



# WRLFMD Quarterly Report October to December 2018

Foot-and-Mouth Disease





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# 1. Summary of samples tested and reported

## FMD outbreaks

### 1.1. Asia

#### China, People's Republic of

Two further outbreaks of **FMD type O** were reported in cattle in the Inner Mongolia and Xinjiang Autonomous Regions on the 12<sup>th</sup> and 25<sup>th</sup> October, respectively. No genotyping results have been reported.

#### Israel

Between 25/09/2018 and 26/12/2018, 17 outbreaks of **FMD type O** were reported in the Northern District (Hazafon). These mainly occurred in cattle, but also included wild boar and mountain gazelle (*Gazella gazella*). No genotyping results have been reported.

#### Laos

One sample was received on 14/11/2018. It was collected from cattle on 22/01/2018 (location not specified). Conventional virus isolation on primary BTy cells failed to grow any virus, but rRT-PCR was positive. Chemical transfection of LFBK cells with the RNA resulted in virus growth. VP1 sequencing of amplicons from both the RNA extracted from the original sample and from the LFBK cell culture fluid showed the virus to be **FMD type O** and genotyping revealed it to belong to the PanAsia lineage of the ME-SA toptotype (see below). The two sequences were identical.

#### Mongolia

Three retrospective outbreaks of **FMD type O** were reported in (Bactrian?) camels (Dundgovi, 03/01/2018) and cattle (Uvurkhangai, 15/05/2018 and Arkhangai, 28/05/2018). Genotyping of O/MOG/2/2018 (camel, 03/01/2018) was reported in the previous quarterly report as ME-SA/Ind-2001e. No genotyping results have been reported on the other two outbreaks.

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## Thailand

Nineteen samples were received on 14/11/2018. They were collected between February 2017 and August 2018 from cattle in various regions throughout the country. Eight **FMD type O** and eight **FMD type A** viruses were isolated and FMDV genome detected in the remaining three samples by rRT-PCR. Genotyping revealed that the type O viruses belonged to the ME-SA toptotype, five being the PanAsia lineage and three the Ind-2001 lineage (sublineage e) (see below). All eight of the type A viruses belonged to the ASIA toptotype, Sea-97 lineage (see below).

## Turkey

Four **FMD type O** sequences were received from the FMDI-Ankara on 18/10/2018. They were collected during 2018 from Ankara and Van provinces. Genotyping revealed them to belong to the ME-SA toptotype, PanAsia-2 lineage, QOM-15 sublineage (see below).

## Vietnam

A single **FMD type O** VP1 sequence was sent from Regional Animal Health Office No.6 (RAHO6) on 17/12/2018. The sample had been collected from a pig during November 2018 (the location was not specified). Genotyping showed it to belong to the SEA toptotype, Mya-98 lineage (see below).

## 1.2. Africa

### Algeria

Between 11/07/2018 and 12/11/2018, 45 outbreaks of **FMD type O** were reported in cattle, sheep and goats across northern Algeria. Previous analyses showed the viruses to belong to the EA-3 toptotype (see previous quarterly report).

### Burkina Faso

Eighteen samples were received on 06/12/2018. They were collected from cattle sampled between June and August 2018 in four regions (Centre, Centre-Ouest, Plateau-Central and Boucle du Mouhoun). **FMD type O** viruses were isolated from seven samples, five were FMDV-GD and the remaining six were NVD. Genotyping of the virus isolates showed the toptotype to be EA-3 (see below).

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## Gambia

Two samples were received on the 25 October 2018. They were collected on 23/07/2018 and may have been from the reported outbreaks in Njallal Samba and Ndownen villages (Niani district, Central River Division). **FMD type O** was isolated from both samples and genotyping revealed the topotype to be EA-3 (see below).

## Guinea

Between 27/07/2018 and 16/09/2018, eight outbreaks of **FMD type O** were reported in cattle in five of the seven administrative regions. Previous analyses showed the viruses to belong to the EA-3 topotype (see previous quarterly report).

## Malawi

In October and November 2018, two outbreaks of **suspected FMD** were reported in Chitipa (Northern Region), however, no samples were collected. Subsequently another 42 cases were reported and samples taken on the 21<sup>st</sup> December were submitted to the SSARL (BVI); results are awaited.

## Mauritania

Seven VP1 sequences from **FMD type O** viruses were received from ANSES (European Union Reference Laboratory, FAO Reference Centre & OIE Reference Laboratory for FMD). They were collected in July 2018 from Hodh Ech Chargui region. Genotyping showed them to belong to the EA-3 topotype (see below).

## Senegal

Eleven samples were received on 25/10/2018. They were collected from cattle and a pig sampled between May and July 2018 in seven different regions (Dakar, Kaolack, Kedougou, Kolda, Tambacounda, Thies and Ziguinchor). **FMD type O** was isolated from six samples and FMDV genome detected in a further three; no virus or genome was detected in the remaining two samples. Genotyping revealed the topotype to be EA-3 (see below).

## Sierra Leone

Thirty four samples were received on 16/10/2018. They were collected from cattle on 28/08/2018 in the Northern and Eastern provinces. Virus could not be detected in 31 samples and in the remaining 3 cases FMDV genome was detected by rRT-PCR. Subsequently RNA from one of these (from Kono, Eastern province) was chemically

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transfected into LKBK cells and a virus recovered. This was identified as **FMD type O** and genotyped as the EA-3 topotype (see below).

## South Africa

Three further outbreaks due to **FMD type SAT 2** were reported in cattle in the Limpopo province. No genotyping results have been reported. Additionally, sub-clinical infection of African buffalo (*Syncerus caffer*) at Maruleng (Limpopo province) was reported on 12/10/2018.

## South Sudan

During the previous reporting period, on 29/08/2018, a batch of 30 samples was received. They were collected from cattle between April and June 2017. Diagnostic assays failed to isolate any FMD viruses, however, FMDV genome was detected in seven samples. Using a new lineage-specific real-time RT-PCR developed by WRLFMD and NAHDIC (Ethiopia) it was shown that the genome-positive samples probably contained FMDV O/EA-3 RNA. Recently, RNA extracted from one of the FMDV-GD samples was chemically transfected into LFBK cells and a virus was recovered. The virus, from cattle sampled on the 18/05/2017 in Jonglei State, was identified as **FMD type O** and genotyping showed the topotype to be EA-3 (see below).

## Tunisia

Seven outbreaks of **FMD type O** were reported in cattle and sheep in December 2018. No genotyping results have been reported.

## Zambia

Three samples were received on 14/12/2018. They were collected from cattle on 24/10/2018 (unknown location). **FMD type A** viruses were isolated from all three samples. Genotyping is in progress.

## Zimbabwe

Nine outbreaks of **FMD type SAT 1** have been reported in cattle between October and December 2018 in Masvingo province. A single outbreak due to **FMD type SAT 2** was reported in Mashonaland Central in November 2018 and another untyped outbreak of FMD was reported in cattle in Mashonaland West. No genotyping results have been reported.

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## Comment:

### Serotype O in West Africa and the Maghreb

New field outbreaks due to the O/EA-3 toposotype have been widely reported in a number of West African countries. EA-3 normally occurs in East Africa (Sudan, Ethiopia and Eritrea) and spread to Egypt in 2012 (where it has persisted), Libya in 2012 (only one report), Palestine (Gaza & the West Bank; 2017) and Israel (2017). O/EA-3 was first detected in West Africa in Nigeria in 2007 and subsequently in 2009, 2011, 2014 and 2016. Outbreaks due to O/EA-3 have now been confirmed in the Cameroon (2010, 2012-2013, 2015-2016), Burkina Faso (2018), the Gambia (2018), Guinea (2018), Senegal (2018) and Sierra Leone (2018). This viral toposotype has recently spread to the Maghreb (confirmed in Algeria and Mauritania in 2018 and is suspected in Tunisia and Morocco).

The indigenous West African (OWA) toposotype was also present in Nigeria during 2011 to 2014 and 2016 and it will be interesting to see if both of these serotype O toposotypes will continue to coexist in future years.

## 1.3. South America

### Colombia

Between 10/08/2018 and 06/10/2018, five outbreaks of **FMD type O** were reported in cattle and pigs in the Cesar Department. On 13<sup>th</sup> September and 9<sup>th</sup> November, a further two outbreaks of **FMD type O** were reported in cattle and pigs in the La Guajira Department. No genotyping results have been reported.

## 1.4. 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/country-reports/country-reports-2018>.

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Results from samples or sequences 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 from October to December 2018 is shown in Annex 1 (Summary of Submissions). A record of all samples received by WRLFMD is shown in Annex 1 (clinical samples).

**Table 1:** Status of sequencing of samples or sequences received by the WRLFMD from October to December 2018 (\* indicates a batch carried over from the previous quarter).

WRLFMD Batch No.	Date received	Country	Serotype	No. of samples	No. of sequences	Sequencing status
WRLFMD/2018/00026	25/10/2018	Gambia	O	2	2	completed
WRLFMD/2018/00027	16/10/2018	Sierra Leone	O	1	1	completed
WRLFMD/2018/00028	25/10/2018	Senegal	O	6	6	completed
WRLFMD/2018/00029	14/11/2018	Laos	O	1	1	completed
WRLFMD/2018/00030	14/11/2018	Thailand	O	8	8	completed
WRLFMD/2018/00030	14/11/2018	Thailand	A	8	8	completed
WRLFMD/2018/00031	06/12/2018	Burkina Faso	O	7	7	completed
WRLFMD/2018/00032	14/12/2018	Zambia	A	3	-	Pending
<b>Total</b>				<b>36</b>	<b>33</b>	

**Table 2:** VP1 sequences submitted by other FMD Reference laboratories to the WRLFMD from October to December 2018.

WRLFMD Batch No.	Date received	Country	Serotype	No. of sequences	Submitting laboratory
WRLMEG/2018/00037	18/10/2018	Turkey	O	4	FMDI-Ankara
WRLMEG/2018/00039	02/11/2018	Mauritania	O	7	ANSES
WRLMEG/2018/00045	17/12/2018	Vietnam	O	1	RAHO6
<b>Total</b>				<b>12</b>	

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## 2. Detailed Analysis

Key for maps and trees:

<b>Serotype O</b>
<b>Serotype A</b>
<b>Serotype C</b>
<b>Serotype Asia-1</b>
<b>Serotype SAT 1</b>
<b>Serotype SAT 2</b>
<b>Serotype SAT 3</b>
<b>FMDV Genome Detected</b>
<b>No Virus Detected</b>

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## 2.1. Asia

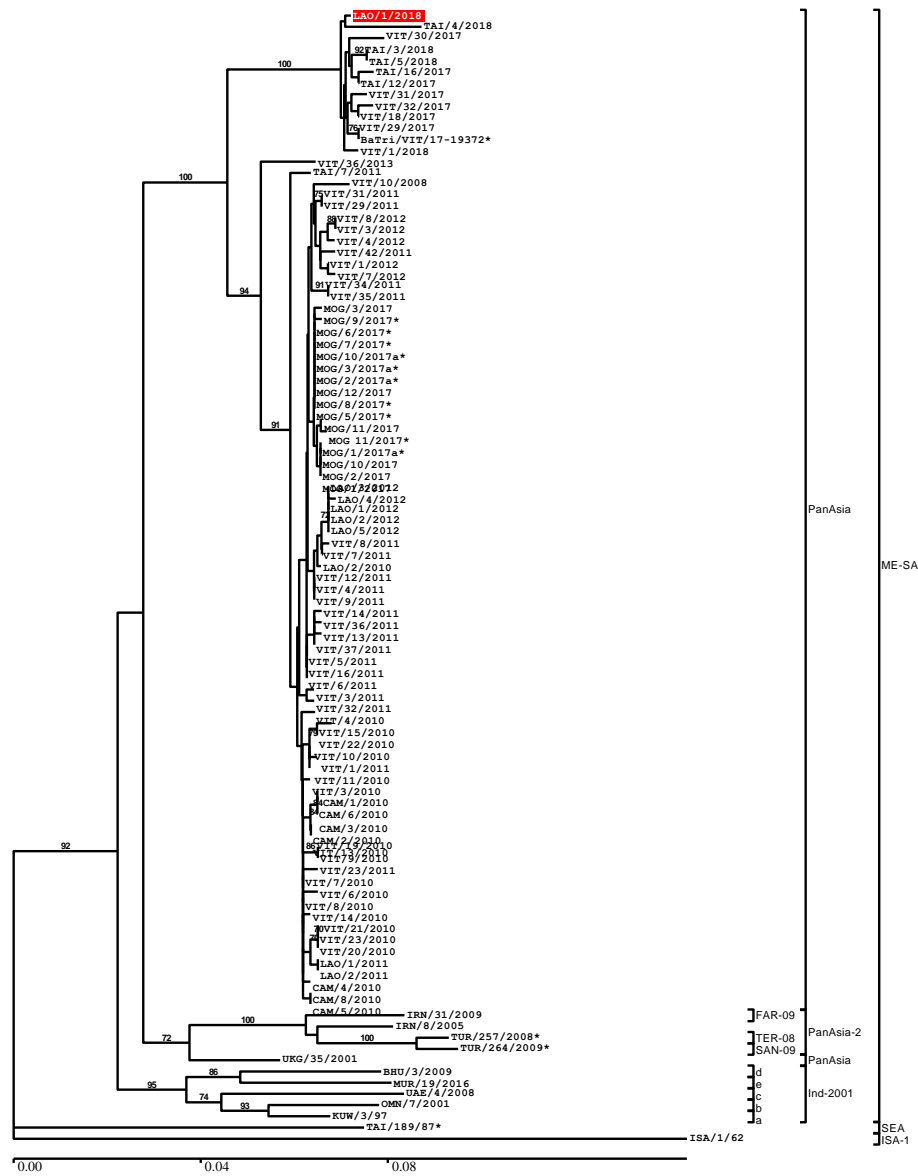
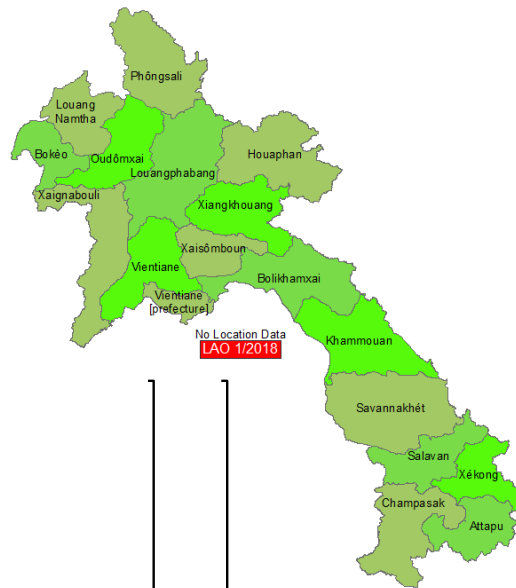
### Laos

Batch: WRLFMD/2018/00029

Date received: 14/11/2018

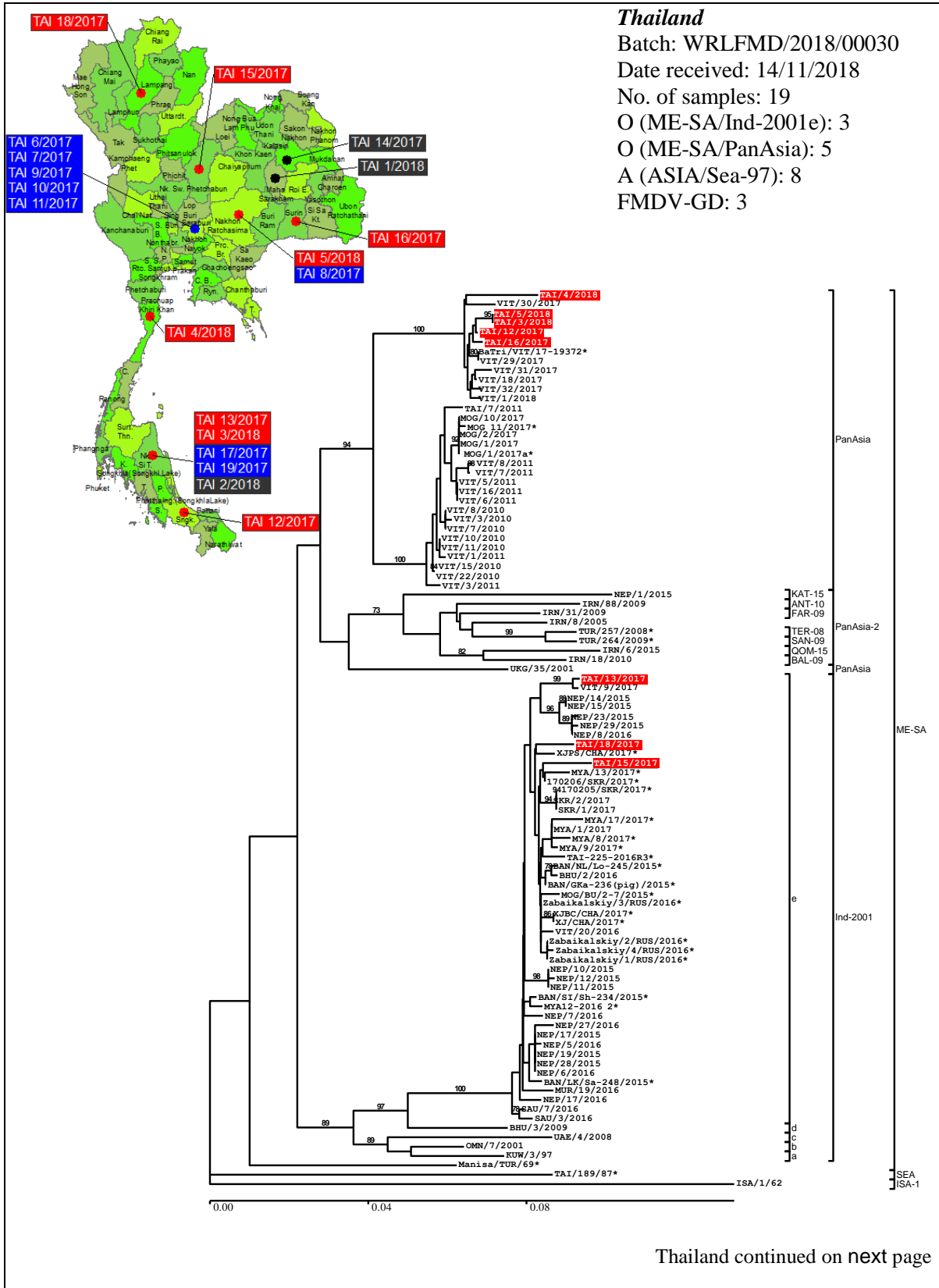
No. of samples: 1

O (SEA/Mya-98): 1



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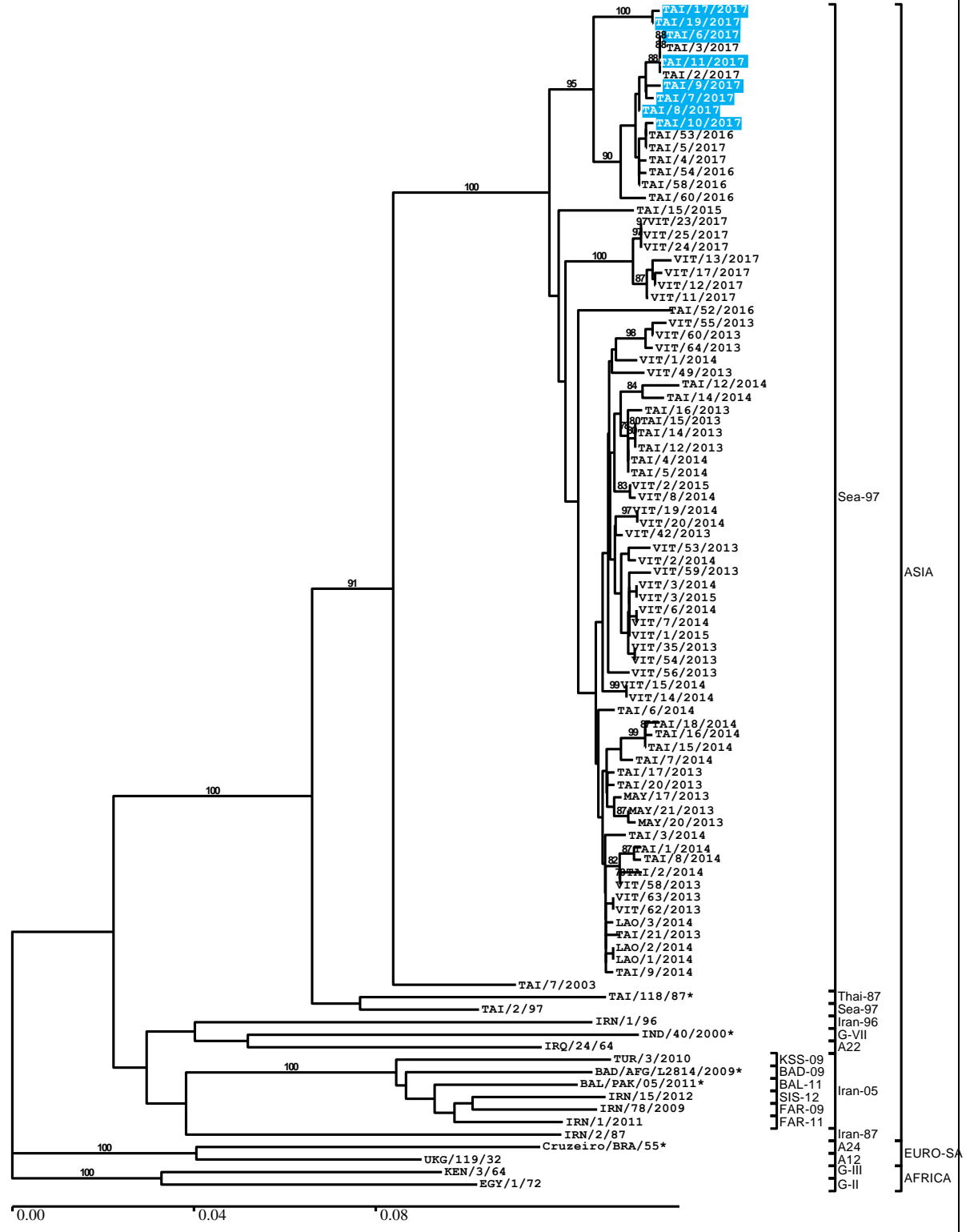
Thailand continued on next page

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Thailand continued



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### Turkey

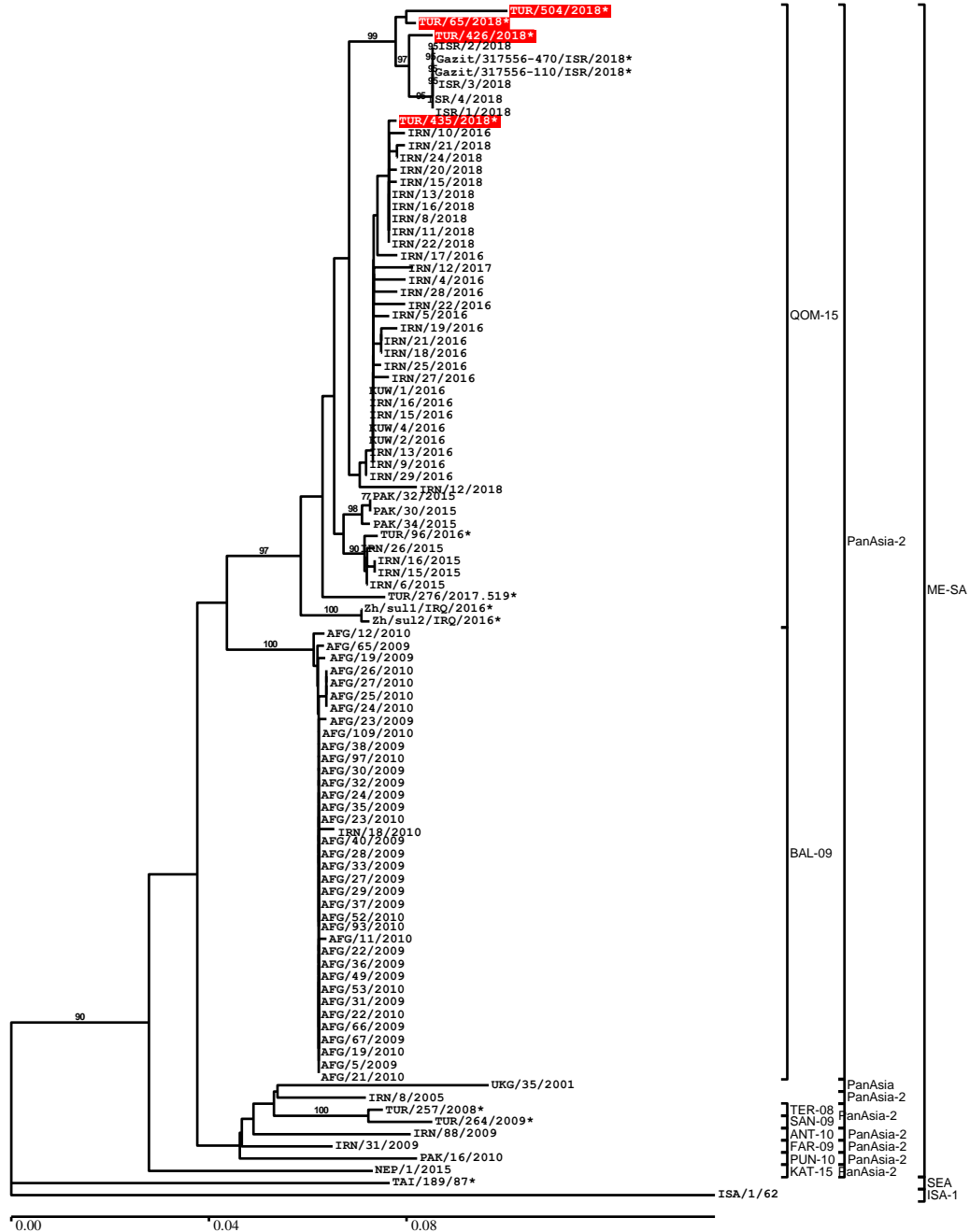
Batch: WRLMEG/2018/00022

Submitted by: FMDI-Ankara

Date received: 18/10/2018

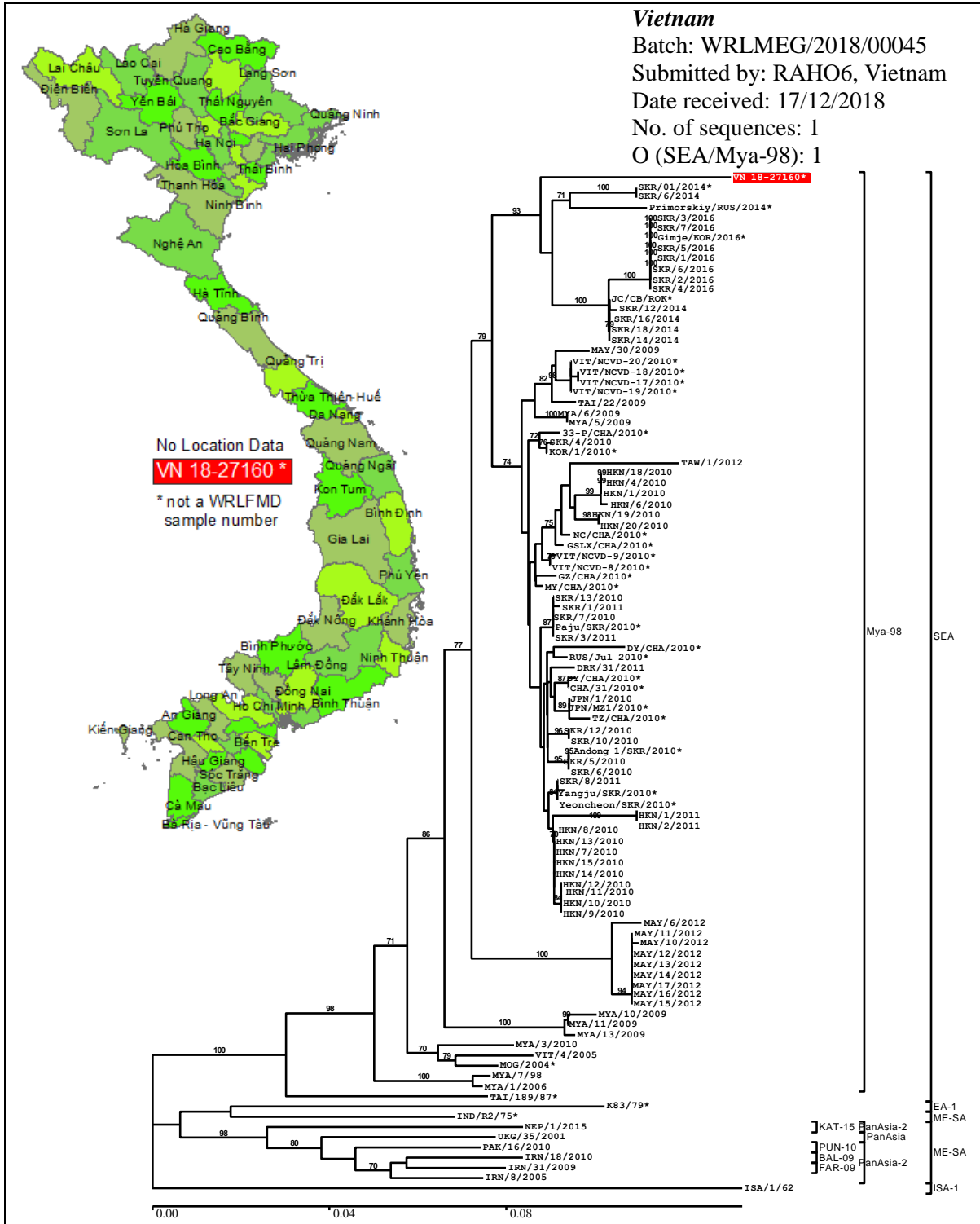
No. of sequences: 4

O (ME-SA/PanAsia-2/QOM-15): 4



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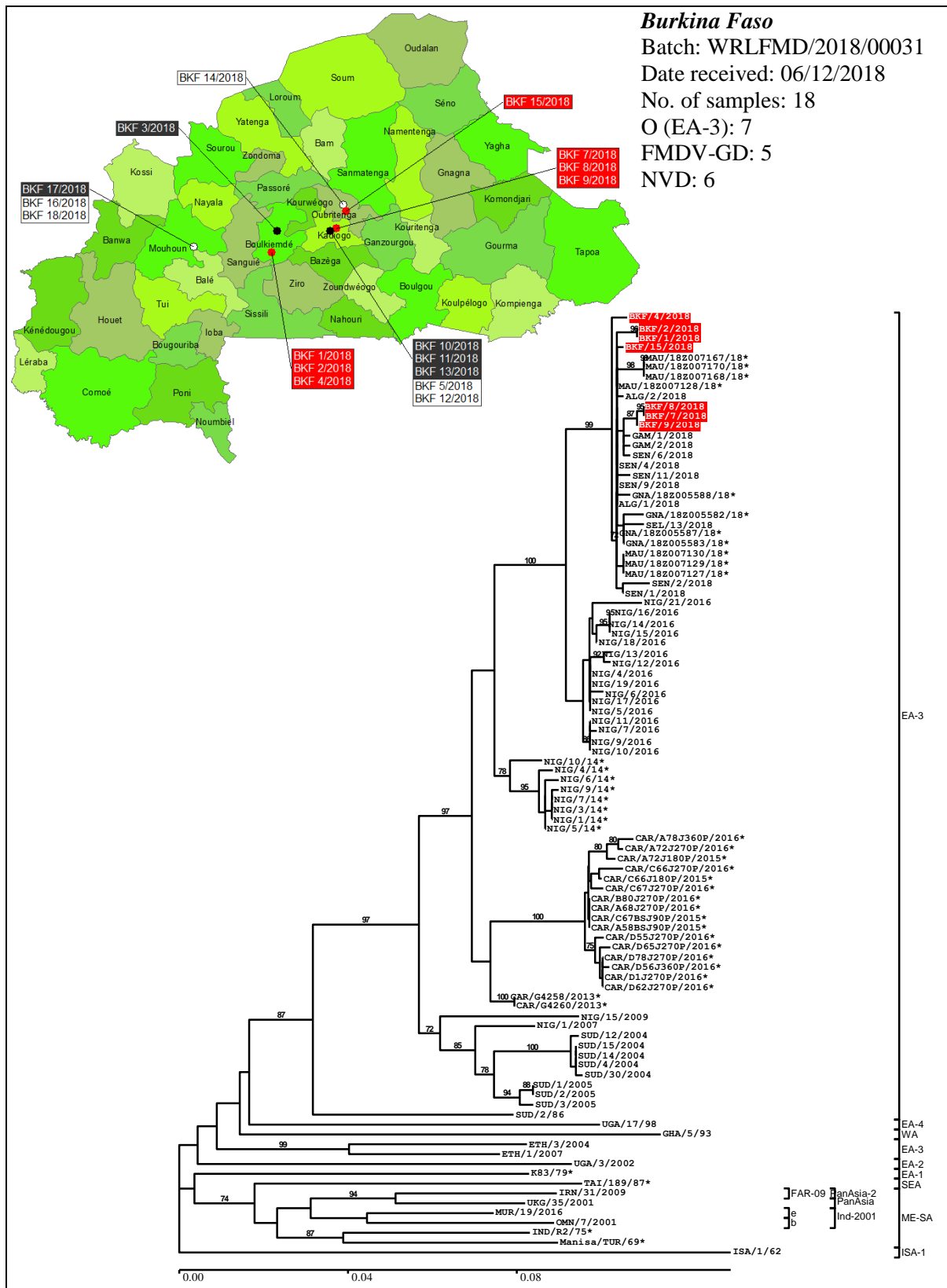


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## 2.2. Africa



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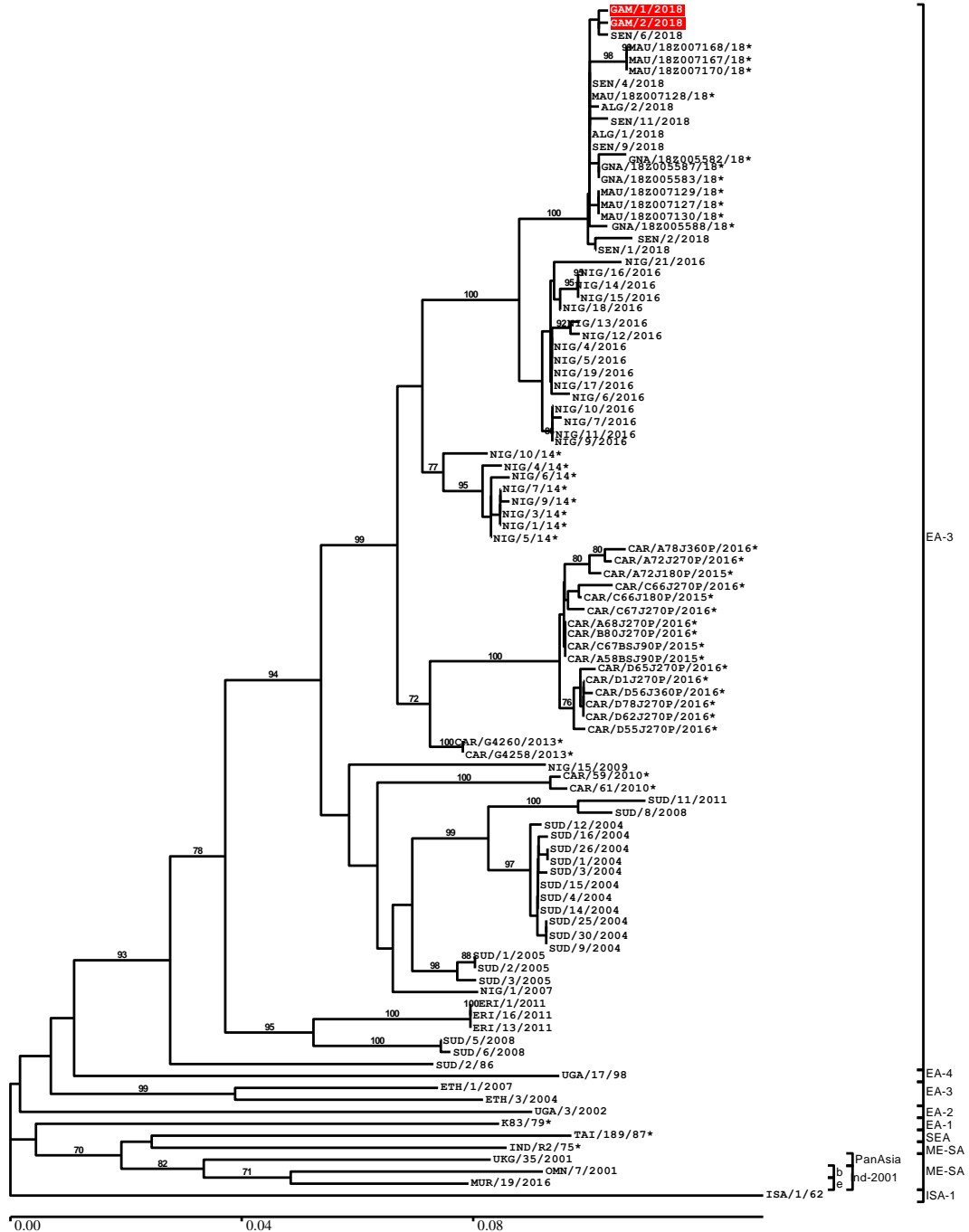
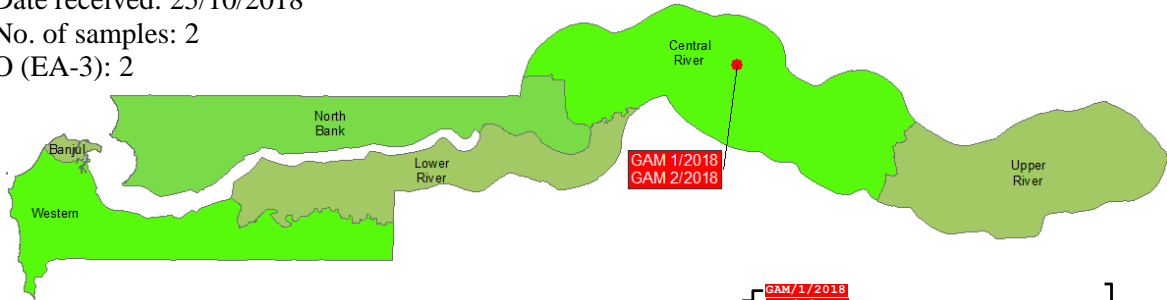
**Gambia**

Batch: WRLFMD/2018/00026

Date received: 25/10/2018

No. of samples: 2

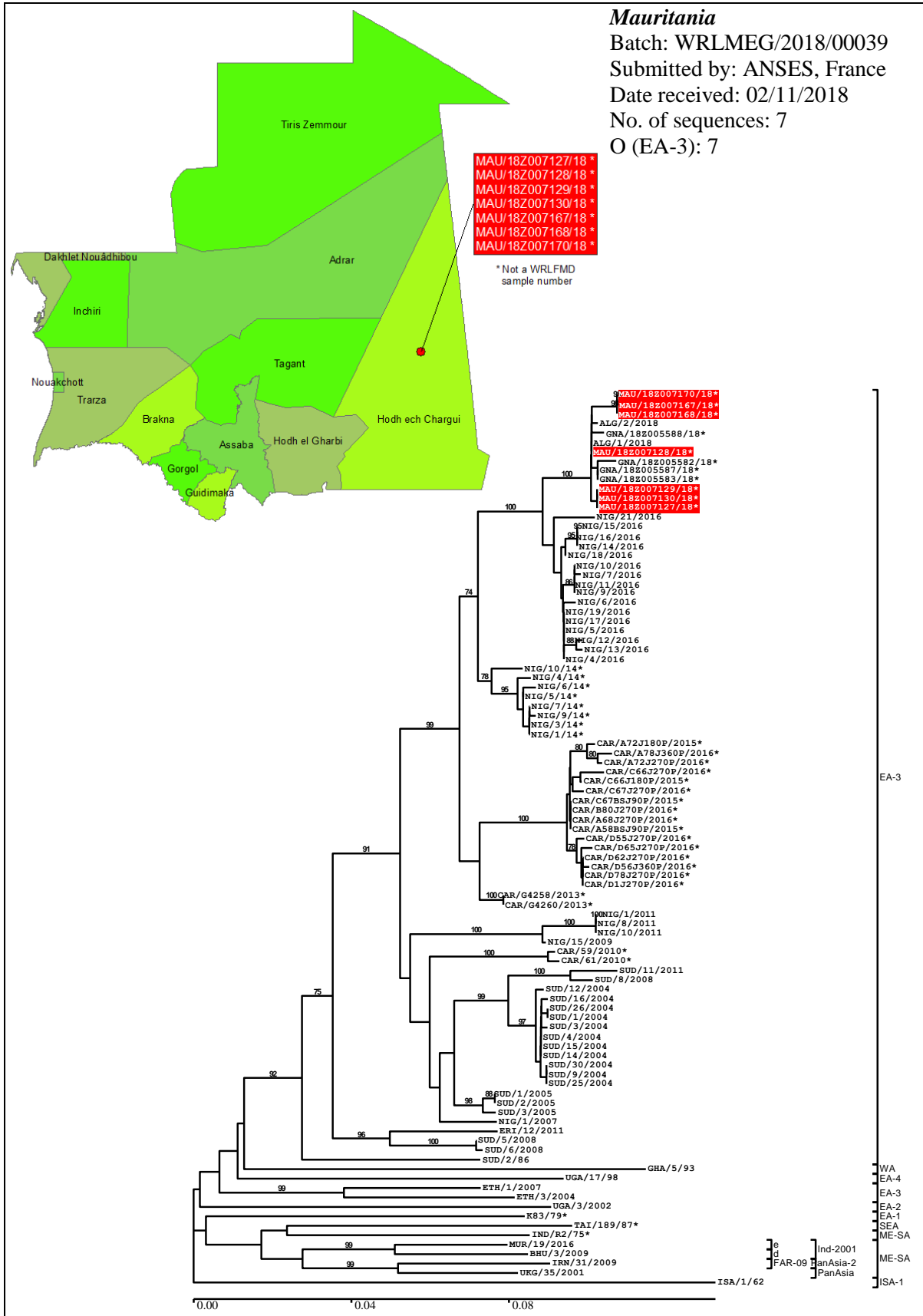
O (EA-3): 2



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### Senegal

Batch: WRLFMD/2018/00028

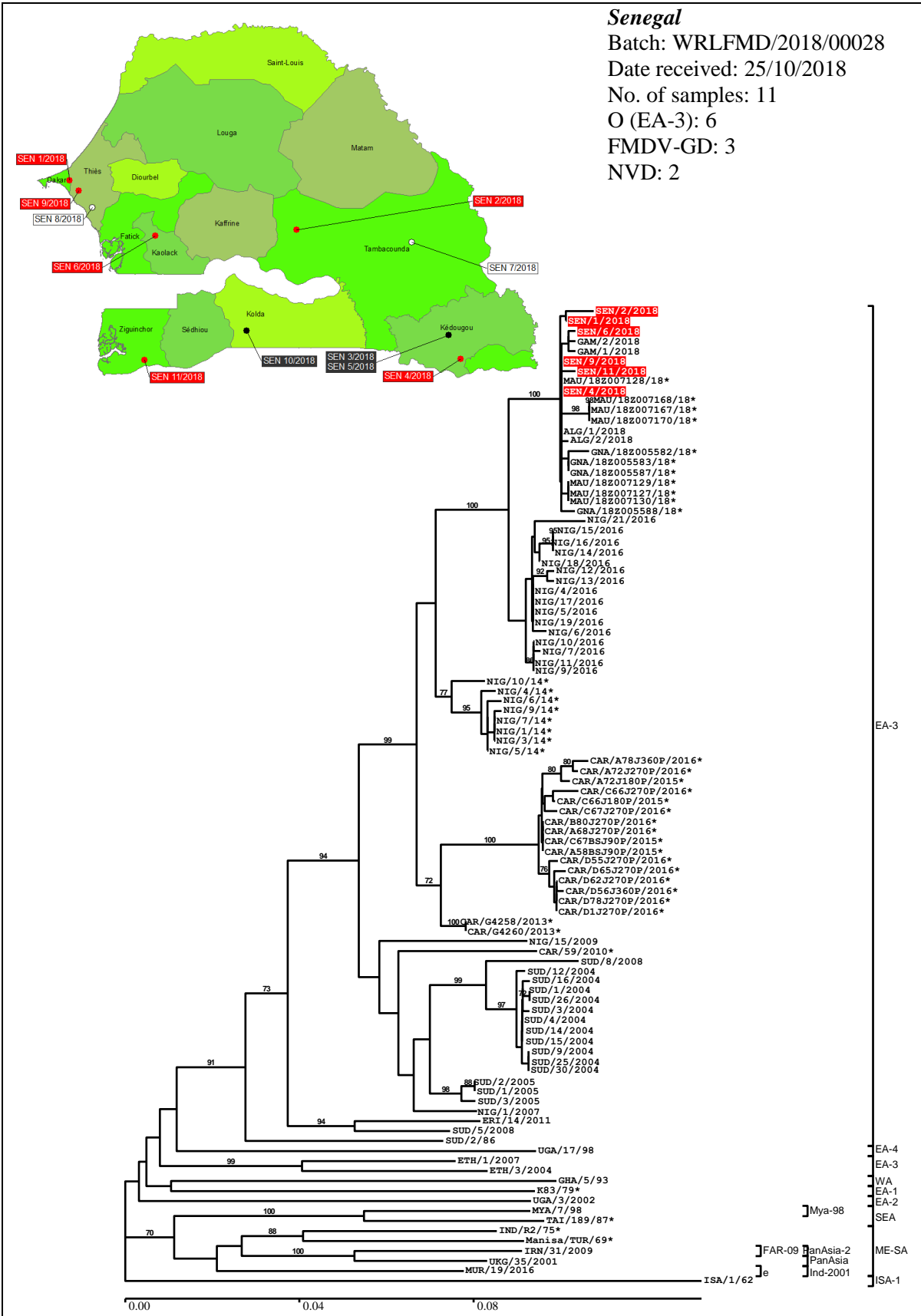
Date received: 25/10/2018

No. of samples: 11

O (EA-3): 6

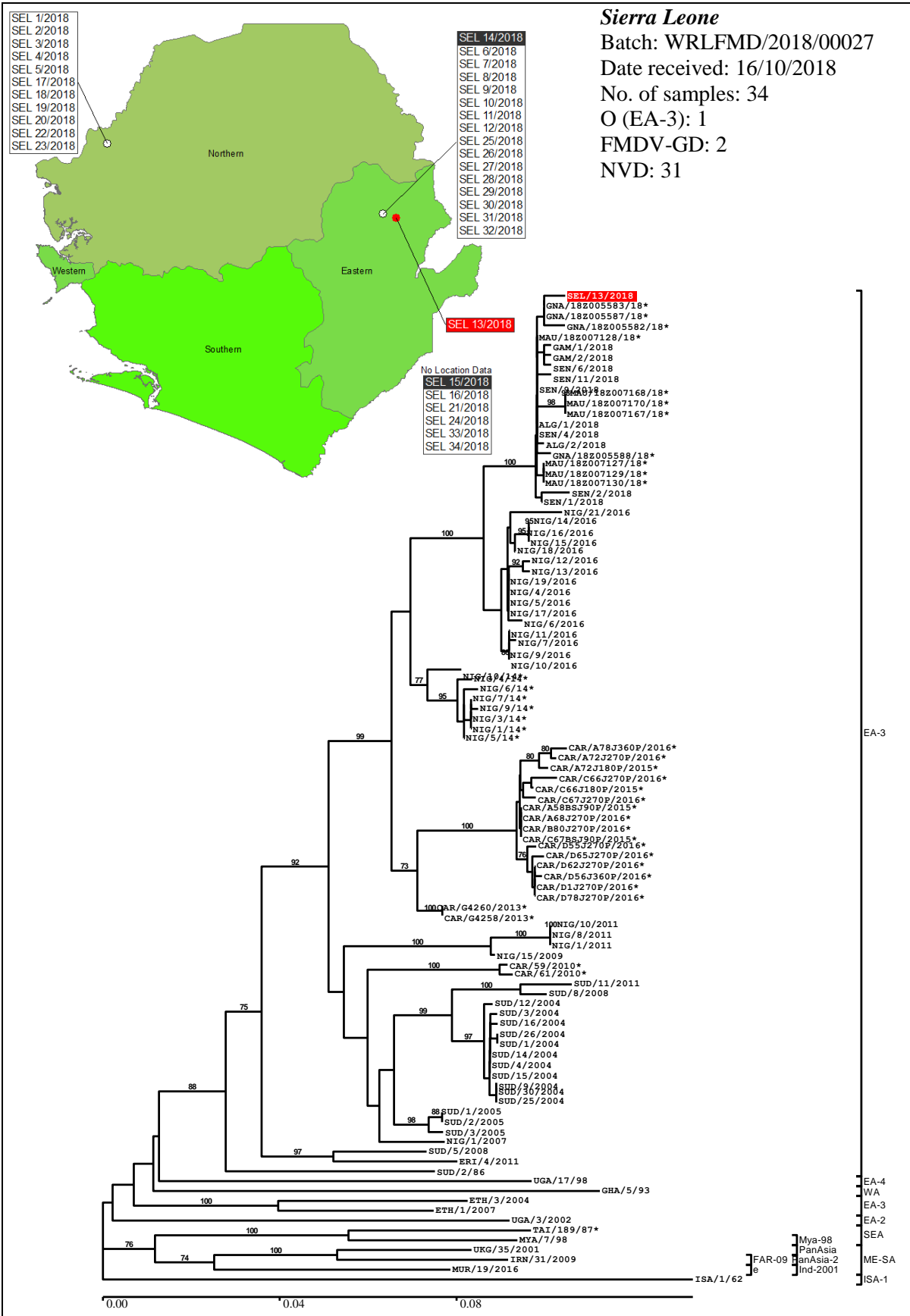
FMDV-GD: 3

NVD: 2



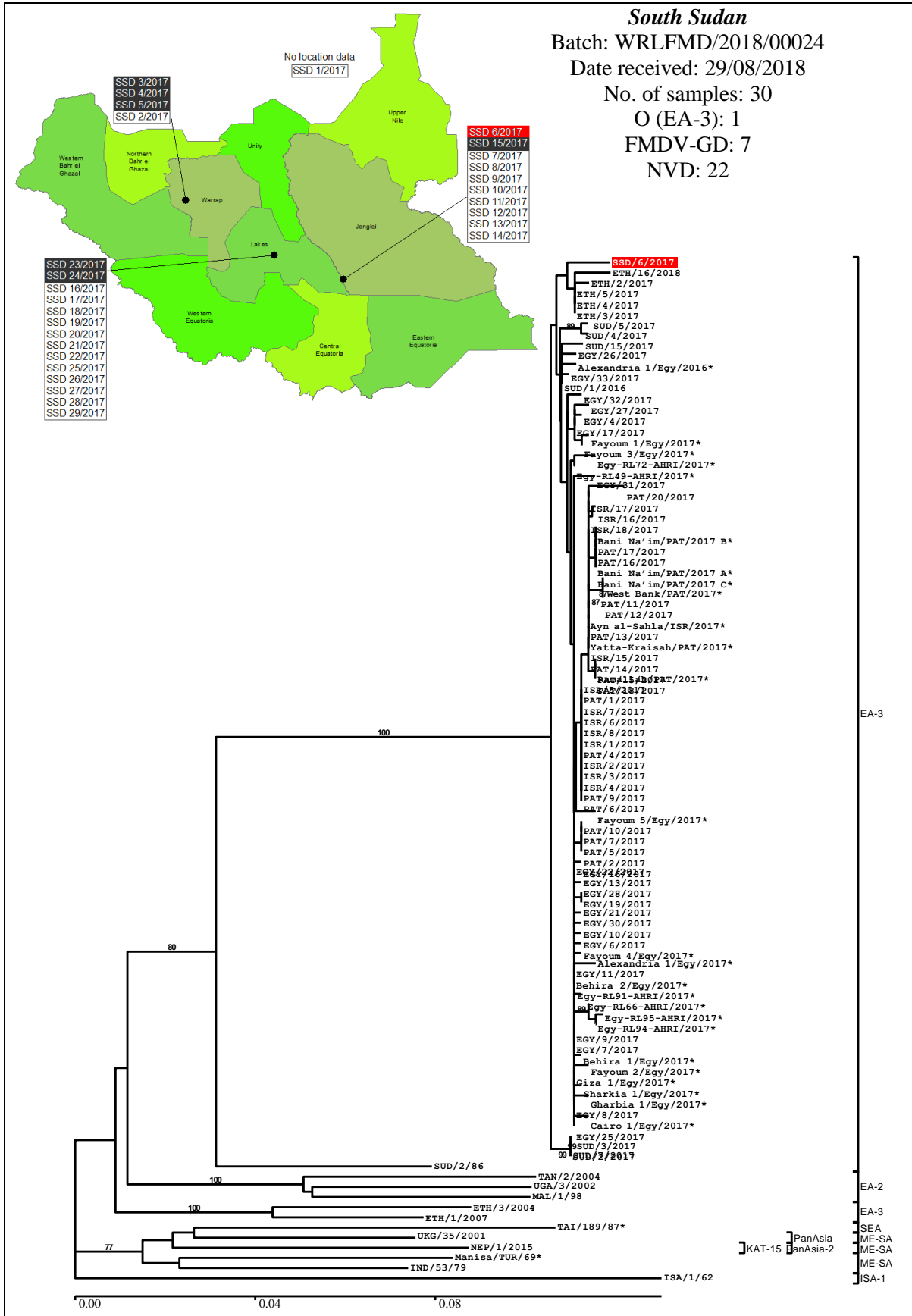
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## 2.3. Vaccine matching

During this reporting period vaccine matching has been undertaken for 28 FMD virus field strains by the WRLFMD® October to December 2018:

**Table 3: Summary of samples tested by vaccine matching.**

<b>Serotype</b>	<b>O</b>	<b>A</b>	<b>C</b>	<b>Asia-1</b>	<b>SAT 1</b>	<b>SAT 2</b>	<b>SAT 3</b>
Gambia	1	-	-	-	-	-	-
Hong Kong	1	-	-	-	-	-	-
Kenya	2	2	-	-	1	1	-
Mongolia	3	-	-	-	-	-	-
Senegal	2	-	-	-	-	-	-
<b>Σ</b>	<b>9</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>

For individual data see Annex 1, section 2.6 (Antigenic Characterisation).

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# Annex 1: Sample data

## 2.4. Summary of Submissions

Table 4: Summary of samples collected and received to WRLFMD (October to December 2018)

Country	N <sup>o</sup> of samples	Virus isolation in cell culture/ELISA							No Virus Detected	RT-PCR for FMD (or SVD) virus (where appropriate)	
		FMD virus serotypes								Positive	Negative
		O	A	C	SAT 1	SAT 2	SAT 3	ASIA -1			
BURKINA FASO	18	7	-	-	-	-	-	-	11	12	6
GAMBIA	2	2	-	-	-	-	-	-	-	1	1
HONG KONG	8	1	-	-	-	-	-	-	1	3	5
LAOS	1	-	-	-	-	-	-	-	1	1	-
SENEGAL	11	6	-	-	-	-	-	-	5	8	3
SIERRA LEONE	34	-	-	-	-	-	-	-	34	3	31
THAILAND	19	8	8	-	-	-	-	-	3	19	-
<b>TOTAL</b>	<b>93</b>	<b>24</b>	<b>8</b>	-	-	-	-	-	<b>55</b>	<b>47</b>	<b>46</b>

### 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

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## 2.5. Clinical Samples

Table 5: Clinical sample diagnostics made by the WRLFMD® October to December 2018

Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				V/ELISA	RT-PCR	Final report
BURKINA FASO	06-Dec-18	18-Dec-18	BKF 1/2018	CATTLE	02-Jun-18	O	POS	O
			BKF 2/2018	CATTLE	02-Jun-18	O	POS	O
			BKF 3/2018	CATTLE	02-Jun-18	NEG	POS	FMDV GD
			BKF 4/2018	CATTLE	02-Jun-18	O	POS	O
			BKF 5/2018	CATTLE	06-Jul-18	NEG	NEG	NVD
			BKF 6/2018	CATTLE	06-Jul-18	NEG	NEG	NVD
			BKF 7/2018	CATTLE	06-Jul-18	O	POS	O
			BKF 8/2018	CATTLE	06-Jul-18	O	POS	O
			BKF 9/2018	CATTLE	06-Jul-18	O	POS	O
			BKF 10/2018	CATTLE	06-Jul-18	NEG	POS	FMDV GD
			BKF 11/2018	CATTLE	06-Jul-18	NEG	POS	FMDV GD
			BKF 12/2018	CATTLE	06-Jul-18	NEG	NEG	NVD
			BKF 13/2018	CATTLE	06-Jul-18	NEG	POS	FMDV GD
			BKF 14/2018	CATTLE	18-Jul-18	NEG	NEG	NVD
			BKF 15/2018	CATTLE	18-Jul-18	O	POS	O
			BKF 16/2018	CATTLE	07-Aug-18	NEG	NEG	NVD
			BKF 17/2018	CATTLE	07-Aug-18	NEG	POS	FMDV GD
			BKF 18/2018	CATTLE	07-Aug-18	NEG	NEG	NVD
GAMBIA	25-Oct-18	14-Nov-18	GAM 1/2018	CATTLE	23-Jul-18	O	POS	O
			GAM 2/2018	CATTLE	23-Jul-18	O	NEG	O
HONG KONG, SAR of PRC	14-Sep-18	01-Oct-18	HKN 10/2018	PIG	07-Jun-18	NEG	POS	FMDV GD
			HKN 11/2018	PIG	07-Jun-18	FMD	POS	FMD
			HKN 12/2018	PIG	09-Jul-18	FMD	NEG	FMD
			HKN 13/2018	PIG	16-Jul-18	FMD, O	POS	FMD, O
			HKN 14/2018	PIG	16-Jul-18	FMD	NEG	FMD
			HKN 15/2018	PIG	16-Jul-18	FMD	NEG	FMD
			HKN 16/2018	PIG	17-Jul-18	FMD	NEG	FMD
			HKN 17/2018	PIG	17-Jul-18	FMD	NEG	FMD
LAOS	14-Nov-18	06-Dec-18	LAO 1/2018	CATTLE	22-Jan-18	NEG	POS	FMDV GD
SENEGAL	25-Oct-18	14-Nov-18	SEN 1/2018	CATTLE	29-May-18	O	POS	O
			SEN 2/2018	PIG	28-Jun-18	O	POS	O
			SEN 3/2018	CATTLE	11-Jul-18	NEG	POS	FMDV GD
			SEN 4/2018	CATTLE	11-Jul-18	O	POS	O
			SEN 5/2018	CATTLE	11-Jul-18	NEG	POS	FMDV GD
			SEN 6/2018	CATTLE	12-Jul-18	O	POS	O
			SEN 7/2018	CATTLE	17-Jul-18	NEG	NEG	NVD
			SEN 8/2018	CATTLE	20-Jul-18	NEG	NEG	NVD
			SEN 9/2018	CATTLE	20-Jul-18	O	NEG	O
			SEN 10/2018	CATTLE	24-Jul-18	NEG	POS	FMDV GD
			SEN 11/2018	CATTLE	31-Jul-18	O	POS	O

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Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				V/ELISA	RT-PCR	Final report
SIERRA LEONE	16-Oct-18	02-Nov-18	SEL 1/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 2/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 3/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 4/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 5/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 6/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 7/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 8/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 9/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 10/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 11/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 12/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 13/2018	CATTLE	29-Aug-18	NEG	POS	FMDV GD
			SEL 14/2018	CATTLE	29-Aug-18	NEG	POS	FMDV GD
			SEL 15/2018	CATTLE	29-Aug-18	NEG	POS	FMDV GD
			SEL 16/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 17/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 18/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 19/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 20/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 21/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 22/2018	CATTLE	28-Aug-18	NEG	NEG	NVD
			SEL 23/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 24/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 25/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 26/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 27/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 28/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 29/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 30/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 31/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 32/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 33/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
			SEL 34/2018	CATTLE	29-Aug-18	NEG	NEG	NVD
THAILAND	14-Nov-18	06-Dec-18	TAI 6/2017	CATTLE	22-Feb-17	A	POS	A
			TAI 7/2017	CATTLE	01-Mar-17	A	POS	A
			TAI 8/2017	CATTLE	28-Mar-17	A	POS	A
			TAI 9/2017	CATTLE	24-Apr-17	A	POS	A
			TAI 10/2017	CATTLE	26-Apr-17	A	POS	A
			TAI 11/2017	CATTLE	26-Apr-17	A	POS	A
			TAI 12/2017	CATTLE	10-Nov-17	O	POS	O
			TAI 13/2017	CATTLE	17-Nov-17	O	POS	O
			TAI 14/2017	CATTLE	20-Nov-17	NEG	POS	FMDV GD
			TAI 15/2017	CATTLE	23-Nov-17	O	POS	O
			TAI 16/2017	CATTLE	15-Dec-17	O	POS	O
			TAI 17/2017	CATTLE	18-Dec-17	A	POS	A
			TAI 18/2017	CATTLE	25-Dec-17	O	POS	O
			TAI 19/2017	CATTLE	27-Dec-17	A	POS	A
			TAI 1/2018	CATTLE	09-Mar-18	NEG	POS	FMDV GD
			TAI 2/2018	CATTLE	09-Mar-18	NEG	POS	FMDV GD

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Country	Date		WRL for FMD Sample Identification	Animal	Date of Collection	Results		
	Received	Reported				VI/ELISA	RT-PCR	Final report
			TAI 3/2018	CATTLE	09-Jul-18	O	POS	O
			TAI 4/2018	CATTLE	09-Jul-18	O	POS	O
			TAI 5/2018	CATTLE	08-Aug-18	O	POS	O
			TOTAL	93				

### 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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## 2.6. Antigenic Characterisation

Antigenic characterisation of FMD field isolates by matching with vaccine strains by 2dmVNT from October to December 2018.

**Table 6: Vaccine matching studies for O FMDV by VNT**

Strain	Serotype	Topotype	Lineage	O 3039	O1 Manisa	O/TUR/5/2009
MOG/02/2018	O	ME-SA	Ind-2001e	0.55	0.37	0.66
MOG/07/2018	O	SEA	Mya-98	0.40	0.19	0.46
MOG/10/2018	O	ME-SA	PanAsia	0.62	0.44	0.51
HKN/13/2018	O	CATHAY	-	0.11	0.09	0.11
KEN/11/2017	O	EA-2	-	1	1	0.81
KEN/15/2017	O	EA-2	-	0.5	0.52	0.47
GAM/01/2018	O	EA-3	-	0.45	0.30	0.52
SEN/02/2018	O	EA-3	-	0.38	0.30	0.49
SEN/11/2018	O	EA-3	-	0.63	0.39	0.54

**Table 7: Vaccine matching studies for A FMDV by VNT**

Strain	Serotype	Topotype	Lineage	A/IRN/05	A/TUR/20/06	A22 IRAQ	A/ERI/3/98
KEN/14/2017	A	AFRICA	G-I	0.05	0.00	0.21	0.20
KEN/17/2017	A	AFRICA	G-I	0.03	0.00	0.30	0.10

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**Table 8: Vaccine matching studies for SAT 1 FMDV by VNT**

<b>Strain</b>	<b>Serotype</b>	<b>Topotype</b>	<b>Lineage</b>	<b>SAT 1/RHO/12/78</b>
KEN/08/2017	SAT 1	I (NWZ)	-	0.25

**Table 9: Vaccine matching studies for SAT 2 FMDV by VNT**

<b>Strain</b>	<b>Serotype</b>	<b>Topotype</b>	<b>Lineage</b>	<b>SAT 2 ERI</b>	<b>SAT 2 ZIM</b>
KEN/19/2017	SAT 2	IV	-	0.50	0.31

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## Abbreviations used in tables

M	Vaccine Match <i><math>r_1 = \geq 0.3</math>. 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.</i>
N	No Vaccine Match <i><math>r_1 = &lt; 0.3</math>. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect</i>
B	Borderline <i>Any <math>r_1</math> values between 0.28 to 0.32</i>
NT	Not tested against this vaccine

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## Annex 2: FMD publications

Recent FMD Publications (October to December 2018) cited by Web of Science (Pirbright Institute papers and authors are highlighted in **BOLD AND GREY**)

1. Abdрахманов, S.K., S.B. Tyulegenov, F.I. Korennoy, A.A. Sultanov, Sytnik, I.I., K.K. Beisembaev, A.A. Bainiyazov, A.E. Munsey, A.M. Perez, and K. VanderWaal (2018). Spatiotemporal analysis of foot-and-mouth disease outbreaks in the Republic of Kazakhstan, 1955-2013. *Transboundary and Emerging Diseases*, **65**(5): 1235-1245.
2. Adhikari, G., K.P. Acharya, M. Upadhyay, R. Raut, K. Kaphle, T. Khanal, M.R. Bertram, C. Stenfeldt, and J. Arzt (2018). Outbreak investigations of *Foot-and-Mouth Disease virus* in Nepal between 2010 and 2015 in the context of historical serotype occurrence. *Veterinary Medicine and Science*, **4**(4): 304-314.
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4. **Armson, B., V. Mioulet, C. Doel, M. Madi, S. Parida**, K.A. Lemire, D.J. Holder, A. Das, M.T. McIntosh, and **D.P. King** (2018). Detection of *Foot-and-Mouth Disease Virus* in milk samples by real-time reverse transcription polymerase chain reaction: Optimisation and evaluation of a high-throughput screening method with potential for disease surveillance. *Veterinary Microbiology*, **223**: 189-194.
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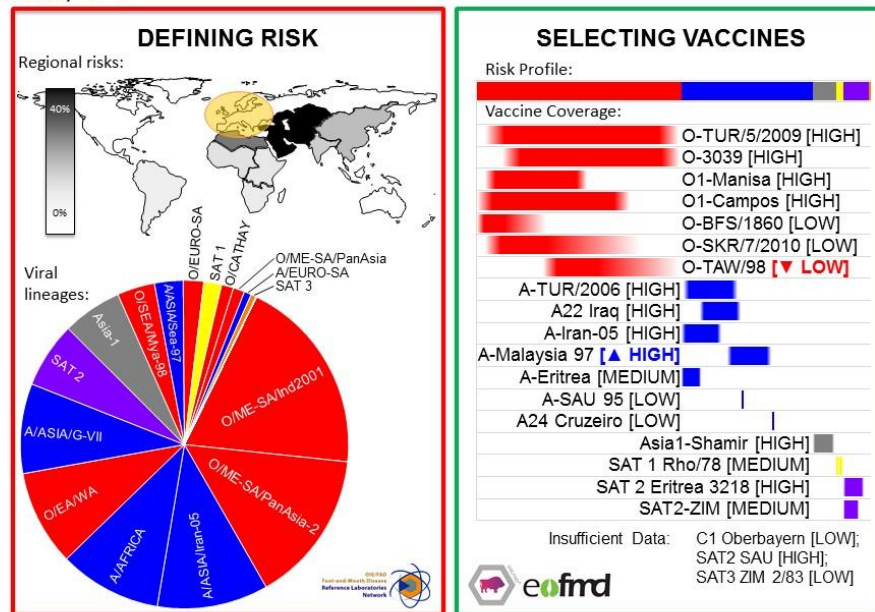
## Annex 3: Vaccine Recommendations

This report provides recommendations of FMDV vaccines to be included in antigen banks. These outputs are generated with a new tool (called PRAGMATIST) that has been developed in partnership between WRLFMD® and EuFMD. These analyses accommodate the latest epidemiological data collected by the OIE FAO FMD Laboratory Network regarding FMDV lineages that are present in different *source regions* (see Table below), as well as available *in vitro*, *in vivo* and field data to score the ability of vaccines to protect against these FMDV lineages.

Lineage	West Eurasia	East Asia	North Africa	India and Southern Asia	East Africa	West and Central Africa	Southern Africa	South America
O ME-SA PanAsia-2	35	-	-	-	-	-	-	-
O ME-SA PanAsia	-	10	-	-	-	-	-	-
O SEA Mya-98	-	33	-	-	-	-	-	-
O ME-SA Ind2001	6	20	35	80	-	-	-	-
O EA or O WA	3	-	20	-	45	37	-	-
O EURO-SA	-	-	-	-	-	-	-	74
O CATHAY	-	10.5	-	-	-	-	-	-
A ASIA Sea-97	-	25	-	-	-	-	-	-
A ASIA Iran-05	25.5	-	-	-	-	-	-	-
A ASIA G-VII	17.5	-	-	16	-	-	-	-
A AFRICA	-	-	35	-	24	25	-	-
A EURO-SA	-	-	-	-	-	-	-	26
Asia-1	12.5	1.5	-	4	-	-	-	-
SAT 1	-	-	-	-	10	10	27	-
SAT 2	0.5	-	10	-	20	28	57	-
SAT 3	-	-	-	-	1	-	16	-
C	-	-	-	-	-	-	-	-

### Vaccine Antigen Prioritisation: Europe

January 2019



NB: Analyses uses best available data, however there are gaps in surveillance and vaccine coverage data

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The table defines the relative distribution of FMDV lineages in each of the eight *source regions*, while the figure highlights the importance of these *source regions* for **Europe** (using data collected at the EU-RL Workshop); please contact WRLFMD EuFMD for assistance to tailor these outputs to other geographical regions. NB: Vaccine-coverage data presented is based on available data and may under-represent the true performance of individual vaccines.

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## Annex 4: Other WRLFMD Activities

### Proficiency test scheme organised by WRLFMD:

Phase XXX: sample panels are being dispatched to participating laboratories (including “live” and inactivated samples for virology assays, and validated sera for FMDV-specific antibody tests). Please contact WRLFMD if you would like more information about this exercise.

Summary of participating laboratories (status as of January 2019):

<b>Phase XXX</b>	
Total invited laboratories	102
Participants from European Union (funded by EURL for FMD)	26 (EU member states)
Participants from Global Network	Argentina, Brazil, Canada, Russia, Senegal, Thailand Pending: Botswana, China, Ethiopia, India, Kenya, Nepal, Nigeria, Republic of Korea, South Africa, USA
Participants from EuFMD Member states (non-EU)	Bosnia & Herzegovina, Georgia, Kosovo, FYRO Macedonia, Norway, Serbia, Switzerland, Turkey Pending: Albania,
Participants from neighbourhood countries	Algeria, Armenia, Montenegro, Morocco Pending: Belarus, Iran, Iraq, Jordan, Lebanon, Moldova, Tunisia, Ukraine
Other participating countries	Australia, Namibia, New Zealand, Singapore, Chinese Taipei,

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## Training courses:

**20<sup>th</sup> February 2019:** E-learning training course covering FMD Diagnostic methods:

# FMD Laboratory Investigation Training Course

This course is aimed at those working in national or regional foot-and-mouth disease laboratories and involved in carrying out or managing laboratory testing activities.

The course involves 14 hours of interactive e-learning content over a four week period.

The course provides a unique opportunity to interact with your colleagues in FMD laboratories around the world.

A limited number of places are available on this course. To apply, send an email to: [eufmd-training@fao.org](mailto:eufmd-training@fao.org)

Dates and more information on the e-learning courses are available at <https://eufmdlearning.works>

**Online training**

The course covers the full range of activities carried out by FMD laboratories from supervising collection of diagnostic samples through to advanced laboratory testing procedures, biosafety and quality assurance.

Participants will learn to

- Interact with field staff and guide them in collection and submission of appropriate, quality diagnostic samples
- Select appropriate diagnostic tests to detect FMD virus and FMD virus-specific antibodies, and interpret the results of these tests
- Describe the principles of accurate virus detection test methods and assays used for serology
- Outline techniques for further characterization of FMD virus including genomic sequencing and vaccine matching tests
- Explain the importance and basic principles of laboratory Quality Assurance
- Explain the key principles of biosecurity and biosafety measures to be carried out in an FMD laboratory

  The EufMD and the World Reference Laboratory for FMD, based at the Pirbright Institute, have partnered to produce the online FMD Laboratory Investigation Training Course - FLITC.

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