

SUPPLEMENTARY MATERIAL

Human metapneumovirus G protein is highly conserved within but not between genetic lineages

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Supplemental Table 1. Primers used for HMPV G gene amplification and sequencing.

First round	Sequence 5'-3'	Location	Tm (°C)
F5521 (SHF1ab)	AAGGCGATGTCATWAAAAGTGATGG	5521	57.4
R7332 (LaR1)	AGTCCTATGGCAACTTTTGCAGTG	7332	56.4
R7332 (LbR1)	ACGTCTACAGCAACTTTAGCAGTG	7332	52.6
Second round (nested)			
F5532 (SHaF2)	CTAGCAGTGATGGGTCTTCAAAAAC	5532	55.3
F5532 (SHbF2)	GATCCAGTGATGGATCCTCAGAAAC	5532	56.8
R7299 (LaR2)	AGCTGCGGTAAGGTCTTTTAAAGAG	7299	55.9
R7299 (LbR2)	CGTACCGATAGGGTCTTTTCAAAAAG	7299	56.5

Supplemental figure 1. Amino acid sequence alignment of full-length G genes from group A1 HMPV isolates. Sequences are arranged in chronological order from top to bottom. The letters indicate origin: "TN" = Tennessee; "CAN" = Canada; "NL" = Netherlands; and "JPS" = Japan. The first two digits of each isolate indicate the year. Sequences from Canada, the Netherlands and Japan obtained from GenBank as described in the text. TN sequences have been deposited in GenBank.

											100
TN/82-518	MEVKVENIRA	IDMLKARVKN	RVARSKCFKN	ASLILIGITT	LSIALNIYLI	INYTMOENTS	ESEHHTSSSP	MESKKTPTV	PIDNSDTNPS	SOHPTQOSAE	
TN/85-416	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TN/94-336	.....T	.....	.....	V.....	.....	.....	.....	.....R.....	.....T.....	..YS...T.	
TN/94-344	.....T	.....	.....	.....	.....	.....	.....Q.....	.....R.....	.....T.....	..YS...T.	
TN/94-711	.....T	.....	.....	.....	.....	.....	.....	.....R.....	.....T.....	...S...T.	
TN/94-911	.....T	.V.....	.....	..V.....	.....	..K..K..	.....	.....R.....	.....T.....S.	P.....T.	
TN/95-28	.....T	.V.....	.....	..V.....	.....	..K..K..	.....	.....R.....	.....T.....S.	P.....T.	
TN96-12	.....T	.....	.....	.....	.....	.....	.....	.....R.....	.....	..Y...T.	
TN/99-46	.....T	.V.....	.....	..V.....	.....	..K..K..	.....	.....R.....	.....T.....S.	P.....T.	
CAN/99-81	.....T	.....	.....	.....	.....	.....	K.....	.....R.....	.....	..G..Y...T.	
NL/00-1	.....T	.....	.....	..V.....	.....	..K..K..	.....	.....R.....	.....T.....S.	P.....T.	
CAN/00-13	.....T	.....	.....	.....	.....	.....	.....	.....R.....	.....	..G..Y...T.	
JPS/03-180	.....T	.....	.....	.....	.....	.....	.....	.....R.....	..M.....G	..Y...T.	
											200
TN/82-518	GSTLHSAASA	SSPETEPTST	PGTTSRPPSV	DHTTTPPSAS	RRTTSPAVHT	KNNPRIGSRT	HSPSRAMTGT	VRRTTALHTS	STRKRPSTAS	VQPDSSTITH	
TN/85-416	.....	.....	.D.....F.	.....	..K.....	.....	.....	.....R.....	.....P.....	.....T..	
TN/94-336	...Y.....	.....	.D.....F.	.....	..K.....	..L..S...	..PW...R.	.....T.R..	.....	.....AT..	
TN/94-344	...Y.....	..G.....	.D.....F.	.....	..K.....	..L..S...	..PW...R.	.....T.R..	.....	.....AT..	
TN/94-711	..PY.....	..G.....	.D.....F.	.....	..K.....	..L..S...	..PW..KR.	.....T.R..	.....	.....AT..	
TN/94-911	...YF....	.....	.D..N..F.	.....	..K.....	.....TS...	..P..T.R.	A...T.R..	.....	...I..AT..	
TN/95-28	...YF....	.....	.D..N..F.	.....	..K.....	.....TS...	..P..T.R.	A...T.R..	.....	...I..AT..	
TN96-12	...YF....	.....	.D.....F.	.....	..K.....	.....S...	..PW...R.	.....T.R..	..I...S...	.....AT..	
TN/99-46	...YF....	.....	.D..N..F.	.....	..K.....	.....TS...	..P..T.R.	A...T.R..	.....	...I..AT..	
CAN/99-81	...F.....	.....	.D.....F.	.....	.....	.....SP..	..PW...R.	..G..T.R..	.....	.....AT..	
NL/00-1	...YF....	.....	.D..N..F.	.....	..K.....	.....TS...	..P..T.R.	A...T.R..	.....	...I..AT..	
CAN/00-13	...F.....	.....	.D.....F.	.....	.....	..LK.SP..	..PW...R.	..G..T.R..	..I.....	.....T..	
JPS/03-180	.....T	.P.....	.D.....F.	.....	K.....	.....TNP..	..PW...R.	..G..T.R..	.....	.....AT..	
											230
TN/82-518	NHEETSPVSL	QTSASTTRPQ	RKSMEASTST	TYNQTS							
TN/85-416	.....	.....R.....	.....	.....					
TN/94-336	K...A...P	.....	.....	.....				
TN/94-344	K...A...P	.....	.....	.....				
TN/94-711	K...A...P	.....	.....	.....				
TN/94-911	KN..A..A.P	.....I.	..V..N..	.....						
TN/95-28	KN..A..A.P	.....I.	..V..N..	.....						
TN96-12	K...A...P	.....	.....	.....				
TN/99-46	KN..A..A.P	.....I.	..V..N..	.....						
CAN/99-81	K...A...P	.....A...	..G.....	.....						
NL/00-1	KN..A..A.P	.....I.	..V..N..	.....						
CAN/00-13	K...A...P	.....A...	..G.....	..H.....							
JPS/03-180	K...A...P	.....A...	..G.....	.....						

Supplemental figure 2. Amino acid sequence alignment of full-length G genes from group A2 HMPV isolates. Sequences are arranged in chronological order from top to bottom. The letters indicate origin: "TN" = Tennessee; "CAN" = Canada; "NL" = Netherlands; and "JPS" = Japan. The first two digits of each isolate indicate the year. Sequences from Canada, the Netherlands and Japan obtained from GenBank as described in the text. TN sequences have been deposited in GenBank.

	MEVKVENIRA	IDMLKARVKN	RVARSKCFKN	ASLILIGITT	LSIALNIYLI	VNYTKQKTTTS	ESEHHTSSPP	TESNKETSTI	PTDNPDPINPN	SOHQTTQOSTE
TN82-79										
TN84-127	I..I.....	.....	.....	.....	..P.....
TN85-57M..	.....	.....	.....	I..I.....	.....	.....	.....	..P.....
TN85-63	I..I.....	.....	.....	.....	..P.....
TN85-115	I..I.....	.....	.....	.....	..P.....
TN86-314	I..I.....	.....	.....	.....	..P...Y..
TN88-59	I..I.....	.....N..	.....	S.....	..P.....
TN91-1292M.....	.....I.....	.....	.....	.....T..	..P.....
TN92-250	I..I..N..	.....	.....A..	S.....	..P.....
TN92-313K..	.....	.....	.....	I..I..I..	.....	.....	.....T..	..P.....
TN92-357	I..I.....	.....	.....A..	S.....	..P.....
TN92-361	I..I.....	.....A.....	.....	.....	..P.....
TN92-396	I..I..N..	.....	.....A..	S.....	..P.....
TN92-435F.....	.....	.....	.....	.....I.....	.....	.....	.....T..	..P.....
TN94-49V.....	.....R.....	.....	.....	.....I.....	.....	.....	.....	..P.....
TN94-66	I..I.....	.....	.....	.....I..N...	..LP.....
TN94-616	I..I.....	.....	.....A..	S.....	..P.....
TN95-354	I..I.....	.....	.....	.....SI.....	..P.....
CAN97-83	I..I..S..	.....	.....A..	S.....	..P.....
TN00-31	I..I.....	.....	.....A..	S.....	..P.....
TN00-43	I..M.....	.....	.....A..	S.....	..P.....
NL00-17	I..I.....	.....	.....P..A..	S.....S	..P.....
CAN00-16P..T.....	.....H..	I..I.....	.....	.....A..	S.....	..P.....
JPS03-178	I..I.....	.....G.....	.....	.....SI.....	..P...P..

TN82-79	SPTLNPAASV	SPSETEPAST	PDTNRLSSV	DRSTTOPSES	RTKTKPTVHT	KNNPSTVSRT	QSPLRATKA	VLRATAFRTS	STGKRPTTTS	VQSDSSTTQ
TN84-127	.....T.P.	.SP..G.T..	.....	.....A.	.....S.....	.....	..QP.....	.H.....	.....	.....
TN85-57	.....T...	.SL..G....	.....	.....A.	.....S.....	.....	..QP.....	.H.....	.....	.....
TN85-63	.....	.....	S.....	.....A.	.....	.....	..L.....	.H.T.....	.....	.....
TN85-115	.....	.....	S.....	.....A.	.....	.....	.....	.H.T.....	.....	.....
TN86-314	.....	.....	S.....	.....A.	.....	.....	.....	.H.T.....	.....	.....
TN88-59	.L.P.ST...	.....D..L.	.....	.....I.....	.....I.....	.....	..PL.....	A.....L...	..ES.....	.....
TN91-1292	.....T...A	.....	.....A	.....	.....	N....A...	..P.T....	...T..LH..	.....	.....
TN92-250	N....T...	.....	.....	..A.....	.....	R....A...	.....	I.....M.	.....L	.....
TN92-313	.L.....T..	.....	.....	.....	..R.....K	..I...P..	..P...T.	....SL...	..E.....	.....
TN92-357	N.....	.....	.....	..A.....	.....	R....A...	.....E.	.....N	.....	.....
TN92-361	..S.S.T.P.	..P..G....	.....	.....T.	.....S.....	..G.....	..QP.....	.H.T.....	I..N.....	.....
TN92-396	N...S.T...	.....	.....	..A.....	.....	R....A...	.....	I.....I.	.....L	.....
TN92-435	.....T....	.....	.....A	.....	.....	N....A...	..PL.....	.P.T...H.	.P.....	.....
TN94-49	.....T...A	..P.....	.....A	.....	.....L...	.....A...	..P.....	.P...LH..	.....	.....
TN94-66	.L.....	.....	.....	.....	.....L..K	..I.....	..T.....	.....	..E.....	.....
TN94-616	N....T...	.....	.....A	..A.....	.....	R....A...	.....E	IP...L.M.	.....A.	.....
TN95-354	.....	.....	S...S.P..A	.....	..AR.....K	..I.....	..P.....	.....	..EG.....	.....
CAN97-83	N.....	.....	.....	..A.....	.....	R....A.S.	..P.....	IR...T..M.	.....	.....
TN00-31	N.....	.....	.....	..A.....	.....	R....A.S.	..T.V....	I...V..M.	.....L	.....
TN00-43	N.....	.....T..	...S.....	..A.....	...N.....	R....A.S.	..PQ.....	IP.....	.....L	.....
NL00-17	N.....A	.....	.....	..A.....	.....	I...N.A.S.	..P.T....	IR...T..M.	.....L	.....
CAN00-16	N.....V.T	.....T..	.....	..A.....	.....S.....	R....A.S.	..P.....	IR...T..M.	..E.....L	..Y.....
JPS03-178	.L..Y..S..	.S.....	.GI.....	.....K.	..N.T...K	R.I.....K	..PWT.A..	.P...T....	..E.....	..N.....

TN82-79	NHEETSSANP	QASASTMQ--	-----TSTPT	I*-----
TN84-127	.....	.....I..PQ	RKSIE.....	..-----
TN85-57	.....	.....I..PQ	RKSIE.....	..-----
TN85-63	.....	.E.....	-----	-----
TN85-115	.....	.E.....	-----	-----
TN86-314	.....	.E.....	-----	-----
TN88-59	.....	.....V.--	-----	.QS.--
TN91-1292	.....S..	.....	-----R.S.	.Q.K.--
TN92-250	.....G....	.....	-----	-----
TN92-313	.....	.....	-----L.	.....
TN92-357	.....G....	.....	-----	-----
TN92-361	.....	...T..I.PQ	RKSIE..I..	..-----
TN92-396	.....G....	.....	-----	-----
TN92-435	.....S..	.....	-----R...	.Q.K.--
TN94-49	.....PS..	.....	-----R...	.Q.K.--
TN94-66	.....G....*	-----	-----
TN94-616	.....G....	.....	-----	-----
TN95-354	.....G....	.....	-----	LQ....
CAN97-83	.....G....	.....V.....	-----	-----
TN00-31	.....G....	.....	-----	-----
TN00-43	.....D....	.....	-----	-----
NL00-17	.....G....	.....	-----I	.....
CAN00-16	.....G....	...V...*	-----	.....S*
JPS03-178	.....G....	.....N.....	-----	-----

Supplemental figure 3. Amino acid sequence alignment of full-length G genes from group B1 HMPV isolates. Sequences are arranged in chronological order from top to bottom. The letters indicate origin: "TN" = Tennessee; "CAN" = Canada; "NL" = Netherlands; and "JPS" = Japan. The first two digits of each isolate indicate the year. Sequences from Canada, the Netherlands and Japan obtained from GenBank as described in the text. TN sequences have been deposited in GenBank.

											100
TN/87-27	MEVRVENIRA	IDMFKAKIKN	RTRNSRCYRN	ATLILIGLTA	XSMALNIFLI	IDHATLKNMI	KTENCANMPS	AEPSKKTLMT	STAGPNTKPN	PQOATQWTT	E
TN/88-421	.....	.....	.I.....	.....	L.....	.....	.....	.....	.....	.....
TN/89-113	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....	.....
TN/89-420	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....	.....
TN/89-713	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....	.....
TN/94-11	.....	.....	.I.S.....	.....	L.....	.....	.....	.....P..	.....	.....
TN/94-137	.....	.....	.I.S.....	.....	L.....	.....	.....	.....P..	.....	.....
CAN/97-82	.....	.....T..	.I.S.....	.....	L.....	.....R...	.....P	.....Q..	.....	.....
TN/97-235	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....	.....
TN/97-237	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....	.....
TN/98-242	.....	.....	.I.S.....	.....	L.....	.....	.....	.....R...S	.....D	.....
NL/99-1	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....	.....
JPS/02-76	.....	.....	.IKS.....	.....	L.....	.....R...	.....L.	.....P..	.....S..	.....
JPS/03-194	.....	.....	.I.S.....	.....	L.....	.....R...	.....	.....P..	.....S..	.....
											200
TN/87-27	NSTSPAATSG	GYLYIGTTPT	PDTTAPQQTP	DKHTALLKST	NEQITQTTTE	KKTTRATTKK	GKKGKENTNQ	TTSTAATQTT	NTTNQIRNVS	ETTTTSARPR	
TN/88-421	.....	.....T....	.....	.....	.....	.....I...	.....	.....	.....L....	.....
TN/89-113	.....V..PE	.HP.T..Q.	S.....T	...P.P...	.....	...I...Q.	RE.....	.....	.....A..	..I...D...	
TN/89-420	.....V..PE	.HP.T..Q.	S.....T	...P.P...	.....	...I...Q.	RE.....	.....	.....A..	..I...D...	
TN/89-713	.....V..PE	.HP.T..Q.	S.....T	...P.P...	.....	...I...Q.	RE.....	.....	.....A..	..I...D...	
TN/94-11	.....V..E	.H..T..Q.	.....T	...TPQ...	.....	.....Q.	E.....	.....	.....A..	..I...D...	
TN/94-137	.....V..E	.H..T..Q.	.....T	...TPQ...	.....	.....Q.	E.....	.....	.....A..	..I...D...	
CAN/97-82	.....PE	.HP.TE.Q.	.....T	...P...	.....	.....Q.	RE.....	.....	.....A..	..I...D...	
TN/97-235	.....PE	.H..T..Q.	.....T	...P...	.....	.....Q.	RE.....	.....	.....A..	..I...D...	
TN/97-237	.....PE	.H..T..Q.	.....T	...P...	.....	.....Q.	RE.....	.....	.....A..	..I...D...	
TN/98-242	...L...E	...T..IQ.	.....T	..Y.....	.....	...A.Q.	.....	.....	...T..AN	..I...D...	
NL/99-1	.....V..PE	.HP.T..Q.	S.....T	...P...	.....	...I...Q.	RE.....	.....	.....A..	..I...D...	
JPS/02-76	.....LE	.HP.TE.Q.	.....T	...P...	.....	.....Q.	RE.....	.....	.....A..	..I...D...	
JPS/03-194	.....LE	.HP.T..Q.	.....T	...P...	.....	.....Q.	R.....	.....	.....A..	..I...D...	
											240
TN/87-27	IDTTTOSSEQ	TTQATDSSSL	PHHAORGAKP	K-----	----						
TN/88-421	T.....	.....	..Y..S...	-----	----						
TN/89-113	T.....	..R...P..P	-----	-----	----						
TN/89-420	T.....	..R...P..P	-----	-----	----						
TN/89-713	T.....	..R...P..P	-----	-----	----						
TN/94-11	T.....	..R...P...	..Y.....L	-----	----						
TN/94-137	T.....	..R...P...	..Y.....L	-----	----						
CAN/97-82	T.....R..	.....NP..P	.....S...	*-----	----						
TN/97-235	T.S.....	..R...A..P	..Y.....L	-----	----						
TN/97-237	T.S.....	..R...A..P	..Y.....L	-----	----						
TN/98-242	T.I.....	...T...P..P	..Y.....QL	.QTQHTNIPS	K*--						
NL/99-1	T.....	..R...P..P	-----	-----	----						
JPS/02-76	T.I.....	..R...EPG.P	...R.D.G.	R*-----	----						
JPS/03-194	.....	..R...EPG.S	..Y..R...G.	R*-----	----						

Supplemental figure 4. Amino acid sequence alignment of full-length G genes from group B2 HMPV isolates. Sequences are arranged in chronological order from top to bottom. The letters indicate origin: "TN" = Tennessee; "CAN" = Canada; "NL" = Netherlands; and "JPS" = Japan. The first two digits of each isolate indicate the year. Sequences from Canada, the Netherlands and Japan obtained from GenBank as described in the text. TN sequences have been deposited in GenBank.

100

TN/82-59	MEVRVENIRA	IDMFKAKIKN	RIRSSKCYRN	ATLILIGLTA	LSMALNIFLI	INHATLKNMT	KAHECANMPP	AEPSKKTGMT	STVDSNTKPN	SQQATQWTE
TN/83-126	L.....	.....	.....	.....	.D.....	.....	....T.....	...Y.....	P.....
TN/83-1211	L.....	.....	.....	.....	.D.....	.....	....T.....	...Y.....	P.....
TN/84-611	L.....	.....	.....	.....	.D.....	.....	....T.....	...Y.....	P.....
TN/85-123M..	.....	.....	.....	.DY.....T..	.V...V...V	.....	.A.....	P.....L...
TN/85-417M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L.....	P.....L...
TN/89-356M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L.....	P.....L...
TN/89-515M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A.....	P.....L...
TN/89-1144M..	.....	.....	.....	.DY.A.....	.V...V...V	.....	.A...I...	P.....L...
TN/89-1259M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A.....	P.....L...
TN/90-140M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A.....	P.....L...
TN/90-422M..	.....	.....	.....	.DY.A.....	.V...V...V	.....	.A.....	P.....L...
TN/90-1031M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L.....	P.....L...
TN/91-316M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L.....	P.....L...
TN/91-320M..	.....	.....	.....	.DY.....	.VK..V...V	.....	.A..L.....	P.....L...
TN/91-334M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A.....	P..V..L...
TN/91-349M..	.....	.....	.....	.DY.....	.VK..V...V	.....	.A..L.....	P.....L...
TN/91-451M..	.....	.....	.....	.DY.....	.VK..V...V	.....	.A..L.....	P.....L...
TN/91-521M..	.....	.....	.....	.DY.....	.VK..V...V	.....	.A..P.....	P.....S...
TN/92-1031M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/92-1120M..	.....	.....	.....	.DY.I.....	.V...V...VG	.....	.A..L..L..L	P.....L...
TN/93-32M..	.....	.....	.....	.DY.I.....	.V...V...VG	.....	.A..L..L..L	P.....L...
TN/93-413M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/93-616M..	.....	.....	.....	.DY.I.....	.V...V...VG	.....	.A..L..L..L	P.....L...
NL/94-1M..	.....	.....	.....	.DY.M.....	.V...V...V	.....	.A..L.....	P.....LAA
TN/95-111M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/95-252M..	.....	.....	.....	.DY.I.....	.V...V...V	.....A...	.A..L..L..L	P.....L...
TN/96-35	.....T	.....M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/96-44M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A.....	P.....L...
TN/96-102M..	.....	.....	.....	.DY.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/96-115M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/96-213M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/96-217M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A..L..L..L	P.....L...
TN/96-325	.....T	.....M..	.....	.....	.....	.DY.I.....	.V...V...V	.....	.A..L..L..L	P.....L...
CAN/98-73M..	.....	.....	.....	.DY...K...	.V...V...V	.....	.A..L.....	P.....L...
TN/99-419M..	.....	.....S.	.....	.DY..S....	RV...V...V	.....	.A..L.....	P..R...L...

TN/82-59	DSTSLAATSE	DHLHTGTTPT	PDATVLQOTP	DENTTPLRRT	NGOTTQTTE	KKPTGATTKK	G--TTNQTS	TAATQTSNTT	NQTRNGKETT	TTSARSRNDA
TN/83-126	.....	.....	.....P.....	..H...S.	.....A.I.	.....	E--.....	.....F...	.....R..A	.....KD..
TN/83-1211	.....	.....	.....P.....	..H...S.	.....A.I.	.....	E--.....	.....F...	.....R..A	.....KD..
TN/84-611	.....	.....	.....P.....	..H...S.	.....A.I.	.....	E--.....	.....F...	.....R..A	.....KD..
TN/85-123	.....	.....	.....S.....	..H..L.S.	.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/85-417	.....	.....	.....S.....	..H..L.P.	.....	.....R.....	E--..TR..	.....L...	.....S.ER.A	...V...G.
TN/89-356	.....	.....	.....S...T	..H..L.S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....S.
TN/89-515	...P.....	.....	.....S...T	..H..L.S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/89-1144	...P.....	.....	.....S...T	..H...S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/89-1259	...P.....	.....	.....S...T	..H...S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/90-140	...P.....	.....	.....S...T	..H...S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/90-422	...P.....	.....	.....S...T	..H...S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/90-1031	.....L.	.....R.....	.....S...T	..H..L.S.	..R.....	.....	E--..TR..	.....L...	.....S..R.A	.....G.
TN/91-316	.....	.....	.....S...T	..H..L.S.	..RL.....	.....	E--N..TR..	.....L...	.....S..R.A	.....G.
TN/91-320	.....	.....	.....S...T	..H..L.S.	..R.....	Q...RT...	---..TR..	.....L...	.....S..R.AI	.....G.
TN/91-334	...P.....	.....	.....S...T	..H..L.S.	..R.....	.....	EKEI..TR..	.....L...	.....S..R.A	.....G.
TN/91-349	.....	.....	.....S...T	..H..L.S.	..R.....	Q...RT...	---..TR..	.....L...	..R.S..R.AI	.....G.
TN/91-451	.....	.....	.....S...T	..H..L.S.	..R.....	Q...RT...	---..TR..	.....L...	.....S..R.AI	.....G.
TN/91-521	.....P.....	.....	.....S...T	..H..L.S.	..R.....	...RT...	---..TR..	.....L...	.....S..R.AI	.....G.
TN/92-1031	.....	.....	.....IS...T	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.A	.....G.
TN/92-1120	.....	.....	.....S...T	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.A	.....G.
TN/93-32	.....P.....	.....	.....S...T	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.A	.....G.
TN/93-413	.....	.....	.....S...T	..H..L.SI	..K.....	.....	EKE..TR..	.....L...	.....S..R.A	.....G.
TN/93-616	.....	.....	.....S...T	..H..L.SI	..R.....	.....	EKE..TR..G	.....L...	.....S..R.A	.....G.
NL/94-1	.....	.....	.....S...T	..Y..L.S.	..R.....	.....	E--..TR..	.....L...	.....SYVR.A	.....S.
TN/95-111	.....R.....	.....	.....S...T	..H..L.SI	..R.....	R.....	EKE..TR..	.....L...	.....S..RKA	.....G.
TN/95-252	.....I.....	.....	.....S...A	E.H..L.SI	..K.....	...N.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
TN/96-35	.....P.....	.....	.....S...A	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
TN/96-44	...P...P.	...P.....	.....S...A	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
TN/96-102	.....R.....	.....	.....S...T	..H..L.SI	..R.....I..	R.....	EKE..TR..	.....L...	.....S..R.A	.....G.
TN/96-115	.....P.....	.....	.....S...A	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
TN/96-213	.....P.....	.....	.....S...A	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
TN/96-217	.....P.....	.....	.....S...A	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
TN/96-325	.....P.....	.....	.....S...A	..H..L.SI	..R.....	.....	EKE..TR..	.....L...	.....S..R.AA	.....G.
CAN/98-73	.....L.	.....	.....S...T	..H..L.S.	..R.....A.	...R.....	E--..TR..	.....L...	.....S..R.A	.....N.
TN/99-419	.....L.	.....	.....S...T	..H..L.S.	..R.....A.	...R.....	E--..TR..	.....LKA.	.....S..R.A	.....N.

TN/82-59	AAQSSKQTTQ	ATDPSSQPHH	TQKSTTTM--	-----
TN/83-126	TT...G..A.	.N.G.....	ARE..AA.--	-----
TN/83-1211	TT...G..A.	.N.G.....	ARE..AA.--	-----
TN/84-611	TT...G..A.	.N.G.....	ARE..AA.--	-----
TN/85-123	TT...E....	.A.....	.....TWT	QHRHIFSK
TN/85-417	TT...E....	.A.....	A.....TWT	QHRHIFSK
TN/89-356	TT...N....	.A.....	.....	-----
TN/89-515	TT...D....	.A.....R	.....TWT	QHRHIFSK
TN/89-1144	TT...D....	.A.....R	.....TWT	QHRHIFSK
TN/89-1259	TT...D....	.A...P...R	.....TWT	QHRHIFSK
TN/90-140	TT...D....	.A.....R	.....TWT	QHRHIFSK
TN/90-422	TT...D....	.A.....R	.....TWT	-----
TN/90-1031	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/91-316	TT...D....	.A.....	.....TYN	TDTSSPSS
TN/91-320	.T...D....	.A.....	.....TYN	TDTSSPSS
TN/91-334	TT...D....	.A.....	.....T--	-----
TN/91-349	.T...D....	.A.....	.....TYN	TDTSSPSS
TN/91-451	.T...D....	.A.....	.....TYN	TDTSSPSS
TN/91-521	.T...D....	.A.....	.....TYN	TDTSSPSS
TN/92-1031	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/92-1120	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/93-32	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/93-413	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/93-616	TT.N.D....	.A.....	.....TYN	TDTSSPSS
NL/94-1	TT...D....	.A.....	.....TYN	TDTSSPSS
TN/95-111	TT.N.D....	.A.....S..	.....TYN	TDTSSPSS
TN/95-252	TT.N.D....	.A.....	.....TYN	TDTSSSSS
TN/96-35	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/96-44	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/96-102	TT.N.D....	.A.....S..	.....TYN	TDTSSPSS
TN/96-115	TT.N.D....	.A.....	.....TYN	TDTSSPSS
TN/96-213	TT.N.D....	.A....R...	.....TYN	TDTSSPSS
TN/96-217	TT.N.D....	.A....R...	.....TYN	TDTSSPSS
TN/96-325	TT.N.D....	.A.....	.....TYN	TDTSSPSS
CAN/98-73	TT...D....	.A.....SQ.	.....TYN	IDTSSPSS
TN/99-419	TT...D....	TA.....SQ.	.....TYN	TDTSSPSS