

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

## Genotyping Report

FMDV serotype: SAT2  
Country: Iraq  
Year: 2022, 2023  
Batch: WRLMEG/2023/00006  
No. of sequences: 4  
Report date: 14th February 2023  
Report generated by: Nick Knowles  
Report checked by: Don King

This report is prepared on behalf of the Şap Enstitüsü (Ankara, Turkey) and Veterinary Authorities in Iraq and covers VP1 sequences submitted to the WRLFMD on 14 February 2023.



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:	S26/Baghdad/IRQ/2022
Sender reference:	S26
Location of origin:	Althahab Alabiadh, Baghdad Governorate
Country of origin:	Iraq
Date of collection:	05/12/2022
Host species:	water buffalo
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	n/a
Harvest date of material:	n/a
Primers:	n/a
Received for sequencing:	n/a
Created:	14/02/2023
Last updated:	14/02/2023
VIBASys IDs: sample 52457, genome 52458, sequence viba_52459, sequencing info 52460	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_52467	S19/Baghdad/IRQ/2022	water buffalo	99.8	0	SAT2	XIV		
viba_52471	S41/Nineveh/IRQ/2023	cattle	99.8	0	SAT2	XIV		
viba_52405	JOR/2023	cattle	99.2	0	SAT2	XIV		
viba_52463	S25/Baghdad/IRQ/2022	water buffalo	99.1	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.6	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.4	0	SAT2	XIV		
viba_3530	ETH/1/91	cattle	83.9	0	SAT2	XIV		
viba_3537	ETH/3/91	cattle	83.9	0	SAT2	XIV		
viba_724	ETH/2/91	cattle	83.9	0	SAT2	XIV		
viba_3533	ETH/2/91	cattle	83.9	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	75.5	0	SAT2	XIII		
viba_752	SA/106/59		75.0	0	SAT2	I		
viba_470	KEN/2/84	bovine	74.6	0	SAT2	IX		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_183	ZIM/14/2002	bovine	74.4	0	SAT2	I		
viba_500	NIG/2/75	bovine	74.4	0	SAT2	V		
viba_451	BOT/P3/98 VUM-29	African buffalo	74.0	1	SAT2	III		
viba_193	SUD/6/77		73.7	0	SAT2	XIII		
viba_380	RHO/1/48		73.1	0	SAT2	III		

Virus sample name:	S25/Baghdad/IRQ/2022
Sender reference:	S25
Location of origin:	Fudhailia, Baghdad Governorate
Country of origin:	Iraq
Date of collection:	06/12/2022
Host species:	water buffalo
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	n/a
Harvest date of material:	n/a
Primers:	n/a
Received for sequencing:	n/a
Created:	14/02/2023
Last updated:	14/02/2023
VIBASys IDs: sample 52461, genome 52462, sequence viba_52463, sequencing info 52464	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_52405	JOR/2023	cattle	99.2	0	SAT2	XIV		
viba_52467	S19/Baghdad/IRQ/2022	water buffalo	99.2	0	SAT2	XIV		
viba_52471	S41/Nineveh/IRQ/2023	cattle	99.2	0	SAT2	XIV		
viba_52459	S26/Baghdad/IRQ/2022	water buffalo	99.1	0	SAT2	XIV		
viba_51516	ETH/2/2022	bovine	98.6	0	SAT2	XIV		
viba_51520	ETH/3/2022	bovine	98.4	0	SAT2	XIV		
viba_3530	ETH/1/91	cattle	84.2	0	SAT2	XIV		
viba_3537	ETH/3/91	cattle	84.2	0	SAT2	XIV		
viba_724	ETH/2/91	cattle	84.2	0	SAT2	XIV		
viba_3533	ETH/2/91	cattle	84.2	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	84.2	0	SAT2	XIV		
viba_139	ETH/2/2007	cattle	75.5	0	SAT2	XIII		
viba_470	KEN/2/84	bovine	75.1	0	SAT2	IX		
viba_500	NIG/2/75	bovine	75.0	0	SAT2	V		
viba_111	MAL/1/2003	bovine	74.3	0	SAT2	I		
viba_183	ZIM/14/2002	bovine	74.2	0	SAT2	I		
viba_752	SA/106/59		73.7	0	SAT2	I		
viba_728	GHA/2/90	bovine	73.7	0	SAT2	V		
viba_193	SUD/6/77		73.5	0	SAT2	XIII		
viba_567	ZIM/7/83	bovine	73.5	0	SAT2	II		

Virus sample name:	S19/Baghdad/IRQ/2022
Sender reference:	S19
Location of origin:	Fudhailia, Baghdad Governorate
Country of origin:	Iraq
Date of collection:	15/12/2022
Host species:	water buffalo
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	n/a
Harvest date of material:	n/a
Primers:	n/a
Received for sequencing:	n/a
Created:	14/02/2023
Last updated:	14/02/2023
VIBASys IDs: sample 52465, genome 52466, sequence viba_52467, sequencing info 52468	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_52471	S41/Nineveh/IRQ/2023	cattle	100.0	0	SAT2	XIV		
viba_52459	S26/Baghdad/IRQ/2022	water buffalo	99.8	0	SAT2	XIV		
viba_52405	JOR/2023	cattle	99.4	0	SAT2	XIV		
viba_52463	S25/Baghdad/IRQ/2022	water buffalo	99.2	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_3530	ETH/1/91	cattle	83.9	0	SAT2	XIV		
viba_3537	ETH/3/91	cattle	83.9	0	SAT2	XIV		
viba_724	ETH/2/91	cattle	83.9	0	SAT2	XIV		
viba_3533	ETH/2/91	cattle	83.9	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	75.5	0	SAT2	XIII		
viba_752	SA/106/59		75.0	0	SAT2	I		
viba_470	KEN/2/84	bovine	74.6	0	SAT2	IX		
viba_500	NIG/2/75	bovine	74.5	0	SAT2	V		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_183	ZIM/14/2002	bovine	74.2	0	SAT2	I		
viba_451	BOT/P3/98 VUM-29	African buffalo	74.0	1	SAT2	III		
viba_193	SUD/6/77		73.9	0	SAT2	XIII		
viba_728	GHA/2/90	bovine	73.2	0	SAT2	V		

Virus sample name:	S41/Nineveh/IRQ/2023
Sender reference:	S41
Location of origin:	Damarji, Nineveh Governorate
Country of origin:	Iraq
Date of collection:	18/01/2023
Host species:	cattle
Serotype:	SAT2
Topotype:	XIV
Lineage:	
Sublineage:	
Sequence length:	642
Ambiguities:	0
Material submitted for sequencing:	n/a
Harvest date of material:	n/a
Primers:	n/a
Received for sequencing:	n/a
Created:	14/02/2023
Last updated:	14/02/2023
VIBASys IDs: sample 52469, genome 52470, sequence viba_52471, sequencing info 52472	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_52467	S19/Baghdad/IRQ/2022	water buffalo	100.0	0	SAT2	XIV		
viba_52459	S26/Baghdad/IRQ/2022	water buffalo	99.8	0	SAT2	XIV		
viba_52405	JOR/2023	cattle	99.4	0	SAT2	XIV		
viba_52463	S25/Baghdad/IRQ/2022	water buffalo	99.2	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_3530	ETH/1/91	cattle	83.9	0	SAT2	XIV		
viba_3537	ETH/3/91	cattle	83.9	0	SAT2	XIV		
viba_724	ETH/2/91	cattle	83.9	0	SAT2	XIV		
viba_3533	ETH/2/91	cattle	83.9	0	SAT2	XIV		

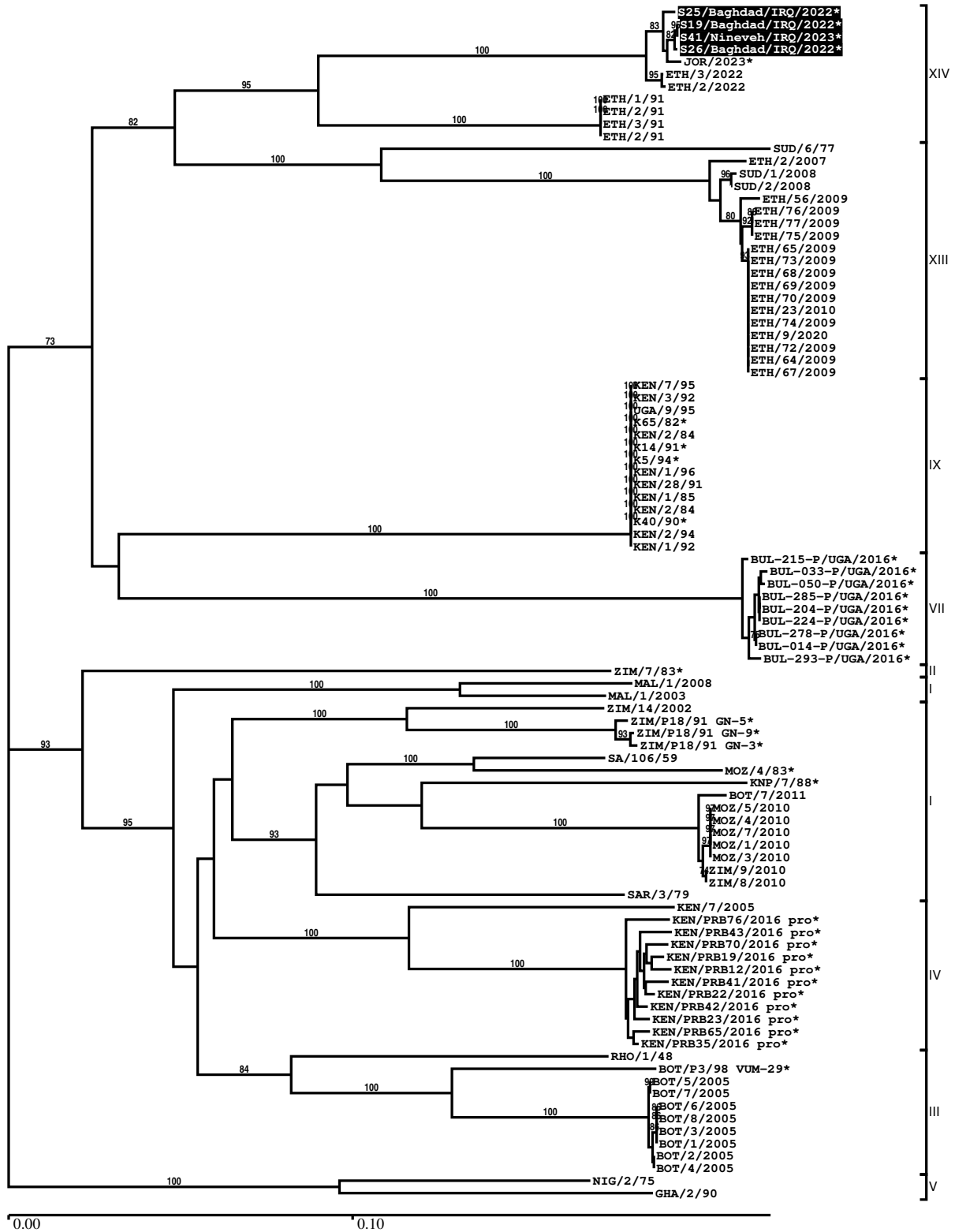
### Most Closely Related Prototype Sequences

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	75.5	0	SAT2	XIII		
viba_752	SA/106/59		75.0	0	SAT2	I		
viba_470	KEN/2/84	bovine	74.6	0	SAT2	IX		
viba_500	NIG/2/75	bovine	74.5	0	SAT2	V		
viba_111	MAL/1/2003	bovine	74.4	0	SAT2	I		
viba_183	ZIM/14/2002	bovine	74.2	0	SAT2	I		
viba_451	BOT/P3/98 VUM-29	African buffalo	74.0	1	SAT2	III		
viba_193	SUD/6/77		73.9	0	SAT2	XIII		
viba_728	GHA/2/90	bovine	73.2	0	SAT2	V		

Report on FMDV SAT2 in Iraq in 2022, 2023

Batch: WRLMEG/2023/00006



\*, not a WRLFMD Reference Number

## Analysis Parameters

VP1 subsequence extractor:	vp1_SAT2
Query sequence set:	WRLMEG/2023/00006-Iraq-SAT2 (4 sequences)
Sequence database set:	allseqs_SAT2 (1123 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:	12
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
S25/Baghdad/IRQ/2022*	n/a	water buffalo	FMDI	Iraq	XIV
S19/Baghdad/IRQ/2022*	n/a	water buffalo	FMDI	Iraq	XIV
S41/Nineveh/IRQ/2023*	n/a	cattle	FMDI	Iraq	XIV
S26/Baghdad/IRQ/2022*	n/a	water buffalo	FMDI	Iraq	XIV
JOR/2023*	n/a	cattle	JUST	Jordan	XIV
ETH/3/2022	n/a	bovine	WRLFMD	Ethiopia	XIV
ETH/2/2022	n/a	bovine	WRLFMD	Ethiopia	XIV
ETH/1/91	FJ798158	cattle	WRLFMD	Ethiopia	XIV
ETH/2/91	AY343938	cattle	OVI	Ethiopia	XIV
ETH/3/91	FJ798160	cattle	WRLFMD	Ethiopia	XIV
ETH/2/91	FJ798159	cattle	WRLFMD	Ethiopia	XIV
SUD/6/77	AY343939	n/a	OVI	Sudan	XIII
ETH/2/2007	FJ798161	cattle	WRLFMD	Ethiopia	XIII
SUD/1/2008	GU566072	cattle	WRLFMD	Sudan	XIII
SUD/2/2008	GU566073	cattle	WRLFMD	Sudan	XIII
ETH/56/2009	KF112943	cattle	WRLFMD	Ethiopia	XIII
ETH/76/2009	KF112954	cattle	WRLFMD	Ethiopia	XIII
ETH/77/2009	KF112955	cattle	WRLFMD	Ethiopia	XIII
ETH/75/2009	KF112953	cattle	WRLFMD	Ethiopia	XIII
ETH/65/2009	KF112945	cattle	WRLFMD	Ethiopia	XIII
ETH/73/2009	KF112951	cattle	WRLFMD	Ethiopia	XIII
ETH/68/2009	KF112947	cattle	WRLFMD	Ethiopia	XIII
ETH/69/2009	KF112948	cattle	WRLFMD	Ethiopia	XIII
ETH/70/2009	KF112949	cattle	WRLFMD	Ethiopia	XIII
ETH/23/2010	MN987543	porcine	WRLFMD	Ethiopia	XIII
ETH/74/2009	KF112952	cattle	WRLFMD	Ethiopia	XIII
ETH/9/2020	n/a	bovine	WRLFMD	Ethiopia	XIII
ETH/72/2009	KF112950	porcine	WRLFMD	Ethiopia	XIII
ETH/64/2009	KF112944	cattle	WRLFMD	Ethiopia	XIII
ETH/67/2009	KF112946	cattle	WRLFMD	Ethiopia	XIII
KEN/7/95	AY343956	n/a	OVI	Kenya	IX
KEN/3/92	AY343951	n/a	OVI	Kenya	IX
UGA/9/95	AY343967	n/a	OVI	Uganda	IX
K65/82*	HM623680	n/a	Makerere University	Kenya	IX
KEN/2/84	n/a	bovine	WRLFMD	Kenya	IX

*continued on next page*

label	accession	host(s)	lab	country	taxonomic information
K14/91*	HM623689	n/a	Makerere University	Kenya	IX
K5/94*	HM623692	n/a	Makerere University	Kenya	IX
KEN/1/96	AY343960	n/a	OVI	Kenya	IX
KEN/28/91	AY343948	n/a	OVI	Kenya	IX
KEN/1/85	AY343942	n/a	OVI	Kenya	IX
KEN/2/84	AY343941	bovine	OVI	Kenya	IX
K40/90*	HM623688	n/a	Makerere University	Kenya	IX
KEN/2/94	AY343955	n/a	OVI	Kenya	IX
KEN/1/92	AY343953	n/a	OVI	Kenya	IX
BUL-215-P/UGA/2016*	MH367452	cattle	PIADC	Uganda	VII
BUL-033-P/UGA/2016*	MH367450	cattle	PIADC	Uganda	VII
BUL-050-P/UGA/2016*	MH367446	cattle	PIADC	Uganda	VII
BUL-285-P/UGA/2016*	MH367460	cattle	PIADC	Uganda	VII
BUL-204-P/UGA/2016*	MH367453	cattle	PIADC	Uganda	VII
BUL-224-P/UGA/2016*	MH367447	cattle	PIADC	Uganda	VII
BUL-278-P/UGA/2016*	MH367464	cattle	PIADC	Uganda	VII
BUL-014-P/UGA/2016*	MH367448	cattle	PIADC	Uganda	VII
BUL-293-P/UGA/2016*	MH367454	cattle	PIADC	Uganda	VII
ZIM/7/83*	AF136607	bovine	OVI	Zimbabwe	II
MAL/1/2008	n/a	n/a	WRLFMD	Malawi	I
MAL/1/2003	n/a	bovine	WRLFMD	Malawi	I
ZIM/14/2002	KF219689	bovine	WRLFMD	Zimbabwe	I
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
SA/106/59	AY593848	n/a	PIADC	South Africa	I
MOZ/4/83*	AF367101	n/a	OVI	Mozambique	I
KNP/7/88*	AF367103	African buffalo	OVI	South Africa (KNP)	I
BOT/7/2011	n/a	cattle	WRLFMD	Botswana	I
MOZ/5/2010	n/a	cattle	WRLFMD	Mozambique	I
MOZ/4/2010	n/a	cattle	WRLFMD	Mozambique	I
MOZ/7/2010	n/a	n/a	WRLFMD	Mozambique	I
MOZ/1/2010	n/a	cattle	WRLFMD	Mozambique	I
MOZ/3/2010	n/a	cattle	WRLFMD	Mozambique	I
ZIM/9/2010	n/a	bovine	WRLFMD	Zimbabwe	I
ZIM/8/2010	n/a	bovine	WRLFMD	Zimbabwe	I
SAR/3/79	KF112966	cattle	WRLFMD	Republic of South Africa	I
KEN/7/2005	n/a	cattle	WRLFMD	Kenya	IV
KEN/PRB76/2016 pro*	MH882656	African buffalo	PIADC	Kenya	IV
KEN/PRB43/2016 pro*	MH882632	African buffalo	PIADC	Kenya	IV
KEN/PRB70/2016 pro*	MH882652	African buffalo	PIADC	Kenya	IV
KEN/PRB19/2016 pro*	MH882621	African buffalo	PIADC	Kenya	IV
KEN/PRB12/2016 pro*	MH882616	African buffalo	PIADC	Kenya	IV
KEN/PRB41/2016 pro*	MH882630	African buffalo	PIADC	Kenya	IV
KEN/PRB22/2016 pro*	MH882623	African buffalo	PIADC	Kenya	IV
KEN/PRB42/2016 pro*	MH882631	African buffalo	PIADC	Kenya	IV
KEN/PRB23/2016 pro*	MH882624	African buffalo	PIADC	Kenya	IV
KEN/PRB65/2016 pro*	MH882647	African buffalo	PIADC	Kenya	IV
KEN/PRB35/2016 pro*	MH882626	African buffalo	PIADC	Kenya	IV
RHO/1/48	AY593847	n/a	PIADC	Rhodesia	III
BOT/P3/98 VUM-29*	AF367124	African buffalo	OVI	Botswana	III
BOT/5/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/7/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/6/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/8/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/3/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/1/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/2/2005	n/a	cattle	WRLFMD	Botswana	III
BOT/4/2005	n/a	cattle	WRLFMD	Botswana	III
NIG/2/75	AF367139	bovine	OVI	Nigeria	V
GHA/2/90	AF479415	bovine	OVI	Ghana	V



\*, not a WRLFMD Reference Number  
n/a, not available