



VETERINARIA

RIVISTA DI
SANITÀ PUBBLICA
VETERINARIA

ITALIANA



SUPPLEMENTARY INFORMATION

Table S1. The nucleotide identity results of complete genome sequence of bovine coronavirus (BCoV) Kirikkale strain that are retrieved from NCBI BLASTN.

The coronavirus strains that are compared to the BCoV Kirikkale strain (OQ161705)	GenBank accession numbers	Nucleotide identity
Bovine coronavirus/ Respiratory/ France	MG757138.1 - MG757142.1	97.76-97.85%
Bovine coronavirus/ Enteric/ France	KX982264.1	97.74%
Bovine coronavirus/ Respiratory/ Ireland	ON792941.1 - ON792964.1	97.55-97.67%
Bovine coronavirus/ Enteric/ USA	AF391541.1, EF424615.1, EF424616.1, EF424619.1, FJ938064.1, MH043953.1, MH043954.1, NC_003045.1, OP037381.1-OP037383.1, OP037421.1, OP037422.1, OP037424.1-OP037426.1, OP037431.1, OP037433.1	96.90-97.18%
Bovine coronavirus/ Respiratory/ USA	AF391542.1, EF424617.1, EF424618.1, EF424620.1, FJ938065.1, FJ938066.1, OP037365.1-OP037371.1, OP037373.1, OP037375.1, OP037376.1, OP037386.1, OP037387.1, OP037417.1, OP037419.1	96.91-97.22%
Bovine coronavirus/ Enteric/ Japan (LC494169.1)	LC494138.1-LC494140.1, LC494160.1-LC494166.1, LC494168.1, LC494169.1, LC494172.1, LC494174.1	96.92-97.00%
Bovine coronavirus/ Respiratory/ Japan	LC494130.1, LC494167.1	96.95-97.00%
Human coronavirus/ Enteric/ Germany	FJ415324.1	96.93%
Human coronavirus/ Enteric/ USA	FJ938067.1	96.86%
Sambar deer coronavirus/ Enteric/ USA	FJ425188.1 - FJ425190.1	97.25-97.28%
Waterbuck coronavirus/ Enteric/ USA	FJ425184.1 - FJ425186.1	97.26-97.27%
White-tailed deer coronavirus/ Enteric/ USA	FJ425187.1	97.22%
Sable antelope coronavirus/ Enteric/ USA	EF424621.1	97.12%
Bovine coronavirus isolate Alpaca/ Enteric/ USA	DQ915164.2	97.00%
Bovine coronavirus DB2/ Enteric/ USA	DQ811784.2	97.30%
Bovine coronavirus Kakegawa/ Enteric/ Japan	AB354579.1	97.09%
Bovine coronavirus Mebus/ Enteric/ USA	U00735.2	96.95%

Table S2. The amino acid substitutions in the structural and non-structural proteins of the bovine coronavirus Kirikkale strain and comparison with the protein sequences of other selected coronaviruses. Amino acids that are identical to the bovine coronavirus Mebus strain are indicated by dot. The bovine coronavirus Kirikkale strain is from the present study and indicated in bold.

HEMAGGLUTININ ESTERASE	2	5	16	19	20	22	49	66	72	108	109	114	124	147	150	158	173	181	182
AAA66393 AAA66394 AAA66395 Bovine coronavirus Mebus	F	L	S	F	D	P	N	D	S	Y	H	T	Q	N	Y	S	A	F	G
Bovine coronavirus strain Kirikkale	V	P	.	.	.	L	T	.	.	.	.	.	.	.	.	.	.	.	.
AVI15032 ICSA-pool-EN Bovine coronavirus	.	P	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.
AVI15021 ICSA16-LBA Bovine coronavirus	.	P	.	Y	-	.	T	.	.	.	.	.	.	.	.	.	.	.	.
ARD05998 BCoV 2014 13 Bovine coronavirus	.	P	.	.	.	.	T	.	.	H	.	.	.	.	.	P	.	.	.
UTM74756 ABGEB0-66 Bovine coronavirus	.	P	.	.	.	.	T	.	.	.	.	I	.	.	.	P	.	L	.
UTM74866 ABGEB0-128 Bovine coronavirus	.	P	.	.	.	.	T	.	.	.	.	.	.	.	H	P	.	L	.
UTM74926 ABGEDB-205 Bovine coronavirus	.	P	.	.	.	.	T	.	.	.	.	.	.	.	.	P	.	L	.
ABG89283 Bovine coronavirus DB2	.	P	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ACJ67011 Sambar deer coronavirus US/OH-WD388-TC/1994	.	P	I	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.
ACJ66968 Waterbuck coronavirus US/OH-WD358/1994	.	P	I	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.
ACJ66975 White-tailed deer coronavirus US/OH-WD470/1994	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
ACT11018 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	V	.	.
NP 150076 Bovine coronavirus BCoV-ENT	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
ABP38240 Bovine coronavirus E-AH65	.	P	.	.	.	.	T	G	A	.	.	.	.	.	.	.	.	.	.
ABP38304 Sable antelope coronavirus US/OH1/2003	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
ABI94000 Bovine coronavirus isolate Alpaca	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
AVZ61118 4-17-08 Bovine coronavirus	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
UVC32823 Bovine coronavirus MARC/2013/01/R	.	P	.	.	E	.	T	G	.	.	.	.	.	S	.	.	.	.	.
BBM61326 Bovine coronavirus TCG-12	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
BBM61346 Bovine coronavirus TCG-14	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	.
UVC33495 Bovine coronavirus VDC/2018/06/E	.	P	.	.	.	.	T	G	.	.	.	.	.	.	.	.	.	.	R
BAF75630 Bovine coronavirus Kakegawa	.	.	C	.	.	.	.	.	.	.	Y	.	H	.	.	.	.	.	.
ACJ35485 Human enteric coronavirus 4408	.	P	.	.	E	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ACT11029 Human enteric coronavirus strain 4408	.	P	.	.	E	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	191	201	214	237	239	253	297	298	305	350	357	359	362	367	376	380	382	392	415
AAA66393 AAA66394 AAA66395 Bovine coronavirus Mebus	D	I	N	S	E	V	R	Q	V	Q	D	V	V	S	D	P	V	L	V
Bovine coronavirus strain Kirikkale	.	N	.	A	Q	A	.	.	A	.	.	.	I	P	.	S	.	I	.

AVI15032 ICSA-pool-EN Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	I	P	.	.	.	I	.
AVI15021 ICSA16-LBA Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	I	P	.	.	.	I	.
ARD05998 BCoV 2014 13 Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	I	.	P	.	.	.	I	.
UTM74756 ABGEB0-66 Bovine coronavirus	.	.	S	A	Q	.	.	.	.	.	.	.	.	I	P	.	.	.	I	.
UTM74866 ABGEB0-128 Bovine coronavirus	.	.	S	A	Q	.	.	.	.	.	.	.	.	I	P	.	.	.	I	.
UTM74926 ABGEDB-205 Bovine coronavirus	.	.	S	A	Q	.	.	.	.	L	.	.	.	I	P	.	.	.	I	.
ABG89283 Bovine coronavirus DB2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ACJ67011 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ACJ66968 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ACJ66975 White-tailed deer coronavirus US/OH-WD470/1994	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ACT11018 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	.	.	.	.	.	M	.	.	.	.	.	.	.	P	.	.	.	I	E
NP 150076 Bovine coronavirus BCoV-ENT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ABP38240 Bovine coronavirus E-AH65	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ABP38304 Sable antelope coronavirus US/OH1/2003	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
ABI94000 Bovine coronavirus isolate Alpaca	.	.	.	.	.	.	T	.	.	.	.	.	.	.	P	.	.	.	I	.
AVZ61118 4-17-08 Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
UVC32823 Bovine coronavirus MARC/2013/01/R	.	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
BBM61326 Bovine coronavirus TCG-12	.	.	.	.	.	.	.	L	.	.	.	.	.	.	P	N	.	A	I	.
BBM61346 Bovine coronavirus TCG-14	.	.	.	.	.	.	T	L	.	.	.	.	.	.	P	N	.	A	I	.
UVC33495 Bovine coronavirus VDC/2018/06/E	E	.	.	.	.	.	.	.	.	.	.	.	.	.	P	.	.	.	I	.
BAF75630 Bovine coronavirus Kakegawa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ACJ35485 Human enteric coronavirus 4408	.	.	.	.	.	.	.	.	.	.	.	N	.	.	P	.	.	.	.	.
ACT11029 Human enteric coronavirus strain 4408	.	.	.	.	.	.	.	.	.	.	.	N	.	.	P	.	.	.	.	.
ENVELOPE	33	53	72																	
AAA42914 Bovine coronavirus Mebus	V	G	N																	
OQ161705 Bovine coronavirus strain Kirikkale	.	V	.																	
AVI15037 Bovine coronavirus ICSA-pool-EN	.	V	.																	
AVI15026 Bovine coronavirus ICSA16-LBA	.	V	.																	
ARD06003 Bovine coronavirus BCoV 2014 13	.	V	.																	
UTM74930 Bovine coronavirus ABGEDB-205	.	V	.																	
ABG89286 Bovine coronavirus DB2	.	V	.																	
ACJ67016 Sambar deer coronavirus US/OH-WD388-TC/1994	.	V	.																	
ACJ66969 Waterbuck coronavirus US/OH-WD358/1994	.	V	.																	
ACJ66980 White-tailed deer coronavirus US/OH-WD470/1994	.	V	.																	
ACT11022 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	V	.																	

NP 150081 Bovine coronavirus BCoV-ENT	.	V	.																
ABP38230 Bovine coronavirus E-AH65	.	V	.																
ABP38300 Sable antelope coronavirus US/OH1/2003	.	V	.																
AVZ61123 Bovine coronavirus 4-17-08	.	V	.																
UVC32828 Bovine coronavirus MARC/2013/01/R	.	V	Y																
BBM61331 Bovine coronavirus TCG-12	.	V	.																
BBM61351 Bovine coronavirus TCG-14	.	V	.																
UVC33500 Bovine coronavirus VDC/2018/06/E	.	V	.																
BAF75635 Bovine coronavirus Kakegawa	L	V	.																
ACJ35487 Human enteric coronavirus 4408	.	V	.																
ACT11034 Human enteric coronavirus strain 4408	.	V	.																
NUCLEOCAPSID	15	49	53	55	77	92	146	162	196	218	220	249	308	354	386	423	435	441	
AAA66397 AAA66398 Bovine coronavirus Mebus	F	A	L	S	E	V	F	L	P	N	G	T	P	N	M	S	K	Y	
Bovine coronavirus strain Kirikkale	S	V	Q	.	.	.	.	.	.	.	.	.	.	S	.	.	R	F	
AVI15039 Bovine coronavirus ICSA-pool-EN	S	V	Q	.	.	.	.	.	.	.	.	.	.	S	.	.	R	F	
AVI15028 Bovine coronavirus ICSA16-LBA	S	V	Q	.	.	.	.	.	.	.	.	.	.	S	.	.	R	F	
ARD06005 Bovine coronavirus BCoV 2014 13	S	V	Q	.	.	.	.	.	.	.	.	.	.	S	.	.	R	F	
UTM74762 Bovine coronavirus ABGEB0-66	S	V	Q	.	.	I	.	.	.	.	.	.	.	S	.	.	R	F	
UTM74872 Bovine coronavirus ABGEB0-128	S	V	Q	.	.	I	.	F	.	.	.	.	.	S	.	.	R	F	
UTM74932 Bovine coronavirus ABGEDB-205	S	V	Q	.	.	I	.	.	.	T	.	.	.	S	.	.	R	F	
ABG89284 Bovine coronavirus DB2	S	.	Q	.	.	.	.	.	.	.	.	.	.	.	.	.	.	F	
ACJ67018 Sambar deer coronavirus US/OH-WD388-TC/1994	S	.	Q	.	.	.	.	.	.	.	.	.	.	.	.	.	.	F	
ACJ66964 Waterbuck coronavirus US/OH-WD358/1994	S	.	Q	P	.	.	.	.	.	.	.	.	.	.	.	.	.	F	
ACJ66983 White-tailed deer coronavirus US/OH-WD470/1994	S	.	Q	.	.	.	Y	.	.	.	.	.	.	.	T	I	.	F	
ACT11024 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	S	.	Q	.	.	.	Y	.	L	.	.	.	S	.	T	I	.	F	
NP 150083 Bovine coronavirus BCoV-ENT	S	.	Q	.	.	.	Y	.	.	.	.	A	.	.	T	I	.	F	
ABP38232 Bovine coronavirus E-AH65	S	.	Q	.	.	.	.	.	.	.	.	.	.	.	T	I	.	F	
ABP38302 Sable antelope coronavirus US/OH1/2003	S	.	Q	.	.	.	.	.	.	.	.	.	.	.	T	I	.	F	
ABI94003 Bovine coronavirus isolate Alpaca	S	.	Q	.	.	.	Y	.	.	.	.	.	.	.	T	I	.	F	
AVZ61125 Bovine coronavirus 4-17-08	S	.	Q	.	.	.	.	.	.	.	.	.	.	.	T	I	.	F	
UVC32822 Bovine coronavirus MARC/2013/01/R	S	.	Q	.	.	.	.	.	.	.	.	.	.	.	T	I	.	F	
BBM61333 Bovine coronavirus TCG-12	S	V	Q	.	.	.	Y	.	.	.	.	.	.	.	T	I	.	F	
BBM61353 Bovine coronavirus TCG-14	S	V	Q	.	.	.	Y	.	.	.	.	.	.	.	T	I	.	F	
UVC33494 Bovine coronavirus VDC/2018/06/E	S	.	Q	.	.	I	.	.	.	.	.	.	.	.	T	I	.	F	
BAF75637 Bovine coronavirus Kakegawa	S	.	Q	.	D	.	.	.	.	.	.	.	.	.	.	.	.	.	

ACJ35489 Human enteric coronavirus 4408	S	.	Q	.	.	.	.	.	.	.	D	.	.	.	.	.	.	.
ACT11036 Human enteric coronavirus strain 4408	S	.	Q	.	.	.	.	.	.	.	.	?	.	.	?	.	.	.
MEMBRANE	5	38	57	58	126	175	183	221	229									
AAK29779 AAA66396 Bovine coronavirus Mebus	T	I	I	I	C	T	L	M	N									
Bovine coronavirus strain Kirikkale	.	V	.	L	.	.	.	.	.									
AVI15038 Bovine coronavirus ICSA-pool-EN	.	V	.	L	.	.	.	.	.									
AVI15027 Bovine coronavirus ICSA16-LBA	.	V	.	L	.	.	.	.	.									
ARD06004 Bovine coronavirus BCoV 2014 13	P	V	.	L	.	.	.	.	.									
UTM74761 Bovine coronavirus ABGEB0-66	.	V	.	L	.	.	.	.	.									
UTM74871 Bovine coronavirus ABGEB0-128	.	V	.	L	.	.	.	.	.									
UTM74931 Bovine coronavirus ABGEDB-205	.	V	.	L	.	.	.	.	.									
ABG89282 Bovine coronavirus DB2	.	V	.	.	.	.	.	.	.									
ACJ67017 Sambar deer coronavirus US/OH-WD388-TC/1994	.	V	.	.	.	.	.	.	.									
ACJ66966 Waterbuck coronavirus US/OH-WD358/1994	.	V	.	.	.	.	.	.	.									
ACJ66984 White-tailed deer coronavirus US/OH-WD470/1994	.	V	.	.	.	.	.	L	.									
ACT11023 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	V	.	.	.	.	.	L	.									
NP 150082 Bovine coronavirus BCoV-ENT	.	V	V	.	.	.	.	L	.									
ABP38238 Bovine coronavirus E-AH65	.	V	.	.	.	.	.	L	.									
ABP38305 Sable antelope coronavirus US/OH1/2003	.	V	.	.	.	.	.	L	.									
ABI94002 Bovine coronavirus isolate Alpaca	.	V	.	.	.	.	.	L	.									
AVZ61124 Bovine coronavirus 4-17-08	.	V	.	.	S	S	.	L	.									
UVC32825 Bovine coronavirus MARC/2013/01/R	.	V	.	.	S	S	.	L	.									
BBM61332 Bovine coronavirus TCG-12	.	V	.	.	.	.	.	L	.									
BBM61352 Bovine coronavirus TCG-14	.	V	.	.	.	.	.	L	.									
UVC33497 Bovine coronavirus VDC/2018/06/E	.	V	.	.	A	.	.	L	H									
BAF75636 Bovine coronavirus Kakegawa	.	.	.	.	.	.	F	.	I									
ACJ35488 Human enteric coronavirus 4408	.	V	.	L	.	.	.	.	.									
SPIKE	11	33	40	88	100	109	113	115	143	147	151	157	169	173	177	179	248	253
AAA66399 AAA42910 Bovine coronavirus Mebus	M	A	I	R	I	N	I	K	H	L	L	I	H	H	G	K	L	S
Bovine coronavirus strain Kirikkale Spike Complete	T	V	T	T	T	K	T	N	Y	F	I	V	N	N	S	Q	M	N
AVI15033 Bovine coronavirus ICSA-pool-EN	T	V	T	T	T	.	.	N	.	F	I	V	N	N	.	Q	M	N
AVI15022 Bovine coronavirus ICSA16-LBA	T	V	T	T	T	.	.	N	.	F	I	V	N	N	.	Q	M	N
ARD05999 Bovine coronavirus BCoV 2014 13	T	V	T	T	T	.	.	N	.	F	I	V	N	N	.	Q	M	N
UTM74757 Bovine coronavirus ABGEB0-66	T	V	T	T	T	.	.	N	.	F	I	V	N	N	.	Q	M	N
UTM74867 Bovine coronavirus ABGEB0-128	T	V	T	T	T	.	T	N	.	F	I	V	N	N	.	Q	M	N

UTM74927 Bovine coronavirus ABGEDB-205	T	V	T	T	T	.	.	N	.	F	I	V	N	N	.	Q	M	N
ABG89288 Bovine coronavirus DB2	T	V	T	T	T	.	.	N	.	.	.	.	N	.	.	Q	M	D
ACJ67012 Sambar deer coronavirus US/OH-WD388-TC/1994	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
ACJ66971 Waterbuck coronavirus US/OH-WD358/1994	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
ACJ66977 White-tailed deer coronavirus US/OH-WD470/1994	T	V	T	T	T	.	V	D	.	F	.	.	N	N	.	Q	M	N
ACT11019 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	T	V	T	T	T	.	V	N	.	F	.	.	N	N	.	Q	M	N
NP 150077 Bovine coronavirus BCoV-ENT	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
ABP38236 Bovine coronavirus E-AH65	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
ABP38306 Sable antelope coronavirus US/OH1/2003	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
ABI93999 Bovine coronavirus isolate Alpaca	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	R	M	N
AVZ61119 Bovine coronavirus 4-17-08	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
UVC32821 Bovine coronavirus MARC/2013/01/R	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
BBM61327 Bovine coronavirus TCG-12	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	R	M	N
BBM61347 Bovine coronavirus TCG-14	T	V	T	T	T	.	.	D	.	.	.	.	N	N	.	Q	M	N
UVC33493 Bovine coronavirus VDC/2018/06/E	T	V	T	T	T	.	.	N	.	.	.	V	N	N	.	Q	M	N
BAF75631 Bovine coronavirus Kakegawa	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	R	.	Y
ACJ35486 Human enteric coronavirus 4408	.	V	T	T	T	.	T	N	.	.	.	.	N	.	.	R	M	N
ACT11030 Human enteric coronavirus strain 4408	.	V	T	T	T	.	T	N	.	.	.	.	N	.	.	R	M	N
QGW57585 Bovine coronavirus Turkiye	.	V	T	T	T	.	.	N	.	F	I	V	N	N	.	Q	M	N
	256	458	465	470	484	499	501	509	525	531	543	549	572	609	646	651	668	684
AAA66399 AAA42910 Bovine coronavirus Mebus	M	F	V	H	S	N	P	N	H	N	S	-	Y	D	F	A	L	S
Bovine coronavirus strain Kirikkale Spike Complete	L	S	A	D	T	S	S	T	Y	D	A	K	H	G	I	T	F	R
AVI15033 Bovine coronavirus ICSA-pool-EN	L	S	A	D	T	S	S	T	Y	D	A	K	H	G	.	.	.	.
AVI15022 Bovine coronavirus ICSA16-LBA	L	S	A	D	T	S	S	T	Y	D	A	K	H	G	.	.	.	.
ARD05999 Bovine coronavirus BCoV 2014 13	L	S	A	D	T	S	F	.	Y	D	A	-	H	G	.	.	.	.
UTM74757 Bovine coronavirus ABGEB0-66	L	.	A	D	T	S	S	T	Y	D	A	-	H	G	.	.	.	.
UTM74867 Bovine coronavirus ABGEB0-128	L	.	A	D	T	S	S	T	Y	D	A	-	H	G	.	.	.	.
UTM74927 Bovine coronavirus ABGEDB-205	L	.	A	D	T	S	S	T	Y	D	A	-	H	G	.	.	.	.
ABG89288 Bovine coronavirus DB2	.	S	A	A	T	.	.	T	.	D	A	-	.	.	.	.	.	.
ACJ67012 Sambar deer coronavirus US/OH-WD388-TC/1994	L	S	A	D	T	S	S	.	.	D	A	-	H	.	.	.	.	.
ACJ66971 Waterbuck coronavirus US/OH-WD358/1994	L	S	A	D	T	S	S	.	.	D	A	-	H	.	.	.	.	.
ACJ66977 White-tailed deer coronavirus US/OH-WD470/1994	L	S	A	D	T	S	S	.	.	D	A	-	.	.	.	.	.	.
ACT11019 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	L	S	A	D	T	S	S	.	.	.	A	-	.	.	.	.	.	.
NP 150077 Bovine coronavirus BCoV-ENT	L	S	A	D	T	.	.	T	.	D	A	-	H	.	.	.	.	.
ABP38236 Bovine coronavirus E-AH65	L	S	A	D	T	S	S	.	.	D	A	-	.	.	.	.	.	.

ABP38306 Sable antelope coronavirus US/OH1/2003	L	S	A	D	T	S	S	H	.	D	A	-	H	.	.	.	.	.
ABI93999 Bovine coronavirus isolate Alpaca	L	S	A	D	T	.	.	T	.	.	A	-	.	.	.	.	.	.
AVZ61119 Bovine coronavirus 4-17-08	L	S	A	D	T	.	.	T	Y	D	A	-	H	.	.	.	.	.
UVC32821 Bovine coronavirus MARC/2013/01/R	L	S	A	D	T	.	.	T	Y	D	A	-	H	.	.	.	.	.
BBM61327 Bovine coronavirus TCG-12	L	S	A	D	T	S	S	.	.	D	A	-	H	.	.	.	.	.
BBM61347 Bovine coronavirus TCG-14	L	S	A	D	T	S	S	.	.	D	A	-	H	.	.	.	.	.
UVC33493 Bovine coronavirus VDC/2018/06/E	L	S	A	D	T	S	F	.	Y	D	A	-	H	.	.	.	.	.
BAF75631 Bovine coronavirus Kakegawa	.	S	.	.	T	.	.	.	.	D	.	-	.	.	.	.	.	.
ACJ35486 Human enteric coronavirus 4408	.	S	A	D	T	.	.	.	.	.	.	-	H	G	.	.	.	.
ACT11030 Human enteric coronavirus strain 4408	.	S	A	D	T	.	.	.	.	.	.	-	H	G	.	.	.	.
QGW57585 Bovine coronavirus Türkiye	.	.	A	D	T	S	S	T	Y	D	A	-	H	G	.	.	.	.
	686	687	692	694	727	779	784	786	806	829	889	890	892	893	955	956	957	958
AAA66399 AAA42910 Bovine coronavirus Mebus	Y	S	A	F	Y	T	T	N	E	A	N	F	V	D	-	-	-	-
Bovine coronavirus strain Kirikkale Spike Complete	E	K	S	L	H	N	S	T	D	T	K	C	S	E	?	L	G	T
AVI15033 Bovine coronavirus ICSA-pool-EN	.	.	.	.	.	N	.	K	D	T	K	.	.	.	-	-	-	-
AVI15022 Bovine coronavirus ICSA16-LBA	.	.	.	.	.	N	.	K	D	T	K	.	.	.	-	-	-	-
ARD05999 Bovine coronavirus BCoV 2014 13	.	.	.	.	.	N	.	K	D	T	K	.	.	.	-	-	-	-
UTM74757 Bovine coronavirus ABGEB0-66	.	.	.	.	.	N	.	K	D	T	K	.	.	.	-	-	-	-
UTM74867 Bovine coronavirus ABGEB0-128	.	.	.	.	.	N	.	K	D	T	K	.	.	.	-	-	-	-
UTM74927 Bovine coronavirus ABGEDB-205	.	.	.	.	.	N	.	K	D	T	K	.	.	.	-	-	-	-
ABG89288 Bovine coronavirus DB2	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ACJ67012 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ACJ66971 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ACJ66977 White-tailed deer coronavirus US/OH-WD470/1994	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ACT11019 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
NP 150077 Bovine coronavirus BCoV-ENT	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ABP38236 Bovine coronavirus E-AH65	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ABP38306 Sable antelope coronavirus US/OH1/2003	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
ABI93999 Bovine coronavirus isolate Alpaca	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
AVZ61119 Bovine coronavirus 4-17-08	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
UVC32821 Bovine coronavirus MARC/2013/01/R	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
BBM61327 Bovine coronavirus TCG-12	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
BBM61347 Bovine coronavirus TCG-14	.	T	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
UVC33493 Bovine coronavirus VDC/2018/06/E	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-
BAF75631 Bovine coronavirus Kakegawa	.	.	.	.	.	N	.	.	.	.	.	.	.	.	-	-	-	-

ACJ35486 Human enteric coronavirus 4408	.	.	.	.	.	N	.	.	.	.	.	.	.	.	.	-	-	-	-
ACT11030 Human enteric coronavirus strain 4408	.	.	.	.	.	N	.	.	.	.	.	.	.	.	.	-	-	-	-
QGW57585 Bovine coronavirus Turkiye	.	.	.	.	.	N	.	.	.	.	.	.	.	.	.	-	-	-	-
	959	960	961	962	963	964	966	969	970	971	972	975	976	978	997	1001	1029	1039	
AAA66399 AAA42910 Bovine coronavirus Mebus	-	-	-	-	N	G	K	-	-	-	-	L	L	V	L	V	L	D	
Bovine coronavirus strain Kirikkale Spike Complete	?	F	V	C	K	V	M	?	F	?	?	A	S	E	W	A	F	G	
AVI15033 Bovine coronavirus ICSA-pool-EN	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
AVI15022 Bovine coronavirus ICSA16-LBA	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ARD05999 Bovine coronavirus BCoV 2014 13	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
UTM74757 Bovine coronavirus ABGEB0-66	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
UTM74867 Bovine coronavirus ABGEB0-128	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
UTM74927 Bovine coronavirus ABGEDB-205	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ABG89288 Bovine coronavirus DB2	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ACJ67012 Sambar deer coronavirus US/OH-WD388-TC/1994	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ACJ66971 Waterbuck coronavirus US/OH-WD358/1994	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ACJ66977 White-tailed deer coronavirus US/OH-WD470/1994	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ACT11019 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
NP 150077 Bovine coronavirus BCoV-ENT	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ABP38236 Bovine coronavirus E-AH65	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ABP38306 Sable antelope coronavirus US/OH1/2003	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ABI93999 Bovine coronavirus isolate Alpaca	-	-	-	-	.	.	.	-	-	-	-	.	.	D	W	A	.	G	
AVZ61119 Bovine coronavirus 4-17-08	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
UVC32821 Bovine coronavirus MARC/2013/01/R	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
BBM61327 Bovine coronavirus TCG-12	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
BBM61347 Bovine coronavirus TCG-14	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
UVC33493 Bovine coronavirus VDC/2018/06/E	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
BAF75631 Bovine coronavirus Kakegawa	-	-	-	-	.	.	.	-	-	-	-	.	.	.	W	A	.	.	
ACJ35486 Human enteric coronavirus 4408	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
ACT11030 Human enteric coronavirus strain 4408	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
QGW57585 Bovine coronavirus Turkiye	-	-	-	-	.	.	.	-	-	-	-	.	.	E	W	A	.	G	
	1078	1084	1108	1113	1115	1254	1273	1354											
AAA66399 AAA42910 Bovine coronavirus Mebus	G	L	L	V	V	H	D	I											
Bovine coronavirus strain Kirikkale Spike Complete	P	S	I	A	F	P	N	K											
AVI15033 Bovine coronavirus ICSA-pool-EN	.	.	.	A	.	P	N	K											
AVI15022 Bovine coronavirus ICSA16-LBA	.	.	.	A	.	P	N	K											

ARD05999 Bovine coronavirus BCoV 2014 13	.	.	.	A	.	P	N	K
UTM74757 Bovine coronavirus ABGEB0-66	.	.	.	A	.	P	N	K
UTM74867 Bovine coronavirus ABGEB0-128	.	.	.	A	.	P	N	K
UTM74927 Bovine coronavirus ABGEDB-205	.	.	.	A	.	P	N	K
ABG89288 Bovine coronavirus DB2	.	.	.	A	.	P	H	K
ACJ67012 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	A	.	P	.	K
ACJ66971 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	A	.	P	.	K
ACJ66977 White-tailed deer coronavirus US/OH-WD470/1994	.	.	.	A	.	P	.	K
ACT11019 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	.	.	A	.	P	.	K
NP 150077 Bovine coronavirus BCoV-ENT	.	.	.	A	.	P	.	K
ABP38236 Bovine coronavirus E-AH65	.	.	.	A	.	P	.	K
ABP38306 Sable antelope coronavirus US/OH1/2003	.	.	.	A	.	P	.	K
ABI93999 Bovine coronavirus isolate Alpaca	.	.	.	A	.	P	.	K
AVZ61119 Bovine coronavirus 4-17-08	.	.	.	A	.	P	.	K
UVC32821 Bovine coronavirus MARC/2013/01/R	.	.	.	A	.	P	.	K
BBM61327 Bovine coronavirus TCG-12	.	.	F	A	.	P	.	K
BBM61347 Bovine coronavirus TCG-14	.	.	.	A	.	P	.	K
UVC33493 Bovine coronavirus VDC/2018/06/E	.	.	.	A	.	P	Y	K
BAF75631 Bovine coronavirus Kakegawa	.	.	.	A	.	.	.	.
ACJ35486 Human enteric coronavirus 4408	.	.	.	A	.	P	.	K
ACT11030 Human enteric coronavirus strain 4408	.	.	.	A	.	P	.	K
QGW57585 Bovine coronavirus Türkiye	.	.	.	A	.	P	N	K

NS2	21	37	43	48	51	52	55	59	84	86	89	107	125	137	148	151
AAP20417 Mebus Bovine coronavirus	E	E	I	H	L	A	D	E	K	D	L	D	K	D	F	S
Bovine coronavirus strain Kirikkale	Q	.	.	Q	R	N	E	Z	.	?	H	.	.	.	S	.
AVI15031 ICSA-pool-EN Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
AVI15020 ICSA16-LBA Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
ARD05997 BCoV 2014 13 Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
UTM74755 ABGEB0-66 Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	N
UTM74865 ABGEB0-128 Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	N
UTM74925 ABGEDB-205 Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	E	.	.	N
ABG89287 DB2 Bovine coronavirus DB2	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
ACJ67010 Sambar deer coronavirus US/OH-WD388-TC/1994	Q	V	.	.	.	.	.	.	.	E	H	.	.	.	.	.
ACJ66972 Waterbuck coronavirus US/OH-WD358/1994	Q	V	.	.	.	.	.	.	.	E	H	.	.	.	.	.
ACJ66982 White-tailed deer coronavirus US/OH-WD470/1994	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.

ACT11017 bovine/US/OH-440-TC/1996	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
NP 150075 BCoV-ENT Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	N
ABP38231 Bovine coronavirus E-AH65	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
ABP38301 Sable antelope coronavirus US/OH1/2003	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
ABI94001 Bovine coronavirus isolate Alpaca	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
AVZ61117 4-17-08 Bovine coronavirus	Q	.	.	.	.	V	.	.	.	E	H	.	.	.	.	.
UVC32824 MARC/2013/01/R Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
BBM61325 TCG-12 Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	E	.	.	.	.
BBM61345 TCG-14 Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	E	.	.	.	.
UVC33496 VDC/2018/06/E Bovine coronavirus	Q	.	.	.	.	.	.	.	.	E	H	.	.	.	.	.
BAF75629 Kakegawa Bovine coronavirus	.	.	T	.	.	.	.	.	.	.	H	.	.	.	.	.
ACJ35484 Human enteric coronavirus 4408	.	.	.	.	.	.	V	I	G	H	.	.	N	.	.	.
ACT11028 Human enteric coronavirus strain 4408	.	.	.	.	.	.	?	?	?	H	.	.	B	.	.	.
	168	176	177	178	186	205	214	217	233	248	259	269	274	275	277	278
AAP20417 Mebus Bovine coronavirus	L	E	K	K	V	M	V	K	F	H	S	G	P	V	E	D
Bovine coronavirus strain Kirikkale	.	.	.	E	A	K	.	N	.	.	.	.	S	F	.	.
AVI15031 ICSA-pool-EN Bovine coronavirus	.	.	.	.	A	K	.	.	.	.	.	.	S	F	.	.
AVI15020 ICSA16-LBA Bovine coronavirus	.	.	.	.	A	K	.	.	.	.	.	.	S	F	.	.
ARD05997 BCoV 2014 13 Bovine coronavirus	.	.	.	.	A	K	.	.	.	.	.	.	S	F	.	.
UTM74755 ABGEB0-66 Bovine coronavirus	.	.	.	.	A	K	.	N	.	.	.	.	S	F	.	.
UTM74865 ABGEB0-128 Bovine coronavirus	.	.	.	.	A	K	.	N	.	.	.	.	S	F	.	.
UTM74925 ABGEDB-205 Bovine coronavirus	.	.	.	.	A	K	.	N	.	.	.	.	S	F	V	.
ABG89287 DB2 Bovine coronavirus DB2	.	V	.	.	A	.	.	.	.	.	.	.	S	.	.	.
ACJ67010 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	.	A	.	.	.	.	Y	.	.	S	.	.	.
ACJ66972 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	.	A	.	.	.	.	Y	.	.	S	.	.	.
ACJ66982 White-tailed deer coronavirus US/OH-WD470/1994	.	.	.	.	A	.	.	.	.	.	.	.	S	.	.	.
ACT11017 bovine/US/OH-440-TC/1996	.	.	.	.	A	.	.	.	.	.	.	.	S	.	.	.
NP 150075 BCoV-ENT Bovine coronavirus	.	.	R	.	A	.	.	.	.	.	.	.	S	.	.	.
ABP38231 Bovine coronavirus E-AH65	I	.	.	.	A	.	.	.	.	.	.	.	S	.	.	.
ABP38301 Sable antelope coronavirus US/OH1/2003	I	.	.	.	A	.	.	.	.	.	A	.	S	.	.	.
ABI94001 Bovine coronavirus isolate Alpaca	.	.	.	.	A	.	.	.	.	.	.	.	S	.	.	.
AVZ61117 4-17-08 Bovine coronavirus	I	.	.	.	A	T	M	.	.	.	.	.	S	.	.	.
UVC32824 MARC/2013/01/R Bovine coronavirus	I	.	.	.	A	T	M	.	.	.	.	.	S	F	.	.
BBM61325 TCG-12 Bovine coronavirus	.	.	.	.	A	.	.	.	.	.	.	E	S	.	.	.
BBM61345 TCG-14 Bovine coronavirus	.	.	.	.	A	.	.	.	.	.	.	E	S	.	.	.

UVC33496 VDC/2018/06/E Bovine coronavirus	I	.	.	.	A	T	M	.	S	.	.	.	S	.	.	.					
BAF75629 Kakegawa Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.					
ACJ35484 Human enteric coronavirus 4408	.	.	.	.	.	.	.	.	.	.	.	.	S	.	.	H					
ACT11028 Human enteric coronavirus strain 4408	.	.	.	.	.	.	.	.	.	.	.	.	S	.	.	?					
NS4.8	2	5	8	9	10	16	18	21	28	29	31	37	38	39	40	41	42	43	44	45	
AAA42912 Bovine coronavirus Mebus	P	T	D	G	T	M	S	S	C	S	G	T	G	F	T	C	F	S	R	Y	
Bovine coronavirus strain Kirikkale	Q	.	.	D	.	K	I	F	G	F	R	.	.	L	-	-	.	.	W	.	
AVI15035 Bovine coronavirus ICSA-pool-EN	Q	I	.	D	.	K	I	F	G	F	.	.	.	L	-	-	.	.	W	.	
AVI15024 Bovine coronavirus ICSA16-LBA	Q	I	.	D	.	K	I	F	G	F	.	.	.	L	-	-	.	.	W	.	
ARD06001 Bovine coronavirus BCoV 2014 13	Q	.	.	D	.	K	I	F	G	F	.	.	.	L	-	-	.	.	W	.	
ABG89285 Bovine coronavirus DB2	.	.	.	.	.	.	I	.	V	.	.	.	.	.	.	.	.	.	.	.	
ACJ67014 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	E	.	A	.	I	L	V	.	.	.	.	.	.	.	.	.	.	.	
ACJ66974 Waterbuck coronavirus US/OH-WD358/1994	.	.	E	.	A	.	I	L	V	.	.	.	.	.	.	.	.	.	.	.	
ACJ66979 White-tailed deer coronavirus US/OH-WD470/1994	.	.	E	.	A	.	I	L	V	.	.	.	.	.	.	.	.	.	.	.	
NP 150079 Bovine coronavirus BCoV-ENT	.	.	E	.	A	.	I	L	V	.	.	.	.	.	.	.	.	.	W	.	
ABP38233 Bovine coronavirus E-AH65	.	.	E	V	A	.	I	L	V	.	.	.	.	.	.	.	.	.	.	.	
ABP38298 Sable antelope coronavirus US/OH1/2003	.	.	E	V	A	.	I	L	V	.	.	.	.	-	-	-	-	-	-	-	
AVZ61121 Bovine coronavirus 4-17-08	.	.	E	V	A	.	I	L	V	.	.	.	.	L	-	-	-	-	.	.	
UVC32829 Bovine coronavirus MARC/2013/01/R	.	.	E	V	A	.	I	L	V	.	.	.	A	-	-	-	-	.	.	.	
BBM61329 Bovine coronavirus TCG-12	.	.	E	V	A	.	I	L	V	F	.	.	.	.	.	.	.	.	.	.	
BBM61349 Bovine coronavirus TCG-14	.	.	E	V	A	.	I	L	V	F	.	.	.	.	.	.	.	.	.	.	
UVC33501 Bovine coronavirus VDC/2018/06/E	.	.	E	V	A	.	I	L	V	.	.	I	.	-	-	-	.	.	.	.	
BAF75633 Bovine coronavirus Kakegawa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
ACJ35491 Human enteric coronavirus 4408	.	.	.	.	.	.	.	F	G	F	.	.	.	.	.	.	.	.	.	.	
ACT11032 Human enteric coronavirus strain 4408	.	.	.	.	.	.	.	F	G	F	.	.	.	.	.	.	.	.	.	.	
NS4.9	2	5	8	10	11	14	15	19	23	24	26	36	40	43							
AAK29738 AAA42911 Bovine coronavirus Mebus	T	F	D	L	A	D	I	F	K	L	I	I	M	V							
Bovine coronavirus strain Kirikkale	.	.	.	.	.	.	.	T	.	.	P	L	.	T	.						
AVI15034 Bovine coronavirus ICSA-pool-EN	.	.	.	.	.	.	.	T	.	.	P	L	.	T	.						
AVI15023 Bovine coronavirus ICSA16-LBA	.	.	.	.	.	.	.	T	.	.	P	L	.	T	.						
ARD06000 Bovine coronavirus BCoV 2014 13	.	.	.	.	.	.	.	T	.	.	P	L	.	T	.						
ABG89292 Bovine coronavirus DB2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.						
ACJ67013 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	.	.	.	.	.	S	N	.	.	.	.	.						
ACJ66973 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	.	.	.	.	.	S	N	.	.	.	.	.						
ACT11020 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	.	.	.	.	T	.	.	.	S	N	.	.	-	-	-						

NP 150078 Bovine coronavirus BCoV-ENT	K	.	.	.	T	.	.	S	N	.	.	-	-	-				
ABP38239 Bovine coronavirus E-AH65	K	.	.	.	T	.	.	S	N	.	.	-	-	-				
ABP38303 Sable antelope coronavirus US/OH1/2003	K	.	.	.	T	.	.	S	N	.	.	-	-	-				
AVZ61120 Bovine coronavirus 4-17-08	K	.	.	.	T	Y	.	S	N	.	.	-	-	-				
UVC32830 Bovine coronavirus MARC/2013/01/R	K	L	.	.	T	.	.	S	N	.	.	-	-	-				
BBM61328 Bovine coronavirus TCG-12	K	.	H	.	T	.	.	S	N	.	.	-	-	-				
BBM61348 Bovine coronavirus TCG-14	K	.	H	.	T	.	.	S	N	.	.	-	-	-				
UVC33502 Bovine coronavirus VDC/2018/06/E	K	.	Y	.	T	Y	.	S	N	F	T	-	-	-				
BAF75632 Bovine coronavirus Kakegawa	.	.	.	.	.	.	.	.	.	.	.	.	.	.				
ACJ35490 Human enteric coronavirus 4408	.	.	A	V	.	.	T	.	.	.	.	T	.	F				
ACT11031 Human enteric coronavirus strain 4408	.	.	A	?	.	.	T	.	.	.	.	T	.	F				
NS12.7	5	25	52	57	65	70	72	95	107									
AAA42913 Bovine coronavirus Mebus	R	A	S	L	H	F	V	V	V									
Bovine coronavirus strain Kirikkale	.	V	.	.	.	.	.	.	.									
AVI15036 Bovine coronavirus ICSA-pool-EN	.	V	.	.	.	S	.	.	.									
AVI15025 Bovine coronavirus ICSA16-LBA	.	V	.	.	.	S	.	.	.									
ARD06002 Bovine coronavirus BCoV 2014 13	.	V	.	.	.	S	.	.	.									
ABG89290 Bovine coronavirus DB2	K	.	.	.	.	.	.	.	.									
ACJ67015 Sambar deer coronavirus US/OH-WD388-TC/1994	K	.	.	.	.	.	.	.	.									
ACJ66967 Waterbuck coronavirus US/OH-WD358/1994	K	.	.	.	.	.	.	.	.									
ACJ66976 White-tailed deer coronavirus US/OH-WD470/1994	K	.	.	.	.	.	.	.	.									
ACT11021 Bovine respiratory coronavirus bovine/US/OH-440-TC/1996	K	.	.	.	.	.	.	.	.									
NP 150080 Bovine coronavirus BCoV-ENT	K	.	.	.	.	.	.	.	.									
ABP38237 Bovine coronavirus E-AH65	K	.	.	.	.	.	.	I	.									
ABP38297 Sable antelope coronavirus US/OH1/2003	K	.	.	.	R	.	.	.	L									
ABI94005 Bovine coronavirus isolate Alpaca	K	.	.	F	.	.	.	.	.									
AVZ61122 Bovine coronavirus 4-17-08	K	.	.	F	.	.	.	.	.									
UVC32827 Bovine coronavirus MARC/2013/01/R	K	.	.	F	.	.	.	.	.									
BBM61330 Bovine coronavirus TCG-12	K	.	.	.	.	.	L	.	.									
BBM61350 Bovine coronavirus TCG-14	K	.	.	.	.	.	.	.	.									
UVC33499 Bovine coronavirus VDC/2018/06/E	K	.	.	.	.	.	.	.	.									
BAF75634 Bovine coronavirus Kakegawa	.	.	.	.	.	.	.	.	.									
ACJ35492 Human enteric coronavirus 4408	.	.	N	.	.	.	.	.	.									
ACT11033 Human enteric coronavirus strain 4408	.	.	?	.	.	.	.	.	.									
ORF1A	24	38	118	122	124	145	208	211	215	231	241	285	361	423	480	495	531	556

Bovine coronavirus strain Kirikkale	T	I	V	N	N	N	G	G	N	G	V	I	C	G	I	F	E	N
AVI15030 ICSA-pool-EN Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
AVI15019 ICSA16-LBA Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ARD06007 BCoV 2014 13 Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	H
UTM74753 ABGEB0-66 Bovine coronavirus	.	.	G	.	.	.	.	E	.	S	.	.	S	.	.	Y	D	.
UTM74863 ABGEB0-128 Bovine coronavirus	.	.	G	.	.	.	.	E	.	S	.	.	S	.	.	Y	D	.
UTM74923 ABGEDB-205 Bovine coronavirus	.	.	G	.	.	.	.	E	.	S	.	.	S	.	L	Y	D	.
ABG89289 DB2 Bovine coronavirus DB2	.	.	.	.	.	.	.	E	.	.	I	.	.	V	.	Y	.	.
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	A	.	.	.	.	.	.	E	.	.	I	.	.	.	.	Y	.	.
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	A	.	.	.	.	.	.	E	.	.	I	.	.	.	.	Y	.	.
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	A	.	.	.	.	.	.	E	.	.	I	.	.	.	.	Y	.	.
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	A	.	.	.	.	.	.	E	.	.	I	V	.	.	.	Y	.	.
NP 150074 BCoV-ENT Bovine coronavirus	A	.	.	.	.	.	.	E	.	.	I	.	.	.	.	Y	.	.
ABP38235 Bovine coronavirus E-AH65	A	.	.	.	.	.	.	E	.	.	I	.	.	.	.	Y	.	.
ABP38296 Sable antelope coronavirus US/OH1/2003	A	.	.	.	.	.	.	E	.	.	I	.	.	.	.	Y	.	.
ABI93997 Bovine coronavirus isolate Alpaca	A	.	.	S	K	.	.	E	.	.	I	.	.	.	.	Y	.	.
UVC32820 MARC/2013/01/R Bovine coronavirus	A	T	.	.	.	S	.	E	D	.	I	.	.	.	.	Y	.	.
UVC33492 VDC/2018/06/E Bovine coronavirus	A	.	.	.	.	S	.	E	.	.	I	.	.	.	.	Y	.	.
ACT11026 Human enteric coronavirus strain 4408	A	.	.	.	.	.	V	E	.	.	I	.	.	.	.	Y	.	.
	606	608	628	632	647	674	690	701	703	714	733	784	838	839	910	950	955	968
Bovine coronavirus strain Kirikkale	D	I	S	Y	D	V	L	S	A	V	R	S	H	A	V	D	S	D
AVI15030 ICSA-pool-EN Bovine coronavirus	.	.	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.
AVI15019 ICSA16-LBA Bovine coronavirus	.	.	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.
ARD06007 BCoV 2014 13 Bovine coronavirus	.	.	.	H	.	.	.	.	V	.	.	.	.	.	.	.	.	.
UTM74753 ABGEB0-66 Bovine coronavirus	.	.	.	H	E	.	I	.	V	.	.	.	.	V	.	.	.	.
UTM74863 ABGEB0-128 Bovine coronavirus	.	.	.	H	E	.	I	.	V	.	.	.	.	V	.	.	.	.
UTM74923 ABGEDB-205 Bovine coronavirus	.	.	.	H	E	.	I	.	V	.	.	.	.	V	.	.	.	.
ABG89289 DB2 Bovine coronavirus DB2	G	.	.	H	.	.	I	.	V	.	.	.	.	V	.	E	P	.
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	H	.	.	I	.	V	.	.	.	.	V	.	E	P	.
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	H	.	.	I	.	V	.	.	.	.	V	.	E	P	.
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	.	.	.	H	.	.	I	.	V	.	.	.	.	V	.	E	.	.

ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	.	.	.	H	.	.	I	.	V	.	.	.	Q	V	.	E	P	.
NP 150074 BCoV-ENT Bovine coronavirus	.	.	.	H	.	.	I	.	V	.	.	.	.	V	I	E	.	.
ABP38235 Bovine coronavirus E-AH65	.	.	.	H	.	I	I	.	V	.	.	.	.	V	.	E	.	.
ABP38296 Sable antelope coronavirus US/OH1/2003	.	.	.	.	.	.	I	.	V	.	.	T	.	V	.	E	.	.
ABI93997 Bovine coronavirus isolate Alpaca	.	.	.	H	.	.	I	.	V	.	.	.	.	V	.	E	.	A
UVC32820 MARC/2013/01/R Bovine coronavirus	.	.	.	H	.	.	I	G	V	.	.	.	.	V	I	E	.	.
UVC33492 VDC/2018/06/E Bovine coronavirus	.	.	.	.	.	.	I	.	V	I	C	.	.	V	I	E	.	.
ACT11026 Human enteric coronavirus strain 4408	G	F	G	H	.	.	I	.	V	.	.	.	.	V	I	E	P	.
	970	980	981	1000	1010	1014	1025	1027	1035	1039	1148	1153	1211	1240	1242	1264	1291	1377
Bovine coronavirus strain Kirikkale	L	A	E	E	D	N	V	E	V	S	Y	T	S	I	S	E	I	N
AVI15030 ICSA-pool-EN Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	K	.	.	.	.	.	.
AVI15019 ICSA16-LBA Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	K	.	.	.	.	.	.
ARD06007 BCoV 2014 13 Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	K	.	.	G	.	.	.
UTM74753 ABGEB0-66 Bovine coronavirus	.	V	.	D	.	D	.	.	.	.	H	K	.	.	.	.	.	K
UTM74863 ABGEB0-128 Bovine coronavirus	.	V	.	D	.	D	.	.	.	.	H	K	.	.	.	.	.	K
UTM74923 ABGEDB-205 Bovine coronavirus	.	V	.	D	.	D	.	.	.	.	H	K	.	.	.	.	.	K
ABG89289 DB2 Bovine coronavirus DB2	.	V	.	.	.	D	.	.	.	.	.	K	.	.	.	.	V	K
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	.	V	.	.	.	D	.	.	.	.	.	K	.	V	.	.	V	K
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	.	V	.	.	.	D	.	.	.	.	.	K	.	V	.	.	V	K
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	.	V	.	.	.	D	.	.	A	.	.	K	I	V	.	.	V	K
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	.	V	.	.	.	D	.	.	.	.	.	K	.	V	.	.	V	K
NP 150074 BCoV-ENT Bovine coronavirus	.	V	.	.	.	D	.	.	A	.	.	K	.	V	.	.	V	K
ABP38235 Bovine coronavirus E-AH65	F	V	.	.	.	D	.	.	A	.	.	K	.	V	.	.	V	K
ABP38296 Sable antelope coronavirus US/OH1/2003	.	V	.	.	N	D	.	.	A	.	.	K	.	V	.	.	V	K
ABI93997 Bovine coronavirus isolate Alpaca	.	V	.	.	.	D	.	D	A	.	.	K	.	V	.	.	V	K
UVC32820 MARC/2013/01/R Bovine coronavirus	.	V	.	.	.	D	.	.	A	V	.	K	.	V	.	.	V	K
UVC33492 VDC/2018/06/E Bovine coronavirus	.	V	G	.	.	D	.	.	A	.	.	I	.	V	.	D	V	K
ACT11026 Human enteric coronavirus strain 4408	.	V	.	.	.	D	F	.	.	.	.	K	.	V	.	.	V	K
	1379	1410	1411	1454	1505	1548	1580	1582	1586	1602	1604	1623	1634	1651	1721	1818	1846	1856
Bovine coronavirus strain Kirikkale	F	A	K	V	P	S	F	P	S	T	Y	S	N	S	D	A	D	L
AVI15030 ICSA-pool-EN Bovine coronavirus	L	.	.	.	.	T	.	.	.	.	H	.	.	.	.	.	V	.
AVI15019 ICSA16-LBA Bovine coronavirus	L	.	.	.	.	T	.	.	.	.	H	.	.	.	.	.	V	.
ARD06007 BCoV 2014 13 Bovine coronavirus	L	.	.	.	.	T	.	.	.	.	H	.	.	.	.	.	V	.

UTM74753 ABGEB0-66 Bovine coronavirus	L	V	.	.	.	T	L	.	.	.	H	.	.	.	.	V	V	.
UTM74863 ABGEB0-128 Bovine coronavirus	L	V	.	.	.	T	L	.	.	M	H	.	.	.	.	V	V	.
UTM74923 ABGEDB-205 Bovine coronavirus	L	V	.	.	.	T	L	.	.	.	H	.	.	.	.	V	V	.
ABG89289 DB2 Bovine coronavirus DB2	L	.	.	.	.	.	.	.	N	.	H	.	.	.	.	.	V	.
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	L	.	E	.	.	.	.	.	.	.	H	.	.	F	.	.	V	F
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	L	.	E	.	.	.	.	.	.	.	H	.	.	F	.	.	V	F
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	L	.	E	.	.	.	.	.	.	.	H	.	.	.	.	.	V	.
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	L	.	E	.	.	.	.	.	.	.	H	.	.	.	.	.	V	.
NP 150074 BCoV-ENT Bovine coronavirus	L	.	E	.	.	.	.	.	.	.	H	.	.	.	.	.	V	.
ABP38235 Bovine coronavirus E-AH65	L	.	E	.	.	.	.	.	.	.	H	.	.	.	.	.	V	.
ABP38296 Sable antelope coronavirus US/OH1/2003	L	.	E	.	.	.	.	S	.	.	H	.	.	.	.	.	V	.
ABI93997 Bovine coronavirus isolate Alpaca	L	.	E	.	S	.	.	.	.	.	H	.	.	.	.	.	V	.
UVC32820 MARC/2013/01/R Bovine coronavirus	L	.	E	.	.	.	.	.	.	.	H	G	.	.	E	.	V	.
UVC33492 VDC/2018/06/E Bovine coronavirus	L	.	E	I	.	.	.	.	.	.	H	.	D	.	.	.	V	.
ACT11026 Human enteric coronavirus strain 4408	L	.	.	.	.	.	.	.	.	.	H	.	.	.	.	.	V	.
	2025	2026	2033	2040	2070	2094	2102	2111	2127	2133	2134	2156	2232	2238	2243	2257	2266	2274
Bovine coronavirus strain Kirikkale	N	S	P	K	S	I	R	L	V	A	V	V	T	V	N	H	Y	F
AVI15030 ICSA-pool-EN Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	C	.
AVI15019 ICSA16-LBA Bovine coronavirus	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	C	.
ARD06007 BCoV 2014 13 Bovine coronavirus	.	Y	L	.	.	.	.	.	.	.	.	I	.	A	.	.	C	.
UTM74753 ABGEB0-66 Bovine coronavirus	.	.	T	.	.	.	.	.	.	.	.	I	I	A	.	Q	C	.
UTM74863 ABGEB0-128 Bovine coronavirus	.	.	T	.	.	.	.	.	G	.	.	I	I	A	.	Q	C	.
UTM74923 ABGEDB-205 Bovine coronavirus	.	.	T	.	.	.	.	.	.	.	.	I	I	A	.	Q	C	.
ABG89289 DB2 Bovine coronavirus DB2	I	.	S	.	.	M	.	.	.	.	.	I	.	A	.	.	C	.
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	I	.	S	.	.	M	.	.	.	.	.	I	.	A	S	Q	C	.
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	I	.	S	.	.	M	.	.	.	.	.	I	.	A	S	Q	C	.
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	I	.	S	.	.	M	.	.	.	V	.	I	.	A	S	Q	C	.
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	I	.	S	.	.	M	.	I	.	.	.	I	.	A	S	Q	C	.
NP 150074 BCoV-ENT Bovine coronavirus	I	.	S	.	.	M	.	.	.	.	.	I	.	A	S	Q	C	.
ABP38235 Bovine coronavirus E-AH65	I	.	S	.	.	M	C	.	.	.	.	I	.	.	S	Q	C	.
ABP38296 Sable antelope coronavirus US/OH1/2003	I	.	S	.	.	M	.	.	.	.	M	I	.	A	S	Q	C	.

ABI93997 Bovine coronavirus isolate Alpaca	I	.	S	.	.	M	.	.	.	V	.	I	.	A	S	Q	C	.
UVC32820 MARC/2013/01/R Bovine coronavirus	I	.	S	Q	.	M	.	.	.	.	.	I	.	.	S	Q	C	.
UVC33492 VDC/2018/06/E Bovine coronavirus	I	.	S	.	.	M	.	.	.	.	.	I	.	.	S	Q	C	.
ACT11026 Human enteric coronavirus strain 4408	?	.	.	.	F	?	.	.	.	?	.	I	.	?	.	Q	C	L
	2383	2395	2445	2486	2494	2522	2544	2636	2693	2711	2759	2762	2770	2781	2783	2791	2811	2848
Bovine coronavirus strain Kirikkale	S	P	S	S	E	G	A	K	L	D	V	V	G	H	S	A	F	F
AVI15030 ICSA-pool-EN Bovine coronavirus	.	.	.	G	.	.	.	.	I	.	.	.	.	.	.	.	.	L
AVI15019 ICSA16-LBA Bovine coronavirus	.	.	.	G	.	.	.	.	I	.	.	.	.	.	.	.	.	L
ARD06007 BCoV 2014 13 Bovine coronavirus	.	.	.	G	.	.	.	.	I	.	.	.	.	.	.	.	.	.
UTM74753 ABGEB0-66 Bovine coronavirus	.	.	.	G	D	.	.	.	I	.	.	.	.	.	.	.	.	.
UTM74863 ABGEB0-128 Bovine coronavirus	.	.	.	G	D	.	.	.	I	.	.	.	.	.	.	.	.	.
UTM74923 ABGEDB-205 Bovine coronavirus	.	.	F	G	D	.	.	.	I	G	.	.	.	.	.	.	.	.
ABG89289 DB2 Bovine coronavirus DB2	.	.	.	G	.	.	V	.	I	.	.	.	.	.	.	.	.	L
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	.	.	.	G	.	.	.	.	I	.	I	.	.	.	.	T	.	L
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	.	.	.	G	.	.	.	.	I	.	I	.	.	.	.	T	.	L
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	.	.	.	G	.	.	.	.	I	.	.	L	.	.	.	.	.	L
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	.	.	.	G	.	.	.	.	I	.	.	L	.	.	.	.	.	L
NP 150074 BCoV-ENT Bovine coronavirus	I	.	.	G	.	.	.	.	I	.	.	L	.	.	.	.	.	L
ABP38235 Bovine coronavirus E-AH65	.	.	.	G	.	.	.	.	.	.	.	L	.	.	.	.	.	.
ABP38296 Sable antelope coronavirus US/OH1/2003	.	.	.	G	.	.	.	.	I	.	.	L	.	Q	.	.	.	.
ABI93997 Bovine coronavirus isolate Alpaca	.	.	.	G	.	.	.	.	I	.	.	L	.	.	P	.	.	L
UVC32820 MARC/2013/01/R Bovine coronavirus	.	.	.	G	D	.	.	.	I	.	.	L	V	.	.	.	V	.
UVC33492 VDC/2018/06/E Bovine coronavirus	.	.	.	G	D	.	.	.	I	.	.	L	.	.	.	.	.	.
ACT11026 Human enteric coronavirus strain 4408	.	S	.	G	D	S	.	R	I	.	.	.	.	.	.	.	.	.
	2891	2982	3063	3098	3144	3329	3331	3334	3398	3426	3494	3524	3587	3590	3669	3711	3758	3882
Bovine coronavirus strain Kirikkale	F	I	I	V	A	H	C	V	L	D	I	I	T	M	L	I	V	G
AVI15030 ICSA-pool-EN Bovine coronavirus	S	.	.	A	.	Q	.	.	.	.	V	.	.	.	.	.	.	.
AVI15019 ICSA16-LBA Bovine coronavirus	S	.	.	A	.	Q	.	.	.	.	V	.	.	.	.	.	.	.
ARD06007 BCoV 2014 13 Bovine coronavirus	S	.	.	A	.	Q	S	.	.	.	V	.	.	.	I	.	.	.
UTM74753 ABGEB0-66 Bovine coronavirus	S	V	.	A	.	Q	.	I	.	.	.	.	.	.	.	.	.	.
UTM74863 ABGEB0-128 Bovine coronavirus	S	V	.	A	.	Q	.	I	.	G	.	.	.	.	.	.	.	.
UTM74923 ABGEDB-205 Bovine coronavirus	S	V	.	A	.	Q	.	I	.	.	.	.	.	I	.	.	.	.
ABG89289 DB2 Bovine coronavirus DB2	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	.	.	.

ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	.	.	.
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	.	.	.
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	.	.	.
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	S	.	.	A	.	Q	.	.	.	.	.	V	.	.	.	.	.	.
NP 150074 BCoV-ENT Bovine coronavirus	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	.	.	.
ABP38235 Bovine coronavirus E-AH65	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	.	.	.
ABP38296 Sable antelope coronavirus US/OH1/2003	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	V	.	.	.
ABI93997 Bovine coronavirus isolate Alpaca	S	.	.	A	.	Q	.	.	.	.	.	.	I	.	.	.	.	.
UVC32820 MARC/2013/01/R Bovine coronavirus	S	.	.	A	S	Q	.	.	.	.	.	.	.	.	.	.	.	.
UVC33492 VDC/2018/06/E Bovine coronavirus	S	.	.	A	.	Q	.	.	.	.	.	.	.	.	.	A	.	S
ACT11026 Human enteric coronavirus strain 4408	S	.	V	A	S	Q	.	.	I	.	.	.	.	.	.	.	.	.
	3908	3948	3974	3979	4142	4296	4367											
Bovine coronavirus strain Kirikkale	S	D	A	R	Q	N	T											
AVI15030 ICSA-pool-EN Bovine coronavirus	T	E	.	.	.	.	.											
AVI15019 ICSA16-LBA Bovine coronavirus	T	E	.	.	.	.	.											
ARD06007 BCoV 2014 13 Bovine coronavirus	T	.	V	.	.	.	.											
UTM74753 ABGEB0-66 Bovine coronavirus	.	.	.	.	.	.	.											
UTM74863 ABGEB0-128 Bovine coronavirus	.	.	.	.	.	.	.											
UTM74923 ABGEDB-205 Bovine coronavirus	.	.	.	.	.	.	.											
ABG89289 DB2 Bovine coronavirus DB2	T	.	.	.	.	S	.											
ACJ67008 Sambar deer coronavirus US/OH-WD388-TC/1994	T	.	.	.	.	S	.											
ACJ66965 Waterbuck coronavirus US/OH-WD358/1994	T	.	.	.	.	S	.											
ACJ66978 White-tailed deer coronavirus US/OH-WD470/1994	T	.	.	.	.	S	.											
ACT11015 bovine/US/OH-440-TC/1996 Bovine respiratory coronavirus	T	.	.	.	.	.	.											
NP 150074 BCoV-ENT Bovine coronavirus	T	.	.	.	.	.	.											
ABP38235 Bovine coronavirus E-AH65	T	.	.	.	.	.	.											
ABP38296 Sable antelope coronavirus US/OH1/2003	T	.	.	.	.	.	.											
ABI93997 Bovine coronavirus isolate Alpaca	T	.	.	L	H	.	.											
UVC32820 MARC/2013/01/R Bovine coronavirus	T	.	.	.	.	.	I											
UVC33492 VDC/2018/06/E Bovine coronavirus	T	.	.	.	.	.	.											
ACT11026 Human enteric coronavirus strain 4408	T	.	.	.	.	S	.											

Table S3. The protein accession numbers of structural and non-structural genes of investigated in this study.

The coronavirus strains that are compared to the BCoV Kirikkale strain (OQ161705)	The protein accession numbers of the structural proteins				
	Hemagglutinin Esterase	Spike	Membrane	Envelope	Nucleocapsid
Bovine coronavirus/ Respiratory/ France (MG757141.1, MG757140.1)	AVI15032, AVI15021	AVI15033, AVI15022	AVI15038, AVI15027	AVI15037, AVI15026	AVI15039, AVI15028
Bovine coronavirus/ Enteric/ France (KX982264.1)	ARD05998	ARD05999	ARD06004	ARD06003	ARD06005
Bovine coronavirus/ Respiratory/ Ireland (ON792946.1, ON792957.1, ON792963.1)	UTM74756, UTM74866, UTM74926	UTM74757, UTM74867, UTM74927	UTM74761, UTM74871, UTM74931	UTM74930	UTM74762, UTM74872, UTM74932
Bovine coronavirus/ Enteric/ USA (NC_003045.1, EF424615.1, MH043954.1, OP037421.1)	NP_150076, ABP38240, AVZ61118, UVC33495	NP_150077, ABP38236, AVZ61119, UVC33493	NP_150082, ABP38238, AVZ61124, UVC33497	NP_150081, ABP38230, AVZ61123, UVC33500	NP_150083, ABP38232, AVZ61125, UVC33494
Bovine coronavirus/ Respiratory/ USA (FJ938066.1, OP037365.1)	ACT11018, UVC32823	ACT11019, UVC32821	ACT11023, UVC32825	ACT11022, UVC32828	ACT11024, UVC32822
Bovine coronavirus/ Enteric/ Japan (LC494169.1)	BBM61346	BBM61347	BBM61352	BBM61351	BBM61353
Bovine coronavirus/ Respiratory/ Japan (LC494167.1)	BBM61326	BBM61327	BBM61332	BBM61331	BBM61333
Human coronavirus/ Enteric/ Germany (FJ415324.1)	ACJ35485	ACJ35486	ACJ35488	ACJ35487	ACJ35489
Human coronavirus/ Enteric/ USA (FJ938067.1)	ACT11029	ACT11030	ACT11035	ACT11034	ACT11036
Wild ruminant coronaviruses*/ Enteric/ USA (FJ425190.1, FJ425186.1, FJ425187.1, EF424621.1)	ACJ67011, ACJ66968, ACJ66975, ABP38304	ACJ67012, ACJ66971, ACJ66977, ABP38306	ACJ67017, ACJ66966, ACJ66984, ABP38305	ACJ67016, ACJ66969, ACJ66980, ABP38300	ACJ67018, ACJ66964, ACJ66983, ABP38302
Bovine coronavirus isolate Alpaca/ Enteric/ USA (DQ915164.2)	ABI94000	ABI93999	ABI94002	ND**	ABI94003
Bovine coronavirus DB2/ Enteric/ USA (DQ811784.2)	ABG89283	ABG89288	ABG89282	ABG89286	ABG89284
Bovine coronavirus Kakegawa/ Enteric/ Japan (AB354579.1)	BAF75630	BAF75631	BAF75636	BAF75635	BAF75637
Bovine coronavirus Mebus/ Enteric/ USA (U00735.2)	AAA66393	AAA66399	AAK29779	AAA42914	AAA66397
The coronavirus strains that are compared to the BCoV Kirikkale strain (OQ161705)	The protein accession numbers of the non-structural proteins				
	ORF1a	NS2	NS4.8	NS4.9	NS12.7

Bovine coronavirus/ Respiratory/ France (MG757141.1, MG757140.1)	AVI15030, AVI15019	AVI15031, AVI15020	AVI15035, AVI15024	AVI15034, AVI15023	AVI15036, AVI15025
Bovine coronavirus/ Enteric/ France (KX982264.1)	ARD06007	ARD05997	ARD06001	ARD06000	ARD06002
Bovine coronavirus/ Respiratory/ Ireland (ON792946.1, ON792957.1, ON792963.1)	UTM74753, UTM74863, UTM74923	UTM74755, UTM74865, UTM74925	ND	ND	ND
Bovine coronavirus/ Enteric/ USA (NC_003045.1, EF424615.1, MH043954.1, OP037421.1)	NP_150074, ABP38235, UVC33492	NP_150075, ABP38231, AVZ61117, UVC33496	NP_150079, ABP38233, AVZ61121, UVC33501	NP_150078, ABP38239, AVZ61120, UVC33502	NP_150080, ABP38237, AVZ61122, UVC33499
Bovine coronavirus/ Respiratory/ USA (FJ938066.1, OP037365.1)	ACT11015, UVC32820	ACT11017, UVC32824	UVC32829	ACT11020, UVC32830	ACT11021, UVC32827
Bovine coronavirus/ Enteric/ Japan (LC494169.1)	ND	BBM61345	BBM61349	BBM61348	BBM61350
Bovine coronavirus/ Respiratory/ Japan (LC494167.1)	ND	BBM61325	BBM61329	BBM61328	BBM61330
Human coronavirus/ Enteric/ Germany (FJ415324.1)	ND	ACJ35484	ACJ35491	ACJ35490	ACJ35492
Human coronavirus/ Enteric/ USA (FJ938067.1)	ACT11026	ACT11028	ACT11032	ACT11031	ACT11033
Wild ruminant coronaviruses*/ Enteric/ USA (FJ425190.1, FJ425186.1, FJ425187.1, EF424621.1)	ACJ67008, ACJ66965, ACJ66978, ABP38296	ACJ67010, ACJ66972, ACJ66982, ABP38301	ACJ67014, ACJ66974, ACJ66979, ABP38298	ACJ67013, ACJ66973, ABP38303	ACJ67015, ACJ66967, ACJ66976, ABP38297
Bovine coronavirus isolate Alpaca/ Enteric/ USA (DQ915164.2)	ABI93997	ABI94001	ND	ND	ABI94005
Bovine coronavirus DB2/ Enteric/ USA (DQ811784.2)	ABG89289	ABG89287	ABG89285	ABG89292	ABG89290
Bovine coronavirus Kakegawa/ Enteric/ Japan (AB354579.1)	ND	BAF75629	BAF75633	BAF75632	BAF75634
Bovine coronavirus Mebus/ Enteric/ USA (U00735.2)		AAP20417	AAA42912	AAK29738	AAA42913

*Sambar deer coronavirus, waterbuck coronavirus, white-tailed deer coronavirus, sable antelope coronavirus; ** Bovine coronavirus isolate Alpaca sequence data on GenBank (DQ915164.2) does not contain envelope protein. ND: Not determined.

Table S4. Recombination events of all available complete genome sequences of bovine coronaviruses in the GenBank are detected by RDP4 software.

Event number	Recombinant	Major parent	Minor parent	Detection methods*						
				R	G	B	M	C	S	T
1	OP004056	ON146444	Unknown	+	+	+	+	+	-	+
2	OP296992	U00735	Unknown	+	+	+	+	+	-	+
3	LC494150	LC494147	LC494142	-	+	+	+	+	-	+
4	ON792956	ON792941	MH043954	+	+	+	+	+	-	+
5	OP866728	MH043954	OP924545	-	+	-	-	+	+	+
6	ON792948	ON792945	Unknown	-	+	+	-	-	-	-
7	OP866729	OP866727	OP866726	-	+	-	-	-	+	+
8	LC494179	LC494153	Unknown	+	+	+	+	+	+	+
9	ON142319	OP866729	Unknown	-	+	+	-	-	-	-
10	LC642814	LC494188	LC494159	-	+	-	-	-	-	-
11	OP866728	EF424615	OP866729	-	+	-	-	-	-	-
12	LC494144	Unknown	LC494153	-	+	-	+	-	-	+
13	ON792951	ON792941	ON142315	-	+	-	-	-	-	-
14	ON142317	OP866726	Unknown	-	+	-	-	-	-	-
15	LC494172	Unknown	LC494133	-	+	-	-	-	+	-
16	ON792953	ON792941	Unknown	-	+	-	-	-	-	-
17	LC494177	LC494188	LC494141	-	+	-	-	-	-	-
18	ON544073	Unknown	ON792941	-	+	-	-	-	-	-
19	MH043953	EF424620	OP296992	-	+	-	-	-	-	-
20	LC494153	LC494188	Unknown	-	+	-	-	-	-	-
21	KU886219	Unknown	MH043955	-	+	-	-	-	-	-
22	LC494175	LC494181	Unknown	-	+	-	-	-	-	-
23	AF220295	U00735	Unknown	-	+	-	-	-	-	-
24	LC494175	Unknown	LC494141	-	+	-	-	-	-	-
25	MW711287	KU886219	ON146444	-	+	-	-	-	-	-
26	ON792941	ON792949	OP004056	-	+	-	-	-	-	-
27	ON792963	ON792945	DQ915164	-	+	-	-	-	-	-
28	MW711287	OP924545	LC494175	-	+	-	-	-	-	-
29	LC494142	LC494127	LC494141	-	+	-	-	-	-	-
30	LC494177	LC494188	Unknown	-	+	-	-	-	-	-
31	LC494134	LC494142	Unknown	-	+	-	-	-	-	-
32	LC642814	LC494153	MH043954	-	-	-	+	-	-	+
33	ON142320	Unknown	ON142317	-	+	-	-	-	+	+
34	LC494174	LC494172	LC494162	-	+	-	-	-	-	-
35	OP298992	ON792947	Unknown	+	-	+	+	-	-	-
36	OP866727	ON142319	Unknown	-	+	-	-	-	-	-
37	KU886219	EF424620	U00735	-	+	-	+	-	-	-
38	ON792953	ON792949	DQ915164	-	+	-	-	-	-	-
39	MG757142	ON792953	Unknown	-	+	-	-	-	-	-
40	LC494156	LC494170	Unknown	-	+	-	-	-	-	-
41	LC494177	Unknown	LC494181	-	+	-	-	-	-	-
42	OP924545	Unknown	OP004056	-	+	-	-	-	-	-
43	ON792945	ON792948	MH043955	-	+	-	-	-	-	-
44	OQ161705 [§]	Unknown	KX982264	-	-	-	-	+	-	-
45	OP866727	OP866729	U00735	-	+	-	-	-	-	-

*Detection methods for recombination events are the algorithms in the RDP4 software (R: RDP, G: GENECONV, B: Bootscan, M: MaxChi, C: Chimaera, S: SiScan, T: 3Seq).

[§] Bovine coronavirus strain Kirikkale from this study.

The recombination events that are positive more than two independent algorithms are indicated as bold.

Table S5. Codon usage of some bovine coronavirus strains that are close to bovine coronavirus strain Kirikkale.

ON792946.1 Bovine coronavirus strain ABGEB0-66				
Codon	AA	Fraction	Frequency	Number
GCA	A	0.313	16.025	166
GCC	A	0.124	6.371	66
GCG	A	0.083	4.248	44
GCU	A	0.480	24.616	255
UGC	C	0.285	10.715	111
UGU	C	0.715	26.837	278
GAC	D	0.199	7.819	81
GAU	D	0.801	31.567	327
GAA	E	0.553	15.059	156
GAG	E	0.447	12.163	126
UUC	F	0.173	9.074	94
UUU	F	0.827	43.344	449
GGA	G	0.184	8.302	86
GGC	G	0.126	5.696	59
GGG	G	0.107	4.827	50
GGU	G	0.583	26.354	273
CAC	H	0.369	7.626	79
CAU	H	0.631	13.032	135
AUA	I	0.365	24.809	257
AUC	I	0.136	9.267	96
AUU	I	0.499	33.980	352
AAA	K	0.516	26.161	271
AAG	K	0.484	24.520	254
CUA	L	0.122	15.639	162
CUC	L	0.048	6.082	63
CUG	L	0.126	16.121	167
CUU	L	0.156	19.983	207
UUA	L	0.261	33.401	346
UUG	L	0.287	36.683	380
AUG	M	1.000	32.918	341
AAC	N	0.225	9.653	100
AAU	N	0.775	33.304	345
CCA	P	0.356	11.488	119
CCC	P	0.144	4.634	48
CCG	P	0.063	2.027	21
CCU	P	0.437	14.094	146
CAA	Q	0.474	16.121	167
CAG	Q	0.526	17.859	185
AGA	R	0.331	11.681	121
AGG	R	0.249	8.785	91
CGA	R	0.071	2.510	26
CGC	R	0.093	3.282	34
CGG	R	0.071	2.510	26
CGU	R	0.186	6.564	68
AGC	S	0.151	10.619	110
AGU	S	0.289	20.369	211
UCA	S	0.156	11.005	114

UCC	S	0.070	4.923	51
UCG	S	0.045	3.186	33
UCU	S	0.288	20.272	210
ACA	T	0.343	17.859	185
ACC	T	0.161	8.398	87
ACG	T	0.065	3.379	35
ACU	T	0.430	22.396	232
GUA	V	0.235	22.299	231
GUC	V	0.082	7.819	81
GUG	V	0.255	24.230	251
GUU	V	0.428	40.738	422
UGG	W	1.000	16.797	174
UAC	Y	0.259	10.233	106
UAU	Y	0.741	29.250	303
UAA	*	0.376	10.715	111
UAG	*	0.315	8.978	93
UGA	*	0.308	8.785	91
MG757141.1 Bovine coronavirus isolate ICSA-pool-EN				
Codon	AA	Fraction	Frequency	Number
GCA	A	0.303	14.315	148
GCC	A	0.184	8.705	90
GCG	A	0.102	4.836	50
GCU	A	0.411	19.441	201
UGC	C	0.338	24.567	254
UGU	C	0.662	48.167	498
GAC	D	0.272	8.898	92
GAU	D	0.728	23.793	246
GAA	E	0.625	16.249	168
GAG	E	0.375	9.769	101
UUC	F	0.250	16.829	174
UUU	F	0.750	50.488	522
GGA	G	0.292	15.185	157
GGC	G	0.219	11.413	118
GGG	G	0.121	6.287	65
GGU	G	0.368	19.151	198
CAC	H	0.454	8.995	93
CAU	H	0.546	10.833	112
AUA	I	0.283	13.831	143
AUC	I	0.168	8.221	85
AUU	I	0.549	26.888	278
AAA	K	0.530	20.215	209
AAG	K	0.470	17.893	185
CUA	L	0.081	7.061	73
CUC	L	0.066	5.803	60
CUG	L	0.080	6.964	72
CUU	L	0.181	15.862	164
UUA	L	0.293	25.631	265
UUG	L	0.299	26.115	270
AUG	M	1.000	18.087	187
AAC	N	0.277	10.349	107
AAU	N	0.723	26.985	279
CCA	P	0.392	9.866	102

CCC	P	0.196	4.933	51
CCG	P	0.092	2.321	24
CCU	P	0.319	8.028	83
CAA	Q	0.631	15.572	161
CAG	Q	0.369	9.092	94
AGA	R	0.403	19.538	202
AGG	R	0.226	10.929	113
CGA	R	0.076	3.675	38
CGC	R	0.086	4.159	43
CGG	R	0.054	2.611	27
CGU	R	0.156	7.544	78
AGC	S	0.161	11.703	121
AGU	S	0.275	20.021	207
UCA	S	0.195	14.218	147
UCC	S	0.108	7.834	81
UCG	S	0.046	3.385	35
UCU	S	0.215	15.669	162
ACA	T	0.338	15.572	161
ACC	T	0.225	10.349	107
ACG	T	0.116	5.320	55
ACU	T	0.321	14.798	153
GUA	V	0.201	12.574	130
GUC	V	0.136	8.511	88
GUG	V	0.187	11.703	121
GUU	V	0.475	29.693	307
UGG	W	1.000	25.534	264
UAC	Y	0.378	23.793	246
UAU	Y	0.622	39.075	404
UAA	*	0.490	41.203	426
UAG	*	0.176	14.798	153
UGA	*	0.334	28.146	291
KX982264.1 Bovine coronavirus isolate BCoV_2014_13				
Codon	AA	Fraction	Frequency	Number
GCA	A	0.307	14.491	149
GCC	A	0.183	8.656	89
GCG	A	0.101	4.766	49
GCU	A	0.409	19.354	199
UGC	C	0.336	24.412	251
UGU	C	0.664	48.337	497
GAC	D	0.266	8.753	90
GAU	D	0.734	24.120	248
GAA	E	0.622	15.853	163
GAG	E	0.378	9.628	99
UUC	F	0.246	16.631	171
UUU	F	0.754	50.963	524
GGA	G	0.291	14.978	154
GGC	G	0.219	11.282	116
GGG	G	0.123	6.322	65
GGU	G	0.367	18.868	194
CAC	H	0.461	9.142	94
CAU	H	0.539	10.698	110
AUA	I	0.286	14.102	145

AUC	I	0.168	8.267	85
AUU	I	0.546	26.940	277
AAA	K	0.531	20.230	208
AAG	K	0.469	17.895	184
CUA	L	0.082	7.197	74
CUC	L	0.066	5.738	59
CUG	L	0.080	7.003	72
CUU	L	0.184	16.047	165
UUA	L	0.290	25.287	260
UUG	L	0.298	26.065	268
AUG	M	1.000	18.090	186
AAC	N	0.278	10.309	106
AAU	N	0.722	26.746	275
CCA	P	0.388	9.628	99
CCC	P	0.200	4.960	51
CCG	P	0.082	2.042	21
CCU	P	0.329	8.170	84
CAA	Q	0.628	15.269	157
CAG	Q	0.372	9.045	93
AGA	R	0.400	19.549	201
AGG	R	0.227	11.087	114
CGA	R	0.076	3.696	38
CGC	R	0.088	4.279	44
CGG	R	0.052	2.529	26
CGU	R	0.157	7.683	79
AGC	S	0.160	11.671	120
AGU	S	0.274	19.938	205
UCA	S	0.198	14.394	148
UCC	S	0.108	7.878	81
UCG	S	0.048	3.501	36
UCU	S	0.212	15.464	159
ACA	T	0.346	15.853	163
ACC	T	0.227	10.407	107
ACG	T	0.106	4.863	50
ACU	T	0.321	14.686	151
GUA	V	0.199	12.449	128
GUC	V	0.134	8.364	86
GUG	V	0.188	11.768	121
GUU	V	0.479	29.955	308
UGG	W	1.000	25.870	266
UAC	Y	0.382	24.120	248
UAU	Y	0.618	39.000	401
UAA	*	0.490	41.529	427
UAG	*	0.177	14.978	154
UGA	*	0.333	28.205	290
U00735.2 Bovine coronavirus strain Mebus				
Codon	AA	Fraction	Frequency	Number
GCA	A	0.316	16.241	168
GCC	A	0.122	6.284	65
GCG	A	0.083	4.254	44
GCU	A	0.478	24.555	254
UGC	C	0.290	11.118	115

UGU	C	0.710	27.262	282
GAC	D	0.193	7.541	78
GAU	D	0.807	31.613	327
GAA	E	0.551	15.178	157
GAG	E	0.449	12.374	128
UUC	F	0.182	9.571	99
UUU	F	0.818	43.020	445
GGA	G	0.189	8.604	89
GGC	G	0.125	5.704	59
GGG	G	0.106	4.834	50
GGU	G	0.580	26.392	273
CAC	H	0.358	7.444	77
CAU	H	0.642	13.341	138
AUA	I	0.359	24.749	256
AUC	I	0.143	9.861	102
AUU	I	0.499	34.416	356
AAA	K	0.511	25.522	264
AAG	K	0.489	24.459	253
CUA	L	0.120	15.275	158
CUC	L	0.043	5.510	57
CUG	L	0.128	16.241	168
CUU	L	0.156	19.818	205
UUA	L	0.259	32.869	340
UUG	L	0.294	37.413	387
AUG	M	1.000	33.159	343
AAC	N	0.208	8.701	90
AAU	N	0.792	33.063	342
CCA	P	0.343	11.118	115
CCC	P	0.158	5.124	53
CCG	P	0.072	2.320	24
CCU	P	0.427	13.824	143
CAA	Q	0.472	16.338	169
CAG	Q	0.528	18.271	189
AGA	R	0.341	12.181	126
AGG	R	0.241	8.604	89
CGA	R	0.078	2.804	29
CGC	R	0.084	2.997	31
CGG	R	0.068	2.417	25
CGU	R	0.189	6.767	70
AGC	S	0.155	10.924	113
AGU	S	0.286	20.205	209
UCA	S	0.159	11.214	116
UCC	S	0.067	4.737	49
UCG	S	0.038	2.707	28
UCU	S	0.295	20.882	216
ACA	T	0.342	17.498	181
ACC	T	0.161	8.217	85
ACG	T	0.072	3.674	38
ACU	T	0.425	21.752	225
GUA	V	0.227	21.365	221
GUC	V	0.078	7.347	76
GUG	V	0.259	24.362	252

GUU	V	0.436	41.087	425
UGG	W	1.000	16.725	173
UAC	Y	0.267	10.538	109
UAU	Y	0.733	29.002	300
UAA	*	0.378	10.828	112
UAG	*	0.301	8.604	89
UGA	*	0.321	9.184	95

* indicates termination codons.

Table S6. The amino acid substitutions in the VP1, VP2, VP6, NSP4, NSP5 and NSP6 proteins of the bovine rotavirus Kirikkale strain (RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P[5]) and comparison with the protein sequences of other selected rotaviruses. Amino acids that are identical to the present bovine rotavirus strain are indicated by dot. The bovine rotavirus Kirikkale strain is indicated in bold.

VP1	27	31	58	98	102	157	172	183	191	226	235	236	247	283
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP1 partial	V	L	T	R	V	D	T	V	P	V	S	M	E	?
UYH99844 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	A	.	.	.	.	.	.	.	.	.	.	K
APZ86776 RVA/Cow-wt/TUR/Amasya-2/2015/G8P5	A	.	A	.	.	.	.	.	S	.	.	.	.	R
AHF49967 Rotavirus A strain RF	.	.	A	.	.	.	.	.	.	.	T	.	.	R
AEK32867 Homo sapiens Rotashield DxRRV	.	.	A	.	.	.	.	.	.	.	T	.	.	R
ACC94312 rhesus monkey RVA/Simian-tc/USA/RRV/1975/G3P3	.	.	A	.	.	.	.	.	.	.	T	.	.	R
UVW67528 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	A	.	.	.	.	.	.	.	T	.	.	R
UZY23610 RVA/Bovine/Northern Ireland/R1WTA16/2013/G6P5	.	.	A	.	T	.	.	.	.	.	T	.	.	R
ADK27004 RVA/Vaccine/USA/RotaTeq-WI79-4/1992/G6P1A8	A	.	E	.	.	.	.	.	.	I	T	.	K	R
ADK27008 RVA/Vaccine/USA/RotaTeq-BrB-9/1996/G4P75	A	.	E	.	.	.	.	A	.	I	T	.	K	R
ADK27005 RVA/Vaccine/USA/RotaTeq-WI79-9/1992/G1P75	A	.	E	.	.	.	.	A	.	I	T	.	K	R
ADK27006 RVA/Vaccine/USA/RotaTeq-SC2-9/1992/G2P75	A	.	E	.	.	.	.	A	.	I	T	.	K	R
AMR44584 RVA/roe deer-wt/SLO/D38-14/2014/G6P15	.	F	A	.	.	.	.	.	.	.	T	.	.	R
AOV81271 C/Cervidae/United States/14-02218-2/2014	.	.	A	.	.	E	.	.	.	.	T	.	.	R
ACL27787 Hippotragus niger RVA/Antelope-wt/ZAF/RC-18-08/G6P14	.	.	.	K	.	.	I	.	.	.	T	.	.	R
AFV91311 RVA/Human-wt/AUS/V585/2011/G10P14	.	.	A	.	.	.	.	.	.	.	T	I	.	R
UFK32626 RVA/Horse-wt/IND/ERV2/2015/G6P1	.	.	A	.	.	.	.	.	.	.	T	.	.	R
BAV35169 Rotavirus A RVA/Cow-tc/JPN/KK3/1983/G10P11	.	.	A	.	.	.	.	.	.	.	T	.	.	R
	311	315	347	423	450	451	452	455	491	514	516	535	572	597
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP1 partial	P	D	V	A	N	V	I	I	S	V	K	A	R	E
UYH99844 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.
APZ86776 RVA/Cow-wt/TUR/Amasya-2/2015/G8P5	.	.	.	.	.	.	.	V	.	.	.	.	.	K
AHF49967 Rotavirus A strain RF	.	.	.	.	.	.	.	.	.	.	E	.	.	.
AEK32867 Homo sapiens Rotashield DxRRV	.	.	.	.	.	.	.	.	.	.	.	T	.	.
ACC94312 rhesus monkey RVA/Simian-tc/USA/RRV/1975/G3P3	.	.	.	.	.	.	.	.	.	.	.	T	K	.
UVW67528 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	.	.	.	.	.	.	.	.	.	.	.	.

UZY23610 RVA/Bovine/Northern Ireland/R1WTA16/2013/G6P5	S	.	I	.	.	.	.	.	T	I	.	.	.	.					
ADK27004 RVA/Vaccine/USA/RotaTeq-WI79-4/1992/G6P1A8	.	.	.	.	D	.	.	.	.	.	.	.	.	.					
ADK27008 RVA/Vaccine/USA/RotaTeq-BrB-9/1996/G4P75	.	.	.	.	D	.	.	.	.	.	.	.	.	.					
ADK27005 RVA/Vaccine/USA/RotaTeq-WI79-9/1992/G1P75	.	.	.	.	D	.	.	.	.	.	.	.	.	.					
ADK27006 RVA/Vaccine/USA/RotaTeq-SC2-9/1992/G2P75	.	.	.	.	D	.	.	.	.	.	.	.	.	.					
AMR44584 RVA/roe deer-wt/SLO/D38-14/2014/G6P15	.	.	.	.	.	.	V	.	.	.	.	.	.	.					
AOV81271 C/Cervidae/United States/14-02218-2/2014	.	.	.	.	.	I	.	.	.	.	.	.	.	.					
ACL27787 Hippotragus niger RVA/Antelope-wt/ZAF/RC-18-08/G6P14	.	.	.	V	.	.	.	.	.	.	.	.	.	.					
AFV91311 RVA/Human-wt/AUS/V585/2011/G10P14	.	.	.	.	.	.	.	.	.	.	.	.	.	.					
UFK32626 RVA/Horse-wt/IND/ERV2/2015/G6P1	.	N	.	.	.	.	.	.	.	.	.	.	.	.					
BAV35169 Rotavirus A RVA/Cow-tc/JPN/KK3/1983/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.					
	688	692	700	757	758	759	764	780	798	812	838	865	915						
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP1 partial	E	F	R	T	V	S	P	Y	K	K	I	Y	H						
UYH99844 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.						
APZ86776 RVA/Cow-wt/TUR/Amasya-2/2015/G8P5	.	.	.	.	A	.	.	.	.	.	.	.	.						
AHF49967 Rotavirus A strain RF	G	.	.	.	.	N	.	.	.	.	.	C	.						
AEK32867 Homo sapiens Rotashield DxRRV	.	.	.	.	.	N	.	.	.	.	.	.	.						
ACC94312 rhesus monkey RVA/Simian-tc/USA/RRV/1975/G3P3	.	.	.	.	.	N	.	.	.	.	.	.	.						
UVW67528 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	.	.	.	.	.	.	.	.	V	.	.						
UZY23610 RVA/Bovine/Northern Ireland/R1WTA16/2013/G6P5	.	.	.	.	.	.	.	.	.	.	.	.	.						
ADK27004 RVA/Vaccine/USA/RotaTeq-WI79-4/1992/G6P1A8	.	.	K	.	.	.	.	.	.	.	.	.	.						
ADK27008 RVA/Vaccine/USA/RotaTeq-BrB-9/1996/G4P75	.	.	K	.	.	.	.	.	.	.	.	.	.						
ADK27005 RVA/Vaccine/USA/RotaTeq-WI79-9/1992/G1P75	.	.	K	.	.	.	.	.	.	.	.	.	.						
ADK27006 RVA/Vaccine/USA/RotaTeq-SC2-9/1992/G2P75	.	.	K	.	.	.	.	.	.	.	.	.	.						
AMR44584 RVA/roe deer-wt/SLO/D38-14/2014/G6P15	.	.	.	.	.	N	.	.	.	.	.	.	.						
AOV81271 C/Cervidae/United States/14-02218-2/2014	.	.	.	.	.	.	.	H	.	.	.	.	.						
ACL27787 Hippotragus niger RVA/Antelope-wt/ZAF/RC-18-08/G6P14	.	.	K	V	.	.	.	.	.	.	.	.	Y						
AFV91311 RVA/Human-wt/AUS/V585/2011/G10P14	.	S	.	.	.	.	.	.	.	.	.	.	.						
UFK32626 RVA/Horse-wt/IND/ERV2/2015/G6P1	.	.	.	.	.	.	S	.	N	R	.	.	.						
BAV35169 Rotavirus A RVA/Cow-tc/JPN/KK3/1983/G10P11	.	.	.	.	.	.	S	.	.	.	.	.	.						
VP2	14	15	16	20	23	24	25	26	27	28	29	30	31	32	34	44	47	48	51
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP2 complete	I	N	N	M	K	D	D	K	K	K	N	S	N	N	I	K	V	V	S

QHG11383 Rabbit rotavirus A RRVA/L232	.	S	.	.	.	N	.	E	.	Q	D	.	.	.	M	.	.	.	.
UZY23615 RVA/Bovine/Northern Ireland/R1WTA05/2013/G6P5	.	S	.	.	.	N	.	E	.	Q	D	.	.	.	M	.	.	.	.
UZY23618 RVA/Bovine/Northern Ireland/R1WTA12/2013/G6P5	.	S	.	.	.	N	.	E	.	Q	D	.	.	.	M	.	.	.	.
ADB28000 Rotavirus A giraffe/UCD/IRL/2007	.	S	.	.	.	N	.	E	.	Q	D	.	.	.	M	.	.	.	.
QHU80083 RVA/Calf-wt/MAR/S18/2012/G6P14	.	S	.	.	.	N	.	E	.	Q	D	.	.	D	M	.	.	.	.
BAR88358 RVA/Human-wt/THA/SKT-27/2012/G6P14	.	S	.	.	.	N	.	E	.	Q	E	.	.	.	M	.	.	.	.
UYH99847 RVA/Cow-wt/TUR/K063/2008/G10P11	.	.	.	.	.	.	.	E	.	Q	D	.	S	.	T	R	.	.	.
UYH99848 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	.	.	.	.	.	E	.	Q	D	.	S	.	T	R	.	.	.
AGQ48108 RVA/Rabbit-tc/NLD/K1130027/2011/G6P11	.	.	.	.	.	.	.	E	.	Q	D	.	.	.	M	.	.	.	.
UQQ66507 RVA/Cow-wt/ZAF/MRC-DPRU456/2009/G10P11	.	.	S	.	.	.	N	E	.	Q	D	.	.	.	M	.	.	.	.
UQQ66502 RVA/Cow-wt/ZAF/Bov1/2009/G6P5	V	S	S	T	.	.	.	E	.	H	D	.	.	.	M	.	.	.	.
AHZ32701 RVA/Cow-wt/ZAF/MRC-DPRU3005/2009/G6P11	.	S	S	.	.	.	.	E	.	Q	D	.	.	.	M	.	.	.	.
AER51155 RVA/Cow-wt/ZAF/1604/2007/G8P1	.	S	S	.	.	.	.	G	.	Q	D	.	.	.	M	.	.	.	.
ASM56663 RVA/Goat-wt/UGA/BUW-14-085/2014/G6P1	T	.	.	.	.	.	.	E	.	Q	D	Q	.	.	M	.	I	I	N
ACH97418 Canine rotavirus CU-1	L	G	.	.	E	K	.	N	E	.	Q	D	S	.	M	.	I	.	.
BBJ70244 Human-wt/JPN/Tokyo17-10/2017/G2P4	L	.	.	.	.	I	.	-	D	.	Q	D	S	.	.	.	.	.	.
APT71323 Human rotavirus A CAU11-04	L	.	.	.	.	I	.	-	E	.	Q	D	S	.	.	.	.	.	.
ACH97429 Canine rotavirus K9	L	G	.	.	E	K	.	N	E	.	Q	D	S	.	M	.	I	.	.
ACH97396 Human rotavirus Ro1845	L	G	.	.	E	K	.	N	E	.	Q	D	S	.	M	.	.	.	.
BBJ70246 Human-wt/JPN/Tokyo17-15/2017/G2P4	L	.	.	.	.	I	.	-	D	.	Q	D	S	.	.	.	.	.	.
ACH97462 Feline rotavirus Cat2/G3P9	L	G	.	.	E	K	.	N	E	.	Q	D	S	.	M	.	.	.	.
AIS93076 RVA/Human-wt/BRA/SC19868/2011/G2P4	L	.	.	.	.	I	.	-	E	.	Q	D	S	.	.	.	.	.	.
AEH95559 RVA/Dog-tc/ITA/RV198-95/1995/G3P3	L	G	.	.	E	K	.	N	E	.	Q	D	S	.	M	.	.	.	.
ANN83175 RVA/Human-wt/VNM/12067 87/VP2 c2	L	.	.	.	.	I	.	-	E	.	Q	D	S	.	.	.	.	.	.
BAV57941 Rotavirus A RVA/Human-wt/THA/LS-L7/2014/G2P4	L	.	.	.	.	I	.	-	E	.	Q	D	S	.	.	.	.	.	.
QNG71094 RVA/Human-wt/USA/2009727045/2009/G8P4	L	.	.	.	.	I	.	-	E	.	Q	D	S	.	.	.	.	.	.
	52	55	57	58	61	63	66	73	75	77	86	103	106	110	115	121	129	140	161
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP2 complete	Q	I	I	A	V	K	K	L	V	K	V	S	K	D	Q	K	R	K	D
QHG11383 Rabbit rotavirus A RRVA/L232	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

UZY23615 RVA/Bovine/Northern Ireland/R1WTA05/2013/G6P5	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UZY23618 RVA/Bovine/Northern Ireland/R1WTA12/2013/G6P5	.	.	V	.	.	.	R	.	.	R	.	.	.	.	.	.	.	.	.
ADB28000 Rotavirus A giraffe/UCD/IRL/2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
QHU80083 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	E
BAR88358 RVA/Human-wt/THA/SKT-27/2012/G6P14	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UYH99847 RVA/Cow-wt/TUR/K063/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UYH99848 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
AGQ48108 RVA/Rabbit-tc/NLD/K1130027/2011/G6P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UQQ66507 RVA/Cow-wt/ZAF/MRC- DPRU456/2009/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UQQ66502 RVA/Cow-wt/ZAF/Bov1/2009/G6P5	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
AHZ32701 RVA/Cow-wt/ZAF/MRC- DPRU3005/2009/G6P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	R	.
AER51155 RVA/Cow-wt/ZAF/1604/2007/G8P1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ASM56663 RVA/Goat-wt/UGA/BUW-14-085/2014/G6P1	.	V	.	.	.	.	.	.	.	I	.	R	.	.	.	.	.	.	.
ACH97418 Canine rotavirus CU-1	.	V	.	.	.	R	.	.	.	I	T	.	.	.	.	.	.	R	.
BBJ70244 Human-wt/JPN/Tokyo17-10/2017/G2P4	H	V	V	T	.	.	.	.	.	I	T	R	.	L	.	K	R	.	.
APT71323 Human rotavirus A CAU11-04	H	V	V	T	.	.	.	.	.	I	T	R	.	L	.	K	R	.	.
ACH97429 Canine rotavirus K9	.	V	.	.	.	R	.	.	.	I	T	.	.	.	.	.	.	R	.
ACH97396 Human rotavirus Ro1845	.	V	.	.	.	.	.	.	.	I	T	.	.	.	.	.	.	R	.
BBJ70246 Human-wt/JPN/Tokyo17-15/2017/G2P4	H	V	V	T	.	.	.	.	.	I	T	R	.	L	.	K	R	.	.
ACH97462 Feline rotavirus Cat2/G3P9	.	V	.	.	.	.	.	.	.	I	T	.	.	.	.	.	.	R	.
AIS93076 RVA/Human-wt/BRA/SC19868/2011/G2P4	H	.	V	T	.	.	.	.	.	I	T	R	.	L	.	K	R	.	.
AEH95559 RVA/Dog-tc/ITA/RV198-95/1995/G3P3	.	V	.	.	I	.	.	.	.	I	T	.	.	.	.	.	.	R	.
ANN83175 RVA/Human-wt/VNM/12067 87/VP2 c2	H	V	V	T	.	.	.	.	.	I	T	R	.	L	.	K	R	.	.
BAV57941 Rotavirus A RVA/Human-wt/THA/LS- L7/2014/G2P4	H	V	V	T	.	.	.	.	.	I	T	R	.	L	R	K	R	.	.
QNG71094 RVA/Human-wt/USA/2009727045/2009/G8P4	H	V	V	T	.	.	.	I	.	.	I	T	R	N	L	.	K	R	.
	206	211	220	309	318	385	414	431	436	457	483	523	567	640	649	650	651	655	676
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP2 complete	S	I	A	N	W	A	V	I	V	Q	V	V	H	A	I	H	I	A	V
QHG11383 Rabbit rotavirus A RRVA/L232	.	.	.	S	.	T	.	.	.	.	.	.	.	.	L	.	.	.	.
UZY23615 RVA/Bovine/Northern Ireland/R1WTA05/2013/G6P5	.	M	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.

UZY23618 RVA/Bovine/Northern Ireland/R1WTA12/2013/G6P5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.
ADB28000 Rotavirus A giraffe/UCD/IRL/2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.
QHU80083 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	.	.	.	.	.	.	.	K	.	.	.	.	L	.	.	.	.
BAR88358 RVA/Human-wt/THA/SKT-27/2012/G6P14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	S	.
UYH99847 RVA/Cow-wt/TUR/K063/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	R	.	L	.	.	.	.
UYH99848 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	R	.	L	.	.	.	.
AGQ48108 RVA/Rabbit-tc/NLD/K1130027/2011/G6P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.
UQQ66507 RVA/Cow-wt/ZAF/MRC-DPRU456/2009/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.
UQQ66502 RVA/Cow-wt/ZAF/Bov1/2009/G6P5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.
AHZ32701 RVA/Cow-wt/ZAF/MRC-DPRU3005/2009/G6P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	L	.	.	.	.
AER51155 RVA/Cow-wt/ZAF/1604/2007/G8P1	.	.	V	.	.	.	M	.	.	.	.	.	.	.	L	.	.	.	.
ASM56663 RVA/Goat-wt/UGA/BUW-14-085/2014/G6P1	.	.	.	.	G	.	.	.	.	.	.	.	.	.	L	.	.	.	M
ACH97418 Canine rotavirus CU-1	.	.	.	.	.	I	V	I	.	.	.	.	.	.	L	Y	V	S	I
BBJ70244 Human-wt/JPN/Tokyo17-10/2017/G2P4	.	.	T	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
APT71323 Human rotavirus A CAU11-04	.	.	.	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
ACH97429 Canine rotavirus K9	.	.	.	.	.	I	.	I	.	.	.	.	.	.	L	Y	.	S	I
ACH97396 Human rotavirus Ro1845	.	.	.	.	.	I	.	I	.	.	.	.	.	.	L	Y	.	S	I
BBJ70246 Human-wt/JPN/Tokyo17-15/2017/G2P4	.	.	T	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
ACH97462 Feline rotavirus Cat2/G3P9	.	.	.	.	.	I	.	I	.	.	.	.	.	.	L	Y	.	S	I
AIS93076 RVA/Human-wt/BRA/SC19868/2011/G2P4	.	.	.	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
AEH95559 RVA/Dog-tc/ITA/RV198-95/1995/G3P3	.	.	.	.	.	I	.	I	.	.	.	.	T	.	L	Y	.	S	I
ANN83175 RVA/Human-wt/VNM/12067 87/VP2 c2	.	.	.	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
BAV57941 Rotavirus A RVA/Human-wt/THA/LS-L7/2014/G2P4	.	.	.	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
QNG71094 RVA/Human-wt/USA/2009727045/2009/G8P4	N	.	.	.	.	.	.	I	.	A	I	.	.	.	L	Y	.	S	I
	690	711	726	728	731	741	767	768	796	818	841	865							
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP2 complete	E	Q	D	D	Q	T	T	D	K	V	M	P							
QHG11383 Rabbit rotavirus A RRVA/L232	.	.	N	.	.	.	.	.	.	.	.	.							
UZY23615 RVA/Bovine/Northern Ireland/R1WTA05/2013/G6P5	.	.	N	.	.	.	.	.	.	.	.	.							
UZY23618 RVA/Bovine/Northern Ireland/R1WTA12/2013/G6P5	.	.	N	.	.	.	.	.	.	.	.	.							

ADB28000 Rotavirus A giraffe/UCD/IRL/2007	.	.	N	.	.	.	.	.	.	.	.	.
QHU80083 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	N	.	.	.	.	.	.	.	.	.
BAR88358 RVA/Human-wt/THA/SKT-27/2012/G6P14	.	.	N	.	.	.	.	.	.	I	.	.
UYH99847 RVA/Cow-wt/TUR/K063/2008/G10P11	.	.	N	.	.	.	.	.	.	.	I	.
UYH99848 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	N	.	.	.	.	.	.	.	I	.
AGQ48108 RVA/Rabbit-tc/NLD/K1130027/2011/G6P11	.	.	N	.	.	.	.	.	R	.	.	S
UQQ66507 RVA/Cow-wt/ZAF/MRC-DPRU456/2009/G10P11	.	.	N	.	.	.	.	.	R	.	.	.
UQQ66502 RVA/Cow-wt/ZAF/Bov1/2009/G6P5	.	.	N	.	.	.	.	.	R	.	.	.
AHZ32701 RVA/Cow-wt/ZAF/MRC-DPRU3005/2009/G6P11	.	.	N	.	.	.	.	E	R	.	.	.
AER51155 RVA/Cow-wt/ZAF/1604/2007/G8P1	.	.	N	.	.	.	.	.	R	.	.	.
ASM56663 RVA/Goat-wt/UGA/BUW-14-085/2014/G6P1	D	.	N	.	.	.	M	.	.	.	.	.
ACH97418 Canine rotavirus CU-1	.	.	N	.	.	.	.	.	.	.	.	.
BBJ70244 Human-wt/JPN/Tokyo17-10/2017/G2P4	D	H	N	E	.	S	.	.	.	.	.	.
APT71323 Human rotavirus A CAU11-04	D	H	N	E	.	S	.	.	.	.	.	.
ACH97429 Canine rotavirus K9	.	.	N	.	.	.	.	.	.	.	.	.
ACH97396 Human rotavirus Ro1845	.	.	N	.	.	.	.	.	.	.	.	.
BBJ70246 Human-wt/JPN/Tokyo17-15/2017/G2P4	D	H	N	E	.	S	.	.	.	.	.	.
ACH97462 Feline rotavirus Cat2/G3P9	.	.	N	.	.	.	.	.	.	.	.	.
AIS93076 RVA/Human-wt/BRA/SC19868/2011/G2P4	D	H	N	E	.	S	.	.	.	.	.	.
AEH95559 RVA/Dog-tc/ITA/RV198-95/1995/G3P3	.	.	N	.	.	.	.	.	.	.	.	.
ANN83175 RVA/Human-wt/VNM/12067 87/VP2 c2	D	H	N	E	.	S	.	.	.	.	.	.
BAV57941 Rotavirus A RVA/Human-wt/THA/LS-L7/2014/G2P4	D	H	N	E	K	S	.	.	.	.	.	.
QNG71094 RVA/Human-wt/USA/2009727045/2009/G8P4	D	H	N	E	.	S	.	.	.	.	.	.
VP6	56	117	122	154	211	225	275	281	330	369	394	
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 VP6 complete	I	R	I	K	V	L	A	I	V	D	M	
UYH99855 RVA/Cow-wt/TUR/K063/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.
UYH99856 RVA/Cow-wt/TUR/K060/2008/G10P11	.	.	.	.	.	.	.	.	.	.	.	.
APZ86767 RVA/Cow-wt/TUR/Amasya-1/2015/G8P5	.	.	.	.	.	.	.	.	.	.	.	.
UQQ66486 RVA/Cow-wt/ZAF/Bov7/2003/G10P11	.	.	.	.	.	.	.	.	I	.	.	.
UQQ66491 RVA/Cow-wt/ZAF/MRC-DPRU3005/2009/G6P11	.	.	.	.	.	.	.	.	.	.	.	.
UQQ66489 RVA/Cow-wt/ZAF/MRC-DPRU456/2009/G10P11	.	.	.	.	.	.	.	.	.	.	.	.

UQQ66484 RVA/Cow-wt/ZAF/Bov1/2009/G6P5	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
BAR88361 RVA/Human-wt/THA/SKT-27/2012/G6P14	.	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.
AKA40770 RVA/Pig-wt/ZAF/MRC-DPRU3878/2008/G5PX	.	.	.	.	.	.	P	.	.	.	.	.	.	.	.	.
QHU80089 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ADK26987 RVA/Vaccine/USA/RotaTeq-WI78-8/1992/G3P75	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BAV35173 Rotavirus A RVA/Cow-tc/JPN/KK3/1983/G10P11	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.
UVW67532 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UFK32649 RVA/Horse-wt/IND/ERV2/2015/G6P1	.	I	.	.	I	.	.	.	.	.	.	.	.	.	.	.
AGS43821 RVA/Horse-tc/JPN/OH-4/1982/G6P5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
QHU80088 RVA/Goat-wt/MAR/S19/2012/G10P14	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.
AIM40192 dog-wt/GER/88977/2013/G8P1	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.
QST88821 RVA/Buffalo-wt/ZAF/1442/2007/G10P11	.	.	.	R	I	.	.	.	.	.	.	.	.	.	.	.
QHG11381 Rabbit rotavirus A RRVA/L232	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.
ADC42128 Bovine rotavirus A	.	.	.	R	I	.	.	.	.	E	V	.	.	.	.	.
ANS11443 RVA/Human-wt/Bel/BEF06018/2014/G29P41	V	.	.	.	I	.	.	V	.	.	.	.	.	.	.	.
UQQ66487 RVA/Cow-wt/MOZ/MPT-93/2016/G10P11	.	.	V	.	I	.	.	.	.	.	.	.	.	.	.	.
NSP4	11	12	19	28	45	70	74	76	88	95	111	129	131	135	136	
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 NSP4 complete	L	S	S	P	T	Y	T	F	Q	I	E	R	Y	M	M	
APZ86779 RVA/Cow-wt/TUR/Amasya-1/2015/G8P5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
AAD46918 Bovine rotavirus CBNU-1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
AGS43826 RVA/Horse-tc/JPN/OH-4/1982/G6P5	.	.	.	.	.	.	.	.	.	.	G	.	.	.	.	I
BAV35178 Rotavirus A RVA/Cow-tc/JPN/KK3/1983/G10P11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
UVW67537 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	N	.	.	.	.	.	.	.	.	.	.	V	T	
AIZ08924 Equine rotavirus A FI-14	.	.	N	.	M	.	.	L	.	.	.	C	.	.	.	I
BAQ95482 RVA/Horse-tc/JPN/JE29/1997/G3P12	.	.	N	.	.	.	.	L	.	.	.	C	.	.	.	I
ABY64690 Human rotavirus A N155	.	.	D	S	.	.	.	.	.	.	.	.	.	.	.	I
UFK32662 RVA/Horse-wt/IND/ERV2/2015/G6P1	S	T	.	.	.	.	.	.	.	.	.	.	H	.	.	I
AGF85911 RVA/Human-wt/IND/N228/2004/G10P11	.	.	D	S	.	.	.	.	.	.	.	.	.	.	.	I
BAU88417 RVA/Cat-tc/JPN/FRV537/2004/G6P5	.	G	.	.	.	.	.	.	.	.	.	.	H	.	.	I
AEL87275 Rotavirus A TURV01	S	.	.	.	.	.	.	.	.	.	.	.	H	.	.	I
ACL36062 RVA/Rhesus-tc/USA/PTRV/1990/G8P1	.	G	.	.	M	.	.	.	.	.	.	.	H	.	.	I
ABG75799 RVA/Simian-tc/ZAF/SA11-H96/1958/G3P5B2	.	.	N	.	A	.	.	.	.	.	.	.	.	T	V	

AUC63157 RVA/Llama-wt/PER/L25/2014	.	.	N	.	A	.	K	.	.	.	.	.	.	T	V										
QHU80077 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	.	.	.	C	.	.	.	.	.	.	.	.	V										
AAA47288 Rotavirus subgroup 1	.	.	N	.	.	.	.	.	.	.	.	.	.	.	V										
AEP96171 Bovine rotavirus A cattle	.	.	.	.	.	.	.	.	K	M	.	.	.	.	V										
ABU49806 RVA/Human-tc/AUS/MG6/1993/G6P14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V										
	137	138	139	140	141	142	154	157	161	165	168	169	172	174											
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 NSP4 complete	R	T	A	D	E	I	R	K	N	P	P	K	T	A											
APZ86779 RVA/Cow-wt/TUR/Amasya-1/2015/G8P5	.	.	.	.	.	.	.	.	.	.	.	.	.	.											
AAD46918 Bovine rotavirus CBNU-1	.	.	.	.	.	.	.	.	.	.	.	.	.	.											
AGS43826 RVA/Horse-tc/JPN/OH-4/1982/G6P5	.	.	.	.	.	.	.	.	.	.	.	R	I	.											
BAV35178 Rotavirus A RVA/Cow-tc/JPN/KK3/1983/G10P11	.	.	V	.	.	.	.	.	.	.	L	.	.	.											
UVW67537 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	.	.	.	.	.	.	.	L	.	.	.	.											
AIZ08924 Equine rotavirus A FI-14	.	.	.	.	.	.	.	.	.	.	.	.	.	.											
BAQ95482 RVA/Horse-tc/JPN/JE29/1997/G3P12	.	.	.	.	.	.	.	.	.	.	.	.	.	.											
ABY64690 Human rotavirus A N155	.	.	.	.	.	M	.	.	.	.	.	.	.	.											
UFK32662 RVA/Horse-wt/IND/ERV2/2015/G6P1	.	A	V	.	.	.	.	E	.	.	.	.	.	.											
AGF85911 RVA/Human-wt/IND/N228/2004/G10P11	.	.	.	.	.	M	.	.	.	.	.	.	.	.											
BAU88417 RVA/Cat-tc/JPN/FRV537/2004/G6P5	.	A	.	.	.	.	.	E	.	.	.	.	.	.											
AEL87275 Rotavirus A TURV01	.	A	V	.	.	.	.	E	.	.	.	.	.	.											
ACL36062 RVA/Rhesus-tc/USA/PTRV/1990/G8P1	.	A	.	.	.	.	K	E	.	.	.	.	.	.											
ABG75799 RVA/Simian-tc/ZAF/SA11-H96/1958/G3P5B2	Q	.	T	G	.	.	.	E	S	.	.	R	.	.											
AUC63157 RVA/Llama-wt/PER/L25/2014	Q	.	T	G	.	.	.	E	S	.	.	R	.	.											
QHU80077 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	T	.	.	.	.	.	.	.	.	.	.	T											
AAA47288 Rotavirus subgroup 1	.	S	T	G	.	.	.	E	S	.	.	.	.	.											
AEP96171 Bovine rotavirus A cattle	.	.	T	.	.	.	.	.	.	.	.	.	.	.											
ABU49806 RVA/Human-tc/AUS/MG6/1993/G6P14	.	S	T	.	G	.	K	E	S	.	.	.	.	.											
NSP5	9	39	43	45	46	49	102	113	118	119	126	131	132	137	139	140	141	149	158	170	173	185			
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 NSP5 complete	S	Q	P	A	E	N	N	N	M	N	I	N	S	X	S	D	H	K	D	K	T	M			
APZ86777 RVA/Cow-wt/TUR/Amasya-1/2015/G8P5	.	R	.	.	.	S	.	.	.	S	.	.	.	S	.	.	.	.	.	N	N	.			
BAU88580 RVA/Cow-tc/NGA/NGRBg8/1998/G8P1	.	.	.	.	.	.	.	.	.	.	.	.	.	S	N	.	.	.	.	.	N	.			
ABU49815 RVA/Human-wt/BEL/B10925/1997/G6P14	.	.	.	.	.	S	.	.	.	.	.	S	.	S	.	.	.	.	.	.	N	.			

AXF43190 RVA/Bovine-tc/KOR/KJ19-2/2006/G6P7	.	.	.	.	.	S	.	S	.	.	.	.	.	S	.	.	.	.	.	E	N	.
UFK32666 RVA/Horse-wt/IND/ERV2/2015/G6P1	.	.	.	.	.	S	.	.	.	.	.	S	.	F	.	.	.	.	.	.	N	.
ADK27010 RVA/Vaccine/USA/RotaTeq-WI79-9/1992/G1P75	.	.	.	.	.	S	.	.	.	.	.	I	.	S	.	.	.	.	.	.	N	.
UVW67538 RVA/Oyster-wt/ARG/Crassostrea gigas-	.	.	.	V	.	S	.	S	.	.	.	.	.	S	.	.	.	.	.	.	N	.
QHU80079 RVA/Calf-wt/MAR/S18/2012/G6P14	.	.	.	.	.	S	.	.	.	.	.	S	.	S	.	.	.	R	.	.	N	.
AMR44592 RVA/roe deer-wt/SLO/D38-14/2014/G6P15	.	.	.	.	.	S	.	.	.	.	.	.	.	S	.	.	.	.	.	R	N	.
AII82561 RVA/Human-wt/US/2012841174/2012/G8P14	.	.	.	.	.	S	.	.	.	.	.	.	.	S	.	.	.	.	.	.	N	.
ACH97471 Feline rotavirus Cat2/G3P9	.	.	.	.	.	S	.	.	.	.	.	I	.	S	.	.	Y	.	.	.	N	.
AYE56610 RVA/Human-wt/MOZ/0060b/2012/G12P8P14	.	.	.	.	.	S	.	.	.	.	.	.	.	S	N	.	.	.	.	.	N	.
ANI85934 RVA/Human-wt/USA/2012741499/2012/G24P14	.	.	.	.	D	.	S	.	L	.	.	.	.	S	N	.	.	.	.	.	N	.
AIE90137 RVA/Human-wt/GHA/GH019-08/2008/G8P6	.	.	.	.	.	S	.	.	.	.	.	.	.	S	N	.	.	.	.	.	N	.
UQQ66563 RVA/Cow-wt/MOZ/MPT-93/2016/G10P11	.	.	Q	.	.	G	.	.	.	.	.	.	.	S	N	G	N	.	.	.	N	.
AEK20851 Lamb rotavirus CC0812-1/2008	.	.	.	.	D	S	.	.	V	.	V	S	I	S	N	.	.	.	E	.	N	I
ADC42132 Bovine rotavirus A DQ-75	R	.	.	.	.	S	.	.	V	.	V	.	I	S	N	.	.	.	.	.	N	.
ACN18215 Lamb rotavirus G10P15	.	.	.	.	D	S	.	.	V	.	V	S	I	S	N	.	.	.	E	.	N	I
NSP6			4	5	21	24	26	27	28	30	32	33	35	39	43	50						
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 NSP6 complete			L	R	T	Q	Q	K	H	I	I	C	Q	K	H	I						
ATI14969 RVA/Human-wt/DEU/GER29-14/2014/G6P9			.	Q	.	.	.	.	.	V	.	.	.	.	.	.						
CBJ23808 RVA/Human-wt/HUN/BP1879/2003/G6P14			.	Q	.	.	.	.	.	V	.	.	.	.	.	.						
ACH72471 Bovine rotavirus A G6P5			.	Q	.	.	.	.	.	V	T	.	.	.	.	.						
ACH72468 Human rotavirus A G6P14			.	Q	.	.	.	.	.	V	T	.	.	.	.	.						
AKA40125 RVA/Human-wt/CMR/MRC-DPRU3032/XXXX/G3P6			.	Q	.	.	.	.	.	V	T	.	.	.	.	T						
UZY23690 RVA/Bovine/Northern Ireland/R1WTA16/2013/G6P5			P	Q	.	.	.	.	.	V	T	.	.	.	R	.						
AMR44591 RVA/roe deer-wt/SLO/D38-14/2014/G6P15			.	Q	.	.	R	.	.	V	T	.	.	.	.	.						
QOY58099 Rotavirus A caprine K-98			.	Q	.	.	.	.	R	V	T	.	.	.	.	.						
AHZ32849 RVA/Cow-wt/ZAF/MRC-DPRU3010/2009/G6P5			.	Q	M	.	.	.	.	V	.	.	.	.	.	.						
AAT40861 Lamb rotavirus China			.	Q	I	.	.	M	R	V	.	.	.	R	.	.						
UQQ66564 RVA/Cow-wt/MOZ/MPT-93/2016/G10P11			.	Q	.	K	.	R	R	V	T	.	.	.	.	.						
AEK94039 Rotavirus A HC91xUK reassortant (UKg9KC-1)			.	Q	M	.	.	.	R	V	T	Y	R	.	.	.						
			58	65	75	76	77	81	82	83	93	94	95	96	97	98						
RVA/Cow-wt/TUR/KIRIKKALE/2019/G6P5 NSP6 complete			D	M	Q	H	N	R	A	M	?	T	K	E	L	K						
ATI14969 RVA/Human-wt/DEU/GER29-14/2014/G6P9			.	.	.	.	.	Q	.	.	S	I	.	.	.	.						

CBJ23808 RVA/Human-wt/HUN/BP1879/2003/G6P14	.	.	.	.	.	Q	.	.	L	.	.	.	S	.
ACH72471 Bovine rotavirus A G6P5	.	.	.	.	H	.	.	.	L	I	.	.	.	.
ACH72468 Human rotavirus A G6P14	N	.	.	.	.	Q	.	.	L	I	.	.	.	.
AKA40125 RVA/Human-wt/CMR/MRC-DPRU3032/XXXX/G3P6	.	T	.	.	.	Q	.	.	L	.	.	.	F	.
UZY23690 RVA/Bovine/Northern Ireland/R1WTA16/2013/G6P5	.	.	.	.	.	Q	.	.	L	.	.	.	.	.
AMR44591 RVA/roe deer-wt/SLO/D38-14/2014/G6P15	.	.	.	.	.	Q	V	.	L	I	.	.	.	.
QOY58099 Rotavirus A caprine K-98	.	.	.	.	.	Q	.	.	L	I	R	.	.	E
AHZ32849 RVA/Cow-wt/ZAF/MRC-DPRU3010/2009/G6P5	.	.	R	.	.	Q	.	.	L	I	.	.	-	-
AAT40861 Lamb rotavirus China	.	.	.	.	.	.	.	.	L	.	.	.	S	R
UQQ66564 RVA/Cow-wt/MOZ/MPT-93/2016/G10P11	.	.	.	.	.	Q	.	.	L	I	.	G	.	.
AEK94039 Rotavirus A HC91xUK reassortant (UKg9KC-1)	.	.	.	Y	.	Q	V	T	L	I	.	.	.	.