FAO/OIE Reference Laboratory
January - March 2007

Foot-and-Mouth Disease

FMD Trends

Summary

For Europe and Asia, the issue of greatest concern is the emergence of a highly transmissible lineage of the PanAsia strain of serotype O which has spread from India to the east, north and west causing recent epidemics in a number of countries in the Middle East. This picture somewhat mirrors that seen prior to 2000-2002 when another O PanAsia strain spread into several normally FMD-free countries including Taiwan, Japan, South Africa, UK, France, Netherlands and South Korea. Although, the O Manisa vaccine is predicted to provide protection against this new PanAsia variant, the vaccine has a slightly poorer serological match compared to that which was found against the O UKG 2001 PanAsia virus.

No outbreaks were officially reported in FMD-free countries that did not practice vaccination and the disease remained largely confined to traditionally infected areas between January and March 2007. However, FMD continues to threaten the FMD disease-free areas of Europe. In particular, in the past three months there have been separate outbreaks of two FMD serotypes (O and A) in **Turkey** close to the borders of Greece and Bulgaria. The first of these outbreaks (serotype A: Iran 05 lineage) occurred in January and was briefly described in the previous report and involved two cattle that were clinically confirmed to have FMD in the village of Ogulpasa (Edirne) near the border with Greece. Further outbreaks (in February, and more recently in early April in cattle in Merkez, Kirklareli and Evrese in Cannakale respectively) have occurred in western Turkey due to serotype O. The first outbreak was thought to be linked to contact with wild boar, while the more recent outbreak was reported to be due to the movement of cattle from Adapazari, Sakarya Province. In an attempt to control these outbreaks in Thrace and adjacent areas, 1.5 million doses of trivalent vaccine against FMD were supplied to Turkey in March by the European Commission.

Elsewhere in the Middle East, there have continued to be reports of outbreaks due to serotypes O and A. In **Jordan**, serotype A was confirmed in the outbreak in East Amman in January; whereas serotype O has been confirmed in the two outbreaks in Al Dilal, Az Aarqa and in Faqo Al Karak. There have continued to be outbreaks (Jan-April) of serotype O in northern **Israel** in locations close to those reported previously at the end of 2006. In addition to domesticated livestock, FMD has now also been reported in a wild gazelle herd in the region. Interestingly, over the past 3 months there has been an apparent movement southward of the disease from Hazafon Province in the north, through the **Palestinian Territory** (where over 500 cases have been reported) to the southern Israeli province of Hadarom where recent outbreaks in April have been reported. The mode of spread has been suggested to be due to introduction of new live animals, illegal movement of animals, and contact with infected animals.

Asia: In **North Korea**, an FMD outbreak was recognised in January and reported as due to serotype O. This outbreak in P`yongyan-Si close to the capital, was the first FMD outbreak officially reported (to OIE) in the country since 1960. All susceptible livestock (466 cattle and 2630 pigs) in the outbreak were destroyed. In addition, there are plans to vaccinate 100,000 susceptible animals within a 70-km-radius zone. In **China,** further outbreaks of serotype Asia 1 were reported in January (Gansu Province and Xinjiang Province) and February (Qinghai Province). In January, there were also reports of a FMD outbreak in a Yuen Long pig farm in Lau Fau Shan, **Hong Kong**. The campaign to rid **Taiwan** of FMD has entered a critical period, with pig farms gradually halting the vaccination in five phases. The government`s ultimate goal is to obtain OIE certification as an "FMD-free zone without vaccination" in two years.

Within FMD endemic regions of South East Asia, there were reports of outbreaks in **Vietnam** and **Malaysia**. In Vietnam, the disease has appeared in 25 communes in nine provinces, namely Lai Chau, and Phu Yen, Quang Nam, Quang Ngai, Khanh Hoa, Quang Binh, Binh Dinh, Dac Lac, and Thua Thien Hue. By March 2007, outbreaks were restricted to four Vietnamese provinces in the centre and north of the country. In Malaysia outbreaks of FMD were also reported (in January 2007) in cattle in Terengganu. Investigations showed that the source of the disease was livestock that were not covered in last years vaccination exercise. Addition outbreaks were also reported in mukim Ulu Melaka, and Kampung Nyior Chabang in mukim Bohor and Jeli where it is believed that illegal movement of affected cattle had contributed to the spread of disease.

Africa: As a consequence of the SAT 3 outbreak in **South Africa** (August 2006), two rounds of vaccination combined with mouthing inspections of all cattle have been undertaken in the affected area (Limpopo). In the absence of any clinical disease, the OIE has now declared the area free from FMD. Following the outbreak last year of SAT1 in **Botswana**, the affected herd (in the entire district of in Muchenje) was vaccinated in December 2006. No new cases were noted after this vaccination followed mouthing and clinical inspection of feet for signs of FMD. Consequently Botswana has applied for re-instatement of FMD free status that was lost due to the outbreak. There have been no additional outbreaks of FMD in **Guinea** since the last report

South America: Argentina, Brazil and Paraguay have agreed to a 15km zone of intensive surveillance along their common borders. This agreement was proposed after an expert OIE mission visited the region and concluded that FMD virus was still circulating along the shared borders of the three countries. In addition, in January, **Argentina** presented a request to the OIE to expand the FMD-free area without vaccination to include Rio Negro Province. Currently, only the Argentine territory south of the 42nd parallel is considered FMD free without vaccination by the OIE.

It is estimated that 99.45% of cattle in the State of Mato Grosso (**Brazil**) have been vaccinated during the last FMD mass vaccination campaign, which finished in November 2006. Subsequent seroepidemiological surveys have been carried out to evaluate virus circulation in this state. A cluster of positive reactors cattle was discovered in the municipalities of Japorã, Eldorado and Mundo Novo. From February 30,000 cattle from this region were pre-emptively culled to reduce the risk of FMD spread.

Elsewhere in South America, there have been new outbreaks of FMD (serotype O) reported in **Boliva** and **Ecuador**. Outbreaks affecting mainly cattle reported January and February in Santa Cruz, Bolivia. These were considered to be under control by March. In Ecuador, two separate provinces were affected by FMD. The first cases were in January 2007 (Azuay) and subsequent outbreaks were in March (Imbabura). Both outbreaks affected pigs and were attributed to introduction of new animals.

The WRL vaccine recommendations remain unchanged. During 2005, A Iran 96 and A Iran 99 vaccines were replaced in the Middle East with A22 Iraq vaccines to counter the incursion of A Iran 05 viruses. No recurrence of viruses related to A Iran 96 or 99 has been seen, and if this pattern continues, the high priority for inclusion of these two vaccine strains will need to be reviewed.

Results from samples received to WRL (status of samples under test is shown in Table 1)

Middle East/southern Asia

FMDV serotype O

Further analysis of serotype O viruses from the Middle East (Jordan, Israel and UAE) has been performed (see Annex 2, Figure 1. All these viruses are derived from the PanAsia strain circulating in the region and closely related to each other (and other viruses recently received from other countries in the region).

FMDV serotype A

Phylogenetic analysis has been performed on two serotype A viruses from Iran (IRN 3/2007 and IRN 15/2007): both were closely related to other viruses from the A Iran 05 lineage. Interestingly, the closest relationship was with a virus received from Pakistan (PAK 5/2006). Furthermore, the position of these isolates on the tree (see Annex 2, Figure 2), was also closer to the ancestral root of this lineage and slightly different to other Iranian viruses that have been recently studied. This might indicate a separate introduction (common to these two viruses) into Iran possibly from the East (Pakistan or Afghanistan). Further isolates from the region are required to investigate this question.

Africa

FMDV serotype O

Sequencing of 3 FMDV serotype O isolates from Mali showed that they were members of the West African topotype most closely related to other viruses recently characterised from the region (Senegal, Mali and Togo: see Annex 2, Figure 3).

FMDV serotype A

Two additional serotype A viruses from Mali have also been sequenced. Phylogenetically (see Annex 2, Figure 4), these viruses represent two discrete lineages within the Africa topotype of serotype A. The presence of these two lineages has been separately reported in Mali (2004 and 1997).

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

Batch	Country	Serotype	No of samples.	Status
WRLFMD-2006-00031	Iran	O	18	completed
WRLFMD-2006-00036	Iran	O	29	completed
WRLFMD-2006-00036	Iran	A	2	completed
WRLFMD-2006-00032	Malaysia	O	5	completed
WRLFMD-2006-00033	Mauritania	A	7	completed
WRLFMD-2006-00034	Botswana	SAT2	1	completed
WRLFMD-2006-00037	Jordan	A	3	completed
WRLFMD-2007-00002	United Arab Emirates	O	2	completed
WRLFMD-2007-00003	Israel	O	10	completed
WRLFMD-2007-00004	Mali*	O	3	completed
WRLFMD-2007-00004	Mali*	A	2	completed
WRLFMD-2007-00005	Iran	O	20	in progress
WRLFMD-2007-00005	Iran	A	2	completed
WRLFMD-2007-00007	Ethiopia**	O	2	in progress
WRLFMD-2007-00007	Ethiopia**	A	1	in progress
WRLFMD-2007-00008	Kyrgyzstan	Asia 1	1	in progress
WRLFMD-2007-00008	Kyrgyzstan	O	2	in progress

* an additional 2 samples were FMDV-GD (genome detected) and were not examined
** an additional 11 samples were FMDV-GD; all were RT-PCR negative using O and A VP1 primer sets

Vaccine matching

25 FMDV isolates of serotype A (Iran and Jordan) and Serotype O (Iran, Israel, Jordan, Pakistan, Turkey, Ethiopia and UAE) collected in 2005, 2006 and 2007 were further characterized by liquid phase blocking ELISA (LPBE) and/or VNT (Annex 1; TABLE D).

r-values for each of 2 serotype A and 2 serotype O viruses collected from Jordan in 2006 (JOR 3-4/2006 for type A and JOR 5-6/2006 for type O) showed closest match to A22 for type A and O Manisa for type O. Similar results were observed for 7 type O and A isolates collected from Iran in 2005 and 2006 (A IRN 4/2005, 7/2005 and 54/2006; and O IRN 29/2006, 34/2006, 47/2006 and 52/2006). Furthermore, all 5 type A IRN isolates were closely related to a recently established A TUR 06 vaccine strain by VNT.

Twelve type O isolates collected from Israel (ISR 1/2006, 2/2006, 1/2007, 3/2007, 5/2007, 7/2007 and 9/2007), Turkey (TUR 1/2005, 4/2005 and 5/2005), Pakistan (PAK 8/2006), Ethiopia (ETH 58/2005) and UAE (2/2007) from 2005 to 2007 all generated r-values indicative of a protective response with O1 Manisa vaccine, which indicated that the currently predominant type O virus can be covered by a vaccine present in vaccine banks

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. Shaw AE, Reid SM, Ebert K, Hutchings GH, Ferris NP, King DP. Implementation of a one-step real-time RT-PCR protocol for diagnosis of foot-and-mouth disease. J Virol Methods. 2007 Mar 28; [Epub ahead of print]

2. Horsington J, Zhang Z. Consistent change in the B-C loop of VP2 observed in foot-and-mouth disease virus from persistently infected cattle: Implications for association with persistence. Virus Res. 2007 Apr;125(1):114-8. Epub 2007 Jan 22.

3. Parlak U, Ozyoruk F, Knowles NJ, Armstrong RM, Aktas S, Alkan F, Cokcaliskan C, Christensen LS. Characterisation of foot-and-mouth disease virus strains circulating in Turkey during 1996-2004. Arch Virol. 2007 Feb 9; [Epub ahead of print]

4. Couacy-Hymann E, Aplogan GL, Sangare O, Compaore Z, Karimu J, Awoueme KA Seini A, Martin V, Valarcher JF [Retrospective study of foot and mouth disease in West Africa from 1970 to 2003] Rev Sci Tech. 2006 Dec;25(3):1013-24. Review. French.]

5. Frolich K, Hamblin C, Parida S, Tuppurainen E, Schettler E. Serological survey for potential disease agents of free-ranging cervids in six selected national parks from Germany. J Wildl Dis. 2006 Oct;42(4):836-43.

Annex 1.

Table A: Summary of clinical sample diagnostics made by the WRL between January - March 2007

Country	WRL for FMD Sample Identification	Animal	Date of Collection	Results		
				VI/ELISA	RT-PCR	Final report
UNITED KINGDOM	UKG 1/2007	Pig	08.01.07	NVD	Negative	NVD
	UKG 2/2007	Pig	08.01.07	NVD	Negative	NVD
	UKG 3/2007	Pig	08.01.07	NVD	Negative	NVD
	UKG 4/2007	Pig	08.01.07	NVD	Negative	NVD
	UKG 5/2007	Pig	08.01.07	NVD	Negative	NVD
	UKG 6/2007	Pig	08.01.07	NVD	Negative	NVD
ISRAEL	ISR 1/2007	Goat	01.01.07	O	Positive	O
	ISR 2/2007	Goat	01.01.07	O	Positive	O
	ISR 3/2007	Cattle	03.01.07	O	Positive	O
	ISR 4/2007	Cattle	03.01.07	O	Positive	O
	ISR 5/2007	Cattle	24.01.07	O	Positive	O
	ISR 6/2007	Cattle	24.01.07	O	Positive	O
	ISR 7/2007	Cattle	26.01.07	O	Positive	O
	ISR 8/2007	Cattle	26.01.07	O	Positive	O
	ISR 9/2007	Cattle	27.01.07	O	Positive	O
	ISR 10/2007	Cattle	27.01.07	O	Positive	O
UNITED ARAB EMIRATES	UAE 1/2007	Gazelle	10.01.07	O	Positive	O
	UAE 2/2007	Gazelle	10.01.07	O	Positive	O
ETHIOPIA	ETH 1/2000	NK	00.01.00	NVD	Negative	NVD
	ETH 2/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 3/2000	NK	00.01.00	NVD	Negative	NVD
	ETH 4/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 5/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 6/2000	NK	00.01.00	A	Positive	A
	ETH 7/2000	NK	00.01.00	NVD	Negative	NVD
	ETH 8/2000	NK	00.01.00	NVD	Negative	NVD
	ETH 9/2000	NK	00.01.00	NVD	Negative	NVD
	ETH 10/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 11/2000	NK	00.01.00	NVD	Negative	NVD
	ETH 12/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 13/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 14/2000	NK	00.01.00	NVD	Positive	FMDV GD
	ETH 15/2000	NK	27.12.00	NVD	Positive	FMDV GD
	ETH 1/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 2/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 3/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 4/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 5/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 6/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 7/2003	NK	00.04.03	NVD	Positive	FMDV GD
	ETH 8/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 9/2003	NK	00.04.03	NVD	Negative	NVD
	ETH 10/2003	NK	28.05.03	NVD	Positive	FMDV GD

	ETH 45/2006	NK	28.12.06	NVD	Positive	FMDV GD
	ETH 46/2006	NK	28.12.06	O	Positive	O
	ETH 47/2006	NK	28.12.06	NVD	Negative	NVD
	ETH 48/2006	NK	28.12.06	O	Positive	O
IRAN	IRN 1/2007	Cattle	13.01.07	O	Positive	O
	IRN 2/2007	Cattle	14.01.07	NVD	Negative	NVD
	IRN 3/2007	Cattle	24.01.07	A	Positive	A
	IRN 4/2007	Cattle	01.02.07	O	Positive	O
	IRN 5/2007	Cattle	01.02.07	O	Positive	O
	IRN 6/2007	Cattle	01.02.07	O	Positive	O
	IRN 7/2007	Cattle	03.02.07	O	Negative	O
	IRN 8/2007	Cattle	07.02.07	O	Positive	O
	IRN 9/2007	Cattle	08.02.07	O	Positive	O
	IRN 10/2007	Goat	10.02.07	O	Positive	O
	IRN 11/2007	Cattle	10.02.07	O	Positive	O
	IRN 12/2007	Sheep	10.02.07	NVD	Negative	NVD
	IRN 13/2007	Cattle	12.02.07	O	Positive	O
	IRN 14/2007	Cattle	12.02.07	O	Positive	O
	IRN 15/2007	Goat	20.02.07	A	Positive	A
	IRN 16/2007	Cattle	20.02.07	O	Positive	O
	IRN 17/2007	Cattle	25.02.07	O	Positive	O
	IRN 18/2007	Cattle	25.02.07	O	Positive	O
	IRN 19/2007	Cattle	27.02.07	O	Positive	O
	IRN 20/2007	NK	NK	O	Positive	O
	IRN 21/2007	NK	NK	O	Positive	O
	IRN 22/2007	NK	NK	O	Positive	O
	IRN 23/2007	NK	NK	O	Positive	O
	IRN 24/2007	NK	NK	O	Positive	O
	IRN 25/2007	NK	NK	NVD	Negative	NVD
ITALY**	ITL 5/2005	Pig	27.12.05	SVDV	Positive	SVDV
	ITL 6/2005	Pig	27.12.05	SVDV	Positive	SVDV
	ITL 1/2006	Pig	27.02.06	SVDV	Positive	SVDV
	ITL 2/2006	Pig	07.11.06	SVDV	Positive	SVDV
	ITL 3/2006	Pig	07.11.06	SVDV	Positive	SVDV
	ITL 4/2006	Pig	08.11.06	SVDV	Positive	SVDV
	ITL 5/2006	Pig	14.11.06	SVDV	Positive	SVDV
	ITL 6/2006	Pig	14.11.06	SVDV	Negative	SVDV
	ITL 7/2006	Pig	14.11.06	SVDV	Negative	SVDV
	ITL 8/2006	Pig	21.11.06	SVDV	Positive	SVDV
	ITL 9/2006	Pig	21-23.11.06	SVDV	Positive	SVDV
	ITL 10/2006	Pig	24.11.06	SVDV	Positive	SVDV
	ITL 11/2006	Pig	25.11.06	SVDV	Positive	SVDV
	ITL 12/2006	Pig	27.11.06	SVDV	Positive	SVDV
	ITL 13/2006	Pig	27.11.06	SVDV	Positive	SVDV
	ITL 14/2006	Pig	27.11.06	SVDV	Positive	SVDV
	ITL 15/2006	Pig	29.11.06	SVDV	Positive	SVDV
	ITL 16/2006	Pig	01.12.06	SVDV	Positive	SVDV
	ITL 17/2006	Pig	06.12.06	SVDV	Positive	SVDV
	ITL 18/2006	Pig	06.12.06	SVDV	Positive	SVDV
	ITL 19/2006	Pig	06.12.06	SVDV	Positive	SVDV
	ITL 20/2006	Pig	06.12.06	SVDV	Positive	SVDV
	ITL 21/2006	Pig	11.12.06	SVDV	Positive	SVDV
	ITL 22/2006	Pig	12.12.06	SVDV	Positive	SVDV

	ITL 23/2006	Pig	12.12.06	SVDV	Positive	SVDV
	ITL 24/2006	Pig	13.12.06	SVDV	Positive	SVDV
	ITL 25/2006	Pig	14.12.06	SVDV	Positive	SVDV
	ITL 26/2006	Pig	15.12.06	SVDV	Positive	SVDV
	ITL 27/2006	Pig	18.12.06	SVDV	Positive	SVDV
	ITL 28/2006	Pig	18.12.06	SVDV	Positive	SVDV
	ITL 29/2006	Pig	19.12.06	SVDV	Positive	SVDV
	ITL 30/2006	Pig	19.12.06	SVDV	Positive	SVDV
	ITL 31/2006	Pig	27.12.06	SVDV	Positive	SVDV
	ITL 32/2006	Pig	28.12.06	SVDV	Positive	SVDV
	ITL 33/2006	Pig	29.12.06	SVDV	Positive	SVDV
	ITL 1/2007	Pig	04.01.07	SVDV	Positive	SVDV
	ITL 2/2007	Pig	10.01.07	SVDV	Positive	SVDV
	ITL 3/2007	Pig	12.01.07	SVDV	Positive	SVDV
	ITL 4/2007	Pig	22.01.07	SVDV	Positive	SVDV
	ITL 5/2007	Pig	24.01.07	SVDV	Positive	SVDV
	ITL 6/2007	Pig	30.01.07	SVDV	Positive	SVDV
KYRGYZSTAN	KRG 1/2004	NK	00.00.04	Asia 1	Positive	Asia 1
	KRG 1/2006	Cattle	00.00.06	O	Positive	O
	KRG 2/2006	Cattle	00.00.06	O	Positive	O
MALI	MAI 1/2006	Cattle	00.00.06	NVD	Negative	NVD
	MAI 2/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 3/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 4/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 5/2006	NK	00.00.06	NVD	Positive	FMDV GD
	MAI 6/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 7/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 8/2006	NK	00.00.06	NVD	Positive	FMDV GD
	MAI 9/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 10/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 11/2006	NK	00.00.06	O	Positive	O
	MAI 12/2006	NK	00.00.06	A	Positive	A
	MAI 13/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 14/2006	NK	00.00.06	NVD	Negative	NVD
	MAI 15/2006	NK	00.00.06	O	Positive	O
	MAI 16/2006	NK	00.00.06	A	Positive	A
	MAI 17/2006	NK	00.00.06	O	Positive	O
	TOTAL : 133					

*	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 detection ELISA
RT-PCR	reverse transcription polymerase chain reaction on epithelial suspension for FMD and SVD viral genome
NVD	no foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected

TABLE B: Summary of samples collected in received to IAH (January – March 2007)

Country	No. of samples	Virus isolation in cell culture/ELISA									RT-PCR for FMD (or SVD) virus (where appropriate)	
		FMD virus serotypes							SVD virus	NVD		
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1			Positive	Negative
ETHIOPIA	29	2	1	-	-	-	-	-	-	26	14	15
IRAN	25	20	2	-	-	-	-	-	-	3	21	4
ISRAEL	10	10	-	-	-	-	-	-	-	-	10	-
ITALY**	41	-	-	-	-	-	-	-	41	-	39	2
KYRGYZSTAN	3	2	-	-	-	-	-	1	-	-	3	-
MALI	17	3	2	-	-	-	-	-	-	12	7	10
UNITED ARAB EMIRATES	2	2	-	-	-	-	-	-	-	-	2	-
UNITED KINGDOM	6	-	-	-	-	-	-	-	-	6	-	6
TOTAL	**133**	**39**	**5**	**-**	**-**	**-**	**-**	**1**	**41**	**47**	**96**	**37**

*	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 Italy submitted for SVDV characterisation

NPF, 10 April 2007

TABLE C: Antigenic characterisation of FMD field isolates by matching with vaccine strains by ELISA and/or VNT - r Value data from 1st Jan to 31st Mar 2007

Serotype A Isolates	TEST	Vaccine Strains											
		A May97	A Irn96	A24	A Irn87	A Tur06	A Sau95	A 5295	A22	A22/500/ AZB/64	A 4164	A Eritrea	A Ken 35/80
IRN 01/2005	VNT	0.15	0.06	0.08	0.16	>1.0							
IRN 04/2005	VNT	0.17	0.08	0.07	0.16	>1.0	0.18	0.5	>0.71	0.17			
IRN 07/2005	ELISA		0.12		0.12			<0.17	0.79		0.18		
IRN 07/2005	VNT		0.05			0.72			0.31				
IRN 54/2006	VNT		0.17			1.0			0.51				
IRN 57/2006	VNT		0.13			0.83			0.22				
JOR 03/2006	ELISA	0.32			0.12		0.32		0.52				0.23
JOR 03/2006	VNT	0.24					0.15		0.4			0.2	
JOR 04/2006	ELISA	0.19			0.09		0.18		0.44				0.19
JOR 04/2006	VNT	0.17					0.19		0.51			0.20	

Serotype O Isolates	Test	Vaccine Strains	
		O Manisa	O Lausanne
ETH 58/2005	VNT	0.42	0.32
IRN 29/2006	VNT	0.80	
IRN 34/2006	VNT	0.74	
IRN 47/2006	VNT	0.40	
IRN 52/2006	VNT	0.43	
ISR 01/2006	ELISA	0.44	
ISR 01/2006	VNT	0.45	
ISR 01/2007	VNT	0.46	
ISR 02/2006	VNT	0.47	
ISR 03/2007	VNT	0.48	
ISR 05/2007	VNT	0.49	
ISR 07/2007	VNT	0.50	
ISR 09/2007	VNT	0.51	
JOR 05/2006	VNT	0.52	
JOR 06/2006	VNT	0.53	
PAK 08/2006	VNT	0.54	
TUR 01/2005	VNT	0.55	
TUR 04/2005	VNT	0.56	
TUR 05/2005	VNT	0.57	
UAE 02/2007	VNT	0.58	

Interpretation of r_1 values

In the case of ELISA:

r_1 = 0.4-1.0. 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 = 0.2-0.39, 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

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 the Middle East (Israel and UAE highlighted)

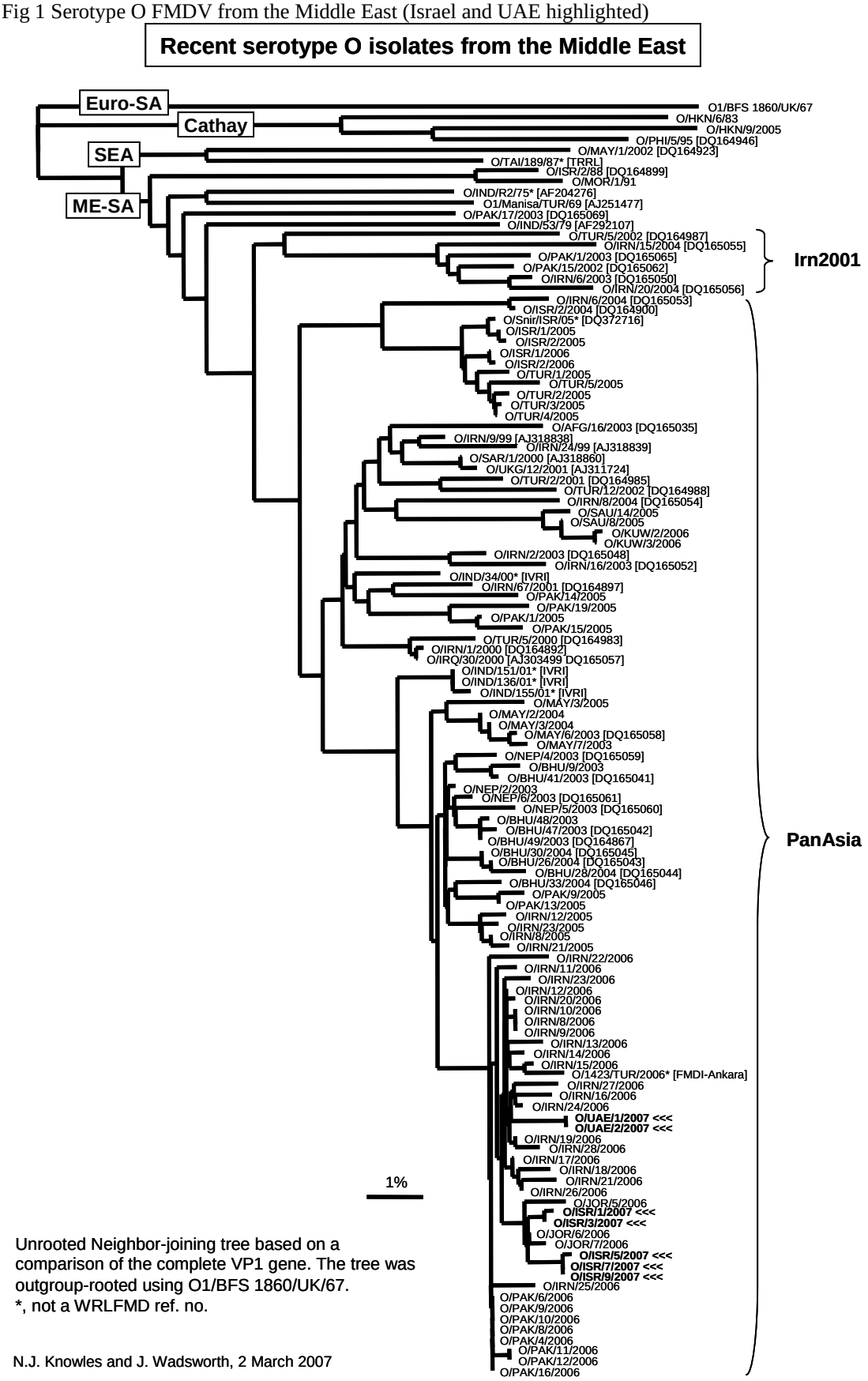


Fig 2 Serotype A from Iran

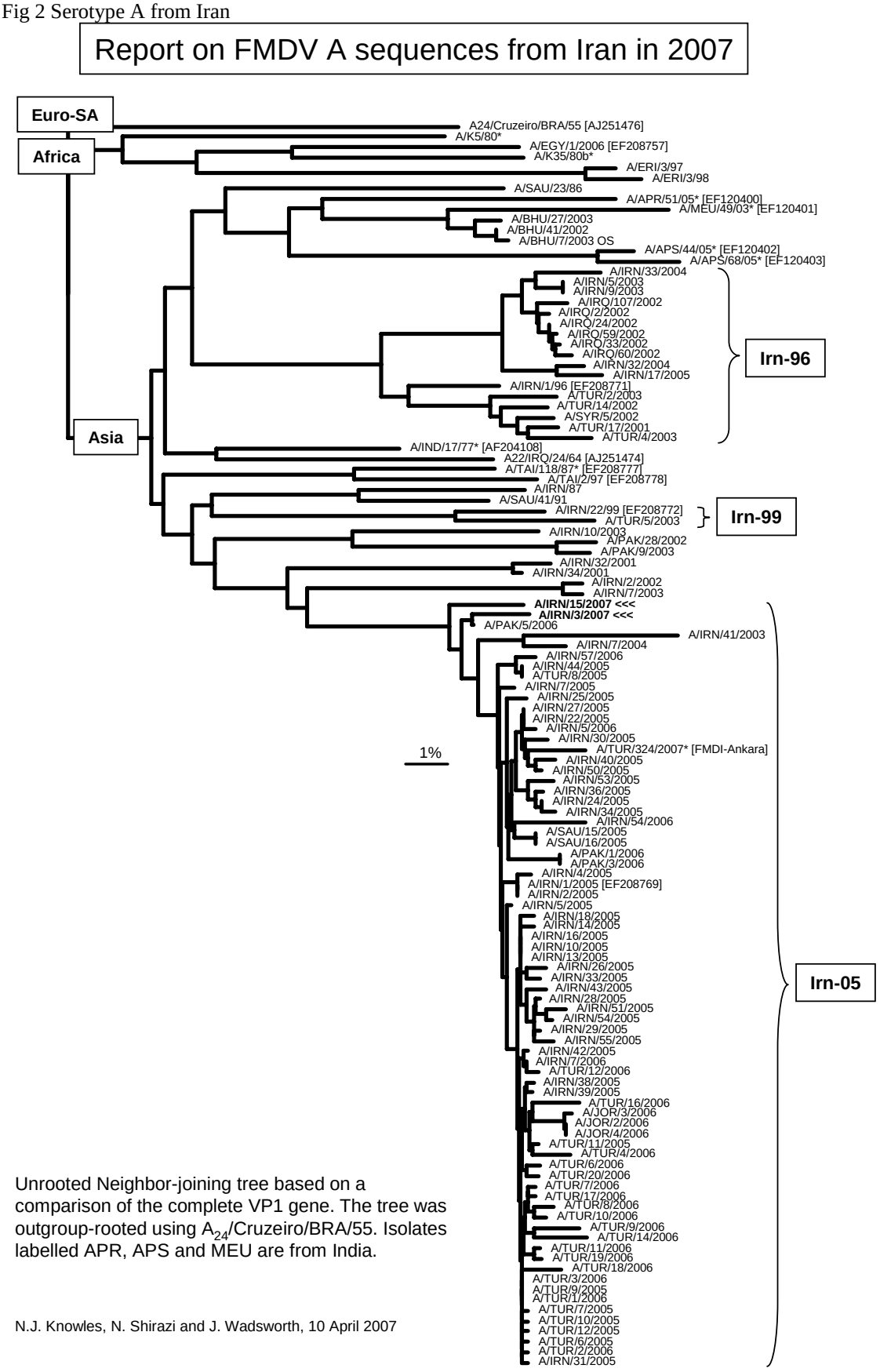
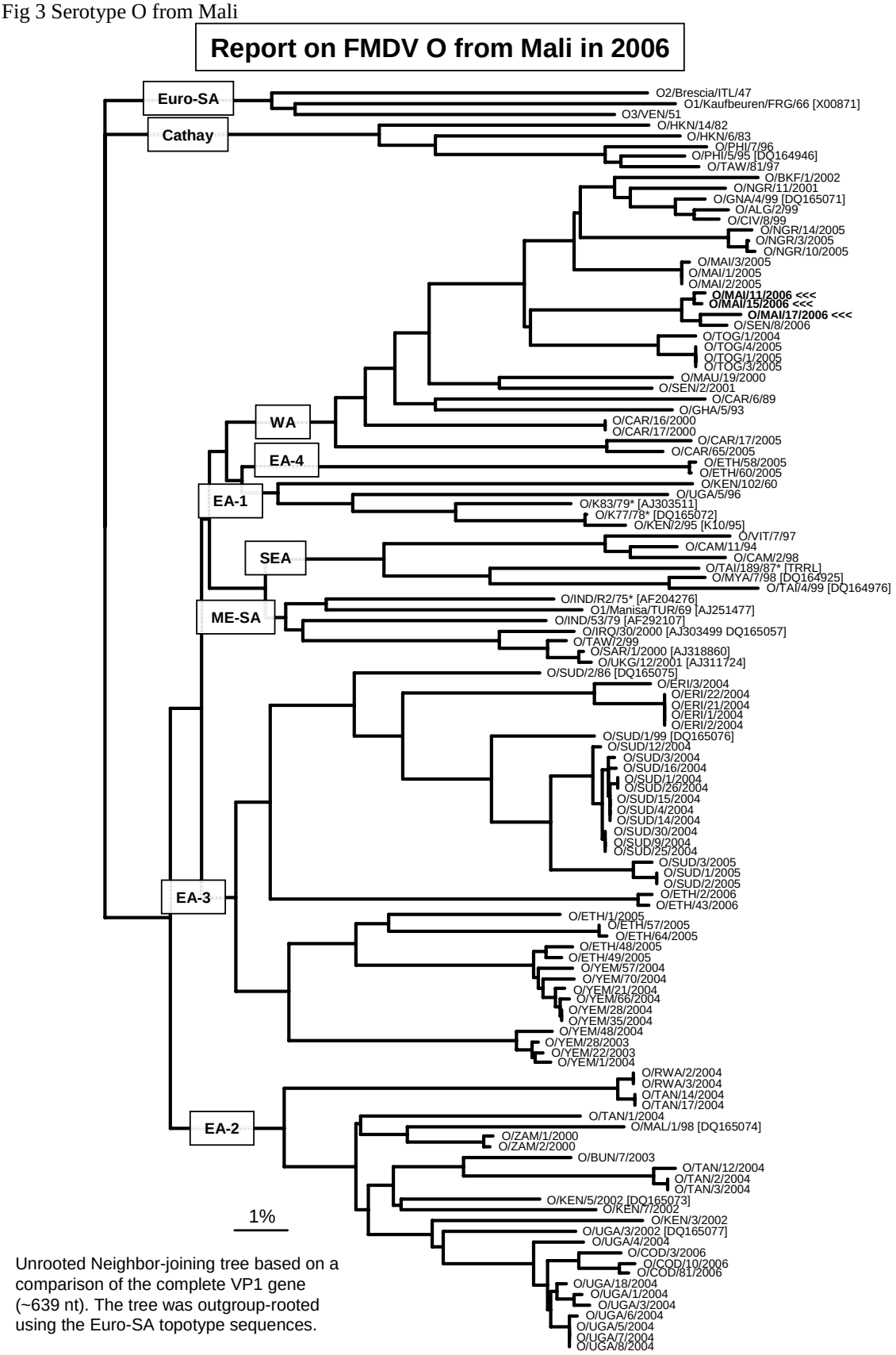


Fig 3 Serotype O from Mali

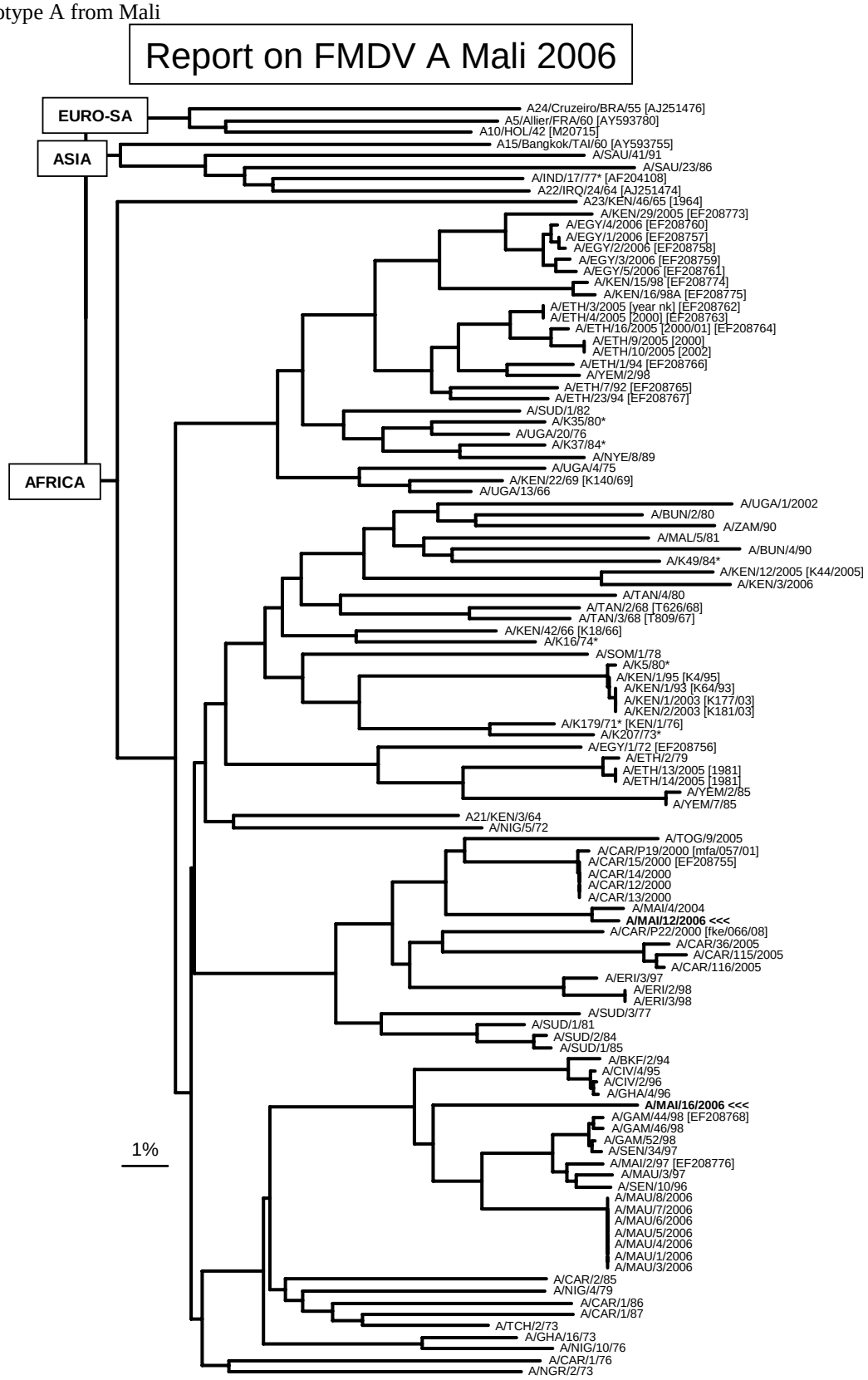


Unrooted Neighbor-joining tree based on a comparison of the complete VP1 gene (~639 nt). The tree was outgroup-rooted using the Euro-SA topotype sequences.

* Not a WRLFMD Ref. No.

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

Fig 4 Serotype A from Mali



Unrooted Neighbor-joining tree based on a comparison of the complete VP1 gene. The tree was outgroup-rooted using members of the Euro-SA topotype.

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

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