



WRLFMD Quarterly Report January to March 2015

Reference Laboratory Contract Report

Foot-and-Mouth Disease



Summary of samples tested and reported FMD outbreaks

ASIA

Afghanistan

Twenty one samples were received on the 31/03/2015; typing and sequencing results are pending and will be reported in the next quarterly report.

Hong Kong SAR, P.R. China

One sample, collected from pigs on the 16/12/2014, was received by the WRLFMD but no virus could be detected.

Republic of Korea (South Korea)

Ten samples, collected from pig on the 3rd December 2014 were received on 22/12/2014 (no locations were given). Four samples were identified as **FMD type O** and VP1 sequencing showed they belonged to the SEA toptotype, Mya-98 lineage (see below). Subsequent to the three FMD outbreaks initially reported in early December 2014, >100 FMD outbreaks have now been reported across the country during 2015. The majority of the affected premises have been pig farms and disease appears to have occurred in spite of a vaccination programme (with O1-Manisa).

Pakistan

Thirty two samples were received on 24/02/2015 which had been collected from cattle and water buffalo between 18/01/2014 and 09/02/2015. **FMD types O, A and Asia 1** were identified. Genotyping is pending.

AFRICA

Algeria

Two outbreaks of **FMD type O** were reported to have occurred in March 2015 in the Sidi Bel Abbes and Saida provinces. These new outbreaks have occurred in small ruminants (goats and sheep) are in a different region to areas that were affected during 2014. Genotyping of representative FMD viruses from these cases is now urgently required to confirm that these outbreaks are caused by the O/ME-SA/Ind-2001 lineage that has spread recently across Libya, Tunisia and Algeria. In view of the rapid spread of this lineage during 2013/14, a resurgence of new cases (now 12 outbreaks in 2015) that is focussed further to the west than the outbreaks in 2014 (and closer to the border with Morocco) needs to be carefully monitored.

Botswana

Three FMDV type SAT 2 VP1 sequences were received from the Botswana Vaccine Institute on 13/03/2015. They were derived from samples collected from cattle in the Kareng Extension Area, Maun, North East District on 4th March 2015. Genotyping revealed them to belong to toptotype III (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/2015.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 2015 is shown in Annex 1 Table 2. A record of all samples received by WRLFMD (January to March 2015) is shown in Annex 1 Table 3.

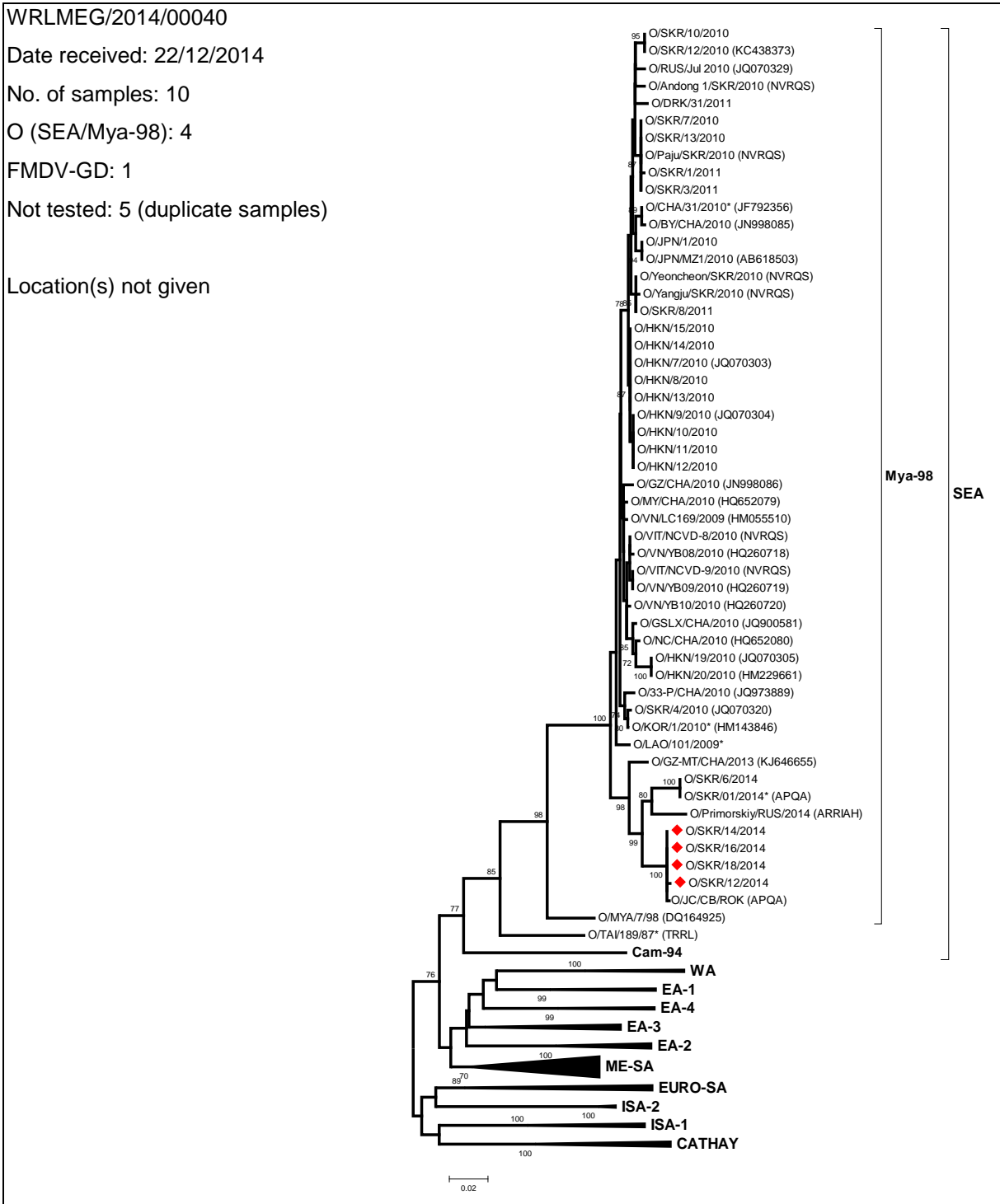
WRLFMD Batch No.	Date received	Country	Serotype	Number of samples	Number of sequences	Sequencing status
WRLFMD/2014/00040*	22/12/2014	South Korea	O	4	4	Completed
WRLFMD/2015/00002	24/02/2015	Pakistan	O	13		Pending
WRLFMD/2015/00002	24/02/2015	Pakistan	A	8		Pending
WRLFMD/2015/00002	24/02/2015	Pakistan	A & O	3		Pending
WRLFMD/2015/00002	24/02/2015	Pakistan	Asia 1	5		Pending
WRLFMD/2015/00002	24/02/2015	Pakistan	Asia 1 & O	1		Pending
WRLFMD/2015/00003	31/03/2015	Afghanistan	Pending	21		Pending
				55	4	

Table 1: Status of sequencing of samples received by the WRLFMD from January to March 2015 (*) indicates samples carried over from the last quarter)



**Detailed Analysis:
ASIA**

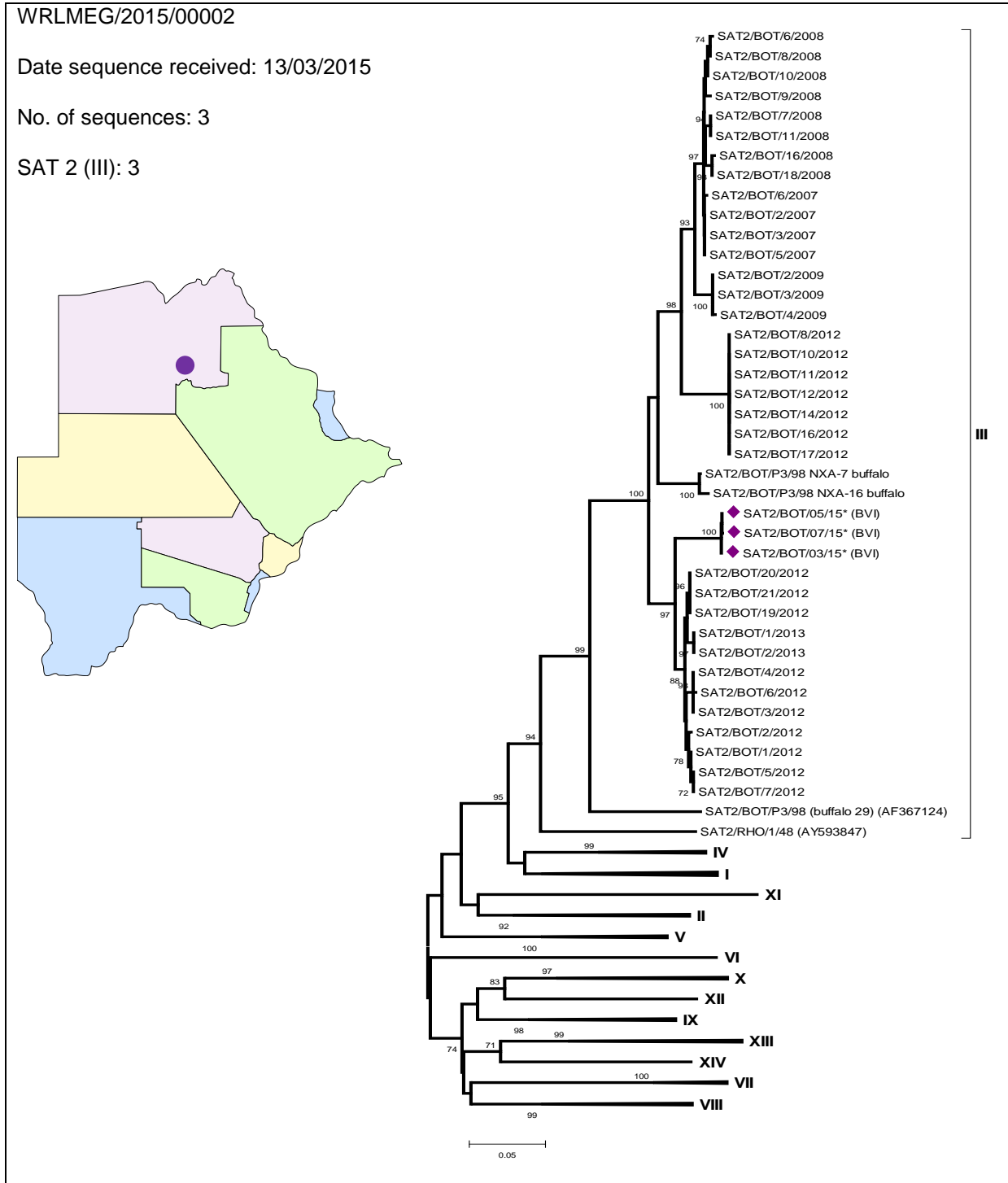
Figure 1: Republic of Korea (South Korea)





AFRICA

Figure 2: Botswana





Vaccine matching

For individual data see Table 4 (Annex 1).

Serotype O

Due to the move into the new high-containment laboratories at the The Pirbright Institute, only a limited number of samples were tested during this reporting period.

We received six samples from South Korea for vaccine matching. These were all serotype O viruses (from the O/SEA/Mya-98 lineage), from recent field cases in South Korea, of which three were originally isolated at Merial before being tested at TPI. There was a good vaccine match for O 3039, O/SKR/7/2010, O Taw98 and O/TUR/5/09; however there was poor vaccine match with O Manisa.



Annex 1

Table 2: Clinical sample diagnostics made by the WRLFMD® between January – March 2015

Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	rRT-PCR	Final report
AFGHANISTAN	AFG 22/2013	BOVINE	27-Jul-13	Pending	Pending	Pending
	AFG 23/2013	BOVINE	18-Dec-13	Pending	Pending	Pending
	AFG 24/2013	BOVINE	23-Dec-13	Pending	Pending	Pending
	AFG 25/2013	BOVINE	24-Dec-13	Pending	Pending	Pending
	AFG 26/2013	BOVINE	26-Dec-13	Pending	Pending	Pending
	AFG 27/2013	BOVINE	28-Dec-13	Pending	Pending	Pending
	AFG 28/2013	BOVINE	30-Dec-13	Pending	Pending	Pending
	AFG 29/2013	BOVINE	30-Dec-13	Pending	Pending	Pending
	AFG 30/2013	BOVINE	30-Dec-13	Pending	Pending	Pending
	AFG 31/2013	BOVINE	30-Dec-13	Pending	Pending	Pending
	AFG 32/2013	BOVINE	30-Dec-13	Pending	Pending	Pending
	AFG 1/2014	BOVINE	03-Apr-14	Pending	Pending	Pending
	AFG 2/2014	BOVINE	09-Apr-14	Pending	Pending	Pending
	AFG 3/2014	BOVINE	12-Apr-14	Pending	Pending	Pending
	AFG 4/2014	BOVINE	19-Apr-14	Pending	Pending	Pending
	AFG 5/2014	BOVINE	23-Apr-14	Pending	Pending	Pending
	AFG 6/2014	BOVINE	24-Apr-14	Pending	Pending	Pending
	AFG 7/2014	BOVINE	26-Apr-14	Pending	Pending	Pending
	AFG 8/2014	BOVINE	28-Apr-14	Pending	Pending	Pending
	AFG 9/2014	BOVINE	02-May-14	Pending	Pending	Pending
AFG 10/2014	BOVINE	11-May-14	Pending	Pending	Pending	
HONG KONG, SAR OF PRC	HKN 16/2014	PORCINE	16-Dec-14	NEG	NEG	NVD
PAKISTAN	PAK 26/2014	CATTLE	18-Jan-14	ASIA-1	POS	ASIA-1
	PAK 27/2014	CATTLE	25-Jan-14	O	POS	O
	PAK 28/2014	CATTLE	30-Jan-14	A	POS	A
	PAK 29/2014	BUFFALO	28-Feb-14	O	POS	O
	PAK 30/2014	CATTLE	02-Apr-14	O	POS	O
	PAK 31/2014	BUFFALO	06-May-14	O	POS	O
	PAK 32/2014	CATTLE	15-May-14	A	POS	A
	PAK 33/2014	CATTLE	22-Oct-14	A, O	POS	A, O

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Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	rRT-PCR	Final report
	PAK 34/2014	CATTLE	01-Nov-14	O	POS	O
	PAK 35/2014	BUFFALO	08-Nov-14	ASIA-1	POS	ASIA-1
	PAK 36/2014	BUFFALO	16-Nov-14	O	POS	O
	PAK 37/2014	CATTLE	17-Nov-14	ASIA-1	POS	ASIA-1
	PAK 38/2014	CATTLE	28-Nov-14	A	POS	A
	PAK 39/2014	CATTLE	02-Dec-14	ASIA-1, O	POS	ASIA-1, O
	PAK 40/2014	BUFFALO	05-Dec-14	O	POS	O
	PAK 41/2014	CATTLE	05-Dec-14	A, O	POS	A, O
	PAK 42/2014	BUFFALO	15-Dec-14	A	POS	A
	PAK 43/2014	CATTLE	20-Dec-14	A	POS	A
	PAK 44/2014	BUFFALO	22-Dec-14	O	POS	O
	PAK 45/2014	CATTLE	29-Dec-14	O	POS	O
	PAK 46/2014	BUFFALO	30-Dec-14	ASIA-1	POS	ASIA-1
	PAK 1/2015	BUFFALO	09-Jan-15	ASIA-1	POS	ASIA-1
	PAK 2/2015	CATTLE	11-Jan-15	O	POS	O
	PAK 3/2015	CATTLE	15-Jan-15	A	POS	A
	PAK 4/2015	CATTLE	18-Jan-15	NEG	POS	FMDV GD
	PAK 5/2015	CATTLE	26-Jan-15	O	POS	O
	PAK 6/2015	BUFFALO	26-Jan-15	NEG	POS	FMDV GD
	PAK 7/2015	CATTLE	28-Jan-15	A, O	POS	A, O
	PAK 8/2015	CATTLE	29-Jan-15	O	POS	O
	PAK 9/2015	CATTLE	30-Jan-15	A	POS	A
	PAK 10/2015	CATTLE	02-Feb-15	A	POS	A
	PAK 11/2015	CATTLE	09-Feb-15	O	POS	O
TOTAL:		54				

Carried over from previous quarterly report:

Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
SOUTH KOREA	SKR 11/2014	PIG	03-Dec-14	Not tested	Not tested	Not tested
	SKR 12/2014	PIG	03-Dec-14	O	POS	O
	SKR 13/2014	PIG	03-Dec-14	Not tested	Not tested	Not tested
	SKR 14/2014	PIG	03-Dec-14	O	POS	O

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Country	WRL for FMD Sample Identification	Species	Date of Collection	Results		
				VI/ELISA	rRT-PCR	Final report
	SKR 15/2014	PIG	03-Dec-14	Not tested	Not tested	Not tested
	SKR 16/2014	PIG	03-Dec-14	O	POS	O
	SKR 17/2014	PIG	03-Dec-14	Not tested	Not tested	Not tested
	SKR 18/2014	PIG	03-Dec-14	O	POS	O
	SKR 19/2014	PIG	03-Dec-14	Not tested	Not tested	Not tested
	SKR 20/2014	PIG	03-Dec-14	NEG	POS	FMDV GD
TOTAL:		10				

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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Copies of all the individual reports cited herein can be obtained from The Pirbright Institute and prior to presentation, publication or any other public use of these data, please contact Dr Donald King, The Pirbright Institute, donald.king@pirbright.ac.uk



Table 3: Summary of samples collected and received to WRLFMD (January to March 2015)

Country	N ^o of samples	Virus isolation in cell culture/ELISA								rRT-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	21	-	-	-	-	-	-	-	-	-	-
HONG KONG, SAR OF PRC	1	-	-	-	-	-	-	-	1	-	1
PAKISTAN ¹	32	16	11	-	-	-	-	6	2	32	-
TOTAL	54	16	11	-	-	-	-	6	3	32	1

Sample results pending from previous report:

South Korea*	10	4	-	-	-	-	-	-	-	5	-
TOTAL	10	4	-	-	-	-	-	-	-	5	-

* 5 samples in this batch were not tested by VI and rRT-PCR methods at the WRLFMD

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



Table 4: Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from January to March 2015

Vaccine Matching Studies for Serotype O FMDV by VNT

Sample Reference	O 3039	O Mansia	O/SKR/7/10**	O TAW/98	O/TUR/5/09
O/SKR/13/2014*	M	N	M	M	M
O/SKR/14/2014	M	N	M	N	M
O/SKR/15/2014*	M	N	M	M	M
O/SKR/16/2014	M	N	M	B	M
O/SKR/18/2014	M	N	M	M	M
O/SKR/19/2014*	M	B	M	M	M

* These isolates provided by Merial Animal Health from the shipment sent to The Pirbright Institute

** This test used a closely related field strain, not the homologous vaccine strain

Abbreviations used in table:

M	Vaccine Match- $r_1 = \geq 0.3$. Suggests that there is a close relationship between field isolate and vaccine strain. A potent vaccine containing the vaccine strain is likely to confer protection.
N	No Vaccine Match - $r_1 = < 0.3$. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect
Borderline	Any r_1 values between 0.28 to 0.32
NT	Not tested against this vaccine



Annex 2

Recent FMD Publications (January-March 2015) cited by Web of Science (Pirbright Institute papers and authors are highlighted in **BOLD AND GREY**)

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Annex 3

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

Note: Virus strains are NOT listed in order of importance

High Priority	O Manisa O PanAsia-2 (or equivalent) O BFS or Campos A24 Cruzeiro Asia 1 Shamir A Iran-05 (or A TUR 06) A22 Iraq SAT 2 Saudi Arabia (or equivalent i.e. SAT 2 Eritrea)
Medium Priority	A Eritrea SAT 2 Zimbabwe SAT 1 South Africa A Malaysia 97 (or Thai equivalent such as A/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.