

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

## Genotyping Report

FMDV serotype: O  
Country: Pakistan  
Year: 2022, 2023  
Batch: WRLFMD/2023/000071  
No. of sequences: 11  
Report date: 28th September 2023  
Report generated by: Nick Knowles  
Report checked by: Jemma Wadsworth



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

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Virus sample name:	PAK/5/2022
Sender reference:	NVL-05
Location of origin:	Jan Muhammad Road, Quetta, Balochistan Province
Country of origin:	Pakistan
Date of collection:	07/02/2022
Host species:	water buffalo
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	31/08/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54119, genome 54120, sequence viba_54121, sequencing info 54122	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_50341	PAK/12/2021	water buffalo	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_53904	ICFMD/IND/214/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50333	PAK/8/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		91.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_650	IRN/8/2005	ovine	89.9	0	O	ME-SA	PanAsia-2	
viba_766	IRN/31/2009	cattle	89.9	0	O	ME-SA	PanAsia-2	FAR-09
viba_491	TUR/257/2008		89.4	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	89.3	0	O	ME-SA	PanAsia	
viba_293	BHU/3/2009	cattle	89.1	0	O	ME-SA	Ind-2001	d
viba_505	TUR/264/2009		89.1	0	O	ME-SA	PanAsia-2	SAN-09
viba_850	NEP/1/2015	cattle	89.0	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	89.0	0	O	ME-SA	Srl-97	
viba_666	IRN/18/2010	cattle	88.9	0	O	ME-SA	PanAsia-2	BAL-09

Virus sample name:	PAK/9/2022
Sender reference:	NVL-09
Location of origin:	Rasani Road, Quetta, Balochistan Province
Country of origin:	Pakistan
Date of collection:	02/03/2022
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	31/08/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54123, genome 54124, sequence viba_54125, sequencing info 54126	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_50341	PAK/12/2021	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_53904	ICFMD/IND/214/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		92.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_766	IRN/31/2009	cattle	90.1	0	O	ME-SA	PanAsia-2	FAR-09
viba_650	IRN/8/2005	ovine	90.0	0	O	ME-SA	PanAsia-2	
viba_491	TUR/257/2008		89.6	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	89.4	0	O	ME-SA	PanAsia	
viba_293	BHU/3/2009	cattle	89.3	0	O	ME-SA	Ind-2001	d
viba_505	TUR/264/2009		89.3	0	O	ME-SA	PanAsia-2	SAN-09
viba_850	NEP/1/2015	cattle	89.1	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	89.1	0	O	ME-SA	Srl-97	
viba_666	IRN/18/2010	cattle	89.1	0	O	ME-SA	PanAsia-2	BAL-09

Virus sample name:	PAK/10/2022
Sender reference:	NVL-25
Location of origin:	Islamabad Capital Territory
Country of origin:	Pakistan
Date of collection:	02/03/2022
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	31/08/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023

VIBASys IDs: sample 54127, genome 54128, sequence viba\_54129, sequencing info 54130

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54145	PAK/11/2022	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	99.5	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	99.5	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	99.5	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		91.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_650	IRN/8/2005	ovine	89.6	0	O	ME-SA	PanAsia-2	
viba_766	IRN/31/2009	cattle	89.6	0	O	ME-SA	PanAsia-2	FAR-09
viba_491	TUR/257/2008		89.1	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	89.0	0	O	ME-SA	PanAsia	
viba_293	BHU/3/2009	cattle	88.8	0	O	ME-SA	Ind-2001	d
viba_505	TUR/264/2009		88.8	0	O	ME-SA	PanAsia-2	SAN-09
viba_9021	LAO/2/2006	cattle	88.7	0	O	ME-SA	PanAsia	
viba_850	NEP/1/2015	cattle	88.7	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	88.7	0	O	ME-SA	Srl-97	

Virus sample name:	PAK/11/2022
Sender reference:	NVL-26
Location of origin:	Islamabad Capital Territory
Country of origin:	Pakistan
Date of collection:	02/03/2022
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	31/08/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54143, genome 54144, sequence viba_54145, sequencing info 54146	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54129	PAK/10/2022	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	99.5	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	99.5	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	99.5	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		91.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_650	IRN/8/2005	ovine	89.6	0	O	ME-SA	PanAsia-2	
viba_766	IRN/31/2009	cattle	89.6	0	O	ME-SA	PanAsia-2	FAR-09
viba_491	TUR/257/2008		89.1	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	89.0	0	O	ME-SA	PanAsia	
viba_293	BHU/3/2009	cattle	88.8	0	O	ME-SA	Ind-2001	d
viba_505	TUR/264/2009		88.8	0	O	ME-SA	PanAsia-2	SAN-09
viba_9021	LAO/2/2006	cattle	88.7	0	O	ME-SA	PanAsia	
viba_850	NEP/1/2015	cattle	88.7	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	88.7	0	O	ME-SA	Srl-97	

Virus sample name:	PAK/12/2022
Sender reference:	NVL-10
Location of origin:	Samali Salam Kili, Quetta, Balochistan Province
Country of origin:	Pakistan
Date of collection:	05/03/2022
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	31/08/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54131, genome 54132, sequence viba_54133, sequencing info 54134	

#### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54141	PAK/21/2022	water buffalo	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50333	PAK/8/2021	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50329	PAK/7/2021	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10

#### 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_719	IRN/88/2009		92.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_766	IRN/31/2009	cattle	90.1	0	O	ME-SA	PanAsia-2	FAR-09
viba_650	IRN/8/2005	ovine	90.0	0	O	ME-SA	PanAsia-2	
viba_491	TUR/257/2008		89.6	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	89.4	0	O	ME-SA	PanAsia	
viba_666	IRN/18/2010	cattle	89.1	0	O	ME-SA	PanAsia-2	BAL-09
viba_293	BHU/3/2009	cattle	89.0	0	O	ME-SA	Ind-2001	d
viba_505	TUR/264/2009		88.9	0	O	ME-SA	PanAsia-2	SAN-09
viba_850	NEP/1/2015	cattle	88.8	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	88.8	0	O	ME-SA	Srl-97	

Virus sample name:	PAK/18/2022
Sender reference:	NVL-29
Location of origin:	Sargodha, Punjab Province
Country of origin:	Pakistan
Date of collection:	25/03/2022
Host species:	water buffalo
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	31/08/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54135, genome 54136, sequence viba_54137, sequencing info 54138	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_50385	PAK/40/2021	cattle	97.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_50357	PAK/16/2021	cattle	97.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	97.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	97.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	97.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	97.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	97.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	97.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	97.6	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		91.2	0	O	ME-SA	PanAsia-2	ANT-10
viba_650	IRN/8/2005	ovine	89.6	0	O	ME-SA	PanAsia-2	
viba_766	IRN/31/2009	cattle	89.3	0	O	ME-SA	PanAsia-2	FAR-09
viba_850	NEP/1/2015	cattle	89.0	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	89.0	0	O	ME-SA	Srl-97	
viba_491	TUR/257/2008		88.8	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	88.7	0	O	ME-SA	PanAsia	
viba_293	BHU/3/2009	cattle	88.5	0	O	ME-SA	Ind-2001	d
viba_860	IRN/6/2015	cattle	88.5	0	O	ME-SA	PanAsia-2	QOM-15
viba_505	TUR/264/2009		88.5	0	O	ME-SA	PanAsia-2	SAN-09

Virus sample name:	PAK/21/2022
Sender reference:	NVL-16
Location of origin:	Jan Muhammad Road, Quetta, Balochistan Province
Country of origin:	Pakistan
Date of collection:	19/04/2022
Host species:	water buffalo
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK2
Harvest date of material:	05/09/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54139, genome 54140, sequence viba_54141, sequencing info 54142	

#### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_50333	PAK/8/2021	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_54133	PAK/12/2022	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50329	PAK/7/2021	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.8	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10

#### 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_719	IRN/88/2009		92.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_766	IRN/31/2009	cattle	90.1	0	O	ME-SA	PanAsia-2	FAR-09
viba_650	IRN/8/2005	ovine	90.0	0	O	ME-SA	PanAsia-2	
viba_491	TUR/257/2008		89.6	0	O	ME-SA	PanAsia-2	TER-08
viba_285	UKG/35/2001	porcine	89.4	0	O	ME-SA	PanAsia	
viba_666	IRN/18/2010	cattle	89.1	0	O	ME-SA	PanAsia-2	BAL-09
viba_293	BHU/3/2009	cattle	89.0	0	O	ME-SA	Ind-2001	d
viba_505	TUR/264/2009		88.9	0	O	ME-SA	PanAsia-2	SAN-09
viba_850	NEP/1/2015	cattle	88.8	1	O	ME-SA	PanAsia-2	KAT-15
viba_27877	SRL/2/97	bovine	88.8	0	O	ME-SA	Srl-97	



Virus sample name:	PAK/1/2023
Sender reference:	NVL-21
Location of origin:	Rahim Yar Khan, Punjab Province
Country of origin:	Pakistan
Date of collection:	03/01/2023
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	06/09/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023

VIBASys IDs: sample 54147, genome 54148, sequence viba\_54149, sequencing info 54150

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54153	PAK/2/2023	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	97.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	97.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	97.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	97.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	97.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	97.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	97.2	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	97.2	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	97.2	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		91.3	0	O	ME-SA	PanAsia-2	ANT-10
viba_650	IRN/8/2005	ovine	89.6	0	O	ME-SA	PanAsia-2	
viba_27877	SRL/2/97	bovine	89.6	0	O	ME-SA	Srl-97	
viba_766	IRN/31/2009	cattle	89.6	0	O	ME-SA	PanAsia-2	FAR-09
viba_285	UKG/35/2001	porcine	89.4	0	O	ME-SA	PanAsia	
viba_850	NEP/1/2015	cattle	89.3	1	O	ME-SA	PanAsia-2	KAT-15
viba_293	BHU/3/2009	cattle	89.0	0	O	ME-SA	Ind-2001	d
viba_491	TUR/257/2008		88.8	0	O	ME-SA	PanAsia-2	TER-08
viba_9021	LAO/2/2006	cattle	88.6	0	O	ME-SA	PanAsia	
viba_354	PAK/16/2010	cattle	88.5	0	O	ME-SA	PanAsia-2	PUN-10

Virus sample name:	PAK/2/2023
Sender reference:	NVL-22
Location of origin:	Rahim Yar Khan, Punjab Province
Country of origin:	Pakistan
Date of collection:	03/01/2023
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	06/09/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54151, genome 54152, sequence viba_54153, sequencing info 54154	

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54149	PAK/1/2023	cattle	99.7	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	97.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	97.5	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	97.5	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	97.5	0	O	ME-SA	PanAsia-2	ANT-10

### 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_719	IRN/88/2009		91.6	0	O	ME-SA	PanAsia-2	ANT-10
viba_650	IRN/8/2005	ovine	89.9	0	O	ME-SA	PanAsia-2	
viba_27877	SRL/2/97	bovine	89.9	0	O	ME-SA	Srl-97	
viba_285	UKG/35/2001	porcine	89.7	0	O	ME-SA	PanAsia	
viba_766	IRN/31/2009	cattle	89.7	0	O	ME-SA	PanAsia-2	FAR-09
viba_850	NEP/1/2015	cattle	89.4	1	O	ME-SA	PanAsia-2	KAT-15
viba_293	BHU/3/2009	cattle	89.3	0	O	ME-SA	Ind-2001	d
viba_491	TUR/257/2008		89.1	0	O	ME-SA	PanAsia-2	TER-08
viba_9021	LAO/2/2006	cattle	88.9	0	O	ME-SA	PanAsia	
viba_505	TUR/264/2009		88.8	0	O	ME-SA	PanAsia-2	SAN-09

Virus sample name:	PAK/7/2023
Sender reference:	NVL-37
Location of origin:	Attock, Punjab Province
Country of origin:	Pakistan
Date of collection:	10/02/2023
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK2
Harvest date of material:	08/09/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023
VIBASys IDs: sample 54155, genome 54156, sequence viba_54157, sequencing info 54158	

#### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54161	PAK/9/2023	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	98.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	98.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	98.9	0	O	ME-SA	PanAsia-2	ANT-10

#### 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_719	IRN/88/2009		91.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_766	IRN/31/2009	cattle	89.0	0	O	ME-SA	PanAsia-2	FAR-09
viba_650	IRN/8/2005	ovine	88.9	0	O	ME-SA	PanAsia-2	
viba_850	NEP/1/2015	cattle	88.7	1	O	ME-SA	PanAsia-2	KAT-15
viba_293	BHU/3/2009	cattle	88.5	0	O	ME-SA	Ind-2001	d
viba_491	TUR/257/2008		88.5	0	O	ME-SA	PanAsia-2	TER-08
viba_505	TUR/264/2009		88.5	0	O	ME-SA	PanAsia-2	SAN-09
viba_285	UKG/35/2001	porcine	88.3	0	O	ME-SA	PanAsia	
viba_27877	SRL/2/97	bovine	88.3	0	O	ME-SA	Sri-97	
viba_666	IRN/18/2010	cattle	88.3	0	O	ME-SA	PanAsia-2	BAL-09

Virus sample name:	PAK/9/2023
Sender reference:	NVL-39
Location of origin:	Attock, Punjab Province
Country of origin:	Pakistan
Date of collection:	22/02/2023
Host species:	cattle
Serotype:	O
Topotype:	ME-SA
Lineage:	PanAsia-2
Sublineage:	ANT-10
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	WRL-LFBK1
Harvest date of material:	06/09/2023
Primers:	O-1C244F & O-1C272F/EUR-2B52R; FMD-3161F/FMD-4303R
Received for sequencing:	18/09/2023
Created:	27/09/2023
Last updated:	27/09/2023

VIBASys IDs: sample 54159, genome 54160, sequence viba\_54161, sequencing info 54162

### Most Closely Related Sequences

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_54157	PAK/7/2023	cattle	100.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_50341	PAK/12/2021	water buffalo	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50317	PAK/3/2021	cattle	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50954	UAE/2/2021	Arabian oryx	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50950	UAE/1/2021	Arabian oryx	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50325	PAK/6/2021	cattle	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_54121	PAK/5/2022	water buffalo	99.1	0	O	ME-SA	PanAsia-2	ANT-10
viba_50385	PAK/40/2021	cattle	98.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_50373	PAK/23/2021	cattle	98.9	0	O	ME-SA	PanAsia-2	ANT-10
viba_54141	PAK/21/2022	water buffalo	98.9	0	O	ME-SA	PanAsia-2	ANT-10

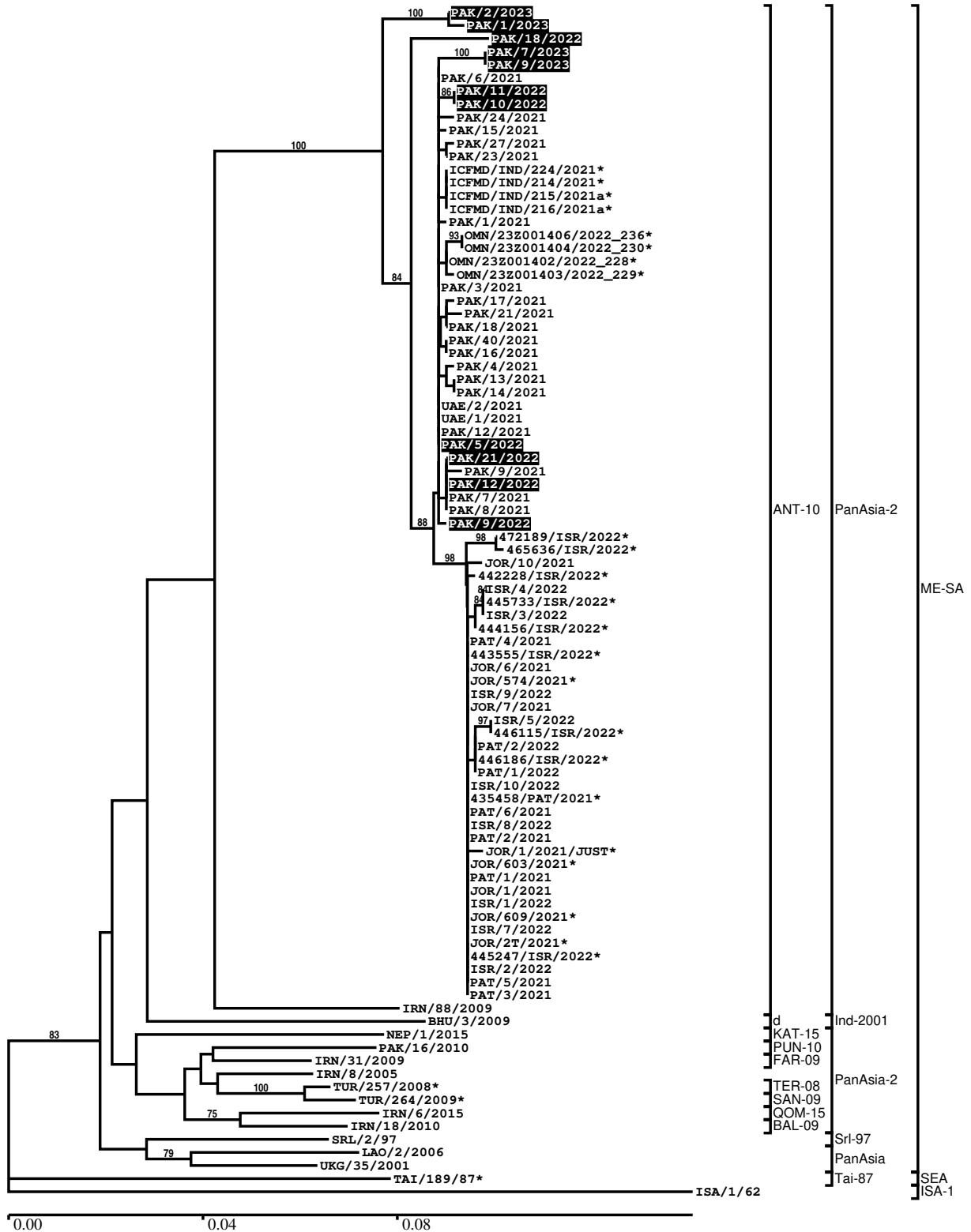
### Most Closely Related Prototype Sequences

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

sequence	virus name	Host	% Id.	# Ambig.	serotype	topotype	lineage	sublineage
viba_719	IRN/88/2009		91.0	0	O	ME-SA	PanAsia-2	ANT-10
viba_766	IRN/31/2009	cattle	89.0	0	O	ME-SA	PanAsia-2	FAR-09
viba_650	IRN/8/2005	ovine	88.9	0	O	ME-SA	PanAsia-2	
viba_850	NEP/1/2015	cattle	88.7	1	O	ME-SA	PanAsia-2	KAT-15
viba_293	BHU/3/2009	cattle	88.5	0	O	ME-SA	Ind-2001	d
viba_491	TUR/257/2008		88.5	0	O	ME-SA	PanAsia-2	TER-08
viba_505	TUR/264/2009		88.5	0	O	ME-SA	PanAsia-2	SAN-09
viba_285	UKG/35/2001	porcine	88.3	0	O	ME-SA	PanAsia	
viba_27877	SRL/2/97	bovine	88.3	0	O	ME-SA	Srl-97	
viba_666	IRN/18/2010	cattle	88.3	0	O	ME-SA	PanAsia-2	BAL-09

Report on FMDV O in Pakistan in 2022, 2023

Batch: WRLFMD/2023/000071



\*, not a WRLFMD Reference Number

## Analysis Parameters

VP1 subsequence extractor:	vp1_O
Query sequence set:	WRLFMD/2023/000071-Pakistan-O (11 sequences)
Sequence database set:	allseqs_O (6137 sequences)
Prototype sequence set:	!prototypes_O (58 sequences)
Number of related sequences reported:	10
Minimal VP1 subsequence match length	600
Sequence alignment method:	muscle (default parameters)
Sequence alignment length:	636
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:	13
VIBASys version:	reflabs-1.1.2

## Sequences in the Phylogenetic Tree

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

label	accession	host(s)	lab	country	taxonomic information
PAK/2/2023	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/1/2023	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/18/2022	n/a	water buffalo	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/7/2023	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/9/2023	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/6/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/11/2022	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/10/2022	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/24/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/15/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/27/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/23/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
ICFMD/IND/224/2021*	<a href="#">OQ847003</a>	cattle	ICAR-DFMD	India	ME-SA/PanAsia-2/ANT-10
ICFMD/IND/214/2021*	<a href="#">OQ847002</a>	cattle	ICAR-DFMD	India	ME-SA/PanAsia-2/ANT-10
ICFMD/IND/215/2021a*	<a href="#">OQ847008</a>	cattle	ICAR-DFMD	India	ME-SA/PanAsia-2/ANT-10
ICFMD/IND/216/2021a*	<a href="#">OQ847009</a>	cattle	ICAR-DFMD	India	ME-SA/PanAsia-2/ANT-10
PAK/1/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
OMN/23Z001406/2022_236*	n/a	cattle	ANSES	Oman	ME-SA/PanAsia-2/ANT-10
OMN/23Z001404/2022_230*	n/a	cattle	ANSES	Oman	ME-SA/PanAsia-2/ANT-10
OMN/23Z001402/2022_228*	n/a	cattle	ANSES	Oman	ME-SA/PanAsia-2/ANT-10
OMN/23Z001403/2022_229*	n/a	cattle	ANSES	Oman	ME-SA/PanAsia-2/ANT-10
PAK/3/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/17/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/21/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/18/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/40/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/16/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/4/2021	n/a	water buffalo	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/13/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/14/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
UAE/2/2021	n/a	Arabian oryx	WRLFMD	United Arab Emirates	ME-SA/PanAsia-2/ANT-10
UAE/1/2021	n/a	Arabian oryx	WRLFMD	United Arab Emirates	ME-SA/PanAsia-2/ANT-10
PAK/12/2021	n/a	water buffalo	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/5/2022	n/a	water buffalo	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10

*continued on next page*

label	accession	host(s)	lab	country	taxonomic information
PAK/21/2022	n/a	water buffalo	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/9/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/12/2022	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/7/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/8/2021	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
PAK/9/2022	n/a	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/ANT-10
472189/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
465636/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
JOR/10/2021	n/a	sheep	WRLFMD	Jordan	ME-SA/PanAsia-2/ANT-10
442228/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
ISR/4/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
445733/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
ISR/3/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
444156/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
PAT/4/2021	n/a	sheep	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
443555/ISR/2022*	n/a	sheep	KVI	Israel	ME-SA/PanAsia-2/ANT-10
JOR/6/2021	n/a	cattle	WRLFMD	Jordan	ME-SA/PanAsia-2/ANT-10
JOR/574/2021*	n/a	cattle	JUST	Jordan	ME-SA/PanAsia-2/ANT-10
ISR/9/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
JOR/7/2021	n/a	cattle	WRLFMD	Jordan	ME-SA/PanAsia-2/ANT-10
ISR/5/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
446115/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
PAT/2/2022	n/a	sheep	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
446186/ISR/2022*	n/a	sheep	KVI	Israel	ME-SA/PanAsia-2/ANT-10
PAT/1/2022	n/a	sheep	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
ISR/10/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
435458/PAT/2021*	n/a	sheep	KVI	Palestinian AT	ME-SA/PanAsia-2/ANT-10
PAT/6/2021	n/a	goat	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
ISR/8/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
PAT/2/2021	n/a	cattle	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
JOR/1/2021/JUST*	n/a	cattle	JUST	Jordan	ME-SA/PanAsia-2/ANT-10
JOR/603/2021*	n/a	cattle	JUST	Jordan	ME-SA/PanAsia-2/ANT-10
PAT/1/2021	n/a	cattle	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
JOR/1/2021	n/a	cattle	WRLFMD	Jordan	ME-SA/PanAsia-2/ANT-10
ISR/1/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
JOR/609/2021*	n/a	cattle	JUST	Jordan	ME-SA/PanAsia-2/ANT-10
ISR/7/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
JOR/2T/2021*	n/a	sheep	JUST	Jordan	ME-SA/PanAsia-2/ANT-10
445247/ISR/2022*	n/a	cattle	KVI	Israel	ME-SA/PanAsia-2/ANT-10
ISR/2/2022	n/a	cattle	WRLFMD	Israel	ME-SA/PanAsia-2/ANT-10
PAT/5/2021	n/a	goat	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
PAT/3/2021	n/a	sheep	WRLFMD	Palestinian AT	ME-SA/PanAsia-2/ANT-10
IRN/88/2009	KY091282	n/a	WRLFMD	Iran	ME-SA/PanAsia-2/ANT-10
BHU/3/2009	KM921814	cattle	WRLFMD	Bhutan	ME-SA/Ind-2001/d
NEP/1/2015	MN276045	cattle	WRLFMD	Nepal	ME-SA/PanAsia-2/KAT-15
PAK/16/2010	KY091285	cattle	WRLFMD	Pakistan	ME-SA/PanAsia-2/PUN-10
IRN/31/2009	KY091284	cattle	WRLFMD	Iran	ME-SA/PanAsia-2/FAR-09
IRN/8/2005	KY091281	ovine	WRLFMD	Iran	ME-SA/PanAsia-2
TUR/257/2008*	n/a	n/a	FMDI-Ankara	Turkey	ME-SA/PanAsia-2/TER-08
TUR/264/2009*	n/a	n/a	FMDI-Ankara	Turkey	ME-SA/PanAsia-2/SAN-09
IRN/6/2015	MN276044	cattle	WRLFMD	Iran	ME-SA/PanAsia-2/QOM-15
IRN/18/2010	KY091283	cattle	WRLFMD	Iran	ME-SA/PanAsia-2/BAL-09
SRL/2/97	AJ303531	bovine	WRLFMD	Sri Lanka	ME-SA/Srl-97
LAO/2/2006	EU667451	cattle	WRLFMD	Laos	ME-SA/PanAsia
UKG/35/2001	AJ539141	porcine	PIADC	United Kingdom	ME-SA/PanAsia
TAI/189/87*	KY091288	bovine	TRRL	Thailand	SEA/Tai-87
ISA/1/62	AJ303500	n/a	WRLFMD	Indonesia	ISA-1

\*, not a WRLFMD Reference Number

n/a, not available