

**FAO/OIE Reference Laboratory Report
April-June 2007**

Foot-and-Mouth Disease

FMD Trends

Summary

Information collated from OIE (<http://www.oie.int/wahid-prod/public.php?page=home>), Promed (<http://www.promedmail.org/>) and the FMD news service at UC Davis (<http://fmd.ucdavis.edu/>).

Between April and June 2007, no FMD outbreaks were officially reported in FMD-free countries that did not practice vaccination and the disease remained largely confined to traditionally infected areas. Immediate risks to Europe posed by the presence of serotypes O and A in Turkish Thrace (described in the previous report) have apparently lessened, since there have been no new outbreaks reported in this region indicating that the control measures employed there have been effective.

In the Middle East, there have continued to be reports (April, May and June) of FMD outbreaks due to serotype O in **Israel** in 4 provinces (Hadarom, Hazafon, Hamerkaz and Haifa). Recently, there have also been reports of FMD outbreaks that occurred earlier in the year (February 2007) in 2 separate regions in **Lebanon**. These affected dairy cattle in the south of the country (Al Janoub, Hasbaya) and small ruminants in Al Biqa, Zahle suburb in the east of the country bordering Syria. The serotype causing these Lebanese outbreaks has not been established; but recent outbreaks in neighbouring countries of Israel, Jordan and the Palestinian Territories have mainly been of serotype O (serotype A also in Jordan). These are the first reports of FMD outbreaks in Lebanon since 2003.

Asia: There have been new reports of FMD outbreaks in several central Asia countries. In **Kazakhstan**, FMD outbreaks causing deaths of cattle have been reported in the centre and west of the country (Karaganda, Gur'yev, Ural'sk and Atyrau). The proximity of these outbreaks to the Russian border has led to the suspension of imports of livestock and meat products from Kazakhstan into Russia. Vaccination measures to control these outbreaks have involved 38,500 cattle and 23,500 sheep (to date). Serotype O (PanAsia lineage) has been implicated as the causative strain, although the characterisation of representative viruses from these separate regions has not yet been reported. In May and June, outbreaks affecting cattle due to serotypes O (Chuy region) and A (Batken region) were reported in **Kyrgyzstan** including the Osh region adjacent to the border with Uzbekistan. In addition, there have also been unofficial reports of FMD outbreaks in cattle in Tajikabad District in the east of **Tajikistan**. Elsewhere in Asia, FMD outbreaks have continued to be reported in **China**: in Gansu (affecting pigs and dairy cattle) and Qinghai (affecting cattle). In endemic areas, outbreaks of FMD have been reported in central (Ha Tinh, Phu Yen, Quang Tri, Thanh Hoa and Gia Lai provinces) and northern (Thai Nguyen and Quang Ninh) provinces of **Vietnam**. FMDV isolates obtained from 15 outbreaks in Quang Tri affecting predominantly cattle have been characterised as serotype Asia-1. Serotype Asia 1 was also recovered at IAH-Pirbright from a sample sent in from **North Korea** associated to an outbreak at the start of 2007. In the **Philippines**, progress has been made towards the eradication of FMD. For the past eight years, Mindanao, Visayas, Palawan and Masbate have remained free (without vaccination) from FMD.

In Africa, there have been unofficial reports of FMD outbreaks in Rwanda and Uganda.

In South America, there have been further FMD outbreaks of serotype O affecting cattle in **Ecuador** (close to the Pacific coast and further west than region affected by outbreaks earlier in the year) and in **Bolivia** (Santa Cruz). Across the region, vaccination programmes are continuing to control the spread of disease. In Brazil, a new initiative to vaccinate 100 million cattle and buffaloes in 14 States was started. States covered include Mato Grosso do Sul where FMD outbreaks were reported in 2006. Initial estimates (June 2007) indicate as many as 137 million cattle have been vaccinated in the country. In Argentina, >4.7 million cattle have been vaccinated in Entre Rios province neighbouring Uruguay and 0.7 million cattle have been vaccinated in Rio Negro. Details of new mass vaccination programmes have also been announced in Ecuador (3.5 million doses), Columbia (14.5 million doses) as well as Venezuela, Bolivia and Uruguay. The control of FMD in the region has led to changes in the recognised status within some South American countries. Most of the Argentine territory is now FMD-free with vaccination and the region considered FMD-free without vaccination has been extended to include Northern Patagonia. The area FMD-free with vaccination has also been extended to the region north of the Rio Negro apart from the border areas with Paraguay and Bolivia, which are being closely monitored. The state of Santa Catarina became the first FMD-free without vaccination region in Brazil. Part of the state of Para in Brazil has been recognized FMD-free with vaccination. Further north, the border with Ecuador, part of the Valley [Valle] and Caqueta, and Western Cundinamarca were declared FMD-free by the OIE. Seventy-five percent of the Colombian territory is now considered FMD-free. There are 16 million cattle in the FMD-free area,

representing 73% of the Colombian herd. The OIE has also defined a 15-km buffer zone in the common borders between Argentina, Brazil, Paraguay, and Bolivia, which will not be considered FMD-free.

The WRL vaccine recommendations remain unchanged.

Results from samples received to WRL (status of samples being testing is shown in Table 1)

Middle East/Asia

FMDV serotype O

Phylogenetic analysis performed on 8 FMDV isolates from Afghanistan (collected in 2007: see Annex 2, Figure 1) and an isolate from Cambodia (collected in 2006) showed that these were all from the PanAsia lineage widely circulating through the Middle East and south Asia. In addition, 5 FMDV isolates obtained from a wild oryx sampled in Saudi Arabia have been sequenced. These sequences were all identical to each other and were also characterised as belonging to the PanAsia lineage circulating in the region (see Annex 2, Figure 1). Two serotype O isolates supplied from Kyrgyzstan were also characterised and shown to be from the ME-SA toptotype, but sharing closest relationship with historical viruses from Russia (from 1958 and 1976) rather than to contemporary serotype O viruses from the Middle East and Asia.

FMDV serotype A

The spread of the Iran-05 lineage of serotype A through the Middle East (Iran, Turkey and Jordan) has been described in previous reports. Three further viruses collected from Afghanistan (in 2007) were characterised as belonging to this lineage. (Annex 2, Figure 2). From South-East Asia, isolates collected from Thailand (9), Laos (3) and Cambodia (2) in 2006 have been characterised. Within countries, these isolates group together and are all characterised as members of the ASIA toptotype of serotype A. (Annex 2, Figure 3).

FMDV serotype Asia-1

In the previous report (Jan-Mar 2007), the first FMD outbreak since 1960 officially reported (to OIE) in North Korea was described. The causative agent was initially characterised as serotype O. However, subsequent analysis showed that sequences obtained from material sent to Pirbright were identical to an attenuated North Korean vaccine strain (data not shown). Additional field material was requested and sent to Pirbright for analysis. FMD virus subsequently isolated was characterised as Asia-1 serotype, a conclusion supported by serological testing of sera from affected animals, and sequence analysis that showed that the North Korean isolate shared highest nucleotide identity (98.3%) to Russian isolates of the Asia-1 serotype collected in 2005. (See Annex 2, Figure 4). An additional Asia-1 isolate from Kyrgyzstan (collected in 2004) was also analysed (See Annex 2, Figure 4).

Africa

FMDV serotype O

Phylogenetic analysis has been performed on 3 serotype O viruses from Africa. Two viruses from Ethiopia (collected in 2006), were closely related to other viruses from the region in the EA-3 toptypes (see Annex 2, Figure 5). A cell culture isolate from Egypt was closely related (99.2% identity) to the vaccine strain O1/Sharquia/EGY/72 (data not shown).

FMDV serotype A

Three additional isolates from the recent FMD Serotype A outbreak in Egypt were characterised. All were identical to each other and closely related to other field material received to the WRL from the outbreak. Three further African serotype A viruses (2 from Sudan and 1 from Ethiopia) were analysed and shown (Annex 2, Figure 6) to be closely related to other viruses from the regions where they were collected, within the AFRICA toptotype of serotype A.

FMDV serotype SAT2

A single SAT2 isolate (SUD 1/2007) from Sudan has been sequenced and was most closely related to other North African viruses of the SAT2 serotype (Annex 2, Figure 7).

Table 1: Status of sequencing of samples received recently to WRLFMD

Batch	Country	Serotype	No. of samples	Status
WRLFMD-2007-00007	Ethiopia*	O	2	completed

WRLFMD-2007-00007	Ethiopia*	A	1	completed
WRLFMD-2007-00008	Kyrgyzstan	Asia 1	1	completed
WRLFMD-2007-00008	Kyrgyzstan	O	2	completed
WRLFMD-2007-00007	Ethiopia*	O	2	completed
WRLFMD-2007-00005	Iran	O	20	completed
WRLFMD-2007-00009	Sudan	A	2	completed
WRLFMD-2007-00009	Sudan	SAT 2	1	completed
WRLFMD-2007-00010	Egypt	A	3	completed
WRLFMD-2007-00010	Egypt	O	1	completed
WRLFMD-2007-00011	North Korea	O	1	completed
WRLFMD-2007-00013	Thailand	A	10	completed
WRLFMD-2007-00013	Thailand	FMDV-GD	1	not done
WRLFMD-2007-00014	Cambodia	A	2	completed
WRLFMD-2007-00014	Cambodia	O	1	completed
WRLFMD-2007-00014	Cambodia	FMDV-GD	1	not done
WRLFMD-2007-00015	Vietnam	FMDV-GD	2	not done
WRLFMD-2007-00016	Laos	A	3	completed
WRLFMD-2007-00017	Saudi Arabia	O	5	completed
WRLFMD-2007-00018	Afghanistan	A	3	completed
WRLFMD-2007-00018	Afghanistan	O	8	completed
WRLFMD-2007-00018	Afghanistan	FMDV-GD	7	not done
WRLFMD-2007-00019	Pakistan	O	43	in progress
WRLFMD-2007-00019	Pakistan	FMDV-GD	10	not done
WRLFMD-2007-00020	Portugal	SVD	1	completed

* an additional 11 samples were FMDV-GD; all were RT-PCR negative using O and A VP1 primer sets

Vaccine matching

Nine FMDV type O isolates (O Eth 67/2005, 48/2006; O Irn 34, 47, 52/2006, O Mai 11, 17/2006, O Pak 4/2006 and O Sau 5/2007) from Ethiopia, Iran, Mali, Pakistan and Saudi Arabia collected in 2005, 2006 and 2007 were further characterised by two dimensional virus neutralisation test (Annex 1; TABLE C), showing that most of these isolates were antigenically matched with O1 Manisa vaccine strains and indicating that the currently predominant type O virus can be covered by a vaccine present in many vaccine banks. Further work is required to investigate the poor match to O Pak 4/2006.

Publication of data to the scientific community and the industry

FMD papers published in the reporting period from the Pirbright Laboratory (Pirbright authors underlined):

1. Horsington J, Zhang Z. Analysis of foot-and-mouth disease virus replication using strand-specific quantitative RT-PCR. J Virol Methods. 2007 Jun 8; [Epub ahead of print]
2. Gerner W, Carr BV, Wiesmuller KH, Pfaff E, Saalmuller A, Charleston B. Identification of a novel foot-and-mouth disease virus specific T-cell epitope with immunodominant characteristics in cattle with MHC serotype A31. Vet Res. 2007 July-August;38(4):565-572. Epub 2007 May 30.
3. Nunez JI, Molina N, Baranowski E, Domingo E, Clark S, Burman A, Berryman S, Jackson T, Sobrino F. Guinea Pig-adapted Foot-and-Mouth Disease Virus with Altered Receptor Recognition Can Productively Infect a Natural Host. J Virol. 2007 May 23; [Epub ahead of print]

4. Ryan E, Zhang Z, Brooks HW, Horsington J, Brownlie J. Foot-and-Mouth Disease Virus Crosses the Placenta and Causes Death in Fetal Lambs. *J Comp Pathol*. 2007 May;136(4):256-65. Epub 2007 Apr 24.
5. Hema M, Nagendrakumar SB, Yamini R, Chandran D, Rajendra L, Thiagarajan D, Parida S, Paton DJ, Srinivasan VA. Chimeric tymovirus-like particles displaying foot-and-mouth disease virus non-structural protein epitopes and its use for detection of FMDV-NSP antibodies. *Vaccine*. 2007 Jun 15;25(25):4784-94. Epub 2007 Apr 26.
6. Sammin DJ, Paton DJ, Parida S, Ferris NP, Hutchings GH, Reid SM, Shaw AE, Holmes C, Gibson D, Corteyn M, Knowles NJ, Valarcher JF, Hamblin PA, Fleming L, Gwaze G, Sumption KJ. Evaluation of laboratory tests for SAT serotypes of foot-and-mouth disease virus with specimens collected from convalescent cattle in Zimbabwe. *Vet Rec*. 2007 May 12;160(19):647-54.
7. Valarcher JF, Gloster J, Doel CA, Bankowski B, Gibson D. Foot-and-mouth disease virus (O/UKG/2001) is poorly transmitted between sheep by the airborne route. *Vet J*. 2007 Jul 11;
8. Sellers R, Gloster J. Foot-and-mouth disease: A review of intranasal infection of cattle, sheep and pigs. *Vet J*. 2007 May 15; [Epub ahead of print]
9. Kitching P, Hammond J, Jeggo M, Charleston B, Paton D, Rodriguez L, Heckert R. (2007). Global FMD control-Is it an option? *Vaccine*. [Epub ahead of print]
10. Ryan E. The pathogenesis of foot-and-mouth disease in foetal and neonatal lambs. PhD thesis. 2007, University of London.

Annex 1.

Table A: Summary of clinical sample diagnostics made by the WRL between April - June 2007

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
EGYPT	EGY 6/2006	NK	NK	A	Positive	A
	EGY 7/2006	NK	NK	A	Positive	A
	EGY 8/2006	NK	NK	O	Positive	O
	EGY 9/2006	NK	NK	A	Positive	A
NORTH KOREA	NKR 1/2007	NK	NK	O	Positive	O
SUDAN	SUD 1/2006	Cattle	09.11.06	A	Positive	A
	SUD 2/2006	Cattle	10.11.06	NVD	Negative	NVD
	SUD 3/2006	Cattle	26.11.06	A	Positive	A
	SUD 1/2007	Cattle	21.01.07	SAT 2	Positive	SAT 2
CAMBODIA	CAM 1/2006	Cattle	13.07.06	A	Positive	A
	CAM 2/2006	Cattle	13.07.06	A	Positive	A
	CAM 3/2006	Cattle	28.07.06	NVD	Positive	FMDV GD
	CAM 4/2006	Cattle	28.07.06	O	Positive	O
LAOS	LAO 6/2006	Cattle	25.12.06	A	Positive	A
	LAO 7/2006	Cattle	25.12.06	A	Positive	A
	LAO 8/2006	Cattle	25.12.06	A	Positive	A
MALTA	MTA 1/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 2/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 3/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 4/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 5/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 6/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 7/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 8/2007	Cattle	28.04.07	NVD	Negative	NVD
	MTA 9/2007	Cattle	28.04.07	NVD	Negative	NVD
SAUDI ARABIA	SAU 1/2007	Oryx	00.05.07	O	Negative	O
	SAU 2/2007	Oryx	00.05.07	O	Positive	O
	SAU 3/2007	Oryx	00.05.07	O	Positive	O
	SAU 4/2007	Oryx	00.05.07	O	Positive	O
	SAU 5/2007	Oryx	00.05.07	O	Positive	O
THAILAND	TAI 1/2006	Cattle	16.01.06	A	Positive	A
	TAI 2/2006	Cattle	06.03.06	A	Positive	A
	TAI 3/2006	Cattle	24.05.06	A	Positive	A
	TAI 4/2006	Cattle	14.06.06	A	Positive	A
	TAI 5/2006	Cattle	29.06.06	NVD	Positive	FMDV GD
	TAI 6/2006	Cattle	18.09.06	A	Positive	A
	TAI 7/2006	Cattle	25.09.06	A	Positive	A
	TAI 8/2006	Cattle	07.11.06	A	Positive	A

	TAI 9/2006	Cattle	10.11.06	A	Positive	A
	TAI 10/2006	Cattle	20.11.06	A	Positive	A
	TAI 11/2006	Cattle	29.12.06	A	Positive	A
	TAI 1/2007	Cattle	09.01.07	NVD	Negative	NVD
VIETNAM	VIT 12/2006	Cattle	07.07.06	NVD	Positive	FMDV GD
	VIT 13/2006	Cattle	07.07.06	NVD	Positive	FMDV GD
AFGHANISTAN	AFG 1/2007	Cattle	00.00.07	NVD	Negative	NVD
	AFG 2/2007	Cattle	00.00.07	NVD	Negative	NVD
	AFG 3/2007	Cattle	00.00.07	NVD	Positive	FMDV GD
	AFG 4/2007	Cattle	00.00.07	NVD	Positive	FMDV GD
	AFG 5/2007	Cattle	00.00.07	NVD	Positive	FMDV GD
	AFG 6/2007	Cattle	00.00.07	A	Positive	A
	AFG 7/2007	Cattle	00.00.07	A	Positive	A
	AFG 8/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 9/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 10/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 11/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 12/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 13/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 14/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 15/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 16/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 17/2007	Goat	00.00.07	NVD	Negative	NVD
	AFG 18/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 19/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 20/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 21/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 22/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 23/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 24/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 25/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 26/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 27/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 28/2007	Cattle	00.00.07	NVD	Negative	NVD
	AFG 29/2007	Goat	00.00.07	O	Positive	O
	AFG 30/2007	Sheep	00.00.07	NVD	Negative	NVD
	AFG 31/2007	Cattle	00.00.07	NVD	Negative	NVD
	AFG 32/2007	NK	00.00.07	NVD	Positive	FMDV GD
	AFG 33/2007	NK	00.00.07	NVD	Positive	FMDV GD
	AFG 34/2007	Cattle	00.00.07	O	Positive	O
	AFG 35/2007	Cattle	00.00.07	NVD	Negative	NVD
	AFG 36/2007	Cattle	00.00.07	O	Positive	O
	AFG 37/2007	Cattle	00.00.07	O	Positive	O
	AFG 38/2007	NK	00.00.07	NVD	Positive	FMDV GD
	AFG 39/2007	NK	00.00.07	O	Positive	O
	AFG 40/2007	Cattle	00.00.07	NVD	Positive	FMDV GD
	AFG 41/2007	Cattle	00.00.07	NVD	Negative	NVD
	AFG 42/2007	NK	00.00.07	O	Positive	O
	AFG 43/2007	NK	00.00.07	O	Positive	O
	AFG 44/2007	Cattle	00.00.07	A	Positive	A
	AFG 45/2007	NK	00.00.07	O	Positive	O
PAKISTAN	PAK 54/2006	Cattle	00.08.06	NVD	Positive	FMDV GD

PAK 55/3006	Cattle	00.08.06	NVD	Negative	NVD
PAK 56/2006	Cattle	00.08.06	NVD	Positive	FMDV GD
PAK 57/2006	Cattle	00.12.06	NVD	Positive	FMDV GD
PAK 58/2006	Cattle	00.12.06	O	Positive	O
PAK 59/2006	Cattle	00.12.06	NVD	Positive	FMDV GD
PAK 1/2007	Buffalo	15.01.07	O	Positive	O
PAK 2/2007	Buffalo	15.01.07	O	Positive	O
PAK 3/2007	Cattle	15.01.07	O	Positive	O
PAK 4/2007	Cattle	15.01.07	O	Positive	O
PAK 5/2007	Cattle	15.01.07	O	Positive	O
PAK 6/2007	Cattle	15.01.07	O	Positive	O
PAK 7/2007	Buffalo	17.01.07	O	Positive	O
PAK 8/2007	Cattle	17.01.07	O	Positive	O
PAK 9/2007	Cattle	19.01.07	O	Positive	O
PAK 10/2007	Cattle	20.01.07	O	Positive	O
PAK 11/2007	Cattle	21.01.07	O	Positive	O
PAK 12/2007	Cattle	22.01.07	O	Positive	O
PAK 13/2007	Buffalo	25.01.07	NVD	Negative	NVD
PAK 14/2007	Cattle	26.01.07	NVD	Positive	FMDV GD
PAK 15/2007	Cattle	26.01.07	O	Negative	O
PAK 16/2007	Cattle	26.01.07	NVD	Positive	FMDV GD
PAK 17/2007	Cattle	26.01.07	NVD	Positive	FMDV GD
PAK 18/2007	Cattle	26.01.07	NVD	Negative	NVD
PAK 19/2007	Cattle	27.01.07	O	Positive	O
PAK 20/2007	Cattle	02.02.07	O	Positive	O
PAK 21/2007	Cattle	02.02.07	O	Positive	O
PAK 22/2007	Cattle	06.02.07	O	Positive	O
PAK 23/2007	Cattle	06.02.07	O	Positive	O
PAK 24/2007	Cattle	08.02.07	O	Positive	O
PAK 25/2007	Buffalo	08.02.07	O	Positive	O
PAK 26/2007	Buffalo	08.02.07	O	Positive	O
PAK 27/2007	Cattle	09.02.07	NVD	Negative	NVD
PAK 28/2007	Cattle	09.02.07	O	Positive	O
PAK 29/2007	Buffalo	09.02.07	O	Positive	O
PAK 30/2007	Buffalo	09.02.07	O	Positive	O
PAK 31/2007	Cattle	12.02.07	O	Positive	O
PAK 32/2007	Cattle	14.02.07	O	Negative	O
PAK 33/2007	Cattle	14.02.07	O	Positive	O
PAK 34/2007	Cattle	14.02.07	O	Negative	O
PAK 35/2007	Cattle	18.02.07	O	Positive	O
PAK 36/2007	Cattle	00.03.07	O	Positive	O
PAK 37/2007	Buffalo	00.03.07	NVD	Positive	FMDV GD
PAK 38/2007	Cattle	00.03.07	O	Positive	O
PAK 39/2007	Buffalo	00.03.07	NVD	Positive	FMDV GD
PAK 40/2007	Cattle	12.03.07	O	Positive	O
PAK 41/2007	Cattle	12.03.07	O	Positive	O
PAK 42/2007	Cattle	16.03.07	O	Positive	O
PAK 43/2007	Cattle	16.03.07	O	Positive	O
PAK 44/2007	Cattle	16.03.07	O	Positive	O
PAK 45/2007	Cattle	16.03.07	O	Positive	O
PAK 46/2007	Cattle	16.03.07	O	Positive	O
PAK 47/2007	Cattle	16.03.07	O	Positive	O
PAK 48/2007	Cattle	26.03.07	O	Positive	O
PAK 49/2007	Cattle	14.05.07	O	Positive	O
PAK 50/2007	Cattle	25.05.07	O	Positive	O

	PAK 51/2007	NK	00.00.07	NVD	Negative	NVD
	PAK 52/2007	NK	00.00.07	NVD	Positive	FMDV GD
PORTUGAL	POR 1/2007	Pig	00.06.07	NVD	Negative	NVD
	POR 2/2007	Pig	00.06.07	NVD	Negative	NVD
	POR 3/2007	Pig	00.06.07	NVD	Negative	NVD
	POR 4/2007	Pig	00.06.07	NVD	Negative	NVD
	POR 5/2007	Pig	00.06.07	SVDV	Positive	SVDV

TOTAL : 152

* Institute for Animal Health, Pirbright Laboratory, Woking, Surrey GU24 0NF
FMD(V) foot-and-mouth disease (virus)
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
NK not known
NVD no foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected

TABLE B: Summary of samples collected in received to IAH (April – June 2007)

Country	No. of samples	Virus isolation in cell culture/ELISA								NVD	RT-PCR for FMD (or SVD) virus (where appropriate)	
		FMD virus serotypes			SVD virus	Asia	Positive	Negative				
		O	A	C					SAT 1		SAT 2	SAT 3
AFGHANISTAN	45	8	3	-	-	-	-	-	-	34	18	27
CAMBODIA	4	1	2	-	-	-	-	-	-	1	4	-
EGYPT	4	1	3	-	-	-	-	-	-	-	4	-
LAOS	3	-	3	-	-	-	-	-	-	-	3	-
MALTA	9	-	-	-	-	-	-	-	-	9	-	9
NORTH KOREA	1	1	-	-	-	-	-	-	-	-	1	-
PAKISTAN	58	43	-	-	-	-	-	-	-	15	50	8
PORTUGAL**	5	-	-	-	-	-	-	-	1	4	1	4
SAUDI ARABIA	5	5	-	-	-	-	-	-	-	-	4	1
SUDAN	4	-	2	-	-	1	-	-	-	1	3	1
THAILAND	12	-	10	-	-	-	-	-	-	2	11	1
VIETNAM	2	-	-	-	-	-	-	-	-	2	2	-
TOTAL	152	59	23	-	-	1	-	-	1	68	101	51

* 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
 RT-PCR reverse transcription polymerase chain reaction for FMD (or SVD) viral genome
 ** samples from Portugal submitted for SVDV characterisation

NPF, 12 July 2007

TABLE C: Antigenic characterisation of FMD field isolates by matching with vaccine strains by ELISA and/or VNT - r Value data from 1st April to 30th June 2007

r ₁ Values by 2dmVNT	
Field Isolate:	O Manisa
O Eth 67/2005	>0.93
O Eth 48/2006	>0.93
O Im 34/2006	0.64
O Im 47/2006	>0.69
O Im 52/2006	0.64
O Mai 11/2006	>0.75
O Mai 17/2006	0.66
O Pak 4/2006	<0.13
O Sau 5/2007	>0.94

Interpretation of r₁ 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.

Annex 2: Phylogenetic analysis of characterised FMDV isolates:

Fig 1 Serotype O FMDV from ASIA (Afghanistan and Saudi Arabia are highlighted)

Report on FMDV O from Afghanistan and Saudi Arabia in 2007

Software: MEGA 3.1
 No. of Taxa : 180
 Data File : n:\evd\meg\db\fmdv\o\AFG2007a.meg
 Data Title : O/AFG/2007
 Data Type : Nucleotide (Coding)
 Analysis : Phylogeny reconstruction
 Tree Inference : =====
 Method : Neighbor-Joining
 Phylogeny Test and options : Bootstrap (1000 replicates; seed=64238)
 Include Sites : =====
 Gaps/Missing Data : Pairwise Deletion
 Codon Positions : 1st+2nd+3rd+Noncoding
 Substitution Model : =====
 Model : Nucleotide: Kimura 2-parameter
 Substitutions to Include : d: Transitions + Transversions
 Pattern among Lineages : Same (Homogeneous)
 Rates among sites : Uniform rates
 No. of Sites : 639
 No Of Bootstrap Reps = 1000
 Only Bootstrap Values of 70% and above are shown

N.J. Knowles & J. Wadsworth, 27 June 2007

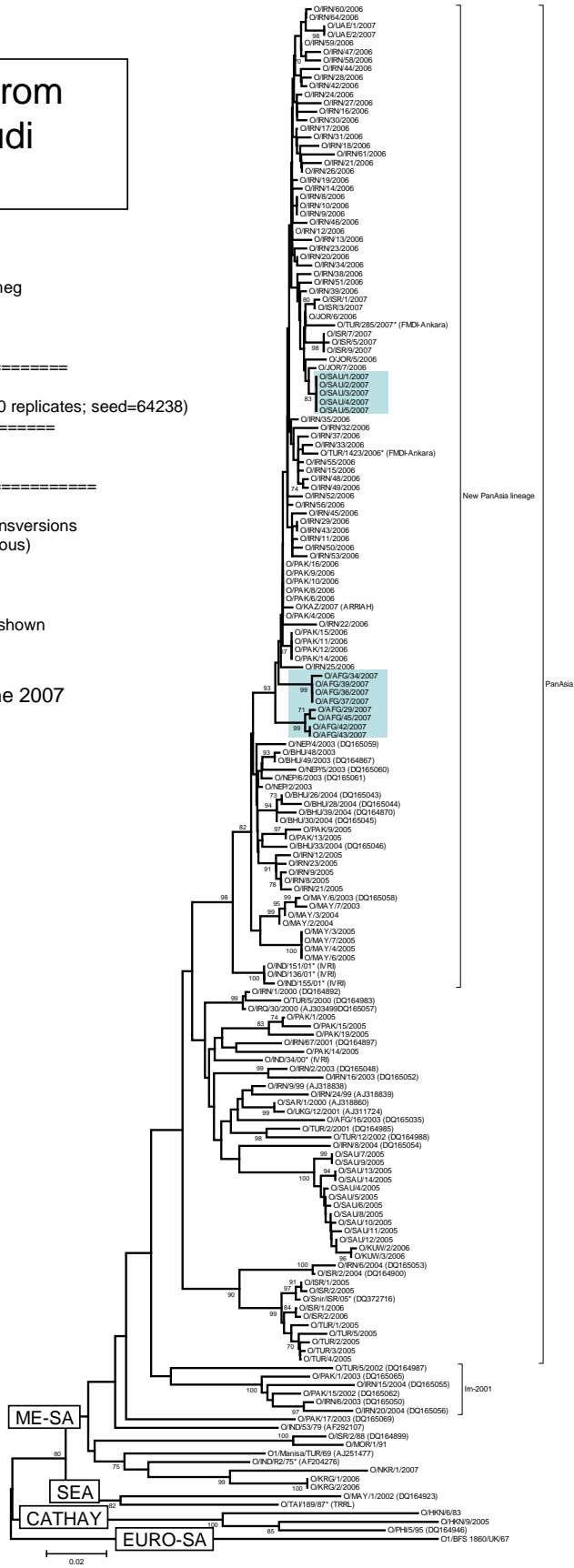


Fig 2 Serotype A from Afghanistan

Report on FMDV A sequences from Afghanistan in 2007

Software: MEGA 3.1
 No. of Taxa : 125
 Data File : n:\evd\meg\db\fmdv\af\AFG2007a.meg
 Data Title : A/AFG/2007
 Data Type : Nucleotide (Coding)
 Analysis : Phylogeny reconstruction
 Tree Inference : =====
 Method : Neighbor-Joining
 Phylogeny Test and options : Bootstrap (1000 replicates; seed=64238)
 Include Sites : =====
 Gaps/Missing Data : Pairwise Deletion
 Codon Positions : 1st+2nd+3rd+Noncoding
 Substitution Model : =====
 Model : Nucleotide: Kimura 2-parameter
 Substitutions to Include : d: Transitions + Transversions
 Pattern among Lineages : Same (Homogeneous)
 Rates among sites : Uniform rates
 No. of Sites : 645
 No Of Bootstrap Reps = 1000
 Only bootstrap values of 70% and above are shown

N.J. Knowles & J. Wadsworth, 25 June 2007

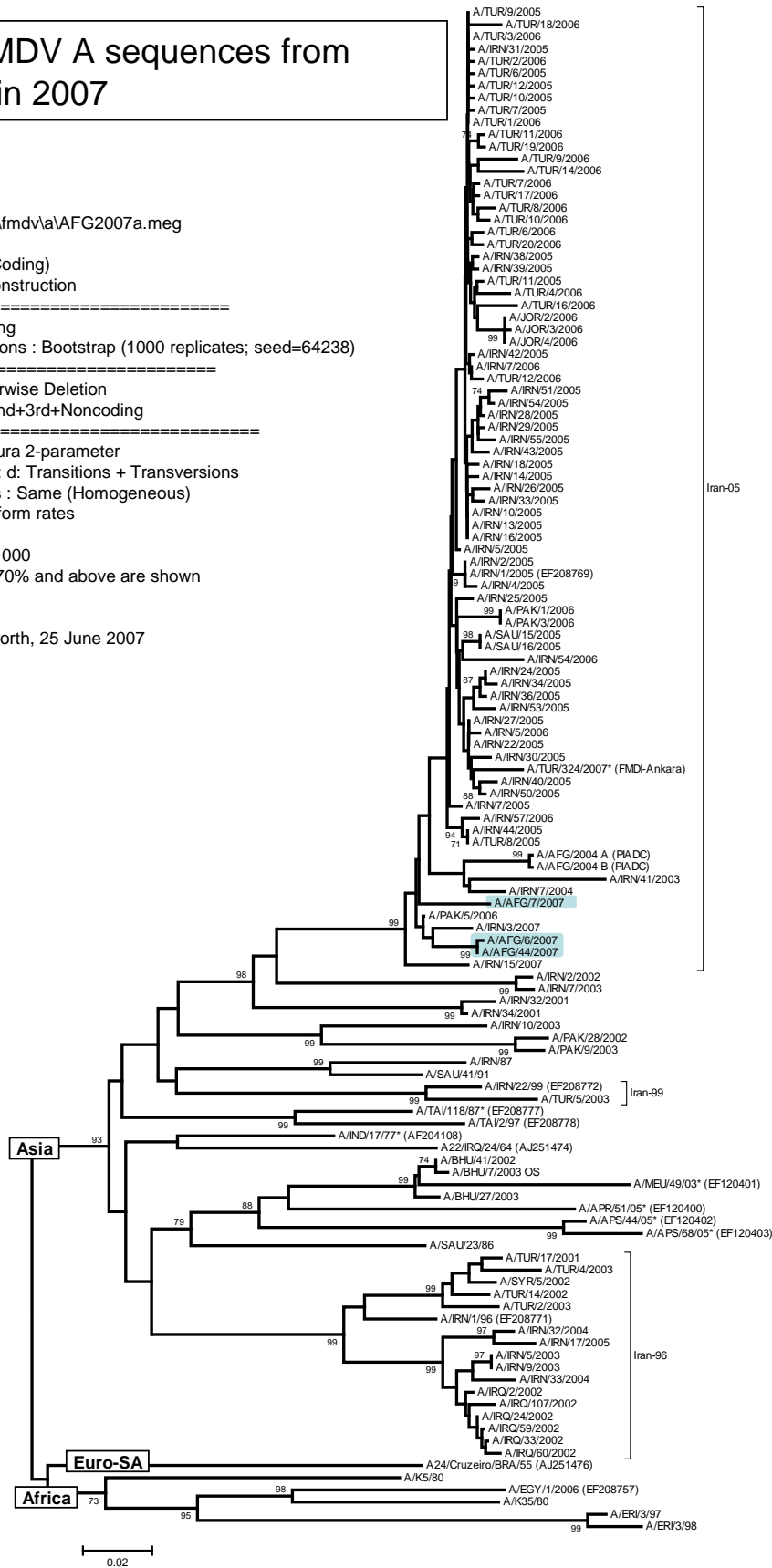


Fig 3 Serotype A from SE Asia

Report on FMDV A from Thailand, Cambodia and Laos in 2006

Software: MEGA 3.1
 No. of Taxa : 118
 Data File : n:\evd\meg\ldb\fmv\la\TAI2006a.meg
 Data Title : Thailand/Cambodia/Laos 2006
 Data Type : Nucleotide (Coding)
 Analysis : Phylogeny reconstruction
 Tree Inference : =====
 Method : Neighbor-Joining
 Phylogeny Test and options : Bootstrap (1000 replicates; seed=64843)
 Include Sites : =====
 Gaps/Missing Data : Pairwise Deletion
 Codon Positions : 1st+2nd+3rd+Noncoding
 Substitution Model : =====
 Model : Nucleotide: Kimura 2-parameter
 Substitutions to Include : d: Transitions + Transversions
 Pattern among Lineages : Same (Homogeneous)
 Rates among sites : Uniform rates
 No. of Sites : 642
 No Of Bootstrap Reps = 1000
 Only bootstrap values of 70% and above are shown

N.J. Knowles & J. Wadsworth, 13 June 2007

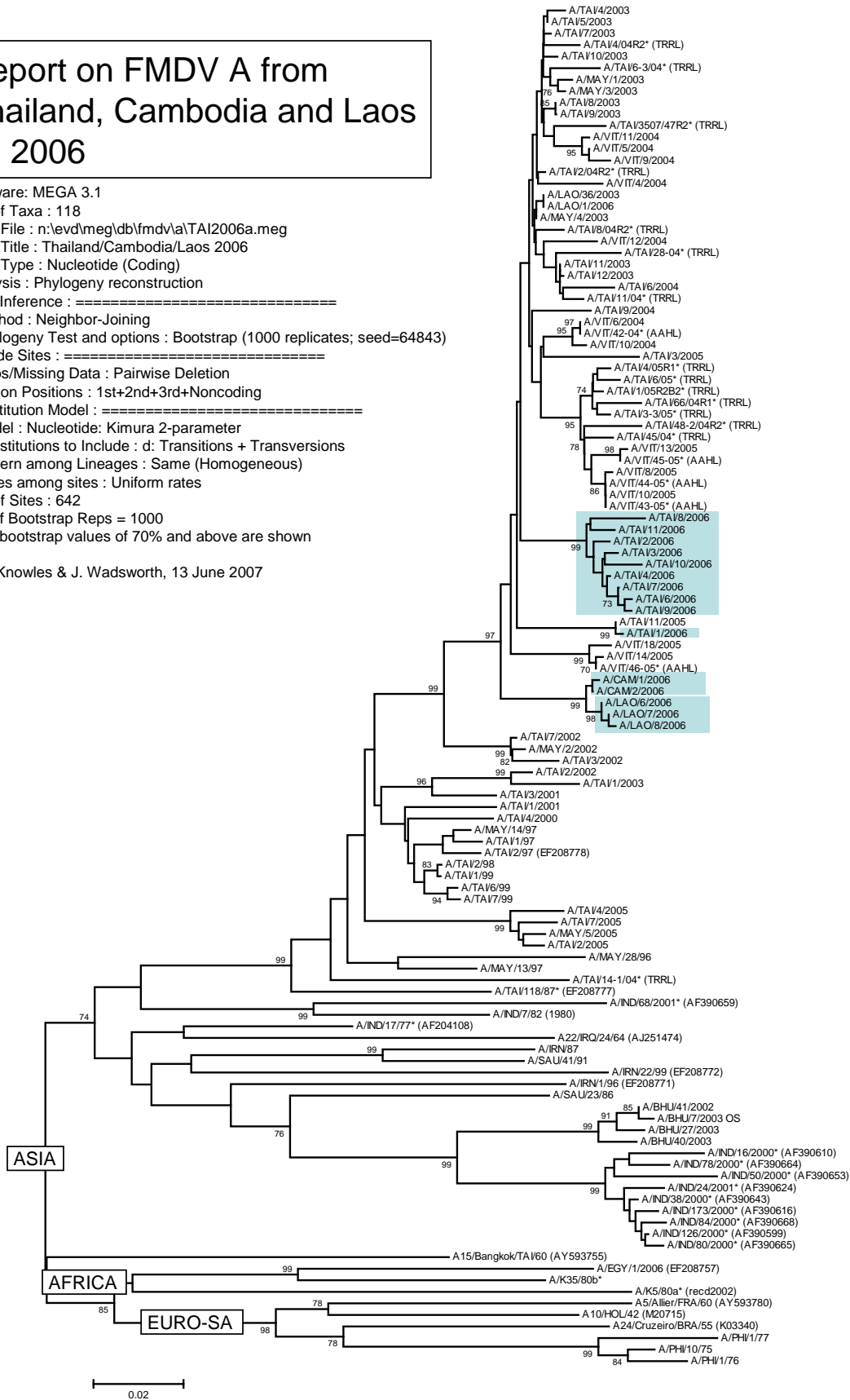
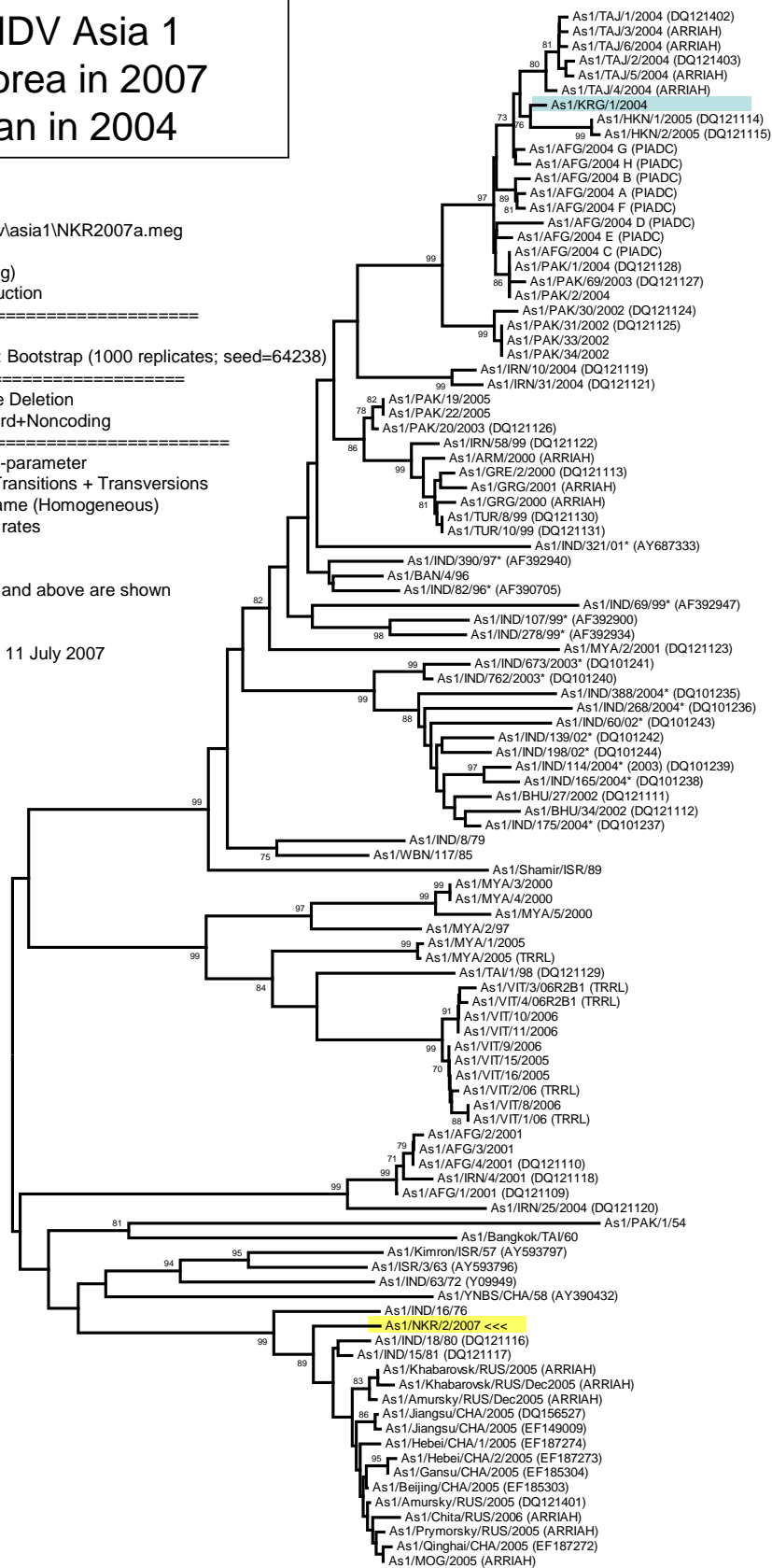


Fig 4: Recently characterised FMDV isolates from the Asia-1 serotype

Report on FMDV Asia 1 from North Korea in 2007 and Kyrgyzstan in 2004

Software: MEGA 3.1
 No. of Taxa : 106
 Data File : n:\evd\meg\db\fmdv\asia1\NKR2007a.meg
 Data Title : North Korea 2007
 Data Type : Nucleotide (Coding)
 Analysis : Phylogeny reconstruction
 Tree Inference : =====
 Method : Neighbor-Joining
 Phylogeny Test and options : Bootstrap (1000 replicates; seed=64238)
 Include Sites : =====
 Gaps/Missing Data : Pairwise Deletion
 Codon Positions : 1st+2nd+3rd+Noncoding
 Substitution Model : =====
 Model : Nucleotide: Kimura 2-parameter
 Substitutions to Include : d: Transitions + Transversions
 Pattern among Lineages : Same (Homogeneous)
 Rates among sites : Uniform rates
 No. of Sites : 636
 No Of Bootstrap Reps = 1000
 Only Bootstrap values of 70% and above are shown

N.J. Knowles & J. Wadsworth, 11 July 2007



0.02

Fig 5: FMDV O from Ethiopia

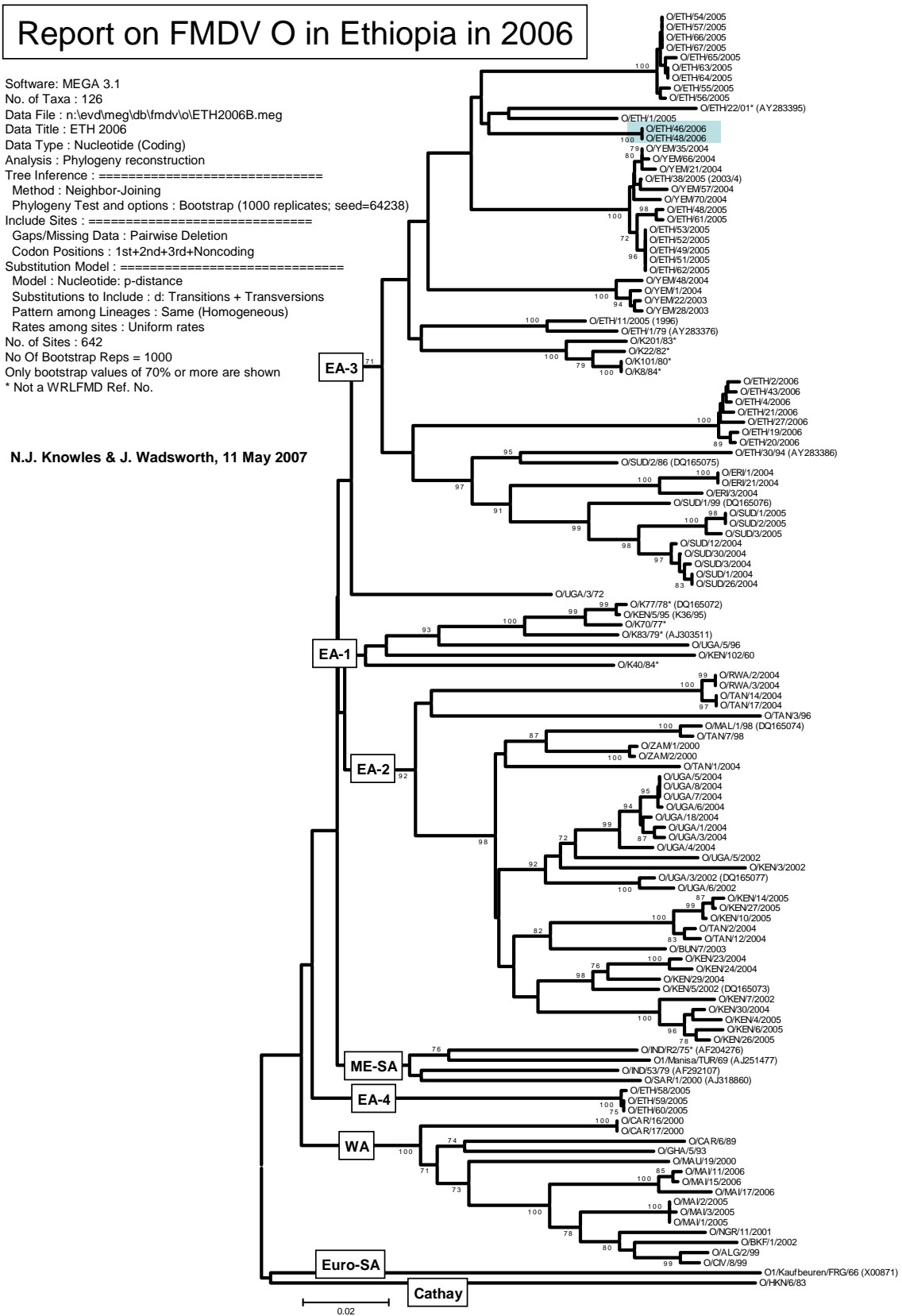


Fig 6: FMDV A from Ethiopia and Sudan

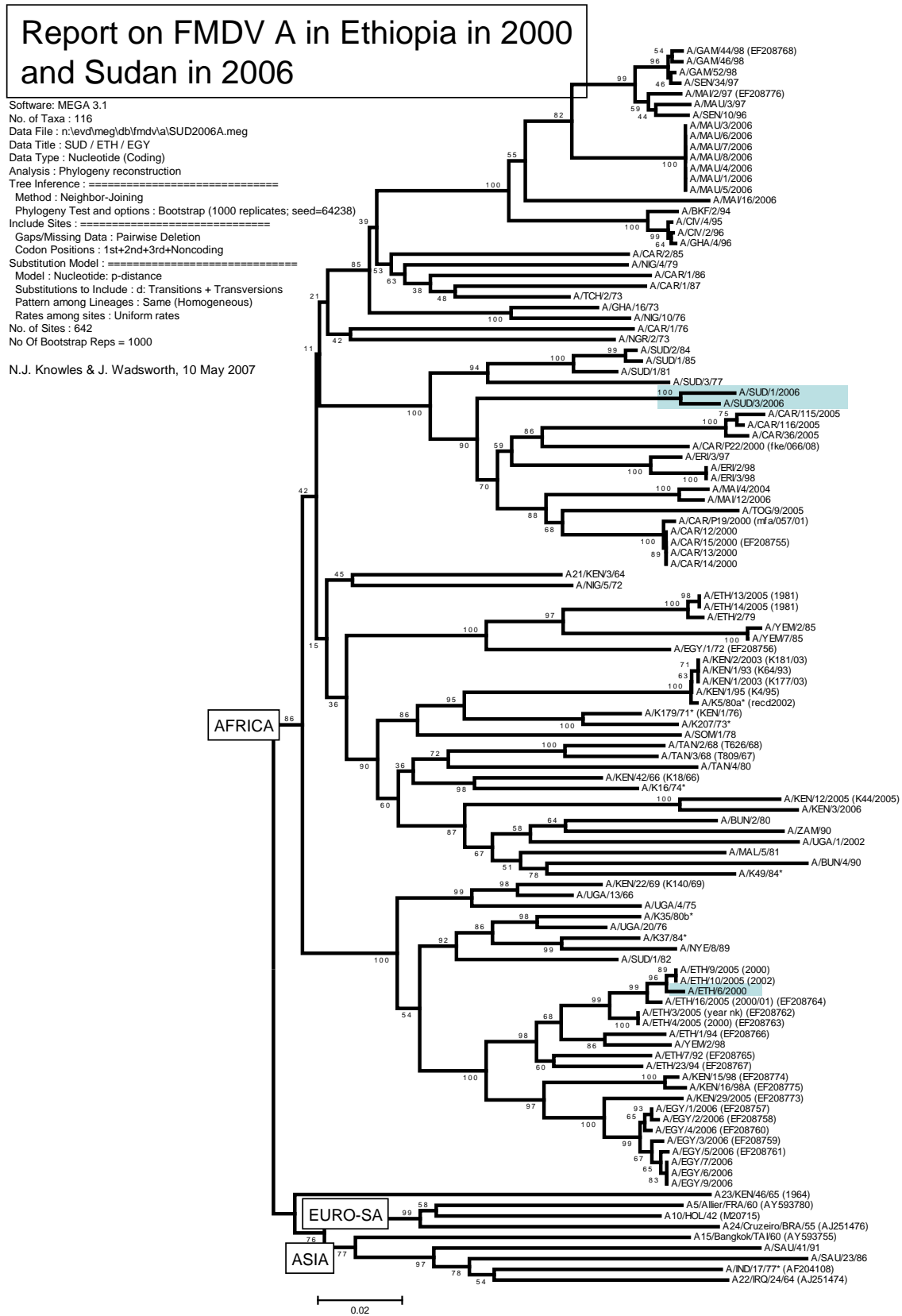
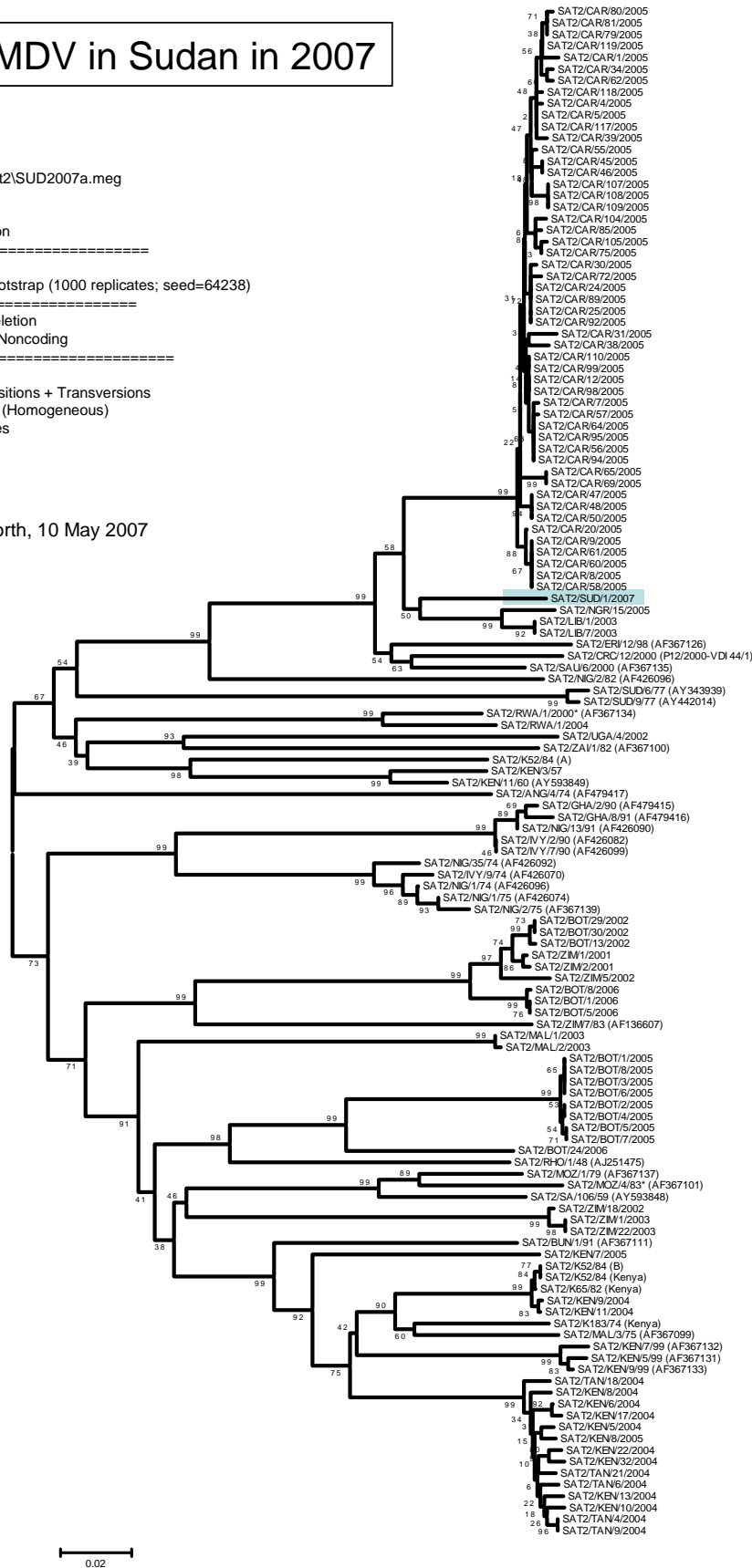


Fig 7: FMDV SAT2 from Sudan

Report on FMDV in Sudan in 2007

Software: MEGA 3.1
 No. of Taxa : 133
 Data File : n:\levd\meg\db\fm\svsat2\SUD2007a.meg
 Data Title : Sudan 2007
 Data Type : Nucleotide (Coding)
 Analysis : Phylogeny reconstruction
 Tree Inference : =====
 Method : Neighbor-Joining
 Phylogeny Test and options : Bootstrap (1000 replicates; seed=64238)
 Include Sites : =====
 Gaps/Missing Data : Pairwise Deletion
 Codon Positions : 1st+2nd+3rd+Noncoding
 Substitution Model : =====
 Model : Nucleotide: p-distance
 Substitutions to Include : d: Transitions + Transversions
 Pattern among Lineages : Same (Homogeneous)
 Rates among sites : Uniform rates
 No. of Sites : 648
 No Of Bootstrap Reps = 1000

N.J. Knowles & J. Wadsworth, 10 May 2007



Annex 4. RECOMMENDATIONS FROM THE WRL ON FMD VIRUS STRAINS TO BE INCLUDED IN FMDV ANTIGEN BANKS – June 2007

High Priority

O Manisa (*covers panasian topotype*)
O BFS or Campos
A24 Cruzeiro
Asia 1 Shamir
A Iran '96
A22 Iraq
SAT 2 Saudi Arabia (*or equivalent*)
(not in order of importance)

Medium Priority

A Eritrea
SAT 2 Zimbabwe
AIran 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)