Southeast Asia but was most closely related to viruses occurring in India in 2000. The sequence clustered with viruses occurring exclusively in India between 1997 and 2008.

Republic of Korea (South Korea)

Since late November 2010, South Korea has experienced over 100 outbreaks of FMD type O. Analysis of four VP1 sequences received from the National Veterinary Research and Quarantine Service (NVRQS) has shown that these are viruses of the SEA topotype, Mya-98 lineage, similar to those previously isolated earlier in 2010 (see below).

Taiwan POC

As the result of a routine serological survey using an NSP ELISA, 10 pigs in a herd of 161, at South District, T'ai-Nan Shih (17/12/2010) were found to be positive for FMDV antibodies. The pigs were all clinically healthy and attempts at virus isolation and RT-PCR were all unsuccessful.

AFRICA

Botswana

In conjunction with the Botswana Vaccine Institute (BVI), VP1 sequence analysis was performed on viruses isolated from an outbreak on 26/07/2010 at Lesoma (Kasane) close to the borders with Namibia, Zambia and Zimbabwe. The viruses were SAT 2 topotype III and most closely related to SAT 2 viruses from Botswana (Kasane) in 2005 (see below).

Mozambique

Two further outbreaks of FMD type SAT 2 were reported in cattle in the south of the country (Motaze, Magude, Maputo) on 17/12/2010. In conjunction with the BVI the VP1 sequences of seven virus isolates from earlier outbreaks (September 2010 at Bilene, Gaza) showed they belonged to SAT 2 topotype I and were most closely related to viruses from South Africa (Kruger National Park) (see below).

Zambia

In conjunction with the BVI, the VP1 sequence of viruses isolated from an outbreak on 22/09/2010 at Mbala, Northern Province were determined. These belonged to the type O EA-2 topotype and were most closely related to viruses from the Democratic Republic of the Congo (2006), Uganda (2004-2006) and Tanzania (2009) (see below).

Zimbabwe

In conjunction with the BVI, the VP1 sequences of viruses isolated from an outbreak on 28/05/2010 at Kitwe Dip Tank, Plumtree, Magwe (Matabeleland South) were determined. They belonged to SAT 2 topotype II and were most closely related to viruses isolated from African buffalo and cattle in Botswana, Namibia and western Zimbabwe, although none were very closely related (see below).

Uncharacterised FMD viruses
A number of other 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/2010.htm.

WRLFMD vaccine recommendations have not changed from the previous report (Annex 3).

Results from samples 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 and December 2010 is shown in Annex 1 Table A. A record of all samples received to IAH-Pirbright (October-December 2010) is shown in Annex 1 Table B.

Table 1: Status of sequencing of samples received by the WRLFMD from October-December 2010.

Batch	Date Recd.	Country	Serotype(s)	No. of isolates	Status
WRLFMD/2010/00030	31/08/2010	Afghanistan	O-GD	39	Completed
			A-GD	1	Completed
WRLFMD/2010/00033	12/10/2010	Mongolia	O	8	Completed
WRLFMD/2010/00034	25/10/2010	Iran	O	16	Completed
			A	7	Completed
WRLFMD/2010/00035	05/11/2010	Vietnam	O	12	Completed
			A	1	Completed
WRLFMD/2010/00036	09/11/2010	Botswana	SAT 2	5	Completed
WRLFMD/2010/00037	09/11/2010	Mozambique	SAT 2	7	Completed
WRLFMD/2010/00038	09/11/2010	Zambia	O	3	Completed
WRLFMD/2010/00039	09/11/2010	Zimbabwe	SAT 2	2	Completed
WRLFMD/2010/00040	17/11/2010	Iran	O	7	Completed
			A	1	Completed
WRLFMD/2010/00041	24/11/2010	Nepal	O	10	Completed
WRLFMD/2010/00042	25/11/2010	Thailand	O	8	Completed
WRLFMD/2010/00043	25/11/2010	Cambodia	O	5	Completed
WRLFMD/2010/00044	25/11/2010	Myanmar	A-GD	1	Completed

WRLFMD/2010/00045	30/11/2010	Pakistan	O	26	Completed
WRLFMD/2010/00047	08/12/2010	Hong Kong SAR	O	3	Completed
Total				162	

*, carried over from last report.
GD, genome detected.

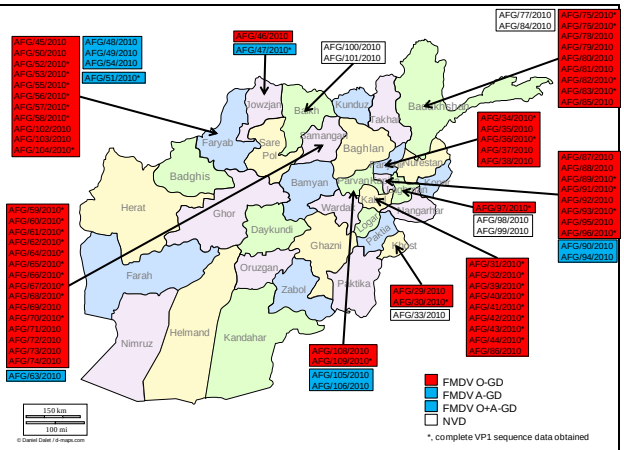
Detailed Analysis:

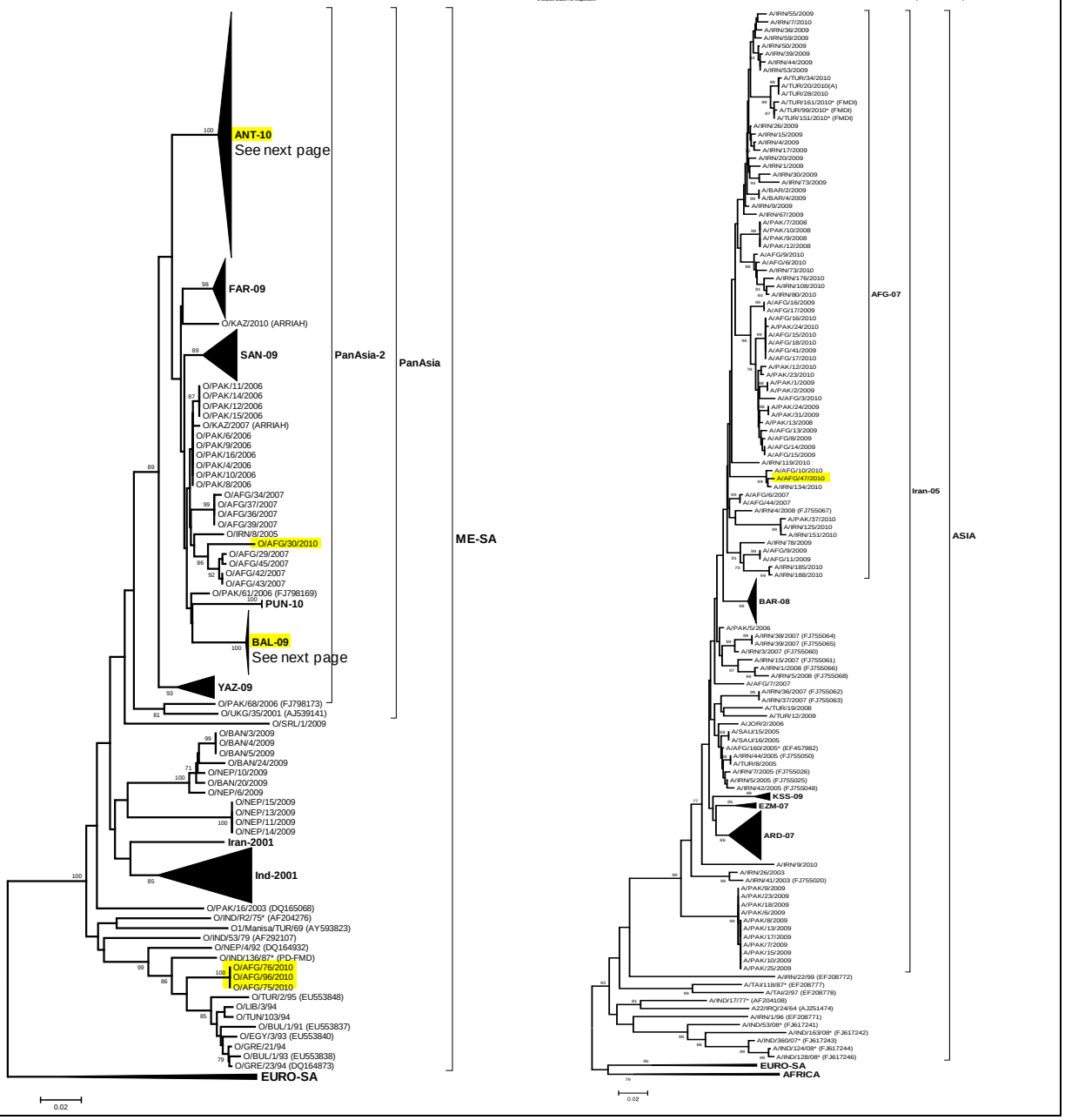
ASIA

Afghanistan

WRLFMD/2010/00030
Date received: 31/08/2010
No. samples: 81 (collected in RNAlater®)
O-GD: 63
A-GD: 8
O+A-GD: 2
NVD: 8

Complete VP1 sequence data was obtained for 39 type O-GD samples and only 1 type A-GD sample.

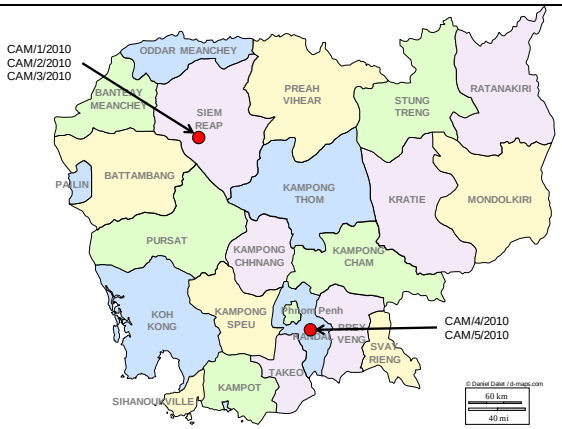


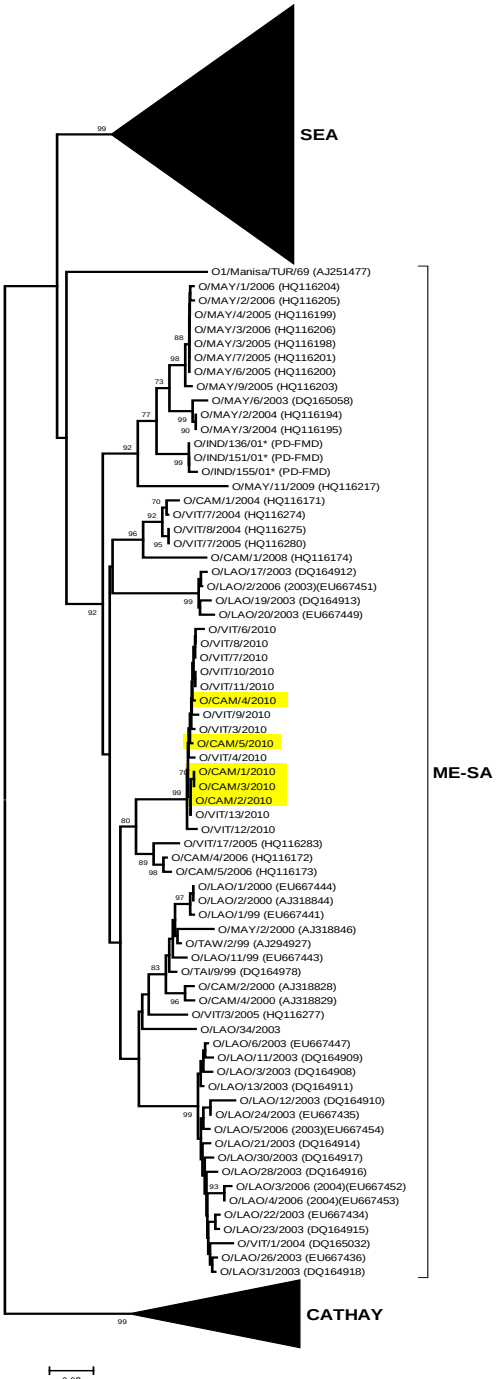


Cambodia

WRLFMD/2010/00043
Date received: 25/11/2010
No. samples: 5
O: 5

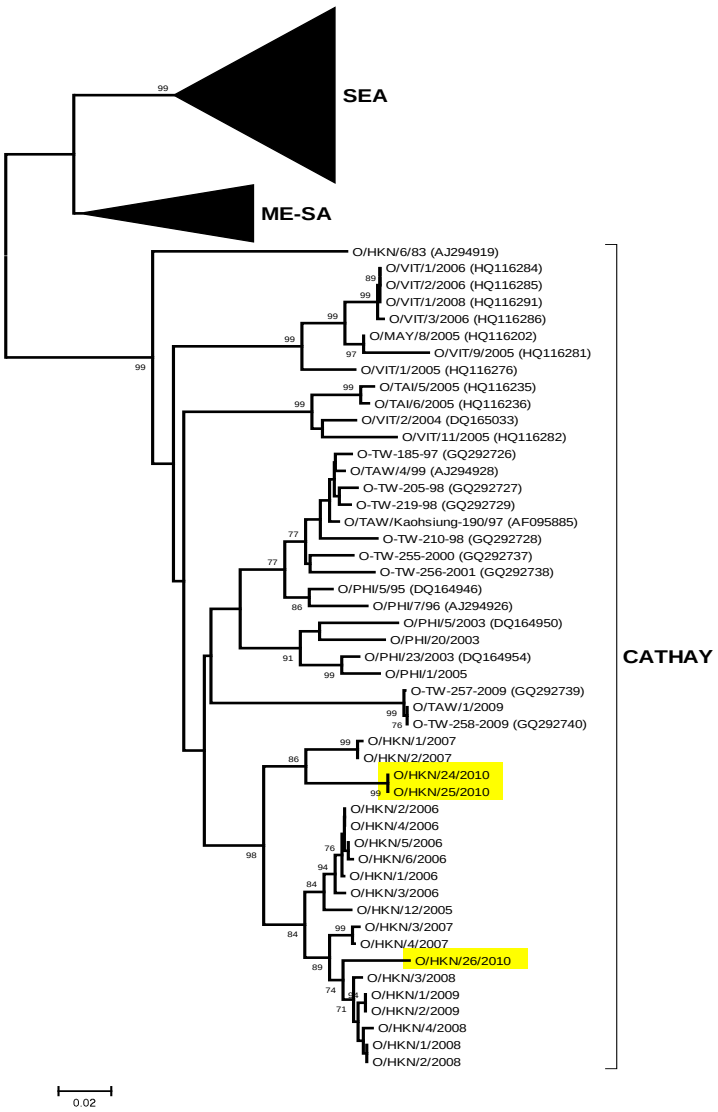
All samples belonged to the ME-SA topotype, PanAsia lineage.





Hong Kong SAR
WRLFMD/2010/00047
Date received: 08/12/2010
No. samples: 3
O: 3
Locations not given.

All three viruses belonged to the CATHAY topotype.



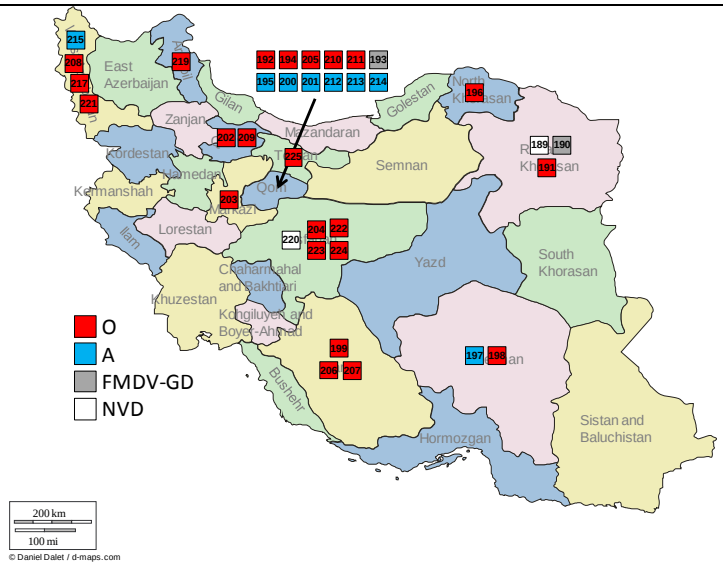
Iran

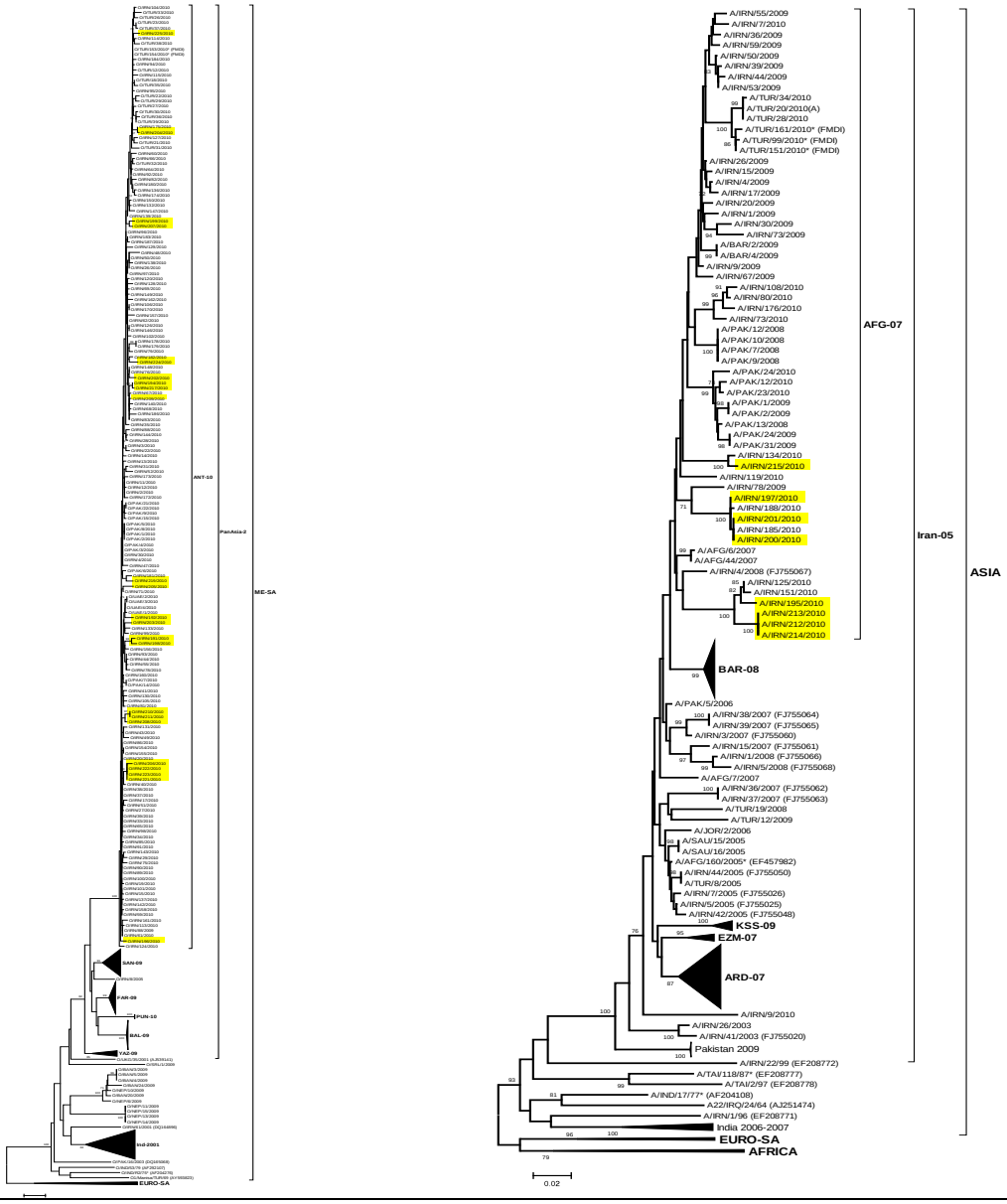
WRLFMD/2010/00034
Date received: 25/10/2010
No. samples: 26
O: 16; A: 7; FMDV-GD: 2; NVD: 1

WRLFMD/2010/00040
Date received: 17/11/2010
No. samples: 11
O: 7; A: 1; NVD: 3

All type O viruses belonged to the ME-SA topotype, PanAsia-2^{ANT-10} lineage.

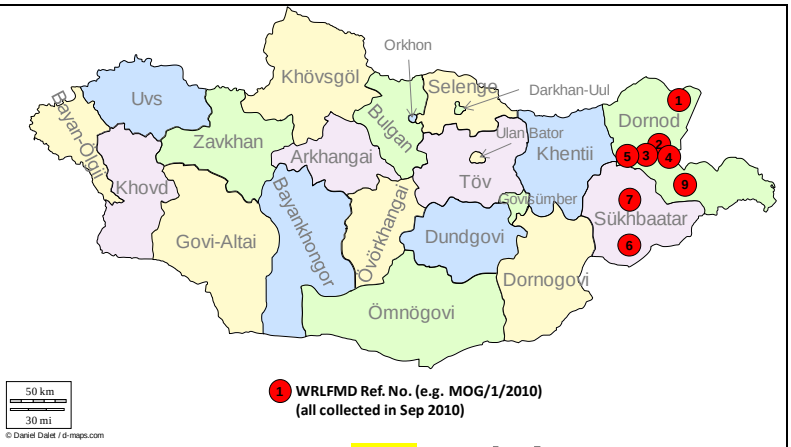
All type A viruses belonged to the ASIA topotype, Iran-05^{AFG-07} lineage.

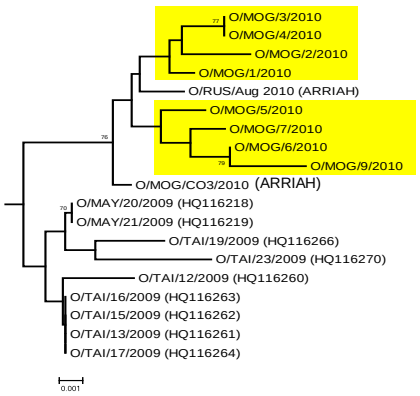


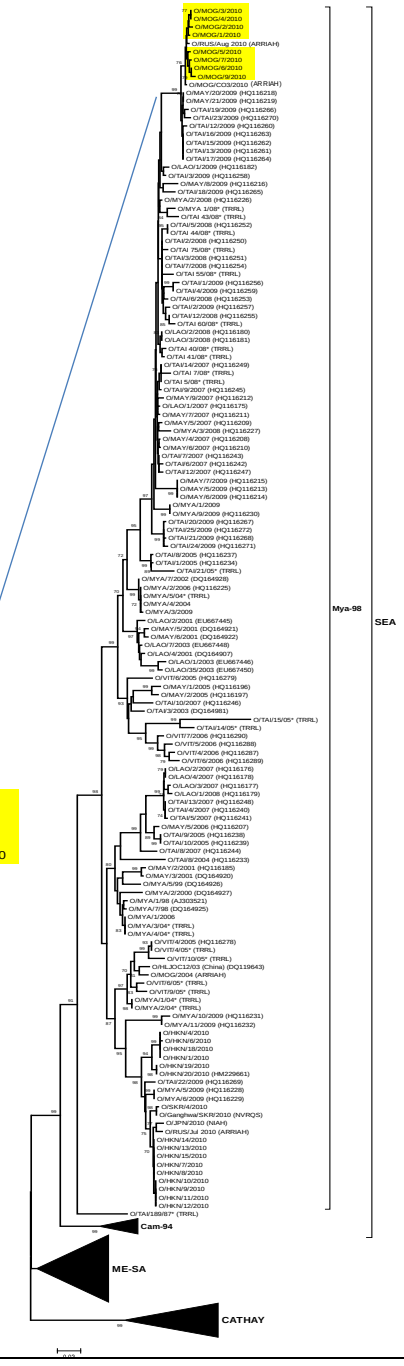


Mongolia
WRLFMD/2010/00033
Date received: 12/10/2010
No. samples: 18
O: 8
FMDV-GD: 1
NVD: 9

All viruses belonged to the SEA topotype, Mya-98 lineage.

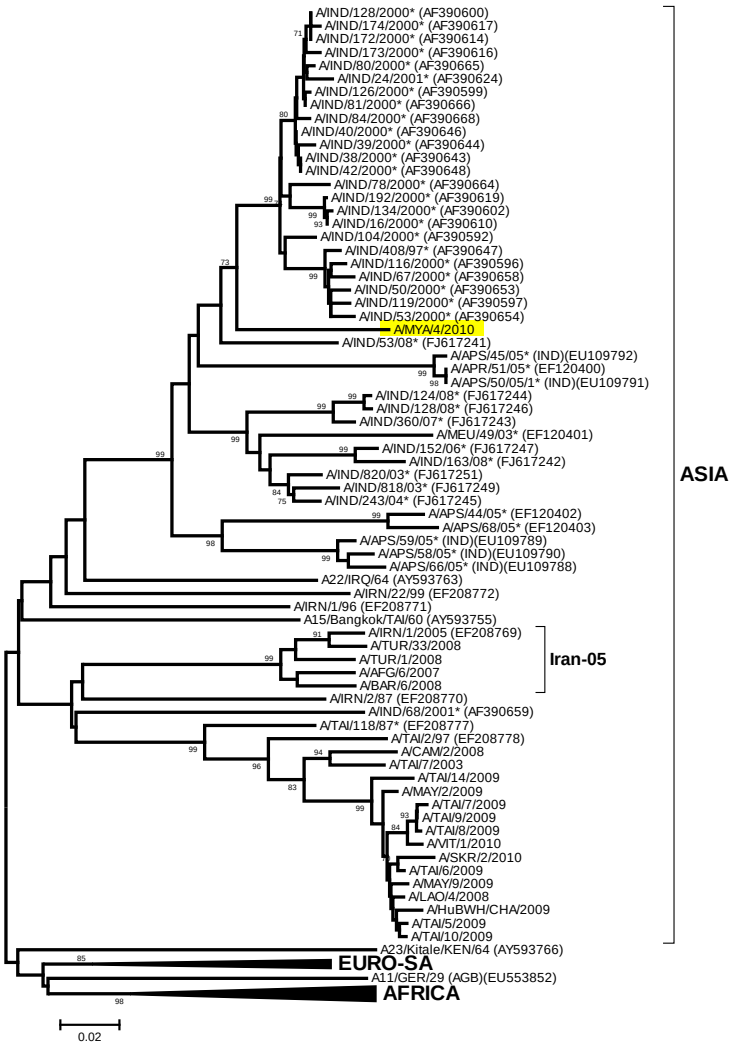






Myanmar
WRLFMD/2010/00044
Date received: 25/11/2010
No. samples: 2
A-GD: 1
FMDV-GD: 1

The type A detected belonged to the ASIA topotype and was most closely related to viruses from India in 2000.

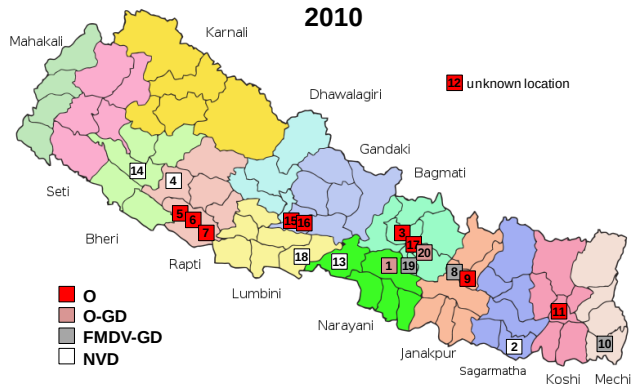


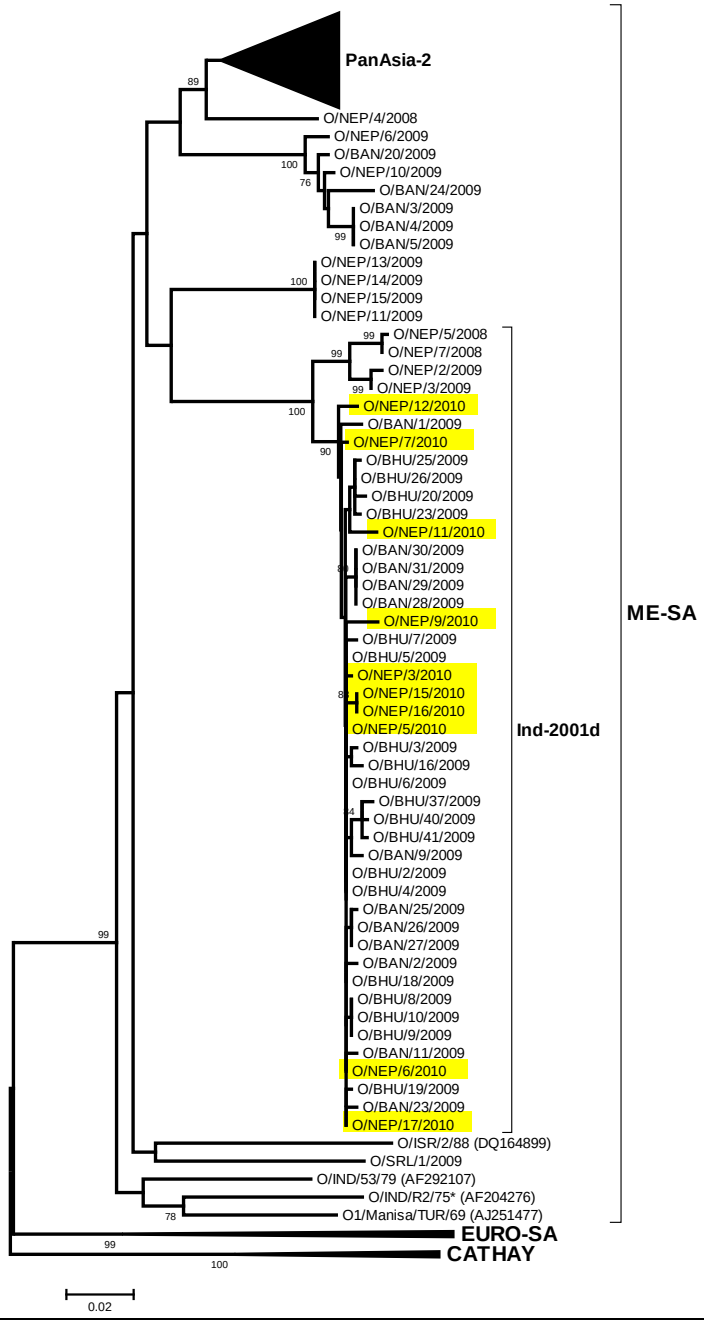
Nepal

WRLFMD/2010/00041
Date received: 24/11/2010
No. samples: 51
O: 10
FMDV-GD: 17
NVD: 24

(only samples from 2010 are mapped)

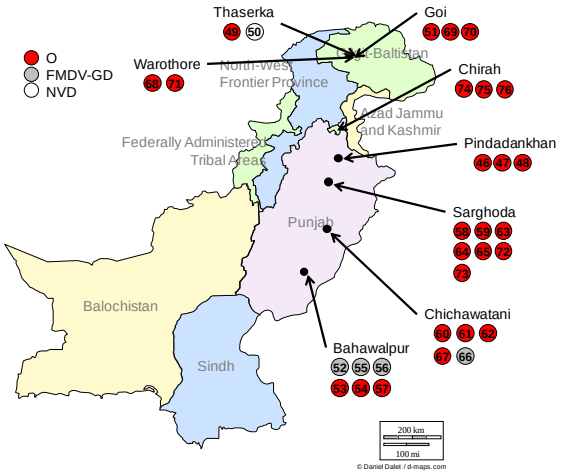
All 10 viruses belonged to the ME-SA topotype, Ind-2001d lineage.

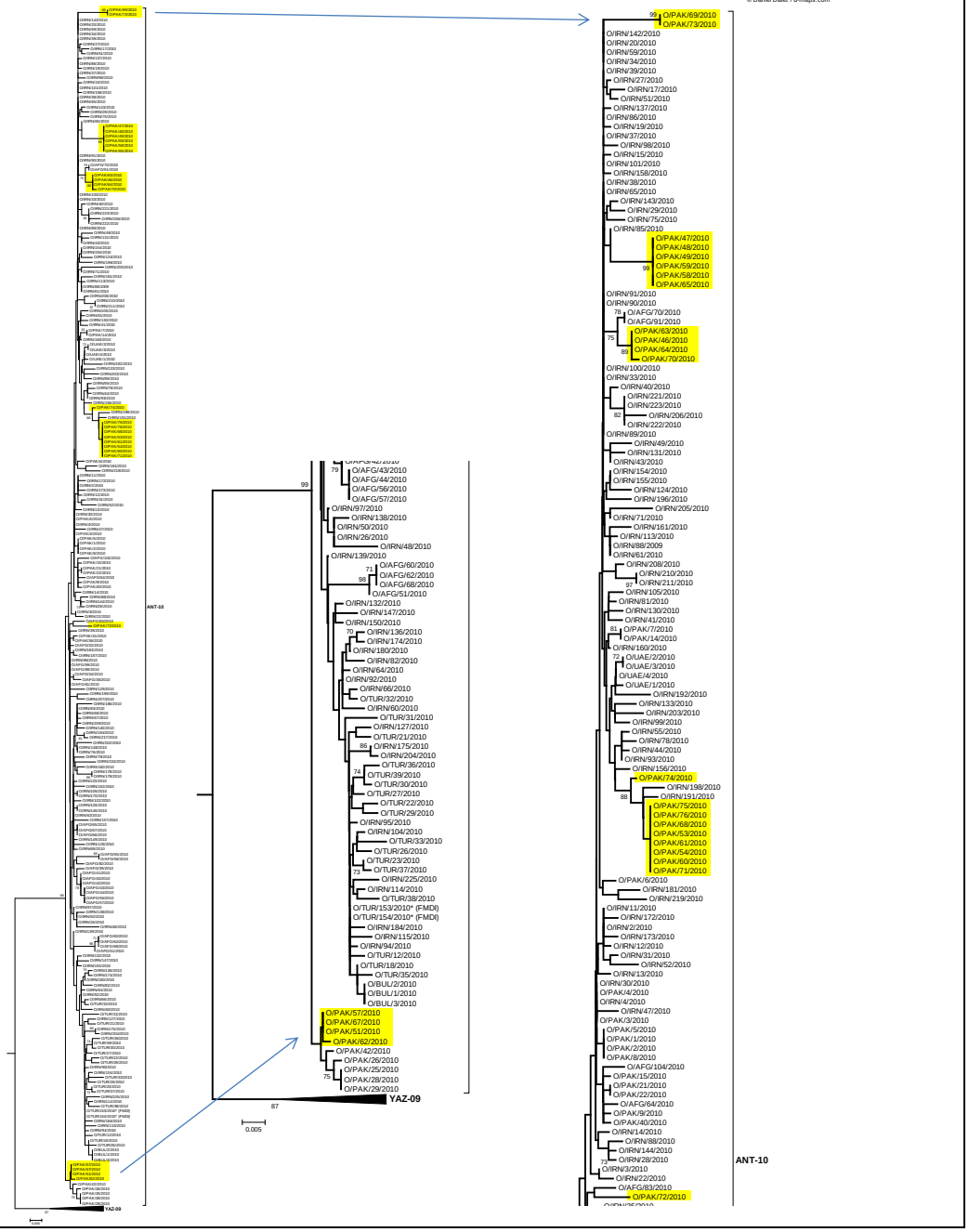




Pakistan
WRLFMD/2010/00045
Date received: 30/11/2010
No. samples: 31
O: 26
FMDV-GD: 4
NVD: 1

All 26 type O viruses belonged to the ME-SA topotype, PanAsia-2^{ANT-10} lineage.

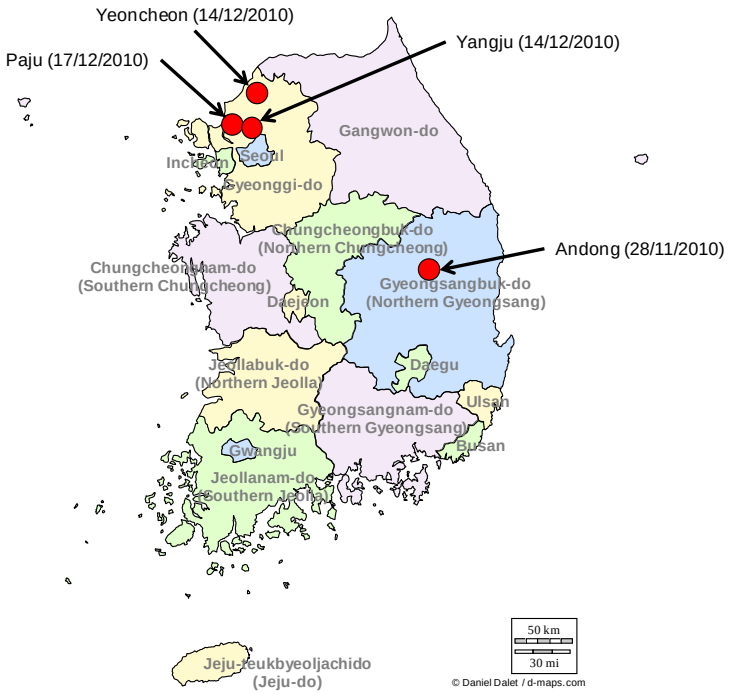


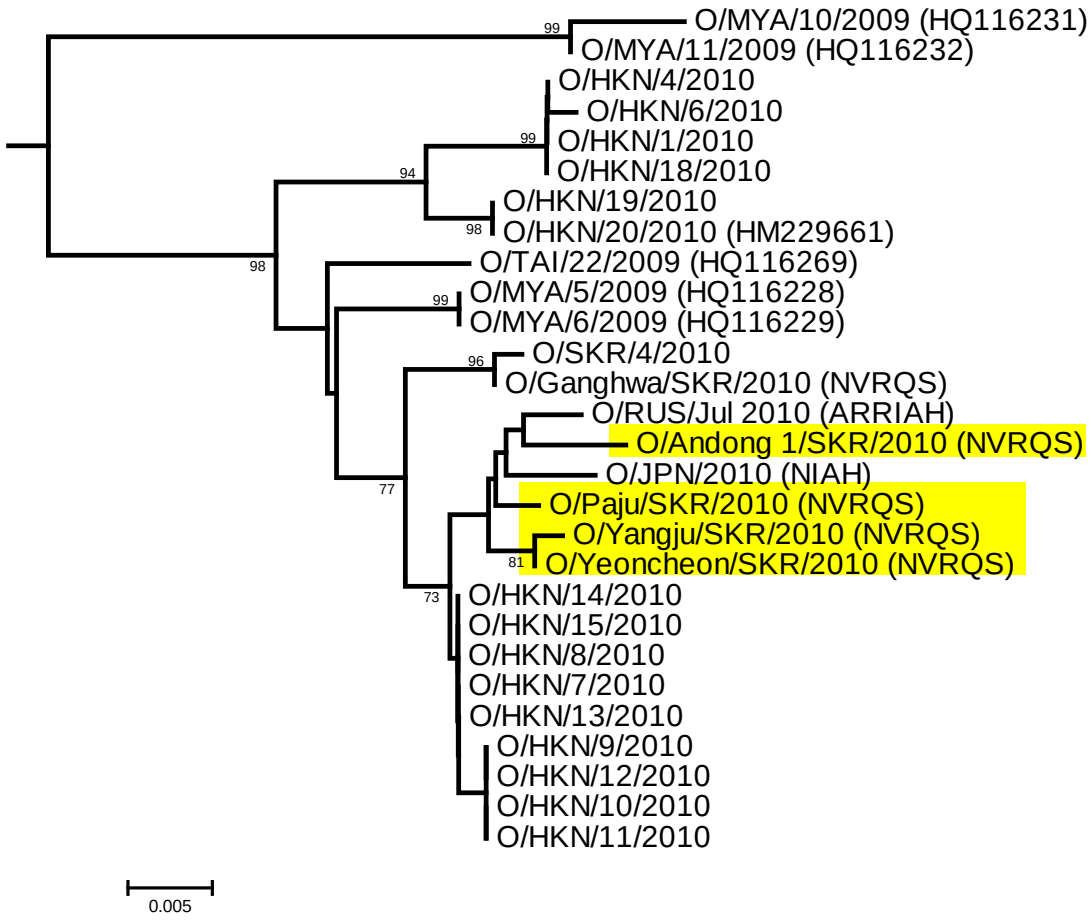


Republic of Korea (South Korea)

VP1 sequences received from National Veterinary Research and Quarantine Service (NVRQS), Anyang, Gyeonggi 430-824, Republic of Korea
Date received: 30/11/2010 to17/12/2010
No. sequences: 4
O: 4

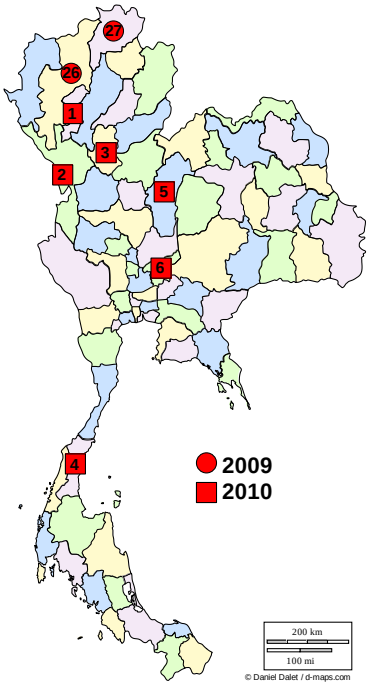
All four sequences belonged to the SEA topotype, Mya-98 lineage.

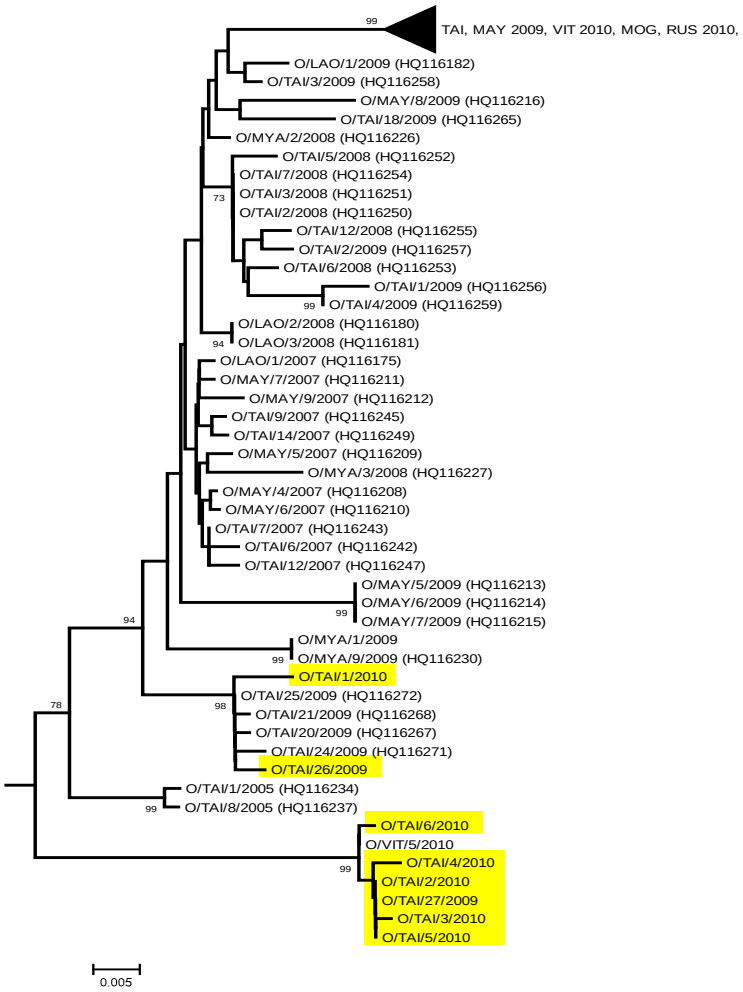




Thailand
WRLFMD/2010/00042
Date received: 25/11/2010
No. samples: 8
O: 8

All viruses belonged to the SEA topotype, Mya-98 linegae.

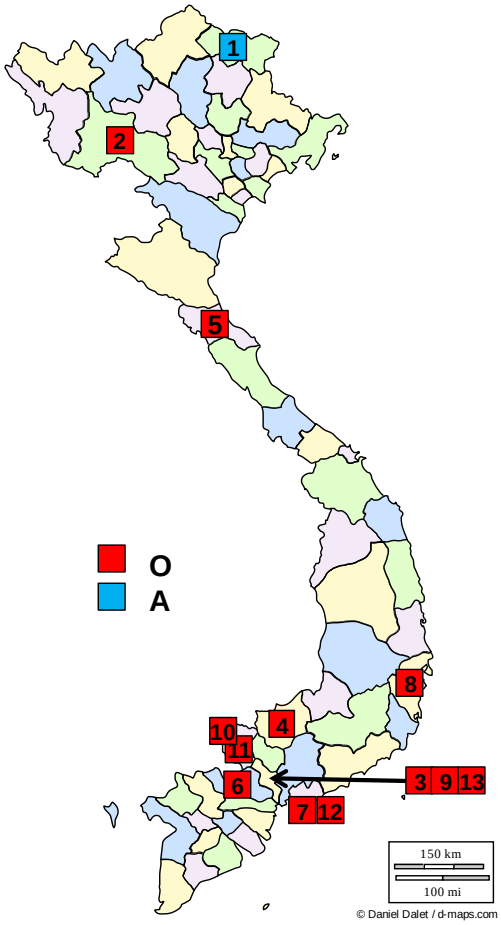


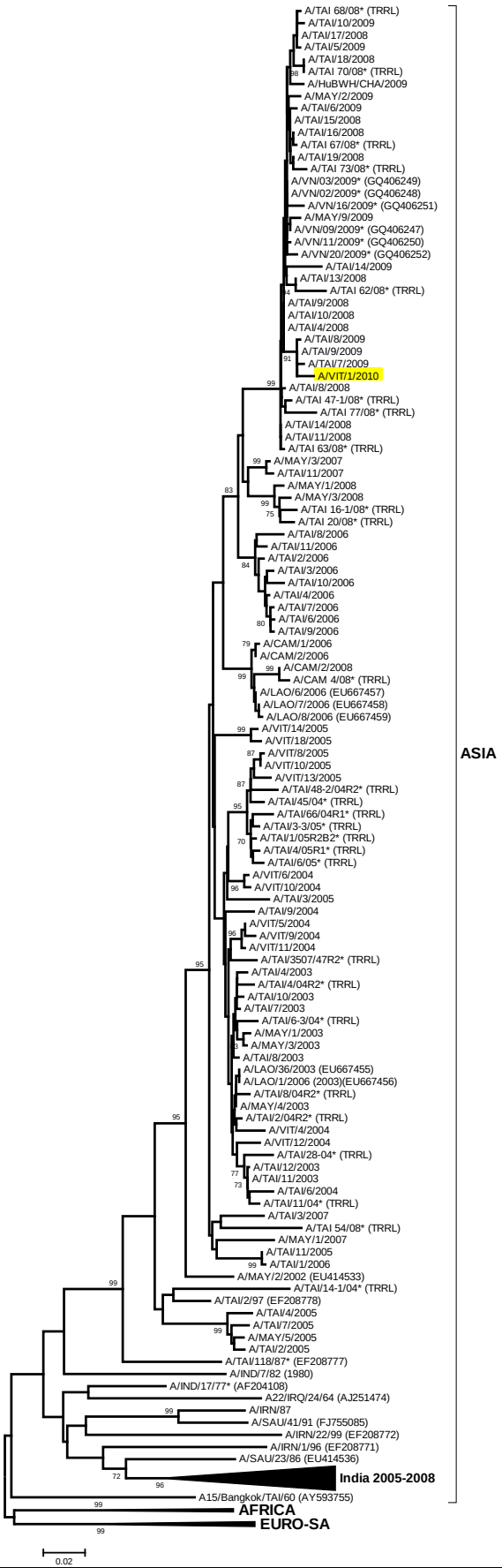


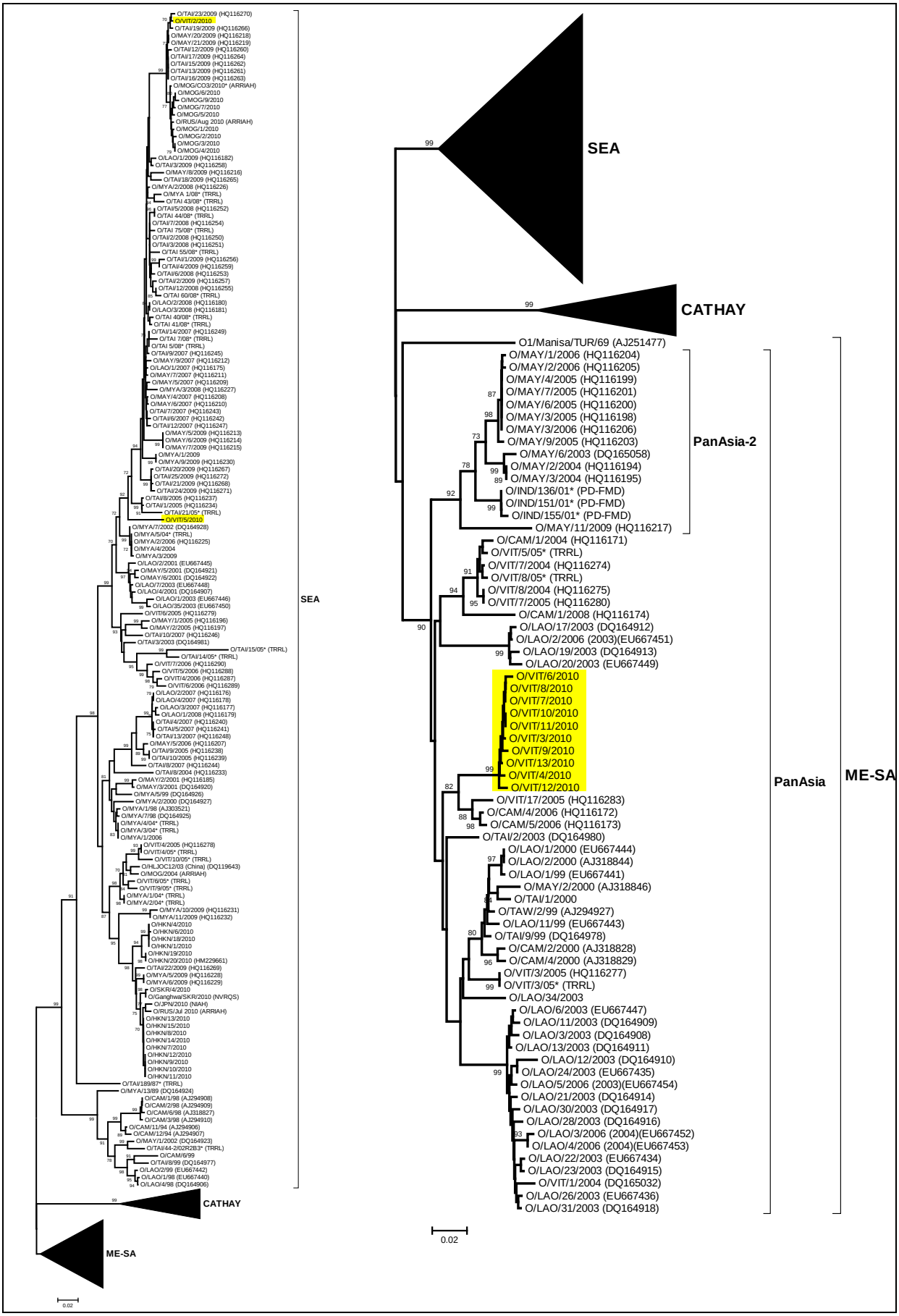
Vietnam
WRLFMD/2010/00035
Date received: 05/11/2010
No. samples: 13
O: 12
A: 1

The type A virus belonged to the ASIA topotype, Sea-97 lineage.

10 of the type O viruses (from the south of the country) belonged to the ME-SA topotype, PanAsia lineage and two (from the north) belonged to the SEA topotype, Mya-98 lineage.






SEA
CATHAY
ME-SA
PanAsia-2
PanAsia
ME-SA
O1/Manisa/TUR/69 (AJ251477)
O/MAY/1/2006 (HQ116204)
O/MAY/2/2006 (HQ116205)
O/MAY/4/2005 (HQ116199)
O/MAY/7/2005 (HQ116201)
O/MAY/6/2005 (HQ116200)
O/MAY/3/2005 (HQ116198)
O/MAY/3/2006 (HQ116206)
O/MAY/9/2005 (HQ116203)
O/MAY/6/2003 (DQ165058)
O/MAY/2/2004 (HQ116194)
O/MAY/3/2004 (HQ116195)
O/IND/136/01* (PD-FMD)
O/IND/151/01* (PD-FMD)
O/IND/155/01* (PD-FMD)
O/MAY/11/2009 (HQ116217)
O/CAM/1/2004 (HQ116171)
O/VIT/5/05* (TRRL)
O/VIT/7/2004 (HQ116274)
O/VIT/8/05* (TRRL)
O/VIT/8/2004 (HQ116275)
O/VIT/7/2005 (HQ116280)
O/CAM/1/2008 (HQ116174)
O/LAO/17/2003 (DQ164912)
O/LAO/2/2006 (2003)(EU667451)
O/LAO/19/2003 (DQ164913)
O/LAO/20/2003 (EU667449)
O/VIT/6/2010
O/VIT/8/2010
O/VIT/7/2010
O/VIT/10/2010
O/VIT/11/2010
O/VIT/3/2010
O/VIT/9/2010
O/VIT/13/2010
O/VIT/4/2010
O/VIT/12/2010
O/VIT/17/2005 (HQ116283)
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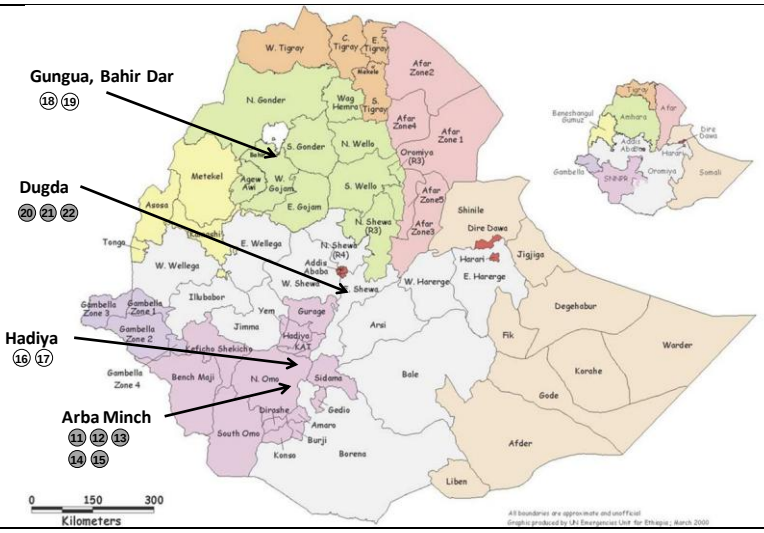
O/TAI/2/2003 (DQ164980)
O/LAO/1/2000 (EU667444)
O/LAO/2/2000 (AJ318844)
O/LAO/1/99 (EU667441)
O/MAY/2/2000 (AJ318846)
O/TAI/1/2000
O/TAW/2/99 (AJ294927)
O/LAO/11/99 (EU667443)
O/TAI/9/99 (DQ164978)
O/CAM/2/2000 (AJ318828)
O/CAM/4/2000 (AJ318829)
O/VIT/3/2005 (HQ116277)
O/VIT/3/05* (TRRL)
O/LAO/34/2003
O/LAO/6/2003 (EU667447)
O/LAO/11/2003 (DQ164909)
O/LAO/3/2003 (DQ164908)
O/LAO/13/2003 (DQ164911)
O/LAO/12/2003 (DQ164910)
O/LAO/24/2003 (EU667435)
O/LAO/5/2006 (2003)(EU667454)
O/LAO/21/2003 (DQ164914)
O/LAO/30/2003 (DQ164917)
O/LAO/28/2003 (DQ164916)
O/LAO/3/2006 (2004)(EU667452)
O/LAO/4/2006 (2004)(EU667453)
O/LAO/22/2003 (EU667434)
O/LAO/23/2003 (DQ164915)
O/VIT/1/2004 (DQ165032)
O/LAO/26/2003 (EU667436)
O/LAO/31/2003 (DQ164918)
0.02

AFRICA

Ethiopia

WRLFMD/2010/00046
Date received: 06/12/2010
No. samples: 12
FMDV-GD: 8
NVD: 4

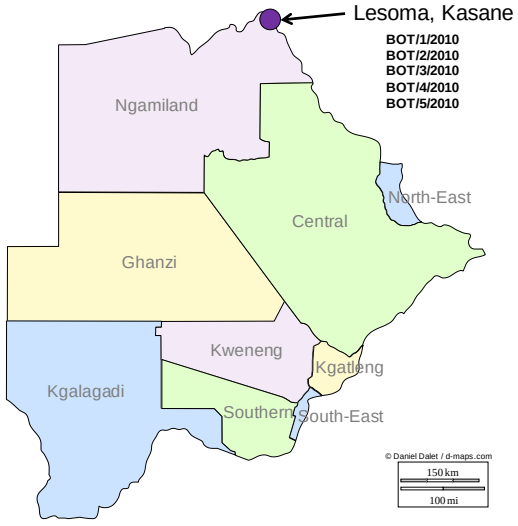
No sequencing was performed.

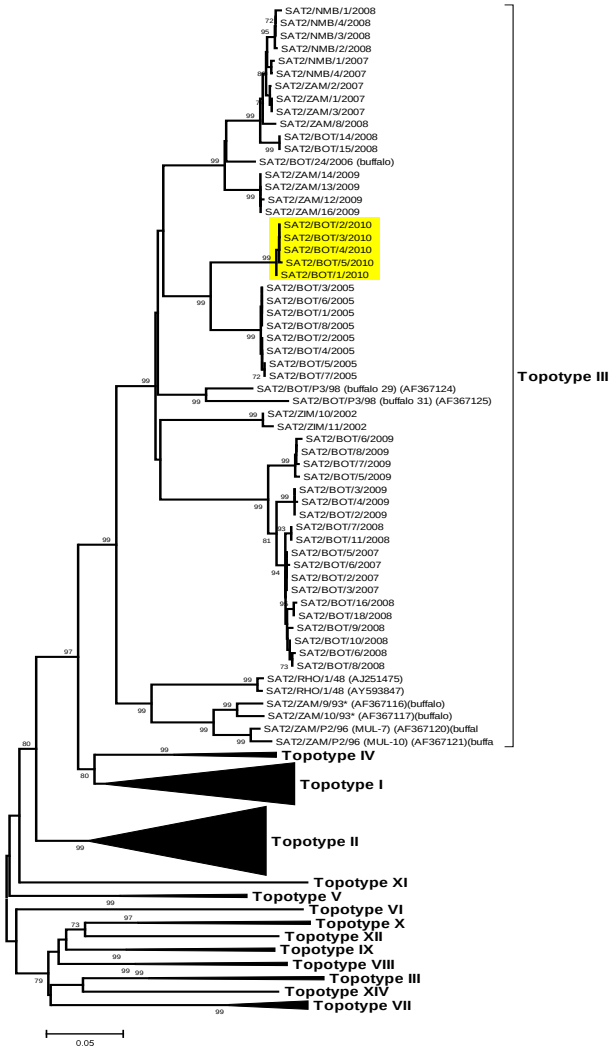


Botswana

WRLFMD/2010/00036
Date received: 09/11/2010
No. samples: 5
SAT 2: 5

All viruses belonged to SAT 2 topotype III.

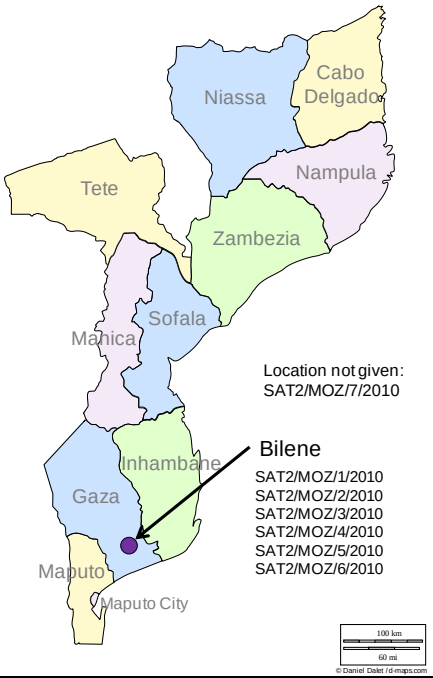


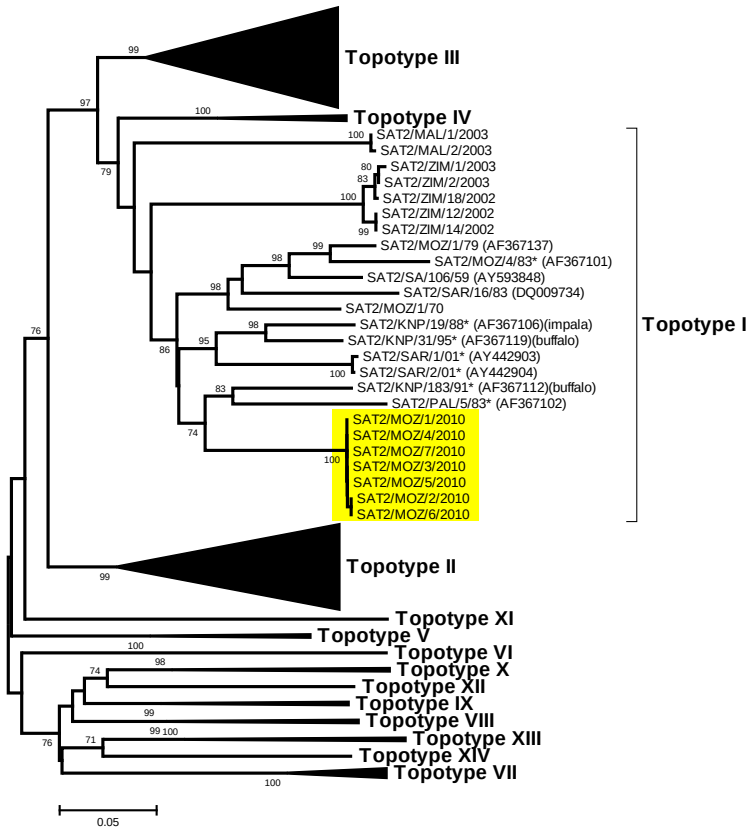


Mozambique

WRLFMD/2010/00037
Date received: 09/11/2010
No. samples: 7
SAT 2: 7

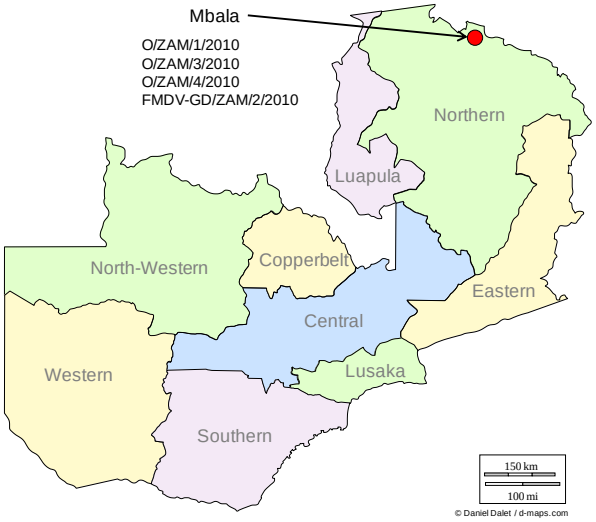
All viruses belonged to SAT 2 topotype I.

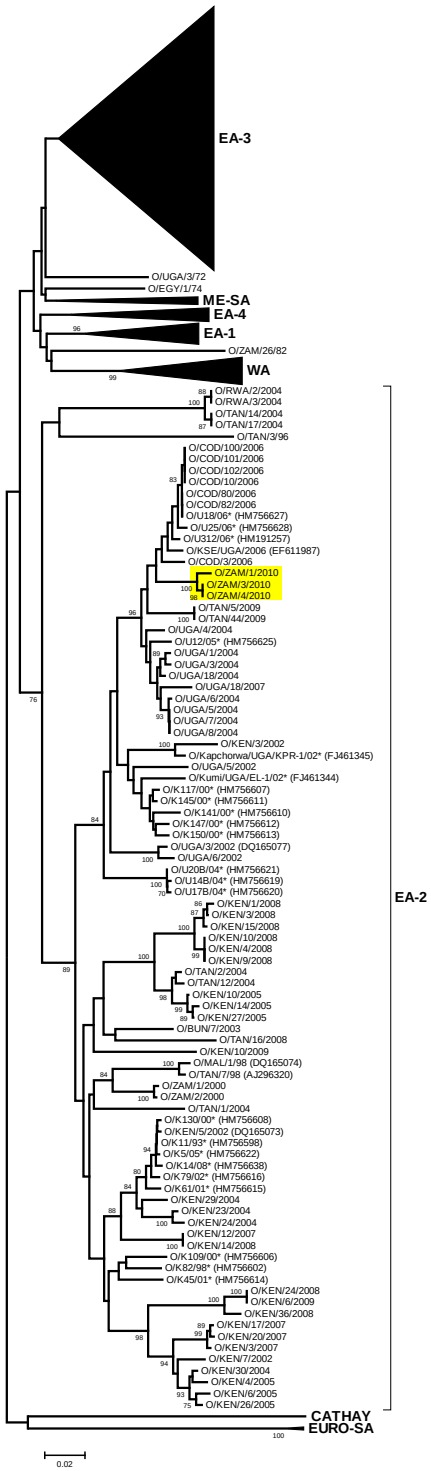




Zambia
WRLFMD/2010/00038
Date received: 09/11/2010
No. samples: 4
O: 3
FMDV-GD: 1

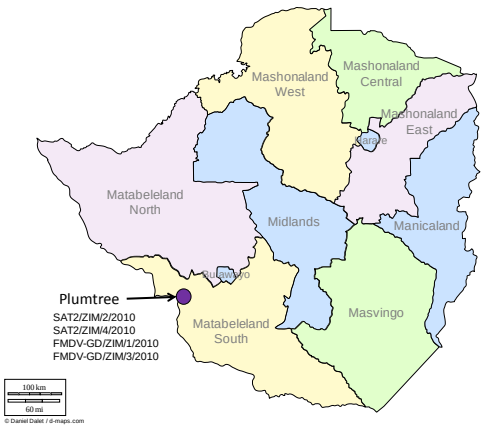
All viruses belonged to the O EA-2 topotype.

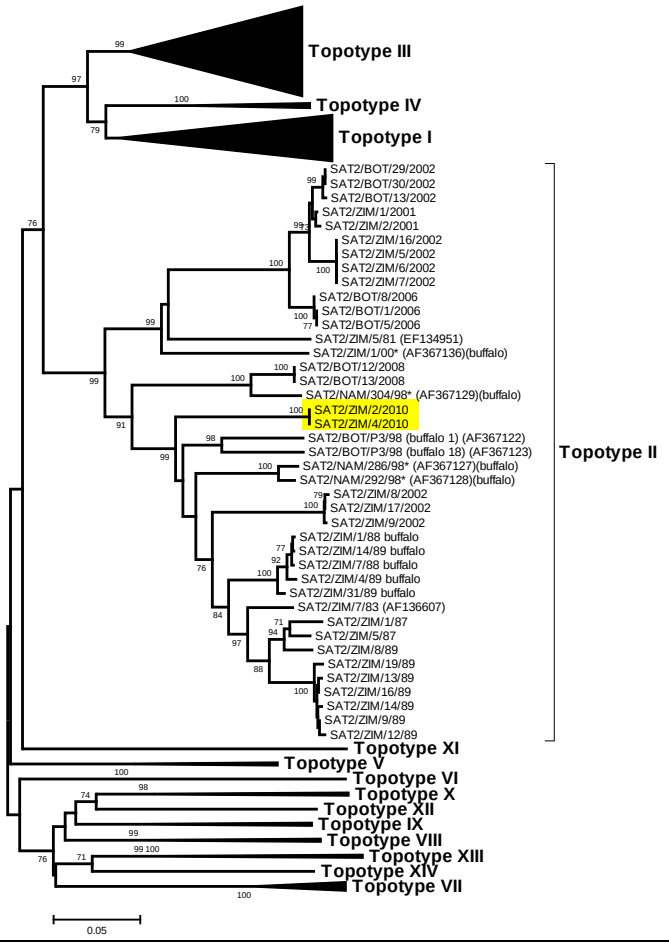




Zimbabwe
WRLFMD/2010/00039
Date received: 09/11/2010
No. samples: 4
SAT 2: 2
FMDV-GD: 2

All viruses belonged to SAT 2 topotype II.





Vaccine matching

Twenty five FMDV type O isolates (See Table C, Type O for details) from Ethiopia, Iran, Kenya, Mongolia, Myanmar, Nigeria, Pakistan, Thailand, Turkey, Tanzania and Zambia collected in 2009 and 2010 were analysed antigenically by the two dimensional virus neutralisation test (2dmVNT) and/or LPBE. Two isolates from Ethiopia showed antigenic matching with O K77/73, O BFS, and O Manisa by VNT and /or LPBE. Out of 7 isolates from Iran, all were antigenically matched with O IND R2/75 and O TAW 98 vaccines; 5 were antigenically close to O 4625, 2/7 and 3/7 were matched with O BFS and O Manisa respectively. Two viruses collected from Kenya were antigenically similar to O IND R2/75 but not to O Manisa, O BFS and O TAW 98. 3 viruses isolated from Mongolia showed an antigenic match with O 4625 vaccine but not with O Manisa or O BFS. Two field isolates from Myanmar showed a match with both O Manisa and O IND R2/75. Two isolates from Pakistan were closely matched with all of O 4625, O BFS, O Manisa, O IND R2/75, O TAW 98 and O TNN 24/84 vaccine strains. Two isolates from Turkey were a close match with all of O 4625, O BFS, O IND R2/75, O PanAsia 2 and O TNN 24/84 vaccine strains with only one antigenically matched with O Manisa. The single isolates from Nigeria, Tanzania and Zambia all showed antigenic similarity to O Manisa strain (Table C).

Four FMDV type SAT 1 viruses (see table C, Type SAT 1 for details) from Kenya collected in 2010 were analysed for antigenic relationships with two vaccine strains by 2dmVNT and/or LPBE. Only one virus showed an antigenic match with SAT 1 RHO and SAT 1 BOT 1/68 by VNT and LPBE, respectively (Table C).

Five FMDV type SAT2 viruses (see table C, Type SAT2 for details) from Ethiopia, Kenya and Tanzania collected in 2009 and 2010 were antigenically matched with different vaccine strains. All viruses showed antigenic matching with SAT 2 Eritrea vaccines. All three virus from Ethiopia were also closely matched with SAT 2 K65/82 by LPBE. One virus each from Kenya and Tanzania were antigenically close to K 65/82 vaccine strain by LPBE. The virus from Kenya was also antigenically matched with SAT 2 Zim vaccine strain by VNT (Table C).

Annex 1.

TABLE A: Clinical sample diagnostics made by the WRL between October and December 2010

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
BOTSWANA	BOT 1/2010	Cattle	00.08.10	SAT 2	Positive	SAT 2
	BOT 2/2010	Cattle	00.08.10	SAT 2	Positive	SAT 2
	BOT 3/2010	Cattle	00.08.10	SAT 2	Positive	SAT 2
	BOT 4/2010	Cattle	00.08.10	SAT 2	Positive	SAT 2
	BOT 5/2010	Cattle	00.08.10	SAT 2	Positive	SAT 2
CAMBODIA	CAM 1/2010	Cattle	17.09.10	O	Positive	O
	CAM 2/2010	Cattle	17.09.10	O	Positive	O
	CAM 3/2010	Cattle	17.09.10	O	Positive	O
	CAM 4/2010	Cattle	22.09.10	O	Positive	O
	CAM 5/2010	Cattle	22.09.10	O	Positive	O
ETHIOPIA	ETH 11/2010	Cattle	26.02.10	NVD	Positive	FMDV GD
	ETH 12/2010	Cattle	26.02.10	NVD	Positive	FMDV GD
	ETH 13/2010	Cattle	26.02.10	NVD	Positive	FMDV GD
	ETH 14/2010	Cattle	26.02.10	NVD	Positive	FMDV GD
	ETH 15/2010	Cattle	26.02.10	NVD	Positive	FMDV GD
	ETH 16/2010	Cattle	03.03.10	NVD	Negative	NVD
	ETH 17/2010	Cattle	03.03.10	NVD	Negative	NVD
	ETH 18/2010	Cattle	24.03.10	NVD	Negative	NVD

	ETH 19/2010	Cattle	24.03.10	NVD	Negative	NVD
	ETH 20/2010	Cattle	16.04.10	NVD	Positive	FMDV GD
	ETH 21/2010	Cattle	16.04.10	NVD	Positive	FMDV GD
	ETH 22/2010	Cattle	16.04.10	NVD	Positive	FMDV GD
HONG KONG	HKN 24/2010	Pig	06.12.10	O	Positive	O
	HKN 25/2010	Pig	06.12.10	O	Positive	O
	HKN 26/2010	Pig	06.12.10	O	Positive	O
IRAN	IRN 189/2010	Sheep	16.09.10	NVD	Negative	NVD
	IRN 190/2010	Sheep	16.09.10	NVD	Positive	FMDV GD
	IRN 191/2010	Cattle	01.10.10	O	Positive	O
	IRN 192/2010	Cattle	03.10.10	O	Positive	O
	IRN 193/2010	Cattle	05.10.10	NVD	Positive	FMDV GD
	IRN 194/2010	Cattle	12.10.10	O	Positive	O
	IRN 195/2010	Cattle	29.07.10	A	Positive	A
	IRN 196/2010	Cattle	08.08.10	O	Positive	O
	IRN 197/2010	Cattle	08.08.10	A	Positive	A
	IRN 198/2010	Cattle	08.08.10	O	Positive	O
	IRN 199/2010	Cattle	19.08.10	O	Positive	O
	IRN 200/2010	Cattle	23.08.10	A	Positive	A
	IRN 201/2010	Cattle	23.08.10	A	Positive	A
	IRN 202/2010	Cattle	23.08.10	O	Positive	O
	IRN 203/2010	Cattle	23.08.10	O	Positive	O
	IRN 204/2010	Cattle	26.08.10	O	Positive	O
	IRN 205/2010	Cattle	07.09.10	O	Positive	O
	IRN 206/2010	Cattle	19.09.10	O	Positive	O
	IRN 207/2010	Cattle	23.09.10	O	Positive	O
	IRN 208/2010	Cattle	26.09.10	O	Positive	O
	IRN 209/2010	Cattle	27.09.10	O	Positive	O
	IRN 210/2010	Cattle	27.09.10	O	Positive	O
	IRN 211/2010	Cattle	27.09.10	O	Positive	O
	IRN 212/2010	Cattle	05.10.10	A	Positive	A
	IRN 213/2010	Cattle	05.10.10	A	Positive	A
	IRN 214/2010	Cattle	05.10.10	A	Positive	A
	IRN 215/2010	Cattle	10.10.10	A	Positive	A
	IRN 216/2010	Goat	11.10.10	NVD	Negative	NVD
	IRN 217/2010	Cattle	17.10.10	O	Positive	O
	IRN 218/2010	Cattle	23.10.10	NVD	Negative	NVD
	IRN 219/2010	Sheep	23.10.10	O	Positive	O
	IRN 220/2010	Sheep	28.10.10	NVD	Negative	NVD
	IRN 221/2010	Cattle	28.10.10	O	Positive	O
	IRN 222/2010	Cattle	31.10.10	O	Positive	O
	IRN 223/2010	Cattle	31.10.10	O	Positive	O
	IRN 224/2010	Cattle	01.11.10	O	Positive	O
	IRN 225/2010	Sheep	10.11.10	O	Positive	O
MONGOLIA	MOG 1/2010	Cattle	10.09.10	O	Positive	O
	MOG 2/2010	Cattle	11.09.10	O	Positive	O
	MOG 3/2010	Cattle	12.09.10	O	Positive	O
	MOG 4/2010	Cattle	12.09.10	O	Positive	O
	MOG 5/2010	Cattle	12.09.10	O	Positive	O
	MOG 6/2010	Cattle	04.09.10	O	Positive	O
	MOG 7/2010	Cattle	06.09.10	O	Positive	O
	MOG 8/2010	Gazelle	06.09.10	NVD	Positive	FMDV GD

	MOG 9/2010	Gazelle	07.09.10	O	Positive	O
	MOG 10/2010	Cattle	12.09.10	NVD	Negative	NVD
	MOG 11/2010	Cattle	12.09.10	NVD	Negative	NVD
	MOG 12/2010	Cattle	12.09.10	NVD	Negative	NVD
	MOG 13/2010	Cattle	07.09.10	NVD	NT	NT
	MOG 14/2010	Cattle	07.09.10	NVD	NT	NT
	MOG 15/2010	Cattle	07.09.10	NVD	NT	NT
	MOG 16/2010	Cattle	04.09.10	NVD	NT	NT
	MOG 17/2010	Gazelle	06.09.10	NVD	NT	NT
	MOG 18/2010	Gazelle	06.09.10	NVD	NT	NT
MOZAMBIQUE	MOZ 1/2010	Cattle	19.10.10	SAT 2	Positive	SAT 2
	MOZ 2/2010	Cattle	19.10.10	SAT 2	Positive	SAT 2
	MOZ 3/2010	Cattle	19.10.10	SAT 2	Positive	SAT 2
	MOZ 4/2010	Cattle	19.10.10	SAT 2	Positive	SAT 2
	MOZ 5/2010	Cattle	19.10.10	SAT 2	Positive	SAT 2
	MOZ 6/2010	Cattle	19.10.10	SAT 2	Positive	SAT 2
	MOZ 7/2010	NK	NK	SAT 2	Positive	SAT 2
MYANMAR	MYA 4/2010	Cattle	29.09.10	NT	NT	NT
	MYA 5/2010	Cattle	29.09.10	NVD	Positive	FMDV GD
NEPAL	NEP 111/97	Cattle	00.00.97	NVD	Positive	FMDV GD
	NEP 112/97	Cattle	00.00.97	NVD	Positive	FMDV GD
	NEP 1/2001	Sheep	00.00.01	NVD	Negative	NVD
	NEP 2/2001	Cattle	00.00.01	NVD	Negative	NVD
	NEP 1/2002	Pig	00.00.02	NVD	Negative	NVD
	NEP 1/2004	Cattle	00.00.04	NVD	Positive	FMDV GD
	NEP 2/2004	Cattle	00.00.04	NVD	Positive	FMDV GD
	NEP 3/2004	Cattle	00.00.04	NVD	Positive	FMDV GD
	NEP 4/2004	Buffalo	00.00.04	NVD	Positive	FMDV GD
	NEP 5/2004	Cattle	00.00.04	NVD	Positive	FMDV GD
	NEP 6/2004	Buffalo	00.00.04	NVD	Positive	FMDV GD
	NEP 7/2004	Cattle	00.00.04	NVD	Positive	FMDV GD
	NEP 1/2006	Cattle	00.00.06	NVD	Positive	FMDV GD
	NEP 2/2006	Buffalo	00.00.06	NVD	Negative	NVD
	NEP 3/2006	Cattle	00.00.06	NVD	Negative	NVD
	NEP 4/2006	Cattle	00.00.06	NVD	Negative	NVD
	NEP 5/2006	Pig	00.00.06	NVD	Negative	NVD
	NEP 6/2006	Cattle	00.00.06	NVD	Negative	NVD
	NEP 6/2007	Goat	00.00.07	NVD	Negative	NVD
	NEP 7/2007	Goat	00.00.07	NVD	Negative	NVD
	NEP 8/2007	Goat	00.00.07	NVD	Negative	NVD
	NEP 9/2007	Goat	00.00.07	NVD	Positive	FMDV GD
	NEP 10/2007	Goat	00.00.07	NVD	Negative	NVD
	NEP 11/2007	Cattle	00.00.07	NVD	Negative	NVD
	NEP 12/2007	Cattle	00.00.07	NVD	Negative	NVD
	NEP 13/2007	Cattle	00.00.07	NVD	Negative	NVD
	NEP 14/2007	Cattle	00.00.07	NVD	Negative	NVD
	NEP 15/2007	Cattle	00.00.07	NVD	Negative	NVD
	NEP 16/2007	Cattle	00.00.07	NVD	Negative	NVD
	NEP 8/2008	Cattle	00.00.08	NVD	Positive	FMDV GD
	NEP 9/2008	Cattle	00.00.08	NVD	Negative	NVD
	NEP 1/2010	Cattle	00.00.10	NVD	Positive	FMDV GD
	NEP 2/2010	Cattle	00.00.10	NVD	Negative	NVD

	NEP 3/2010	Cattle	00.00.10	O	Positive	O
	NEP 4/2010	Cattle	00.00.10	NVD	Negative	NVD
	NEP 5/2010	Cattle	00.00.10	O	Positive	O
	NEP 6/2010	Cattle	00.00.10	O	Positive	O
	NEP 7/2010	Cattle	00.00.10	O	Positive	O
	NEP 8/2010	Cattle	00.00.10	NVD	Positive	FMDV GD
	NEP 9/2010	Cattle	00.00.10	O	Positive	O
	NEP 10/2010	Cattle	00.00.10	NVD	Positive	FMDV GD
	NEP 11/2010	Cattle	00.00.10	O	Positive	O
	NEP 12/2010	NK	00.00.10	O	Positive	O
	NEP 13/2010	Cattle	00.00.10	NVD	Negative	NVD
	NEP 14/2010	Cattle	00.00.10	NVD	Negative	NVD
	NEP 15/2010	Cattle	00.00.10	O	Positive	O
	NEP 16/2010	Cattle	00.00.10	O	Positive	O
	NEP 17/2010	Pig	00.00.10	O	Positive	O
	NEP 18/2010	Cattle	00.00.10	NVD	Negative	NVD
	NEP 19/2010	Cattle	00.00.10	NVD	Positive	FMDV GD
	NEP 20/2010	Cattle	00.00.10	NVD	Positive	FMDV GD
PAKISTAN	PAK 46/2010	Buffalo	08.08.10	O	Positive	O
	PAK 47/2010	Buffalo	08.08.10	O	Positive	O
	PAK 48/2010	Buffalo	08.08.10	O	Positive	O
	PAK 49/2010	Cattle	11.09.10	O	Positive	O
	PAK 50/2010	Cattle	11.09.10	NVD	Negative	NVD
	PAK 51/2010	Cattle	11.09.10	O	Positive	O
	PAK 52/2010	Buffalo	14.09.10	NVD	Positive	FMDV GD
	PAK 53/2010	Buffalo	14.09.10	O	Positive	O
	PAK 54/2010	Buffalo	14.09.10	O	Positive	O
	PAK 55/2010	Buffalo	15.09.10	NVD	Positive	FMDV GD
	PAK 56/2010	Buffalo	15.09.10	NVD	Positive	FMDV GD
	PAK 57/2010	Buffalo	15.09.10	O	Negative	O
	PAK 58/2010	Buffalo	04.10.10	O	Positive	O
	PAK 59/2010	Buffalo	04.10.10	O	Positive	O
	PAK 60/2010	Buffalo	06.10.10	O	Positive	O
	PAK 61/2010	Buffalo	06.10.10	O	Positive	O
	PAK 62/2010	Buffalo	06.10.10	O	Positive	O
	PAK 63/2010	Buffalo	07.10.10	O	Positive	O
	PAK 64/2010	Buffalo	07.10.10	O	Positive	O
	PAK 65/2010	Buffalo	07.10.10	O	Positive	O
	PAK 66/2010	Buffalo	10.10.10	NVD	Positive	FMDV GD
	PAK 67/2010	Buffalo	10.10.10	O	Positive	O
	PAK 68/2010	Cattle	11.10.10	O	Positive	O
	PAK 69/2010	Cattle	15.10.10	O	Positive	O
	PAK 70/2010	Cattle	15.10.10	O	Positive	O
	PAK 71/2010	Cattle	17.10.10	O	Positive	O
	PAK 72/2010	Buffalo	19.10.10	O	Positive	O
	PAK 73/2010	Buffalo	19.10.10	O	Positive	O
	PAK 74/2010	Cattle	19.10.10	O	Positive	O
	PAK 75/2010	Cattle	19.10.10	O	Positive	O
	PAK 76/2010	Cattle	19.10.10	O	Positive	O
THAILAND	TAI 26/2009	Cattle	16.12.09	O	Positive	O
	TAI 27/2009	Buffalo	28.12.09	O	Positive	O
	TAI 1/2010	Cattle	21.01.10	O	Positive	O
	TAI 2/2010	Cattle	NK	O	Positive	O

	TAI 3/2010	Cattle	NK	O	Positive	O
	TAI 4/2010	Cattle	NK	O	Positive	O
	TAI 5/2010	Cattle	NK	O	Positive	O
	TAI 6/2010	Cattle	NK	O	Positive	O
VIETNAM	VIT 1/2010	Cattle	00.01.10	A	Positive	A
	VIT 2/2010	Cattle	00.02.10	O	Positive	O
	VIT 3/2010	Pig	21.09.10	O	Positive	O
	VIT 4/2010	Cattle	27.09.10	O	Positive	O
	VIT 5/2010	Pig	00.09.10	O	Positive	O
	VIT 6/2010	Cattle	01.10.10	O	Positive	O
	VIT 7/2010	Cattle	02.10.10	O	Positive	O
	VIT 8/2010	Cattle	05.10.10	O	Positive	O
	VIT 9/2010	Cattle	14.10.10	O	Positive	O
	VIT 10/2010	Cattle	15.10.10	O	Positive	O
	VIT 11/2010	Cattle	15.11.10	O	NT	O
	VIT 12/2010	Cattle	24.10.10	O	NT	O
	VIT 13/2010	Pig	25.10.10	O	Positive	O
ZAMBIA	ZAM 1/2010	Cattle	18.10.10	O	Positive	O
	ZAM 2/2010	Cattle	18.10.10	NVD	Positive	FMDV GD
	ZAM 3/2010	Cattle	18.10.10	O	Positive	O
	ZAM 4/2010	Cattle	18.10.10	O	Positive	O
ZIMBABWE	ZIM 1/2010	Cattle	00.07.10	NVD	Positive	FMDV GD
	ZIM 2/2010	Cattle	00.07.10	SAT 2	Positive	SAT 2
	ZIM 3/2010	Cattle	00.07.10	NVD	Positive	FMDV GD
	ZIM 4/2010	Cattle	00.07.10	SAT 2	Positive	SAT 2

TOTAL : 200

*	Institute for Animal Health, Pirbright Laboratory, Woking, Surrey GU24 0NF
FMD(V)	foot-and-mouth disease (virus)
GD	genome detected
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 viral genome
NVD	no foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected
NT	Not Tested

TABLE B: Summary of samples collected and received to IAH-Pirbright (October-December 2010)

Country	No. of samples	Virus isolation in cell culture/ELISA									RT-PCR for FMD (or SVD) virus (where appropriate)		
		FMD virus serotypes							NVD	NT			
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1			Positive	Negative	NT
BOTSWANA	5	-	-	-	-	5	-	-	-	-	5	-	-
CAMBODIA	5	5	-	-	-	-	-	-	-	-	5	-	-
ETHIOPIA	12	-	-	-	-	-	-	-	12	-	8	4	-
HONG KONG	3	3	-	-	-	-	-	-	-	-	3	-	-
IRAN	37	23	8	-	-	-	-	-	6	-	33	4	-
MONGOLIA	18	8	-	-	-	-	-	-	10	-	9	3	6
MOZAMBIQUE	7	-	-	-	-	7	-	-	-	-	7	-	-
MYANMAR	2	-	-	-	-	-	-	-	1	1	1	-	1
NEPAL	51	10	-	-	-	-	-	-	41	-	27	24	-
PAKISTAN	31	26	-	-	-	-	-	-	5	-	29	2	-
THAILAND	8	8	-	-	-	-	-	-	-	-	8	-	-
VIETNAM	13	12	1	-	-	-	-	-	-	-	11	-	2
ZAMBIA	4	3	-	-	-	-	-	-	1	-	4	-	-
ZIMBABWE	4	-	-	-	-	2	-	-	2	-	4	-	-
TOTAL	**200**	**98**	**9**	**-**	**-**	**14**	**-**	**-**	**78**	**1**	**154**	**37**	**9**

*	Institute for Animal Health, Pirbright Laboratory, Woking, Surrey GU24 0NF
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 C: Antigenic characterisation of FMD field isolates by matching with vaccine strains by VNT and/or LPBE from 1st October to 31st December 2010

Type O:

Vaccine matching for type O FMDV by VNT and LPBE - WRL FMD															
Isolates	O 3039		O K77/78	O 4625		O BFS		O IND R2/75	O Manisa		O PanAsia 2	O TAI 189/87	O TAW 98	O TNN 24/84	O 4174
	LPBE	VNT	LPBE	LPBE	VNT	LPBE	VNT	VNT	LPBE	VNT	VNT	LPBE	VNT	VNT	LPBE
Eth 07/2010			M			M	N	M	M	M			M		
Eth 09/2010			M			M	N	N	M	N			N		
Irn 88/2010				M		M	N	M	N	N			M		
Irn 92/2010							N	M		N			M		
Irn 99/2010				M			N	M	M	N			M		
Irn 143/2010							N	M	M	M			M		
Irn 149/2010					M		N	M		N			M		
Irn 174/2010		M		M	M	N	M	M	M	M			M		M
Irn 187/2010		M		M	M		M	M	N	M			M		
Ken 100/2010							N	M		N			N		
Ken 125/2009							N	M		N			N		
Mog 3/2010					M	N	N	M	N	N		M			
Mog 4/2010					M	N	N	N	N	N		M	N		
Mog 9/2010					M	N	N	M	N	N		N	N		
Mya 13/2009	M						N	M	M	N					
Mya 3/2010							N	M		M					
Nig 15/2009			M			M	N	M	M	M			N		
Pak 25/2010					M	M	M	M	N	M			M	M	
Pak 42/2010					M	M	M	M	N	M			M	M	
Tai 2/2009						M									
Tai 4/2009						N									
Tan 05/2009			M			M	N	M	M	M			M		
Tur 18/2010					M	M	M	M	N	N	M			M	
Tur 39/2010					M	M	M	M	N	M	M			M	
Zam 04/2010		M			M		M			M			M		

Type SAT 1:

Vaccine matching for type SAT 1 FMDV by VNT and LPBE - WRL FMD			
Isolates	Sat 1 Rho		Sat 1 Bot 1/68
	VNT	LPBE	LPBE
Ken 01/2010	N	N	M
Ken 77/2010	N	N	N
Sat1 Ken 101/2010	N	N	
Sat1 Ken 133/2010	M		

Type SAT2:

Vaccine matching for type SAT 2 FMDV by VNT and LPBE - WRL FMD									
Isolates	Eri 3218		SAT 2 Zim		K65/82	Sat2 Bot 3/77	Sat2 Zim 11/89	Sat2 K65/82	Sat2 Zam 3/81
	VNT	LPBE	VNT	LPBE	LPBE				
Eth 74/2009	M	M	N	N		N		M	
Eth 75/2009	M	N	N	N		M	N	M	N
Eth 02/2010	M	M	N			N		M	
Ken 122/2009	M		M		M				
Tan 43/2009	M		N		M				

M: the isolate was antigenically matched with the vaccine strain
N: the isolate showed no antigenic match with the vaccine strain

Interpretation of r_1 values

In the case of VNT:

$r_1 = \geq 0.3$. 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.
$r_1 = < 0.3$. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect

In the case of LPB ELISA:

$r_1 = 0.4\text{-}1.0$. 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.
$r_1 = 0.2\text{-}0.39$, Suggests that the field isolate is antigenically related to the vaccine strain. The vaccine strain might be suitable for use if no closer match can be found provided that a potent vaccine is used and animals are preferably immunised more than once.
$r_1 = <0.2$. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect

Annex 2. Recent FMD Publications cited by PubMed

1. Abdul-Hamid NF, Hussein NM, Wadsworth J, Radford AD, Knowles NJ, King DP. Phylogeography of foot-and-mouth disease virus types O and A in Malaysia and surrounding countries. Infect Genet Evol. 2010 Nov 18. [Epub ahead of print] PubMed PMID: 21093614.

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Annex 3. RECOMMENDATIONS FROM WRLFMD ON FMD VIRUS STRAINS TO BE INCLUDED IN FMDV ANTIGEN BANKS – December 2010

High Priority

O Manisa (*covers panasian topotype)*
O BFS or Campos
A24 Cruzeiro
Asia 1 Shamir
A Iran-05
A22 Iraq
SAT 2 Saudi Arabia *(or equivalent)*

(not in order of importance)

Medium Priority

A Eritrea
A Iran ’96
SAT 2 Zimbabwe
A Iran 87 or A Saudi Arabia 23/86 *(or equivalent)*
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)*
A Iran ’99

(not in order of importance)

Low Priority

A15 Bangkok related strain
A87 Argentina related strain
C Noville
SAT 2 Kenya
SAT 1 Kenya
SAT 3 Zimbabwe
A Kenya (not in order of importance)