



# WRLFMD Quarterly Report January-March 2014

Reference Laboratory Contract Report

Foot-and-Mouth Disease



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## Summary

### ASIA

#### *Afghanistan*

A batch of 21 samples, collected in 2013, was received and the results are pending.

#### *Democratic People's Republic of Korea*

Between 08/01/2014 and 14/03/2014, 24 outbreaks of FMD type O were reported (mainly in pigs) in P'yongyang-Si, Hwanghae-Bukto and Kangwon-Do. No genotyping has yet been undertaken.

#### *Hong Kong SAR*

Six **FMD type O** viruses were isolated from samples collected from pigs in January, February and March 2014. Genotyping showed them all to be closely related and to belong to the CATHAY topotype (see below).

#### *Iran*

A batch of 31 samples, collected in 2013 and 2014, was received and the genotyping results are pending.

#### *Israel*

Outbreaks of **FMD type O** continue with two being reported in sheep and goats in January 2014 (Hazafon and Hamerkaz). Both were genotyped as ME-SA/PanAsia-2<sup>FAR-09</sup> and were most closely related to the outbreaks in Israel and Palestinian Autonomous Territories at the end of 2013 (see below).

#### *Mongolia*

Three outbreaks of **FMD type A** were reported at the end of January 2014 in cattle in Ongon soum, Sukhbaatar. However, samples received from three neighbouring provinces Sukhbaatar, Dornogovi and Khentii collected from cattle between 30/01/2014 and 17/03/2014 were identified as **FMDV type O** and genotyped as ME-SA/PanAsia, closely related to a virus from an outbreak in the Russian Federation (09/02/2014; cattle in Starotsuruhaitui, Priargunsky, Zabaikalsky krai) and to viruses from Vietnam (see below).

#### *Nepal*

Twenty six **FMD type O** viruses were isolated from samples collected between 2012 and 2014. All were identified as ME-SA/Ind-2001d, being most closely related to viruses from India and Bhutan and also to viruses isolated from the recent outbreaks of this lineage in Libya, Saudi Arabia and the United Arab Emirates (see below).

#### *People's Republic of China*

An outbreak of **FMD type A** was reported in Rikaze, Tibet (02/01/2014; cattle). No genotyping has been reported.

#### *Russian Federation*

Two outbreaks of **FMD type A** were reported Duroy, Priargunsky (25/01/2014; cattle and pigs) and Kulusutai, Ononsky (12/02/2014; cattle), both in Zabajkal'skij Kray. VP1 sequences provided by the FGI-ARRIAH showed the viruses to be closely related to those previously identified in the region in 2013 (ASIA/Sea-97).

An outbreak of **FMD type O** was also reported in cattle in Starotsuruhaitui, Priargunsky, Zabajkal'skij Kray (07/02/2014; cattle). A VP1 sequence provided by the FGI-ARRIAH showed the virus to belong to ME-SA/PanAsia and to be closely related to viruses from Vietnam (and also Mongolia) (see below).

#### *Saudi Arabia*

Four samples collected from cattle in two locations (Al Kharj and Durma) were typed as **FMDV type O**. Genotyping showed them to be ME-SA/Ind-2001d, closely related to viruses from recent outbreaks of this lineage in Libya, UAE and the Indian sub-continent (see below).

#### *United Arab Emirates*

Two samples collected from a gazelle in Abu Dhabi were typed as **FMDV type O**. Genotyping revealed the causal virus to be ME-SA/Ind-2001d, closely related to viruses from recent outbreaks of this lineage in Libya and Saudi Arabia (see below).

### **AFRICA**

#### *Guinea*

Two outbreaks of FMD were reported as starting on 15/02/2014 in cattle in Mandiana Prefecture (in the east of the country close to the border with Mali). No samples were collected.

#### *South Africa*

Two outbreaks of **FMD type SAT 2** were reported in cattle in Bushbuckridge, Mpumalanga (03/01/2014 and 24/01/2014) close to the Kruger National Park. No genotyping has been reported.

#### *Tanzania*

Six **FMD type A** and 11 **FMD type SAT 1** viruses were isolated from cattle in the Mara region (collected between March and October 2013). Genotyping revealed the type A viruses to be AFRICA/G-I and the SAT 1 viruses to be topotype I (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](http://www.wrlfmd.org/fmd_genotyping/2014.htm).

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 January and March 2014 is shown in Annex 1 Table A. A record of all samples received to Pirbright (January to March 2014) is shown in Annex 1 Table B.

**Table 1:** Status of sequencing of samples received by the WRLFMD from January to March 2014.

WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2014/00001	24/01/2014	Israel	O	6	6	Completed
WRLFMD/2014/00002	27/01/2014	Tanzania	A	6	6	Completed
WRLFMD/2014/00002	27/01/2014	Tanzania	SAT 1	11	11	Completed
WRLFMD/2014/00003	05/02/2014	Nepal	O	23	23	Completed
WRLFMD/2014/00004	10/02/2014	Afghanistan	Pending	21		Pending
WRLFMD/2014/00005	17/02/2014	Saudi Arabia	O	1	1	Completed
WRLFMD/2014/00006	05/02/2014	Iran	O	7		Pending
WRLFMD/2014/00006	05/02/2014	Iran	A	18		Pending
WRLFMD/2014/00006	05/02/2014	Iran	Asia 1	1		Pending
WRLFMD/2014/00007	17/02/2014	United Arab Emirates	O	2	2	Completed
WRLFMD/2014/00008	26/02/2014	Hong Kong SAR	O	3	3	Completed
WRLFMD/2014/00009	06/03/2014	Hong Kong SAR	O	2	2	Completed
WRLFMD/2014/00011	17/03/2014	Mongolia	O	5	5	Completed
WRLFMD/2014/00012	21/03/2014	Turkey	Pending	33		Pending
WRLFMD/2014/00013	27/02/2014	Ethiopia	Pending	60		Pending
WRLFMD/2014/00014	25/03/2014	Saudi Arabia	O	3	3	Completed
WRLFMD/2014/00015	27/03/2014	Hong Kong SAR	O	1	1	Completed
				203	63	

**Detailed Analysis:****ASIA****Hong Kong SAR**

WRLFMD/2014/00008

Date received: 26/02/2014

No. of samples: 6

O (CATHAY): 3

NVD: 3

WRLFMD/2014/00009

Date received: 06/03/2014

No. of samples: 4

O (CATHAY): 2

FMDV-GD: 2

(Locations not given)

WRLFMD/2014/00015

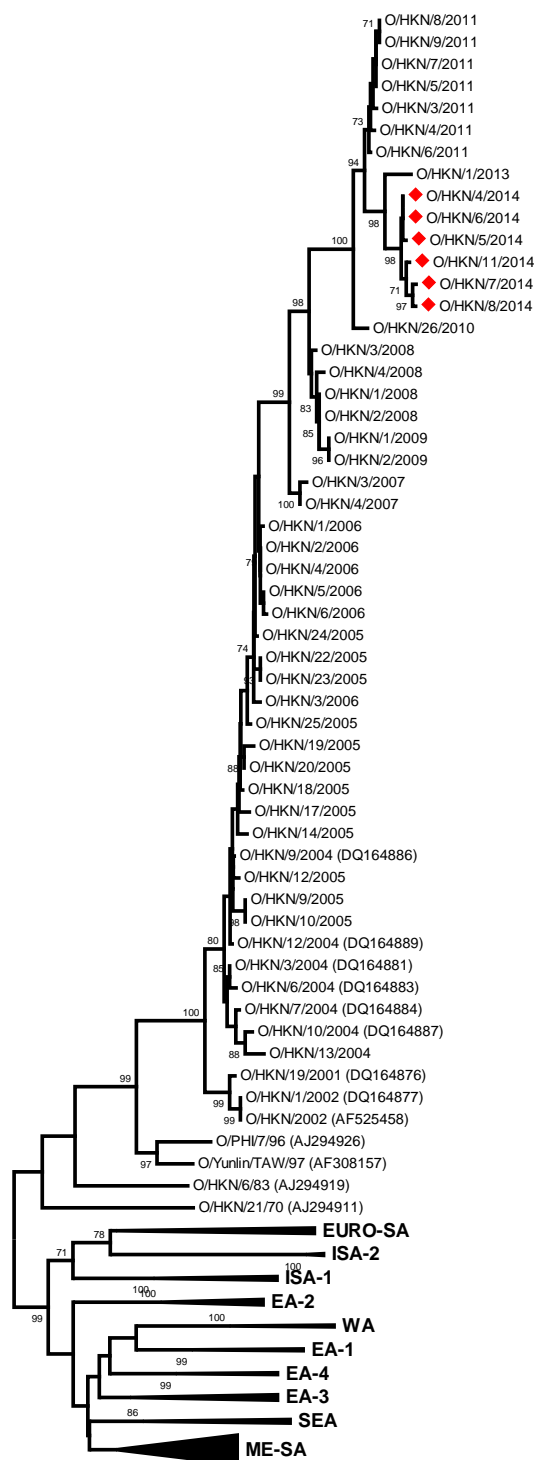
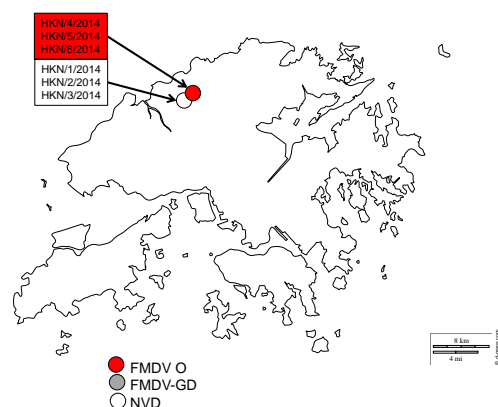
Date received: 27/03/2014

No. of samples: 2

O (CATHAY): 1

NVD: 1

(Locations not given)

**CATHAY**

0.02

**Israel**

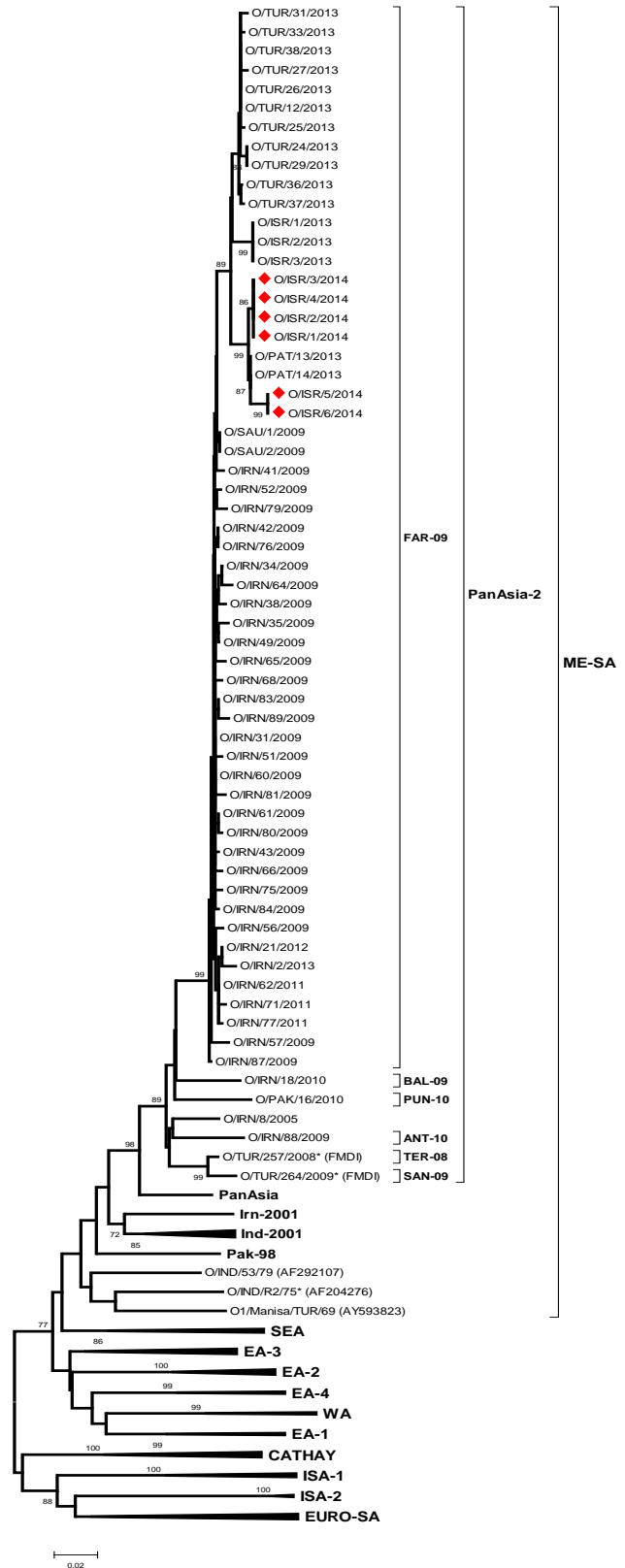
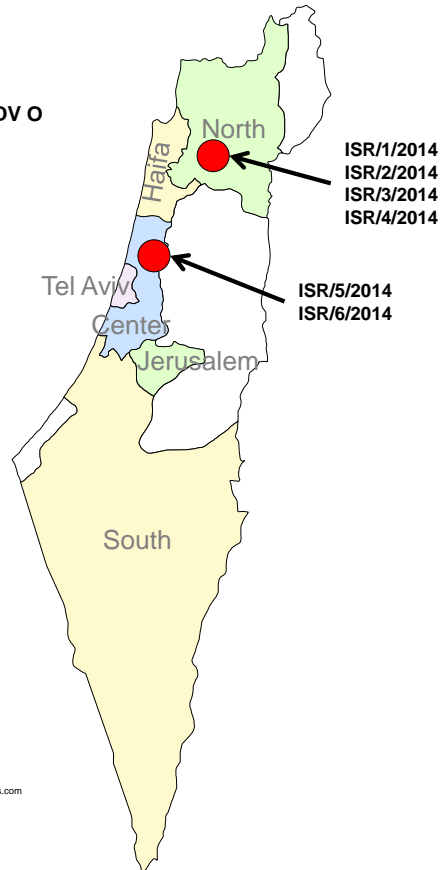
WRLFMD/2014/00001

Date received: 24/01/2014

No. of samples: 6

O (ME-SA/PanAsia-2<sup>FAR-09</sup>): 6

● FMDV O



**Mongolia**

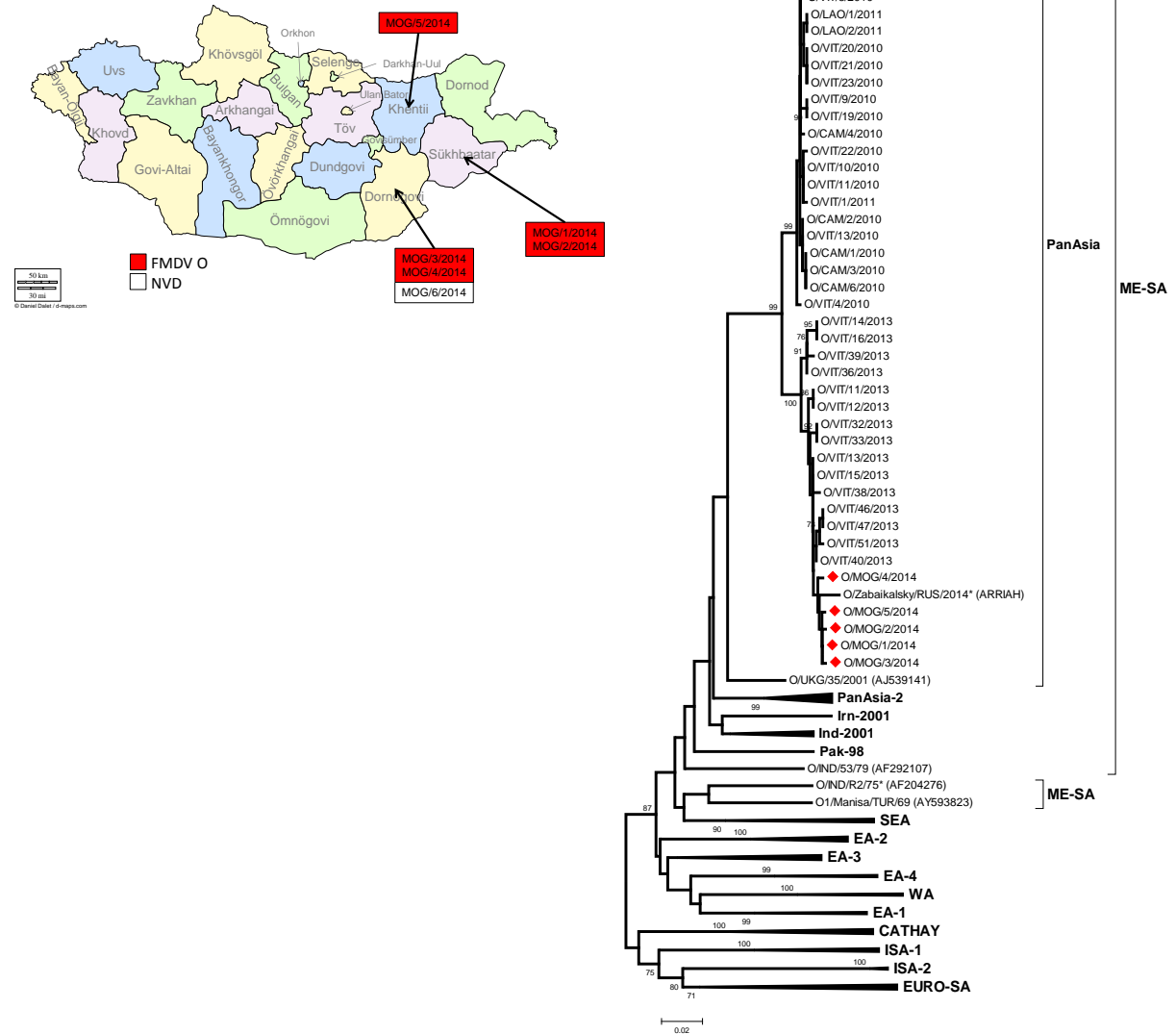
WRLFMD/2014/00011

Date received: 17/03/2014

No. of samples: 6

O (ME-SA/PanAsia): 5

NVD: 1



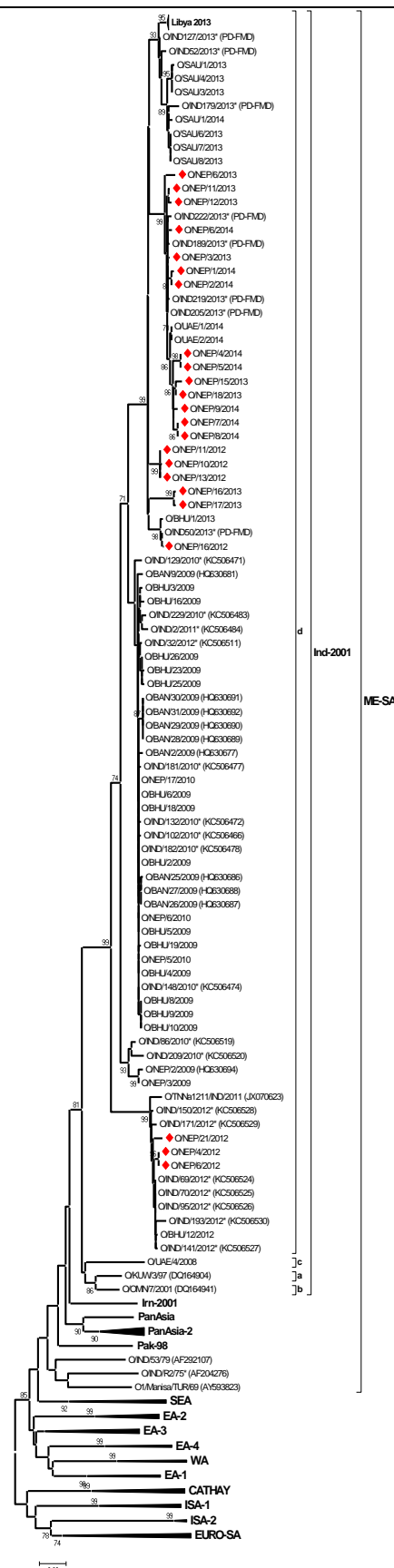
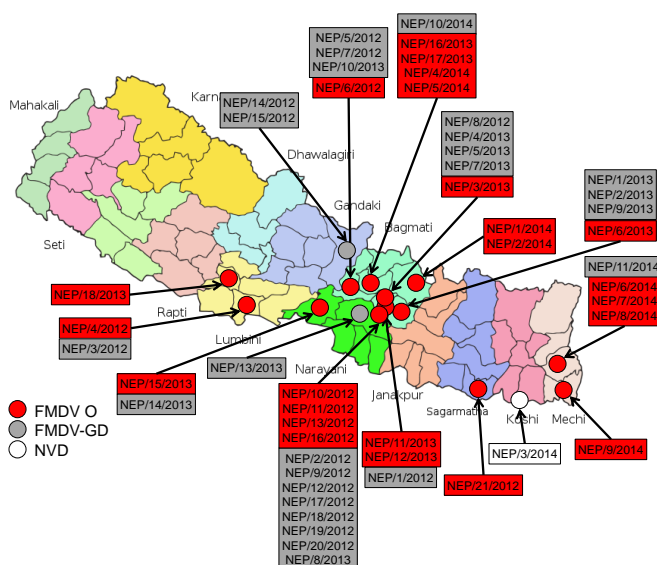


WRLFMD/2014/00003

No. of samples: 50

FMDV-GD: 26

NVD: 1



**Russian Federation**

WRLMEG/2014/00003

VP1 sequences received

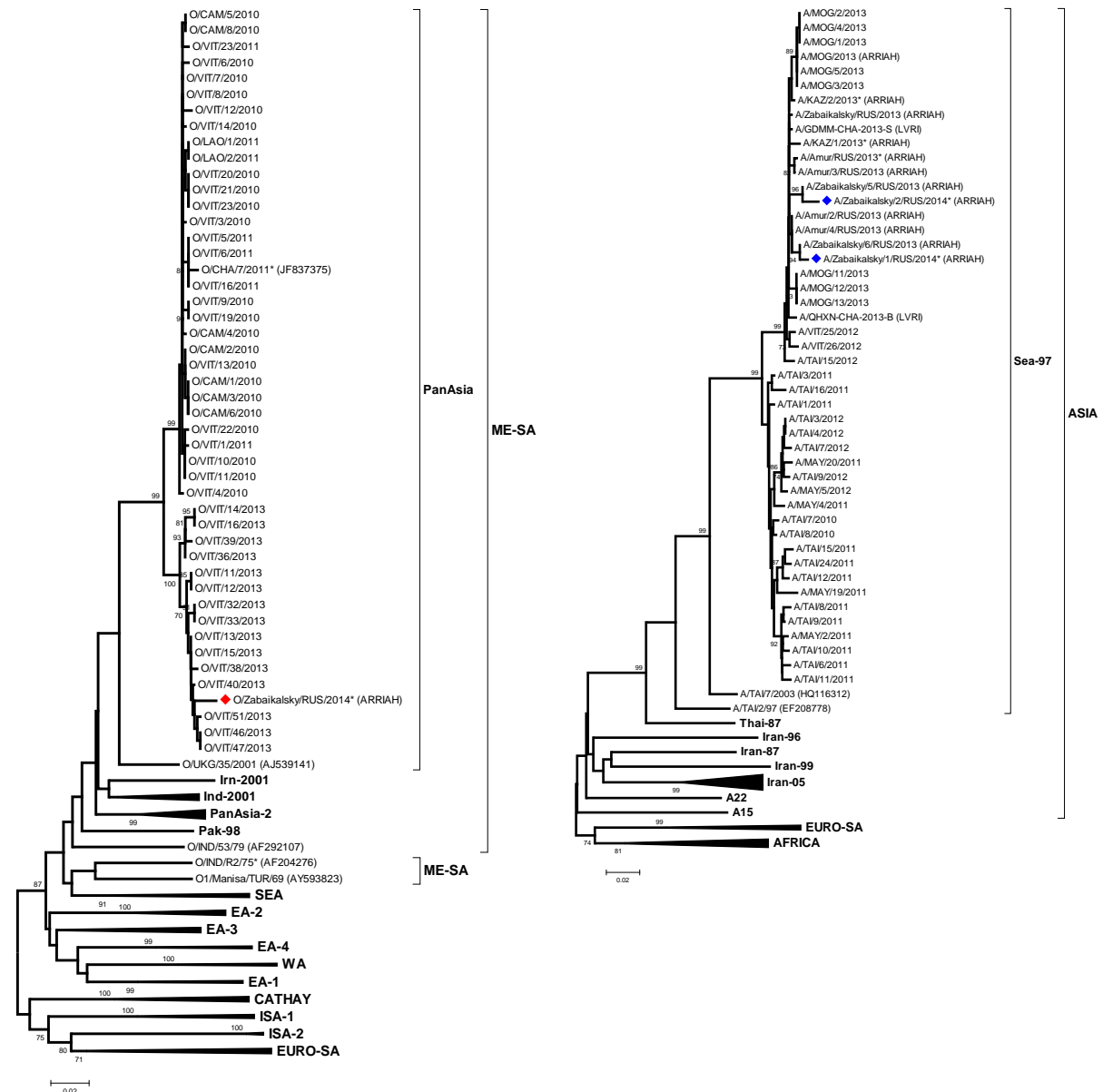
from FGI-ARRIAH

Date received: 18/02/2014

No. of sequences: 3

O (ME-SA/PanAsia): 1

A (ASIA/Sea-97): 2



**Saudi Arabia**

WRLFMD/2014/00005

Date received: 17/02/2014

No. of samples: 1

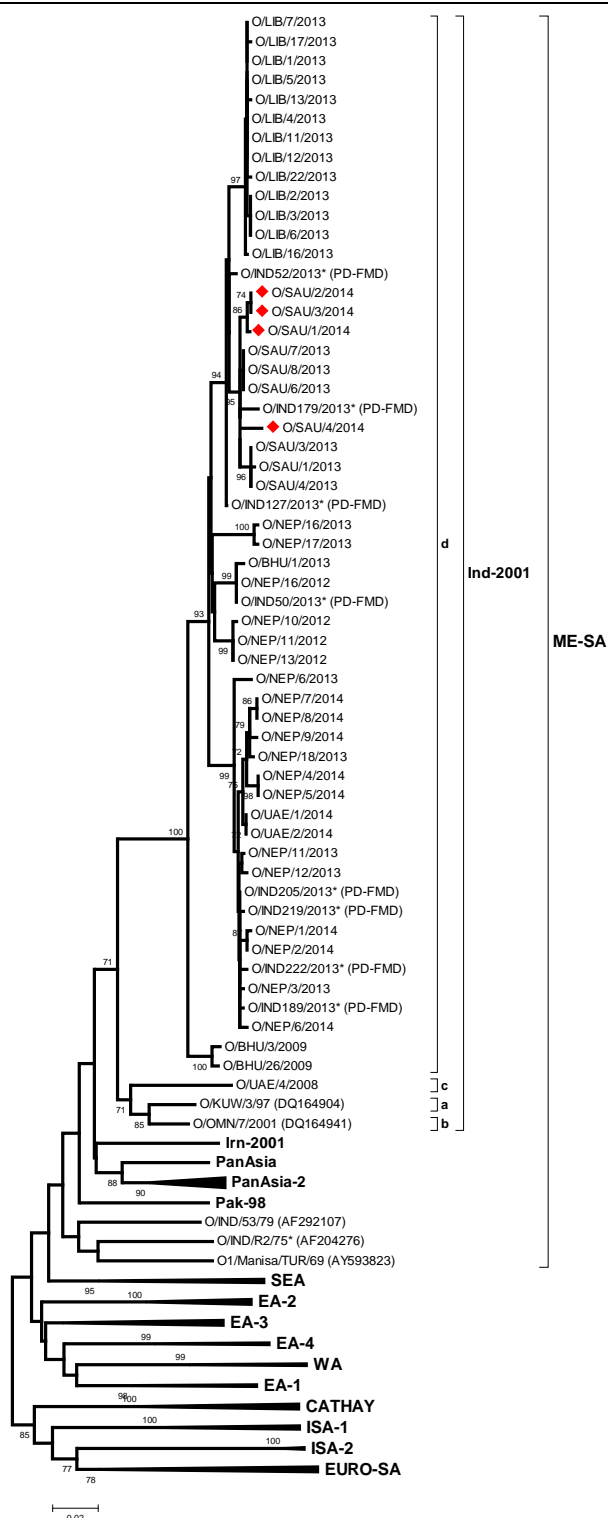
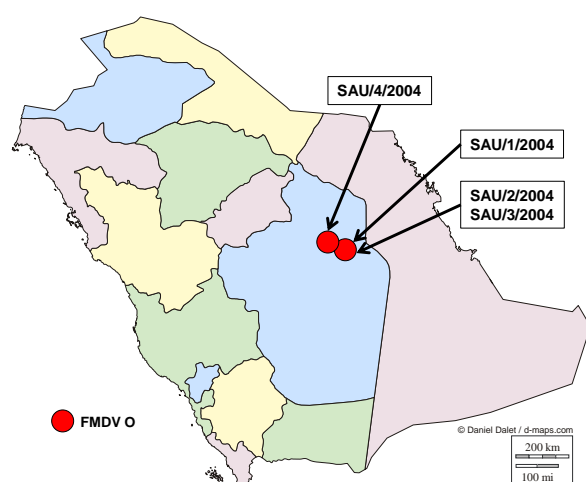
O (ME-SA/Ind-2001d): 1

WRLFMD/2014/00014

Date received: 25/03/2014

No. of samples: 3

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



# United Arab Emirates

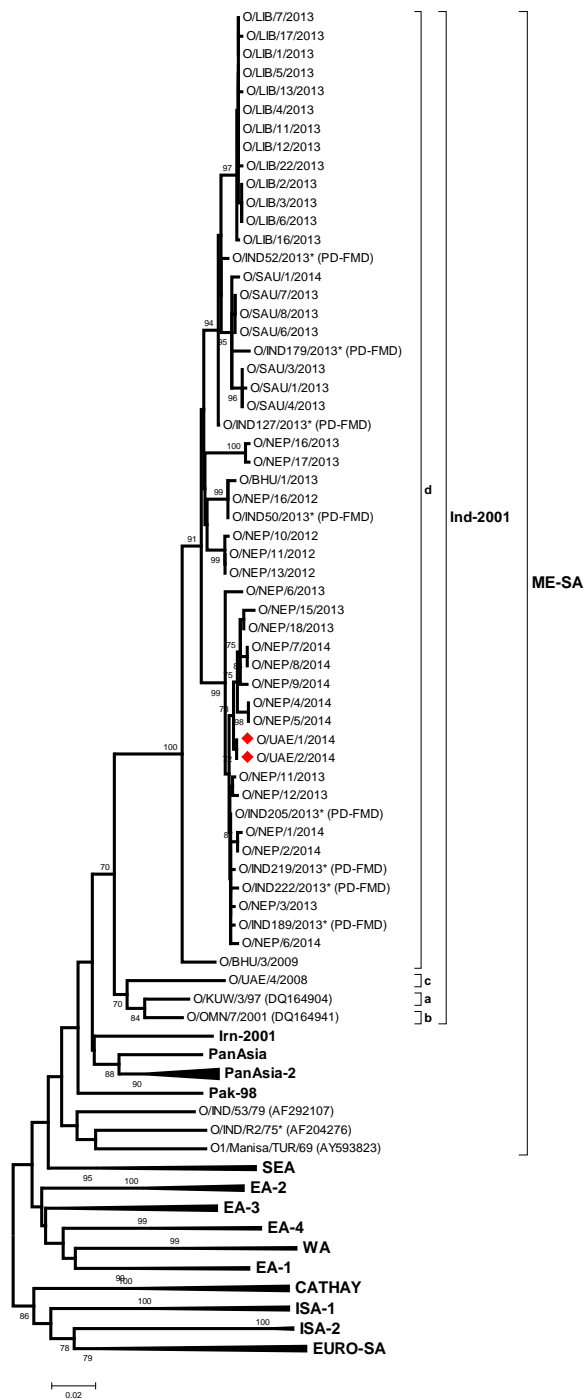
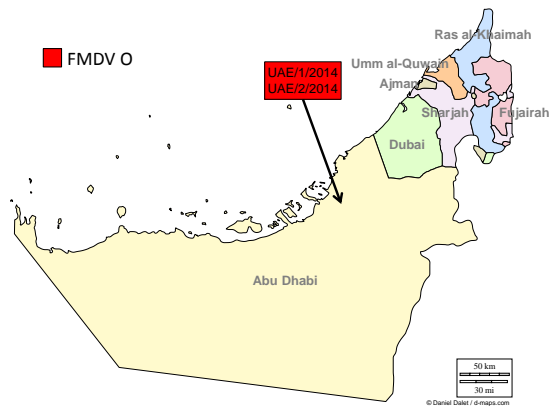
WRLFMD/2014/00007

Date received: 17/02/2014

No. of samples: 2

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

(Gazelles in Abu Dhabi)



## AFRICA

**Tanzania**

WRLFMD/2014/00002

Date received: 27/01/2014

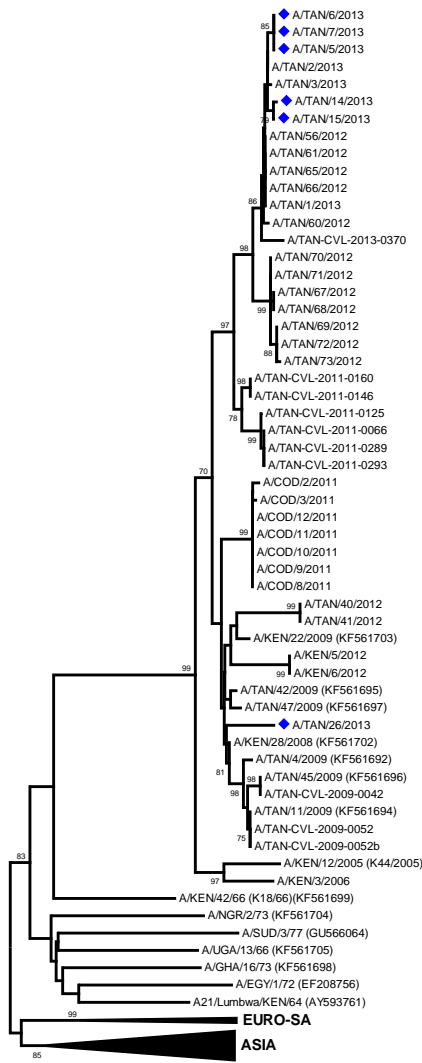
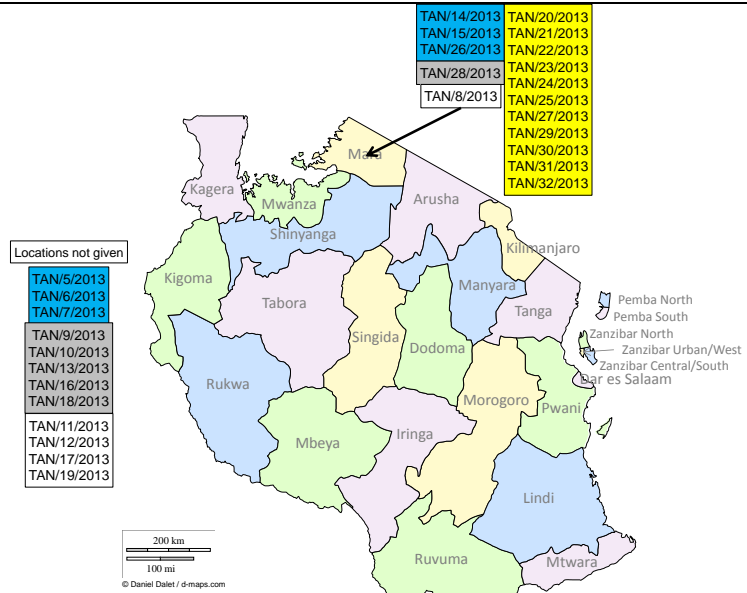
No. of samples: 28

A (AFRICA/G-I): 6

SAT 1 (I): 11

FMDV-GD: 6

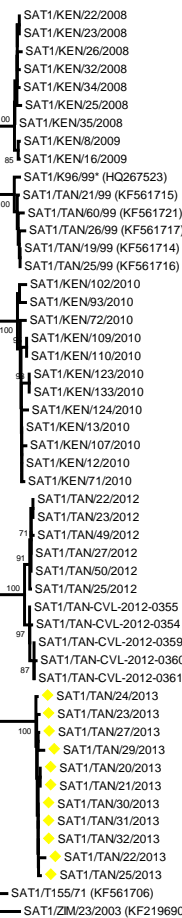
NVD: 5



AFRICA

G-I

G-V  
G-IV  
G-VII  
G-VI  
G-II  
G-III



I (NWZ)

II (SEZ)

IV (EA-1)

VIII (EA-3)

IX (WZ)

V

VII (EA-2)

VI

**Vaccine matching** (for individual data see: Annex 1 Table C)**Serotype O**

Five field isolates from the O/ME-SA/Ind-2001 lineage that has been detected recently in North Africa and the Middle East were tested (2 from Libya, 2 from UAE and 1 from Saudi Arabia) together with 4 isolates from Nepal where this lineage is endemic. These were analysed using the two dimensional neutralisation tests (2dm-VNT) and matched with O 3039 (apart from one isolate that generated borderline values and one isolate that did not match), O/TAW/98 (apart from one isolate) and O TUR/5/09 (all isolates). However, only one out of these 9 O/ME-SA/Ind-2001 isolates matched with O<sub>1</sub> Manisa. These data are similar to those presented in the previous WRLFMD report.

Two O/ME-SA/PanAsia-2 isolates from Israel collected during 2014 (from the FAR-09 sub-lineage) were tested by 2dm-VNT and matched with O 3039, O/TAW/98 and O TUR/5/09. Results for O<sub>1</sub> Manisa varied: one field isolate was matched (O/ISR/5/2014), while one did not match (O/ISR/1/2014).

**Serotype A**

During this quarter, three viruses from Tanzania (from A/lineage G-I) were tested. Variable results were generated using 2dm-VNT: two field isolates (A/TAN/14/2013 and A/TAN/26/2013) were matched to A/ERI/98 but not A/Iran/2005 or A22 Iraq, while a further related virus (A/TAN/7/2013) was not matched to A/ERI/98 but was matched to A/Iran/2005, A/TUR/06 as well as A22 Iraq.

**Serotype SAT 1**

Three viruses from Tanzania collected during 2013 were tested and were either not matched (n=2) or were only a borderline match to SAT1/RHO.

**Annex 1. TABLE A: Clinical sample diagnostics made by the WRLFMD® between January-March 2014**

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
AFGHANISTAN	AFG 1/2013	CATTLE	10-Sep-13	O	POS	O
	AFG 2/2013	CATTLE	10-Sep-13	NVD	POS	FMDV GD
	AFG 3/2013	CATTLE	26-Sep-13	NVD	POS	FMDV GD
	AFG 4/2013	CATTLE	27-Sep-13	A, O	POS	A, O
	AFG 5/2013	CATTLE	02-Oct-13	A	POS	A
	AFG 6/2013	CATTLE	02-Oct-13	NVD	NEG	NVD
	AFG 7/2013	CATTLE	04-Oct-13	NVD	NEG	NVD
	AFG 8/2013	CATTLE	05-Oct-13	A	POS	A
	AFG 9/2013	CATTLE	08-Oct-13	A	POS	A
	AFG 10/2013	CATTLE	08-Oct-13	NVD	NEG	NVD
	AFG 11/2013	CATTLE	09-Oct-13	NVD	NEG	NVD
	AFG 12/2013	CATTLE	09-Oct-13	A	POS	A
	AFG 13/2013	CATTLE	10-Oct-13	A	POS	A
	AFG 14/2013	CATTLE	13-Oct-13	A	POS	A
	AFG 15/2013	CATTLE	16-Oct-13	A	POS	A
	AFG 16/2013	CATTLE	18-Oct-13	NVD	NEG	NVD
	AFG 17/2013	CATTLE	24-Oct-13	O	POS	O
	AFG 18/2013	CATTLE	26-Oct-13	NVD	POS	FMDV GD
	AFG 19/2013	CATTLE	27-Oct-13	A	POS	A
	AFG 20/2013	CATTLE	28-Oct-13	NVD	POS	FMDV GD
	AFG 21/2013	CATTLE	29-Oct-13	O	NEG	O
ETHIOPIA	ETH 10/2001	BOVINE	01-Jan-01	Pending	Pending	Pending
	ETH 11/2001	BOVINE	01-Jan-01	Pending	Pending	Pending
	ETH 9/2004	BOVINE	01-Apr-04	Pending	Pending	Pending
	ETH 10/2004	BOVINE	01-Apr-04	Pending	Pending	Pending
	ETH 23/2010	SWINE	01-Jan-10	Pending	Pending	Pending
	ETH 24/2010	SWINE	01-Jan-10	Pending	Pending	Pending
	ETH 20/2012	SWINE	11-Oct-12	Pending	Pending	Pending
	ETH 21/2012	SWINE	11-Oct-12	Pending	Pending	Pending
	ETH 22/2012	SWINE	11-Oct-12	Pending	Pending	Pending
	ETH 23/2012	SWINE	11-Oct-12	Pending	Pending	Pending
	ETH 24/2012	SWINE	11-Oct-12	Pending	Pending	Pending
	ETH 25/2012	SWINE	11-Oct-12	Pending	Pending	Pending
	ETH 5/2013	BOVINE	11-Oct-13	Pending	Pending	Pending
	ETH 6/2013	BOVINE	11-Oct-13	Pending	Pending	Pending
	ETH 7/2013	BOVINE	11-Oct-13	Pending	Pending	Pending
	ETH 8/2013	BOVINE	11-Oct-13	Pending	Pending	Pending
	ETH 9/2013	BOVINE	11-Oct-13	Pending	Pending	Pending
	ETH 10/2013	BOVINE	11-Oct-13	Pending	Pending	Pending
	ETH 11/2013	BOVINE	17-Oct-13	Pending	Pending	Pending
	ETH 12/2013	BOVINE	17-Oct-13	Pending	Pending	Pending
	ETH 13/2013	BOVINE	17-Oct-13	Pending	Pending	Pending
	ETH 14/2013	BOVINE	17-Oct-13	Pending	Pending	Pending
	ETH 15/2013	BOVINE	17-Oct-13	Pending	Pending	Pending
	ETH 16/2013	SWINE	29-Oct-13	Pending	Pending	Pending
	ETH 17/2013	SWINE	29-Oct-13	Pending	Pending	Pending
	ETH 18/2013	SWINE	30-Oct-13	Pending	Pending	Pending

	ETH 19/2013	SWINE	30-Oct-13	Pending	Pending	Pending
	ETH 20/2013	SWINE	30-Oct-13	Pending	Pending	Pending
	ETH 21/2013	BOVINE	12-Nov-13	Pending	Pending	Pending
	ETH 22/2013	BOVINE	12-Nov-13	Pending	Pending	Pending
	ETH 23/2013	BOVINE	12-Nov-13	Pending	Pending	Pending
	ETH 24/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 25/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 26/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 27/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 28/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 29/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 30/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 31/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 32/2013	SWINE	13-Nov-13	Pending	Pending	Pending
	ETH 33/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 34/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 35/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 36/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 37/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 38/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 39/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 40/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 41/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 42/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 43/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 44/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 45/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 46/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 47/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 48/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 49/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 50/2013	SWINE	14-Nov-13	Pending	Pending	Pending
	ETH 1/2014	BOVINE	03-Jan-14	Pending	Pending	Pending
	ETH 2/2014	BOVINE	03-Jan-14	Pending	Pending	Pending
HONG KONG, SAR OF PRC	HKN 1/2014	PORCINE	08-Jan-14	NVD	NEG	NVD
	HKN 2/2014	PORCINE	08-Jan-14	NVD	NEG	NVD
	HKN 3/2014	PORCINE	21-Jan-14	NVD	NEG	NVD
	HKN 4/2014	PORCINE	07-Feb-14	O	POS	O
	HKN 5/2014	PORCINE	07-Feb-14	O	POS	O
	HKN 6/2014	PORCINE	07-Feb-14	O	POS	O
	HKN 7/2014	PORCINE	24-Feb-14	O	POS	O
	HKN 8/2014	PORCINE	24-Feb-14	O	POS	O
	HKN 9/2014	PORCINE	24-Feb-14	NVD	POS	FMDV GD
	HKN 10/2014	PORCINE	24-Feb-14	NVD	POS	FMDV GD
	HKN 11/2014	PORCINE	06-Mar-14	O	POS	O
	HKN 12/2014	PORCINE	06-Mar-14	NVD	NEG	NVD
IRAN	IRN 14/2013	CATTLE	18-Sep-13	NVD	POS	FMDV GD
	IRN 15/2013	CATTLE	21-Sep-13	ASIA-1	POS	ASIA-1
	IRN 16/2013	CATTLE	29-Sep-13	NVD	NEG	NVD
	IRN 17/2013	CATTLE	07-Oct-13	O	POS	O
	IRN 18/2013	CATTLE	14-Oct-13	A	POS	A
	IRN 19/2013	CATTLE	20-Oct-13	NVD	NEG	NVD
	IRN 20/2013	CATTLE	12-Nov-13	A	POS	A



	IRN 21/2013	CATTLE	15-Nov-13	NVD	POS	FMDV GD
	IRN 22/2013	CATTLE	04-Dec-13	O	POS	O
	IRN 23/2013	CATTLE	05-Dec-13	O	POS	O
	IRN 24/2013	GOAT	05-Dec-13	A	NEG	A
	IRN 25/2013	CATTLE	05-Dec-13	A	POS	A
	IRN 26/2013	CATTLE	11-Dec-13	NVD	NEG	NVD
	IRN 27/2013	CATTLE	12-Dec-13	A	POS	A
	IRN 28/2013	CATTLE	12-Dec-13	A	POS	A
	IRN 29/2013	CATTLE	18-Dec-13	O	POS	O
	IRN 30/2013	CATTLE	25-Dec-13	O	POS	O
	IRN 31/2013	CATTLE	26-Dec-13	O	POS	O
	IRN 32/2013	CATTLE	26-Dec-13	A	POS	A
	IRN 33/2013	CATTLE	28-Dec-13	A	POS	A
	IRN 34/2013	CATTLE	30-Dec-13	A	POS	A
	IRN 1/2014	BOVINE	01-Jan-14	O	POS	O
	IRN 2/2014	CATTLE	06-Jan-14	A	POS	A
	IRN 3/2014	CATTLE	06-Jan-14	A	POS	A
	IRN 4/2014	CATTLE	06-Jan-14	A	POS	A
	IRN 5/2014	CATTLE	06-Jan-14	A	NT	A
	IRN 6/2014	BOVINE	12-Jan-14	A	POS	A
	IRN 7/2014	CATTLE	14-Jan-14	A	POS	A
	IRN 8/2014	CATTLE	14-Jan-14	A	NT	A
	IRN 9/2014	CATTLE	15-Jan-14	A	POS	A
	IRN 10/2014	BOVINE	15-Jan-14	A	POS	A
ISRAEL	ISR 1/2014	SHEEP	11-Jan-14	O	POS	O
	ISR 2/2014	SHEEP	11-Jan-14	O	POS	O
	ISR 3/2014	SHEEP	12-Jan-14	O	POS	O
	ISR 4/2014	SHEEP	12-Jan-14	O	POS	O
	ISR 5/2014	SHEEP	15-Jan-14	O	POS	O
	ISR 6/2014	SHEEP	16-Jan-14	O	POS	O
MONGOLIA	MOG 1/2014	CATTLE	30-Jan-14	O	NT	O
	MOG 2/2014	CATTLE	10-Feb-14	O	NT	O
	MOG 3/2014	CATTLE	12-Feb-14	O	NT	O
	MOG 4/2014	CATTLE	13-Feb-14	O	NT	O
	MOG 5/2014	CATTLE	17-Feb-14	O	NT	O
	MOG 6/2014	GAZELLE	25-Feb-14	NVD	NEG	NVD
NEPAL	NEP 1/2012	CATTLE	09-Apr-12	NVD	POS	FMDV GD
	NEP 2/2012	CATTLE	09-Apr-12	NVD	POS	FMDV GD
	NEP 3/2012	CATTLE	28-Aug-12	NVD	POS	FMDV GD
	NEP 4/2012	CATTLE	28-Aug-12	O	POS	O
	NEP 5/2012	BUFFALO	24-Sep-12	NVD	POS	FMDV GD
	NEP 6/2012	BUFFALO	24-Sep-12	O	POS	O
	NEP 7/2012	BUFFALO	24-Sep-12	NVD	POS	FMDV GD
	NEP 8/2012	CATTLE	18-Nov-12	NVD	POS	FMDV GD
	NEP 9/2012	CATTLE	27-Nov-12	NVD	POS	FMDV GD
	NEP 10/2012	CATTLE	27-Nov-12	O	POS	O
	NEP 11/2012	CATTLE	27-Nov-12	O	POS	O
	NEP 12/2012	CATTLE	27-Nov-12	NVD	POS	FMDV GD
	NEP 13/2012	CATTLE	27-Nov-12	O	POS	O
	NEP 14/2012	CATTLE	05-Dec-12	NVD	POS	FMDV GD
	NEP 15/2012	BUFFALO	05-Dec-12	NVD	POS	FMDV GD
	NEP 16/2012	CATTLE	11-Dec-12	O	POS	O

	NEP 17/2012	CATTLE	11-Dec-12	NVD	POS	FMDV GD
	NEP 18/2012	PIG	11-Dec-12	NVD	POS	FMDV GD
	NEP 19/2012	CATTLE	11-Dec-12	NVD	POS	FMDV GD
	NEP 20/2012	CATTLE	11-Dec-12	NVD	POS	FMDV GD
	NEP 21/2012	BUFFALO	12-Dec-12	O	POS	O
	NEP 1/2013	CATTLE	06-Jul-13	NVD	POS	FMDV GD
	NEP 2/2013	BOVINE	22-Sep-13	NVD	POS	FMDV GD
	NEP 3/2013	CATTLE	22-Oct-13	O	POS	O
	NEP 4/2013	CATTLE	24-Oct-13	NVD	POS	FMDV GD
	NEP 5/2013	CATTLE	06-Nov-13	NVD	POS	FMDV GD
	NEP 6/2013	CATTLE	06-Nov-13	O	POS	O
	NEP 7/2013	CATTLE	07-Nov-13	NVD	POS	FMDV GD
	NEP 8/2013	CATTLE	07-Nov-13	NVD	POS	FMDV GD
	NEP 9/2013	CATTLE	23-Nov-13	NVD	POS	FMDV GD
	NEP 10/2013	CATTLE	23-Nov-13	NVD	POS	FMDV GD
	NEP 11/2013	CATTLE	25-Nov-13	O	POS	O
	NEP 12/2013	CATTLE	25-Nov-13	O	POS	O
	NEP 13/2013	CATTLE	16-Dec-13	NVD	POS	FMDV GD
	NEP 14/2013	CATTLE	16-Dec-13	NVD	POS	FMDV GD
	NEP 15/2013	CATTLE	16-Dec-13	O	POS	O
	NEP 16/2013	CATTLE	23-Dec-13	O	POS	O
	NEP 17/2013	CATTLE	23-Dec-13	O	POS	O
	NEP 18/2013	PIG	26-Dec-13	O	POS	O
	NEP 1/2014	CATTLE	05-Jan-14	O	POS	O
	NEP 2/2014	CATTLE	05-Jan-14	O	POS	O
	NEP 3/2014	CATTLE	05-Jan-14	NVD	NEG	NVD
	NEP 4/2014	CATTLE	07-Jan-14	O	POS	O
	NEP 5/2014	BUFFALO	07-Jan-14	O	POS	O
	NEP 6/2014	CATTLE	07-Jan-14	O	POS	O
	NEP 7/2014	CATTLE	07-Jan-14	O	POS	O
	NEP 8/2014	CATTLE	07-Jan-14	O	POS	O
	NEP 9/2014	CATTLE	07-Jan-14	O	POS	O
	NEP 10/2014	CATTLE	07-Jan-14	NVD	POS	FMDV GD
	NEP 11/2014	CATTLE	07-Jan-14	NVD	POS	FMDV GD
SAUDI ARABIA	SAU 1/2014	CATTLE	01-Feb-14	O	POS	O
	SAU 2/2014	CATTLE	02-Mar-14	O	POS	O
	SAU 3/2014	CATTLE	02-Mar-14	O	POS	O
	SAU 4/2014	CATTLE	09-Mar-14	O	POS	O
TANZANIA	TAN 5/2013	CATTLE	16-Mar-13	A	POS	A
	TAN 6/2013	CATTLE	16-Mar-13	A	POS	A
	TAN 7/2013	CATTLE	16-Mar-13	A	POS	A
	TAN 8/2013	CATTLE	18-Mar-13	NVD	NEG	NVD
	TAN 9/2013	CATTLE	21-Mar-13	NVD	POS	FMDV GD
	TAN 10/2013	CATTLE	07-May-13	NVD	POS	FMDV GD
	TAN 11/2013	CATTLE	07-May-13	NVD	NEG	NVD
	TAN 12/2013	CATTLE	07-May-13	NVD	NEG	NVD
	TAN 13/2013	CATTLE	07-May-13	NVD	POS	FMDV GD
	TAN 14/2013	CATTLE	20-Jun-13	A	POS	A
	TAN 15/2013	CATTLE	20-Jun-13	A	POS	A
	TAN 16/2013	CATTLE	28-Jun-13	NVD	POS	FMDV GD
	TAN 17/2013	CATTLE	28-Jun-13	NVD	NEG	NVD
	TAN 18/2013	CATTLE	28-Jun-13	NVD	POS	FMDV GD
	TAN 19/2013	CATTLE	28-Jun-13	NVD	NEG	NVD

	TAN 20/2013	CATTLE	13-Aug-13	SAT 1	POS	SAT 1
	TAN 21/2013	CATTLE	13-Aug-13	SAT 1	POS	SAT 1
	TAN 22/2013	CATTLE	13-Aug-13	SAT 1	POS	SAT 1
	TAN 23/2013	CATTLE	15-Aug-13	NVD	POS	FMDV GD
	TAN 24/2013	CATTLE	15-Aug-13	SAT 1	POS	SAT 1
	TAN 25/2013	CATTLE	16-Aug-13	SAT 1	POS	SAT 1
	TAN 26/2013	CATTLE	16-Aug-13	A	POS	A
	TAN 27/2013	CATTLE	26-Sep-13	SAT 1	POS	SAT 1
	TAN 28/2013	CATTLE	26-Sep-13	NVD	POS	FMDV GD
	TAN 29/2013	CATTLE	26-Sep-13	SAT 1	POS	SAT 1
	TAN 30/2013	CATTLE	09-Oct-13	SAT 1	POS	SAT 1
	TAN 31/2013	CATTLE	09-Oct-13	SAT 1	POS	SAT 1
	TAN 32/2013	CATTLE	09-Oct-13	SAT 1	POS	SAT 1
TURKEY	TUR 39/2013	CATTLE	19-Oct-13	Pending	Pending	Pending
	TUR 40/2013	CATTLE	15-Nov-13	Pending	Pending	Pending
	TUR 41/2013	CATTLE	31-Dec-13	Pending	Pending	Pending
	TUR 1/2014	CATTLE	03-Jan-14	Pending	Pending	Pending
	TUR 2/2014	CATTLE	06-Jan-14	Pending	Pending	Pending
	TUR 3/2014	CATTLE	06-Jan-14	Pending	Pending	Pending
	TUR 4/2014	SHEEP	08-Jan-14	Pending	Pending	Pending
	TUR 5/2014	CATTLE	13-Jan-14	Pending	Pending	Pending
	TUR 6/2014	CATTLE	14-Jan-14	Pending	Pending	Pending
	TUR 7/2014	CATTLE	14-Jan-14	Pending	Pending	Pending
	TUR 8/2014	CATTLE	14-Jan-14	Pending	Pending	Pending
	TUR 9/2014	CATTLE	15-Jan-14	Pending	Pending	Pending
	TUR 10/2014	CATTLE	16-Jan-14	Pending	Pending	Pending
	TUR 11/2014	CATTLE	01-Feb-14	Pending	Pending	Pending
	TUR 12/2014	CATTLE	05-Feb-14	Pending	Pending	Pending
	TUR 13/2014	CATTLE	06-Feb-14	Pending	Pending	Pending
	TUR 14/2014	CATTLE	07-Feb-14	Pending	Pending	Pending
	TUR 15/2014	CATTLE	07-Feb-14	Pending	Pending	Pending
	TUR 16/2014	CATTLE	10-Feb-14	Pending	Pending	Pending
	TUR 17/2014	CATTLE	11-Feb-14	Pending	Pending	Pending
	TUR 18/2014	CATTLE	14-Feb-14	Pending	Pending	Pending
	TUR 19/2014	CATTLE	21-Feb-14	Pending	Pending	Pending
	TUR 20/2014	CATTLE	24-Feb-14	Pending	Pending	Pending
	TUR 21/2014	CATTLE	24-Feb-14	Pending	Pending	Pending
	TUR 22/2014	CATTLE	26-Feb-14	Pending	Pending	Pending
	TUR 23/2014	CATTLE	27-Feb-14	Pending	Pending	Pending
	TUR 24/2014	CATTLE	28-Feb-14	Pending	Pending	Pending
	TUR 25/2014	CATTLE	04-Mar-14	Pending	Pending	Pending
	TUR 26/2014	CATTLE	04-Mar-14	Pending	Pending	Pending
	TUR 27/2014	CATTLE	07-Mar-14	Pending	Pending	Pending
	TUR 28/2014	CATTLE	09-Mar-14	Pending	Pending	Pending
	TUR 29/2014	CATTLE	11-Mar-14	Pending	Pending	Pending
	TUR 30/2014	CATTLE	12-Mar-14	Pending	Pending	Pending
UNITED ARAB EMIRATES	UAE 1/2014	GAZELLE	08-Jan-14	O	POS	O
	UAE 2/2014	GAZELLE	08-Jan-14	O	POS	O
<b>TOTAL:</b>		<b>253</b>				

FMD(V)  
FMDV GD

Foot-and-mouth disease (virus)  
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 (or SVD) 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 The Pirbright Institute (January-March 2014)**

Country	No. 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			
AFGHANISTAN <sup>a</sup>	21	4	9	-	-	-	-	-	9	15	6
ETHIOPIA	60	-	-	-	-	-	-	-	-	-	-
HONG KONG, SAR OF PRC	12	6	-	-	-	-	-	-	6	8	4
IRAN	31	7	18	-	-	-	-	1	5	25	4
ISRAEL	6	6	-	-	-	-	-	-	-	6	-
MONGOLIA	6	5	-	-	-	-	-	-	1	-	1
NEPAL	50	23	-	-	-	-	-	-	27	49	1
SAUDI ARABIA	4	4	-	-	-	-	-	-	-	4	-
TANZANIA	28	-	6	-	10	-	-	-	12	23	5
TURKEY	33	-	-	-	-	-	-	-	-	-	-
UNITED ARAB EMIRATES	2	2	-	-	-	-	-	-	-	2	-
TOTAL	253	57	33	-	10	-	-	1	60	132	21

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
<sup>a</sup>	1 sample from Afghanistan contained a mixture of FMDVs of types A and O

**TABLE C:** Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from January to March 2014.**Type O:**

<b>Vaccine Matching studies for Serotype O FMDV by VNT</b>				
Sample Reference	O 3039	O1 Manisa	O TAW/98	O TUR/5/09
O/LIB/17/2013	M	N	N	M
O/LIB/22/2013	M	M	M	M
O/SAU/1/2014	Borderline	N	M	M
O/UAE/1/2014	M	Borderline	M	M
O/UAE/2/2014	M	Borderline	M	M
O/ISR/1/2014	M	N	M	M
O/ISR/5/2014	M	M	M	M
O/NEP/13/2012	M	Borderline	M	M
O/NEP/21/2012	N	N	M	M
O/NEP/18/2013	M	N	M	M
O/NEP/1/2014	M	N	M	M

**Type A:**

<b>Vaccine Matching studies for Serotype A FMDV by VNT</b>				
Sample Reference	A/ERI/98	A/Iran/2005	A22 Iraq	A/TUR/06
A/TAN/07/2013	N	M	M	M
A/TAN/14/2013	M	N	N	Borderline
A/TAN/26/2013	M	N	N	Borderline

**Type SAT1:**

<b>Vaccine Matching studies for Serotype SAT1 FMDV by VNT</b>	
Sample Reference	SAT1/RHO
SAT1/TAN/22/2013	N
SAT1/TAN/27/2013	N
SAT1/TAN/30/2013	Borderline

**Results Descriptor:**

**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

□ = Not tested against this vaccine

**Annex 2.** Recent FMD Publications (January-March 2014) cited by PubMed (Pirbright Institute papers and authors are highlighted in **BOLD**)

- **Knight-Jones TJ**, Edmond K, Gubbins S, Paton DJ. **Veterinary and human vaccine evaluation methods.** *Proc Biol Sci.* 2014 Apr 16;281(1784):20132839. doi: 10.1098/rspb.2013.2839. Print 2014. PubMed PMID: 24741009.
- **Valdazo-González B**, Knowles NJ, King DP. **Genome Sequences of Foot-and-Mouth Disease Virus O/ME-SA/Ind-2001 Lineage from Outbreaks in Libya, Saudi Arabia, and Bhutan during 2013.** *Genome Announc.* 2014 Apr 10;2(2). pii: e00242-14. doi: 10.1128/genomeA.00242-14. PubMed PMID: 24723708; PubMed Central PMCID: PMC3983297.
- **Asfor AS**, Upadhyaya S, Knowles NJ, King DP, Paton DJ, Mahapatra M. **Novel antibody binding determinants on the capsid surface of serotype O foot-and-mouth disease virus.** *J Gen Virol.* 2014 Feb 28. doi: 10.1099/vir.0.060939-0. [Epub ahead of print] PubMed PMID: 24584474; PubMed Central PMCID: PMC3983758.
- **Knight-Jones TJ**, Bulut AN, Gubbins S, Stärk KD, Pfeiffer DU, Sumption KJ, **Paton DJ.** **Retrospective evaluation of foot-and-mouth disease vaccine effectiveness in Turkey.** *Vaccine.* 2014 Apr 1;32(16):1848-55. doi: 10.1016/j.vaccine.2014.01.071. Epub 2014 Feb 11. PubMed PMID: 24530150; PubMed Central PMCID: PMC3991324
- **Fowler V**, Bashiruddin JB, Belsham GJ, Stenfeldt C, Bøtner A, Knowles NJ, Bankowski B, Parida S, Barnett P. **Characteristics of a foot-and-mouth disease virus with a partial VP1 G-H loop deletion in experimentally infected cattle.** *Vet Microbiol.* 2014 Feb 21;169(1-2):58-66. doi: 10.1016/j.vetmic.2013.12.008. Epub 2013 Dec 25. PubMed PMID: 24438986.
- **Kasanga CJ**, Wadsworth J, Mpelumbe-Ngeleja CA, Sallu R, Kivaria F, Wambura PN, Yongolo MG, Rweyemamu MM, Knowles NJ, King DP. **Molecular Characterization of Foot-and-Mouth Disease Viruses Collected in Tanzania Between 1967 and 2009.** *Transbound Emerg Dis.* 2014 Jan 25. doi: 10.1111/tbed.12200. [Epub ahead of print] PubMed PMID: 24460931.
- **Ludi A**, Ahmed Z, Pomeroy LW, Pauszek SJ, Smoliga GR, Moritz M, Dickmu S, Abdoukadi S, Arzt J, Garabed R, Rodriguez LL. **Serotype Diversity of Foot-and-Mouth-Disease Virus in Livestock without History of Vaccination in the Far North Region of Cameroon.** *Transbound Emerg Dis.* 2014 Apr 16. doi: 10.1111/tbed.12227. [Epub ahead of print] PubMed PMID: 24735162.
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## Annex 3. RECOMMENDATIONS FROM WRLFMD® ON FMD VIRUS STRAINS TO BE INCLUDED IN FMDV ANTIGEN BANKS – March 2014

### 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*)

(not in order of importance)

### 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*)

(not in order of importance)

### 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

