

# FAO World Reference Laboratory for Foot-and-Mouth Disease (WRLFMD)

## Genotyping Report

FMDV serotype: SAT2  
Country: Bahrain  
Year: 2022  
Batch: WRLFMD/2023/000040  
No. of sequences: 5  
Report date: 29th June 2023  
Report generated by: Nick Knowles  
Report checked by: Jemma Wadsworth



Copyright © 2023 The Pirbright Institute, Ash Road, Pirbright, Woking GU24 0NF, United Kingdom.

www: <http://www.wrlfmd.org/>

email: [reporting@pirbright.ac.uk](mailto:reporting@pirbright.ac.uk)

The contents of this report should not be reproduced without permission.

Virus sample name:	BAR/2/2022
Sender reference:	002, SER-271
Location of origin:	n/a
Country of origin:	Bahrain
Date of collection:	23/11/2022
Host species:	cattle
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	02/06/2023
Primers:	SAT2-1C445F/SAT-2B208R; FMD-3161F/FMD-4303R
Received for sequencing:	26/06/2023
Created:	29/06/2023
Last updated:	29/06/2023
VIBASys IDs: sample 53248, genome 53249, sequence viba_53250, sequencing info 53251	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_53258	BAR/6/2022	cattle	99.4	0	SAT2	XIV		
viba_53266	BAR/4/2022	cattle	99.4	0	SAT2	XIV		
viba_53254	BAR/5/2022	cattle	99.4	0	SAT2	XIV		
viba_53262	BAR/7/2022	cattle	99.4	0	SAT2	XIV		
viba_52881	OMN/1434/2023		98.9	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.8	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.6	0	SAT2	XIV		
viba_52597	IRQ/8/2023	cattle	98.0	0	SAT2	XIV		
viba_52573	IRQ/3/2022	water buffalo	98.0	0	SAT2	XIV		
viba_52569	IRQ/2/2022	water buffalo	98.0	0	SAT2	XIV		

### Most Closely Related Prototype Sequences

see <http://www.wrlfmd.org/fmdv-genome/fmd-prototype-strains>

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_724	ETH/2/91	cattle	83.9	0	SAT2	XIV		
viba_139	ETH/2/2007	cattle	75.2	0	SAT2	XIII		
viba_111	MAL/1/2003	bovine	75.0	0	SAT2	I		
viba_752	SA/106/59		75.0	0	SAT2	I		
viba_470	KEN/2/84	bovine	74.6	0	SAT2	IX		
viba_183	ZIM/14/2002	bovine	74.2	0	SAT2	I		
viba_500	NIG/2/75	bovine	74.0	0	SAT2	V		
viba_728	GHA/2/90	bovine	73.4	0	SAT2	V		
viba_193	SUD/6/77		73.3	0	SAT2	XIII		
viba_380	RHO/1/48		73.3	0	SAT2	III		

Virus sample name:	BAR/4/2022
Sender reference:	N-01000, SER-272
Location of origin:	n/a
Country of origin:	Bahrain
Date of collection:	24/11/2022
Host species:	cattle
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1 & WRL-LFBK2 15/06/2023
Harvest date of material:	02/06/2023
Primers:	SAT2-1C445F/SAT-2B208R; FMD-3161F/FMD-4303R
Received for sequencing:	26/06/2023
Created:	29/06/2023
Last updated:	29/06/2023
VIBASys IDs: sample 53264, genome 53265, sequence viba_53266, sequencing info 53267	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_53258	BAR/6/2022	cattle	100.0	0	SAT2	XIV		
viba_53254	BAR/5/2022	cattle	100.0	0	SAT2	XIV		
viba_53262	BAR/7/2022	cattle	100.0	0	SAT2	XIV		
viba_53250	BAR/2/2022	cattle	99.4	0	SAT2	XIV		
viba_52881	OMN/1434/2023		98.6	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.4	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.3	0	SAT2	XIV		
viba_52597	IRQ/8/2023	cattle	97.7	0	SAT2	XIV		
viba_52573	IRQ/3/2022	water buffalo	97.7	0	SAT2	XIV		
viba_52569	IRQ/2/2022	water buffalo	97.7	0	SAT2	XIV		

### Most Closely Related Prototype Sequences

see <http://www.wrlfmd.org/fmdv-genome/fmd-prototype-strains>

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_724	ETH/2/91	cattle	83.7	0	SAT2	XIV		
viba_470	KEN/2/84	bovine	74.8	0	SAT2	IX		
viba_139	ETH/2/2007	cattle	74.6	0	SAT2	XIII		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_193	SUD/6/77		74.2	0	SAT2	XIII		
viba_500	NIG/2/75	bovine	74.2	0	SAT2	V		
viba_752	SA/106/59		74.2	0	SAT2	I		
viba_380	RHO/1/48		73.9	0	SAT2	III		
viba_183	ZIM/14/2002	bovine	73.9	0	SAT2	I		
viba_728	GHA/2/90	bovine	73.5	0	SAT2	V		

Virus sample name:	BAR/5/2022
Sender reference:	N-00173, SER-272
Location of origin:	n/a
Country of origin:	Bahrain
Date of collection:	24/11/2022
Host species:	cattle
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	14/06/2023
Primers:	SAT2-1C445F/SAT-2B208R; FMD-3161F/FMD-4303R
Received for sequencing:	26/06/2023
Created:	29/06/2023
Last updated:	29/06/2023
VIBASys IDs: sample 53252, genome 53253, sequence viba_53254, sequencing info 53255	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_53258	BAR/6/2022	cattle	100.0	0	SAT2	XIV		
viba_53266	BAR/4/2022	cattle	100.0	0	SAT2	XIV		
viba_53262	BAR/7/2022	cattle	100.0	0	SAT2	XIV		
viba_53250	BAR/2/2022	cattle	99.4	0	SAT2	XIV		
viba_52881	OMN/1434/2023		98.6	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.4	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.3	0	SAT2	XIV		
viba_52597	IRQ/8/2023	cattle	97.7	0	SAT2	XIV		
viba_52573	IRQ/3/2022	water buffalo	97.7	0	SAT2	XIV		
viba_52569	IRQ/2/2022	water buffalo	97.7	0	SAT2	XIV		

### Most Closely Related Prototype Sequences

see <http://www.wrlfmd.org/fmdv-genome/fmd-prototype-strains>

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_724	ETH/2/91	cattle	83.7	0	SAT2	XIV		
viba_470	KEN/2/84	bovine	74.8	0	SAT2	IX		
viba_139	ETH/2/2007	cattle	74.6	0	SAT2	XIII		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_193	SUD/6/77		74.2	0	SAT2	XIII		
viba_500	NIG/2/75	bovine	74.2	0	SAT2	V		
viba_752	SA/106/59		74.2	0	SAT2	I		
viba_380	RHO/1/48		73.9	0	SAT2	III		
viba_183	ZIM/14/2002	bovine	73.9	0	SAT2	I		
viba_728	GHA/2/90	bovine	73.5	0	SAT2	V		

Virus sample name:	BAR/6/2022
Sender reference:	N-00496, SER-272
Location of origin:	n/a
Country of origin:	Bahrain
Date of collection:	24/11/2022
Host species:	cattle
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	13/06/2023
Primers:	SAT2-1C445F/SAT-2B208R; FMD-3161F/FMD-4303R
Received for sequencing:	26/06/2023
Created:	29/06/2023
Last updated:	29/06/2023
VIBASys IDs: sample 53256, genome 53257, sequence viba_53258, sequencing info 53259	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_53266	BAR/4/2022	cattle	100.0	0	SAT2	XIV		
viba_53254	BAR/5/2022	cattle	100.0	0	SAT2	XIV		
viba_53262	BAR/7/2022	cattle	100.0	0	SAT2	XIV		
viba_53250	BAR/2/2022	cattle	99.4	0	SAT2	XIV		
viba_52881	OMN/1434/2023		98.6	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.4	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.3	0	SAT2	XIV		
viba_52597	IRQ/8/2023	cattle	97.7	0	SAT2	XIV		
viba_52573	IRQ/3/2022	water buffalo	97.7	0	SAT2	XIV		
viba_52569	IRQ/2/2022	water buffalo	97.7	0	SAT2	XIV		

### Most Closely Related Prototype Sequences

see <http://www.wrlfmd.org/fmdv-genome/fmd-prototype-strains>

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_724	ETH/2/91	cattle	83.7	0	SAT2	XIV		
viba_470	KEN/2/84	bovine	74.8	0	SAT2	IX		
viba_139	ETH/2/2007	cattle	74.6	0	SAT2	XIII		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_193	SUD/6/77		74.2	0	SAT2	XIII		
viba_500	NIG/2/75	bovine	74.2	0	SAT2	V		
viba_752	SA/106/59		74.2	0	SAT2	I		
viba_380	RHO/1/48		73.9	0	SAT2	III		
viba_183	ZIM/14/2002	bovine	73.9	0	SAT2	I		
viba_728	GHA/2/90	bovine	73.5	0	SAT2	V		

Virus sample name:	BAR/7/2022
Sender reference:	N-00177, SER-272
Location of origin:	n/a
Country of origin:	Bahrain
Date of collection:	24/11/2022
Host species:	cattle
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	13/06/2023
Primers:	SAT2-1C445F/SAT-2B208R; FMD-3161F/FMD-4303R
Received for sequencing:	26/06/2023
Created:	29/06/2023
Last updated:	29/06/2023
VIBASys IDs: sample 53260, genome 53261, sequence viba_53262, sequencing info 53263	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_53258	BAR/6/2022	cattle	100.0	0	SAT2	XIV		
viba_53266	BAR/4/2022	cattle	100.0	0	SAT2	XIV		
viba_53254	BAR/5/2022	cattle	100.0	0	SAT2	XIV		
viba_53250	BAR/2/2022	cattle	99.4	0	SAT2	XIV		
viba_52881	OMN/1434/2023		98.6	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.4	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.3	0	SAT2	XIV		
viba_52597	IRQ/8/2023	cattle	97.7	0	SAT2	XIV		
viba_52573	IRQ/3/2022	water buffalo	97.7	0	SAT2	XIV		
viba_52569	IRQ/2/2022	water buffalo	97.7	0	SAT2	XIV		

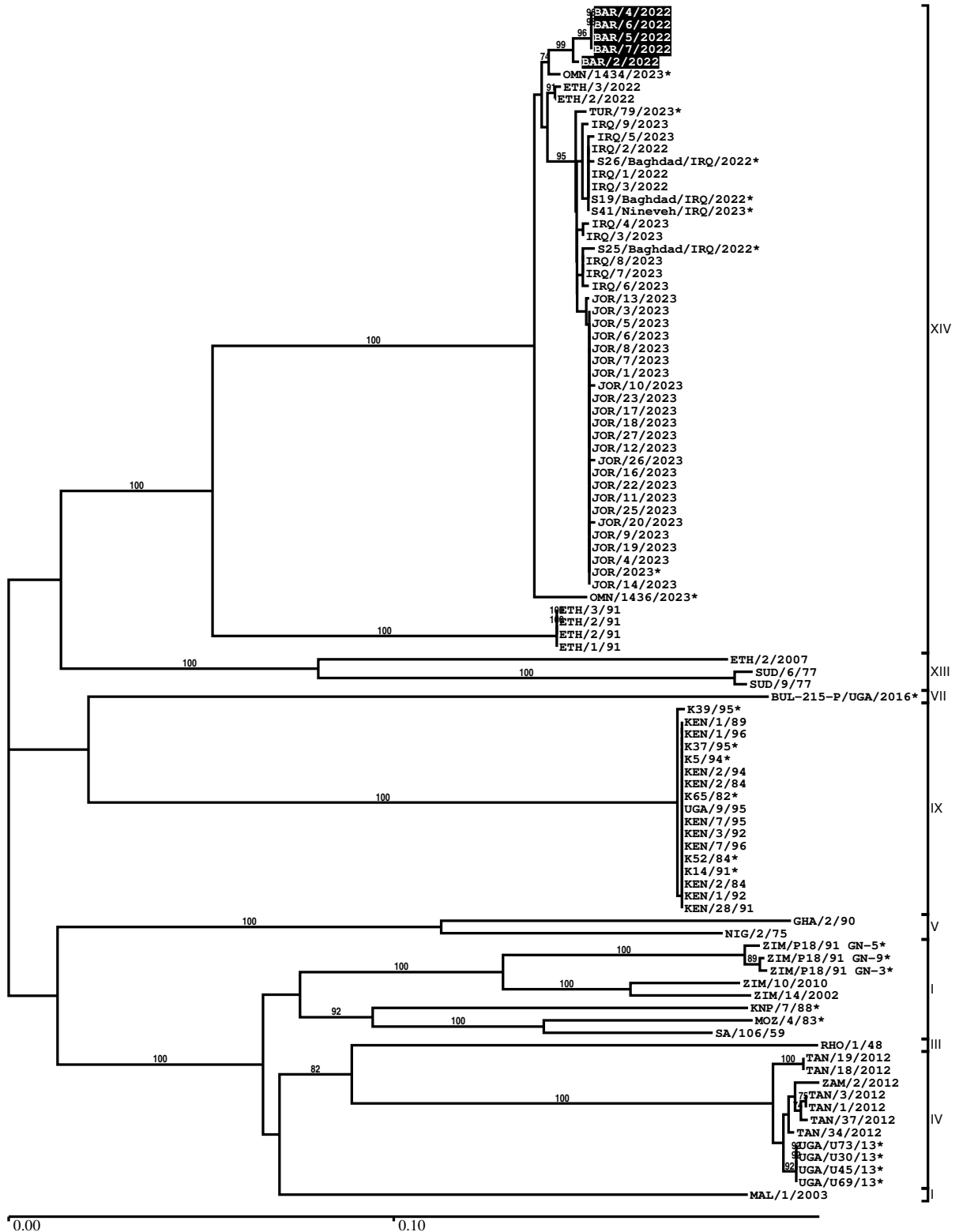
### Most Closely Related Prototype Sequences

see <http://www.wrlfmd.org/fmdv-genome/fmd-prototype-strains>

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_724	ETH/2/91	cattle	83.7	0	SAT2	XIV		
viba_470	KEN/2/84	bovine	74.8	0	SAT2	IX		
viba_139	ETH/2/2007	cattle	74.6	0	SAT2	XIII		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_193	SUD/6/77		74.2	0	SAT2	XIII		
viba_500	NIG/2/75	bovine	74.2	0	SAT2	V		
viba_752	SA/106/59		74.2	0	SAT2	I		
viba_380	RHO/1/48		73.9	0	SAT2	III		
viba_183	ZIM/14/2002	bovine	73.9	0	SAT2	I		
viba_728	GHA/2/90	bovine	73.5	0	SAT2	V		

Report on FMDV SAT2 in Bahrain in 2022

Batch: WRLFMD/2023/000040



\*, not a WRLFMD Reference Number

## Analysis Parameters

VP1 subsequence extractor:	vp1_SAT2
Query sequence set:	WRLFMD/2023/000040-Bahrain-SAT2 (5 sequences)
Sequence database set:	allseqs_SAT2 (1164 sequences)
Prototype sequence set:	!prototypes_SAT2 (25 sequences)
Number of related sequences reported:	10
Minimal VP1 subsequence match length	600
Sequence alignment method:	muscle (default parameters)
Sequence alignment length:	642
Phylogeny reconstruction method:	fdnadist, fneighbor
Number of bootstrap samples:	1000
Random seed for bootstrapping:	1
Displaying bootstrap values above:	70.0%
Number of sequences in tree capped at:	100
Number of prototype sequences in tree:	10
VIBASys version:	reflabs-1.1.2

## Sequences in the Phylogenetic Tree

All sequences in the tree are in taxonomic group FMDV/SAT2

label	accession	host(s)	lab	country	taxonomic information
BAR/4/2022	n/a	cattle	WRLFMD	Bahrain	XIV
BAR/6/2022	n/a	cattle	WRLFMD	Bahrain	XIV
BAR/5/2022	n/a	cattle	WRLFMD	Bahrain	XIV
BAR/7/2022	n/a	cattle	WRLFMD	Bahrain	XIV
BAR/2/2022	n/a	cattle	WRLFMD	Bahrain	XIV
OMN/1434/2023*	n/a	n/a	ANSES	Oman	XIV
ETH/3/2022	n/a	bovine	WRLFMD	Ethiopia	XIV
ETH/2/2022	n/a	bovine	WRLFMD	Ethiopia	XIV
TUR/79/2023*	n/a	cattle	FMDI	Turkey	XIV
IRQ/9/2023	n/a	water buffalo	WRLFMD	Iraq	XIV
IRQ/5/2023	n/a	cattle	WRLFMD	Iraq	XIV
IRQ/2/2022	n/a	water buffalo	WRLFMD	Iraq	XIV
S26/Baghdad/IRQ/2022*	n/a	water buffalo	FMDI	Iraq	XIV
IRQ/1/2022	n/a	water buffalo	WRLFMD	Iraq	XIV
IRQ/3/2022	n/a	water buffalo	WRLFMD	Iraq	XIV
S19/Baghdad/IRQ/2022*	n/a	water buffalo	FMDI	Iraq	XIV
S41/Nineveh/IRQ/2023*	n/a	cattle	FMDI	Iraq	XIV
IRQ/4/2023	n/a	cattle	WRLFMD	Iraq	XIV
IRQ/3/2023	n/a	cattle	WRLFMD	Iraq	XIV
S25/Baghdad/IRQ/2022*	n/a	water buffalo	FMDI	Iraq	XIV
IRQ/8/2023	n/a	cattle	WRLFMD	Iraq	XIV
IRQ/7/2023	n/a	cattle	WRLFMD	Iraq	XIV
IRQ/6/2023	n/a	cattle	WRLFMD	Iraq	XIV
JOR/13/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/3/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/5/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/6/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/8/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/7/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/1/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/10/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/23/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/17/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/18/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/27/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/12/2023	n/a	cattle	WRLFMD	Jordan	XIV

*continued on next page*



label	accession	host(s)	lab	country	taxonomic information
JOR/26/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/16/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/22/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/11/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/25/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/20/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/9/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/19/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/4/2023	n/a	cattle	WRLFMD	Jordan	XIV
JOR/2023*	n/a	cattle	JUST	Jordan	XIV
JOR/14/2023	n/a	cattle	WRLFMD	Jordan	XIV
OMN/1436/2023*	n/a	n/a	ANSES	Oman	XIV
ETH/3/91	FJ798160	cattle	WRLFMD	Ethiopia	XIV
ETH/2/91	AY343938	cattle	OVI	Ethiopia	XIV
ETH/2/91	FJ798159	cattle	WRLFMD	Ethiopia	XIV
ETH/1/91	FJ798158	cattle	WRLFMD	Ethiopia	XIV
ETH/2/2007	FJ798161	cattle	WRLFMD	Ethiopia	XIII
SUD/6/77	AY343939	n/a	OVI	Sudan	XIII
SUD/9/77	AY442014	n/a	OVI	Sudan	XIII
BUL-215-P/UGA/2016*	MH367452	cattle	PIADC	Uganda	VII
K39/95*	HM623696	n/a	Makerere University	Kenya	IX
KEN/1/89	AY343947	n/a	OVI	Kenya	IX
KEN/1/96	AY343960	n/a	OVI	Kenya	IX
K37/95*	HM623695	n/a	Makerere University	Kenya	IX
K5/94*	HM623692	n/a	Makerere University	Kenya	IX
KEN/2/94	AY343955	n/a	OVI	Kenya	IX
KEN/2/84	AY343941	bovine	OVI	Kenya	IX
K65/82*	HM623680	n/a	Makerere University	Kenya	IX
UGA/9/95	AY343967	n/a	OVI	Uganda	IX
KEN/7/95	AY343956	n/a	OVI	Kenya	IX
KEN/3/92	AY343951	n/a	OVI	Kenya	IX
KEN/7/96	AY343959	n/a	OVI	Kenya	IX
K52/84*	n/a	n/a	WRLFMD	Kenya	IX
K14/91*	HM623689	n/a	Makerere University	Kenya	IX
KEN/2/84	n/a	bovine	WRLFMD	Kenya	IX
KEN/1/92	AY343953	n/a	OVI	Kenya	IX
KEN/28/91	AY343948	n/a	OVI	Kenya	IX
GHA/2/90	AF479415	bovine	OVI	Ghana	V
NIG/2/75	AF367139	bovine	OVI	Nigeria	V
ZIM/P18/91 GN-5*	n/a	African buffalo	WRLFMD	Zimbabwe	I
ZIM/P18/91 GN-9*	n/a	African buffalo	WRLFMD	Zimbabwe	I
ZIM/P18/91 GN-3*	n/a	African buffalo	WRLFMD	Zimbabwe	I
ZIM/10/2010	n/a	bovine	WRLFMD	Zimbabwe	I
ZIM/14/2002	KF219689	bovine	WRLFMD	Zimbabwe	I
KNP/7/88*	AF367103	African buffalo	OVI	South Africa (KNP)	I
MOZ/4/83*	AF367101	n/a	OVI	Mozambique	I
SA/106/59	AY593848	n/a	PIADC	South Africa (SA)	I
RHO/1/48	AY593847	n/a	PIADC	Rhodesia	III
TAN/19/2012	MF592615	cattle	WRLFMD	Tanzania	IV
TAN/18/2012	MF592614	cattle	WRLFMD	Tanzania	IV
ZAM/2/2012	n/a	bovine	WRLFMD	Zambia	IV
TAN/3/2012	MF592603	cattle	WRLFMD	Tanzania	IV
TAN/1/2012	MF592602	cattle	WRLFMD	Tanzania	IV
TAN/37/2012	MF592622	cattle	WRLFMD	Tanzania	IV
TAN/34/2012	MF592620	cattle	WRLFMD	Tanzania	IV
UGA/U73/13*	KP089990	bovine	Makerere University	Uganda	IV
UGA/U30/13*	KP089986	bovine	Makerere University	Uganda	IV
UGA/U45/13*	KP089988	bovine	Makerere University	Uganda	IV

continued on next page

---

<b>label</b>	<b>accession</b>	<b>host(s)</b>	<b>lab</b>	<b>country</b>	<b>taxonomic information</b>
UGA/U69/13*	KP089989	bovine	Makerere University WRLFMD	Uganda	IV
MAL/1/2003	n/a	bovine		Malawi	I

\*, not a WRLFMD Reference Number

n/a, not available