

# GMDDPEREVLEWRFDRLAF

## QUERY

CONSENSUS\_A  
 A.FR.HIV232956  
 A.FR.HIV232957  
 A.FR.HIV232959  
 A.KE.Q23-CXC-CG  
 A.SE.SE6594  
 A.SE.SE7253  
 A.SE.SE7535  
 A.SE.SE8131  
 A.SE.SE8538  
 A.SE.SE8891  
 A.UG.92UG037  
 A.UG.U455

## CONSENSUS\_B

B.-.E9ONEF  
 B.-.HIV232997  
 B.-.HIV233002  
 B.-.HIV233009  
 B.-.HIV233016  
 B.-.HIV233020  
 B.-.HIV233023  
 B.-.HIV233029  
 B.-.HIV233030  
 B.-.HIV233032  
 B.-.HIV233037  
 B.-.HIV233038  
 B.-.HIV233043  
 B.-.HIV233045  
 B.-.HIV233046  
 B.AU.1062-1-NEF  
 B.AU.93JW-3  
 B.AU.93LW-3  
 B.AU.AF064660  
 B.AU.AF064667  
 B.AU.AF064676  
 B.AU.MBC200  
 B.AU.MBC925  
 B.CN.AF033570  
 B.CN.AF033572  
 B.CN.PRC8  
 B.CN.RL42  
 B.DE.D31  
 B.DE.HAN  
 B.DE.HEI28CS  
 B.DE.HEI3BL  
 B.DE.HEI4BL  
 B.DE.HIVU52491  
 B.DE.NEFCC  
 B.DE.NEFCCG  
 B.DE.NH53  
 B.ES.89SP061  
 B.ES.AF082355  
 B.ES.AF082357

## GMDDPEREVLEWRFDRLAF

---E-?-?-m-k-----1  
 ---E---T-I-K-----L  
 ---E-K--M-K---S--R  
 ---E-K--M-K---S--R  
 ---E---K-K-----L  
 ---E-K--K-K-----L  
 ---E-K-T-R-----L  
 ---E---K-K-----L  
 ---E---T-M-K---PH--  
 ---E---T-M-K---K--L  
 ---E---T-M-K-----L  
 ---E-K-T-R-K---S--R  
 -V--E-K--M-K---T--L

-----k---v-k-----  
 -----V-----  
 -----K--M-K---x---  
 ---E-----L-K-----  
 ---E-----M-K-----  
 ---E--K--I-K-----  
 ---E--K--V-----  
 -----K--V-----  
 ---E--K--M-K-----  
 ---E--K--M-K-----  
 ---.T-G--SRGS--T---  
 -----K--Q-K---T---  
 -----K--M-K-----  
 ---E--K--K-----  
 ---E--K--K-KL-----  
 ---E--K--V-K---H---  
 -TE-T---M-K---K---  
 ---K--V--L--H---  
 ---L-----V-K---H---  
 ---GK--M-K-----L  
 -I-----V-K-----  
 -----K-----  
 -----G-----  
 ---E-----  
 -T-----M-K-----  
 -A-----M-K-----  
 -T-----M-K-----  
 -A-----M-K-----I  
 -----V-----  
 -TE-T---K-K---H---  
 -----V-K---Y  
 ---E-T-G--R-K---x---  
 ---E--N-----  
 ---E-----V-K---H---  
 -----Q-K---S---  
 ---x--K-x-M-K---x-x  
 -TE-T---K-----H---  
 ---E--K--V-----VL  
 ---E--K-----  
 -----K-----K---

B.ES.AF082358  
 B.ES.AF082359  
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 B.ES.AF082366  
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 B.ES.AF082378  
 B.ES.AF082380  
 B.ES.AF082383  
 B.ES.AF082386  
 B.FR.HIV232961  
 B.FR.HIV232962  
 B.FR.HIV232963  
 B.FR.HIV232964  
 B.FR.HIV232965  
 B.FR.HXB2  
 B.FR.NE100  
 B.FR.SWB884  
 B.GA.OYI  
 B.GB.001GH-93(1)  
 B.GB.002EM-93(1)  
 B.GB.003PW-93(1)  
 B.GB.005PF1-93(1)  
 B.GB.006DC-93(1)  
 B.GB.010JW-93(1)  
 B.GB.011JR-93(4)  
 B.GB.012WM-93(1)  
 B.GB.013PP-94(2)  
 B.GB.016GB-93(1)  
 B.GB.023PA-93(1)  
 B.GB.025JN-93(1)  
 B.GB.027SL-93(1)  
 B.GB.028JH-94(1)  
 B.GB.030JG-93(1)  
 B.GB.031DA-93(1)  
 B.GB.032AN-93(1)  
 B.GB.037BS-94(2)  
 B.GB.039NM-94(1)  
 B.GB.044C1-94(2)  
 B.GB.046JM-94(1)  
 B.GB.048AD-94(1)  
 B.GB.056RP-94B(1)  
 B.GB.057DR-94(1)  
 B.GB.065RK-94(1)  
 B.GB.067MM-94(2)  
 B.GB.068JB-94(1)  
 B.GB.098MS-94(1)  
 B.GB.103CD-94(1)  
 B.GB.104RT-94(1)  
 B.GB.105AS-94(1)  
 B.GB.112CR-94(2)  
 B.GB.117CH-94(2)  
 B.GB.122PS-95(1)  
 B.GB.124PD-95(1)

-W---K--V-K---H---  
 -----K-----K-----  
 --E---G---K-----  
 --E-----M-K-----  
 -IE-A-----V-K-----  
 --E-----V-K-----  
 --E-----V-K-----  
 --E--K--V-K---H--H  
 --E--K--V-----  
 -W---K--M-K-----  
 --E--K-----K-----  
 -----V-----  
 -R---K--Q-K---Y  
 --E-----M-K---H---  
 -----G-----  
 -----M-K-----  
 -----M-K-----  
 -----L-K--V-----  
 -----K--V-----  
 --E--K--V-K---S---  
 --E--K--V-K---S---  
 -----K--V-K-----  
 --E-----V-K-----  
 -----G--Q-K-----  
 -TE--K--Q-K-----  
 -----K--Q-K-----  
 --E-----M-K---H---  
 -----K--V-Q-----  
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 -----K-----L  
 -----K--Q-K---H---  
 --E-T-----V-K-----  
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 -----K--K-----  
 -----K-----K-----  
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 --E--K--V-K-----  
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 -----K--V-K---S---  
 -----K-----L  
 --E--K--Q-----H---  
 -----K--V-K---H---  
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 --E-S-K--L-K---H---  
 -----K--M-K-----  
 -----K-A-----H---  
 -----K--V-K---H---

B.GB.127RG-96(1)  
 B.GB.130WDC-95(1)  
 B.GB.131MVS-95(1)  
 B.GB.143PL-95(1)  
 B.GB.151DH-95(1)  
 B.GB.157GT-95(1)  
 B.GB.160KO-95(1)  
 B.GB.161KC-95(1)  
 B.GB.162BB-95(1)  
 B.GB.163NG-95(1)  
 B.GB.164SZ-95(1)  
 B.GB.165DH-95(1)  
 B.GB.166PW-95(1)  
 B.GB.167RW-95(1)  
 B.GB.168MB-95(1)  
 B.GB.CAM1  
 B.GB.GLNEF1  
 B.GB.MANC  
 B.GB.NEF2  
 B.GB.NEF3  
 B.GB.NEF5  
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 B.IT.B.IT-L3  
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 B.IT.B.IT-L5  
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 B.IT.B.IT-R2  
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 B.KR.AF063931  
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 B.KR.HIV298022  
 B.KR.HIV298024  
 B.KR.HIV298025  
 B.KR.HIV298027  
 B.KR.HIV298029  
 B.KR.HIV298030

---G--K--M-K-----  
 -----K---Q-K-----  
 -----K---V-K-----  
 -----V-K---H---  
 -----G--M-K-----  
 -I-----V-K-----  
 -V---K--M-K---S---  
 --E-K-K--V-K-----  
 -----K-----  
 -----  
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 --E-T-G--M-K-----  
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 --E-A-G--M-K-----  
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 -----K---M-K-----  
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 -----K--V-K-----  
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 -----G-----  
 --E-A-G---K-----  
 -----K---Q-K-----  
 -----K---V-K---K--C  
 --E---G--M-K---L  
 -----K---V-----  
 -----K---V-----x--  
 -----K---V-K-----  
 -----K---x-K---S---  
 --E---K--A-Q-----  
 -----K--A-K---L---  
 -----V-----  
 -IE-----V-K-----  
 -IE-----M-Q-----  
 -----K--V-----  
 ---x---V-K---H---  
 --E--K--A-----x---  
 --E-----A-K-----  
 --E---K--M-K-----  
 --E--K--M-K---N---  
 --E-x-K-----  
 -----K---K---G---  
 -----DND-----  
 --E--K--V-----  
 -----  
 -----H---  
 -----V-K-----  
 -----  
 -----V-K-----  
 -----G--V-----  
 -----  
 -----G-----  
 -IE-----M-K-----  
 -----V-----  
 -----V-----  
 --EG-----V-K---S---

B.KR.HIVZ98032	-----K--V-K-----L	B.US.NEF179C	-I-----M-K-----		
B.KR.HIVZ98034	-----K--V-----	B.US.NEF226B	-----K--Q---G---	CONSENSUS_F	--e-eD----r-?-----l
B.NL.3202A21	-----G--V-K-----	B.US.P102A13	-----K--M-K-----	F.CM.HIV232985	--E-ED----R-K---S--L
B.NL.NEFA	-----RRE--V-K---V	B.US.P233A17	-----G--Q-K-----	F.CM.HIV232986	--E-DDK---K-Q-----L
B.NL.NEFD	-----G---K---S---	B.US.P248A01	-----K--Q-K-----	F.FR.HIV232987	----ED----R-E-----
B.NL.NEFE	--E--K--Q--K--H--Y	B.US.P357A01	-----K-----		
B.SE.AF047082	-----Q-K-----	B.US.P896	-VE-S--Q--V-----	CONSENSUS_F1	--e-ED----?-?-----l
B.SE.AF047083	--E-----M-K-----	B.US.PC-93(1)	--E-S--Q-----	F1.BE.VI850	--E-ED----R-K---S--L
B.SE.AF047085	-----M-K-----	B.US.PRISO(1)	-----K--M-K-----	F1.BR.93BR020.1	--E-EDK---K-E-----L
B.TH.28-19	-----K-----K---K---	B.US.RF	-----K--V-K-----	F1.FI.FIN9363	--E-ED----K-K-----L
B.TH.AF082838	-I-----Q-K-----	B.US.RP12	--E--K--A-----	F1.FR.MP411	----ED----R-E-----
B.TH.AF082839	-----M-K-----	B.US.RR1	--E-----S---		
B.TH.AF082841	-----K--V---T---	B.US.SC	--E-----N---	CONSENSUS_F2	--E-?D?---?-?---?--L
B.TW.LM49	-----K--Q-K-----	B.US.SF2	--E-A-K--V---K---	F2.CM.MP255	--E-ED----R-K---S--L
B.US.HIV1U03375	--E-----Q-K-----	B.US.U16917	-----K--Q-K-----	F2.CM.MP257	--E-DDK---K-Q-----L
B.US.005PF-96(1)	-----K-----	B.US.WEAU160	-----H-K--M-K---K---		
B.US.AD-93(1)	----T--Q-K-----	B.US.WR27	-----K--V-K-----	CONSENSUS_G	--E-eD----v-----S--R
B.US.AD8	-----G---K---S---	B.US.YU2	-----G-----	G.BE.DRCBL	--E-EDG---V-----S--R
B.US.BC	--E-----M-K-----			G.FI.HH8793	E-E-ED----R--#--S--R
B.US.BIB	-----T-----	CONSENSUS_C	--e-eh---k-k---h--r	G.ML.HIV232990	--E-TD----V-----S--R
B.US.BJ-93(1)	-----Q-----	C.BR.92BR025	--E-SH---Q-K---L--R	G.NG.92NG083	--E-ED---V---N-S--R
B.US.BRVA	-----G--V-K-----	C.BW.96BW01B21	--E-EH---K-K---Q--R	G.NG.HIV232991	--E-ED---V-----S--R
B.US.BT-94(1)	--N-----K-----	C.BW.96BW0402	--E-ADG---R-K---H--H	G.NG.HIV232992	--E-ED---V-----S--R
B.US.CD1	-----K--Q-K-----	C.BW.96BW0502	--E-EHG---K-K---Q--R	G.SE.SE6165	--E-ED---V-----S--R
B.US.D8511	EV---K--M-K-----	C.BW.96BW1104	--E-EHK---K-K---Q--R		
B.US.DH1	--E--K--L-K-----Y	C.BW.96BW1210	-IE-AD---K-K---S--R	CONSENSUS_H	--E-e?---m-k-----?
B.US.DH123	--E--G--M-K-----	C.BW.96BW15B03	---N-DK---M-K---H--R	H.BE.VI991	-IE-----M-K-----L
B.US.DJ-93(1)	--E-S-----	C.BW.96BW16B01	--E-AD---K-V---H--R	H.BE.VI997	--E-E-G---M-K-----
B.US.E1	-----N-----	C.BW.96BW17A09	--E-ED---K-K---H--R	H.CD.HIV232994	--E-ED---K-T-----R
B.US.E81NEF	-----V-----	C.ET.ETH2220	-IE-ED---M-K---H--H	H.CD.HIV232995	--E-ED---M-K---H--
B.US.E88NEF	--E-E-K--M-K---S---	C.FR.HIV232966	--E-EHG---R-K---E--R	H.CF.90CF056	--E-DG---M-K-----L
B.US.EP-94(1)	-----Q-----	C.FR.HIV232967	--E-EH---K-K---L--R		
B.US.FA-93(1)	-V---K--M-K-----	C.FR.HIV232968	--E-EHG---K-K---S--R	CONSENSUS_J	-IE-E-----?-K---S--R
B.US.HIV1U16893	--E--K-----	C.FR.HIV232969	-IE-EH---R-K---H--H	J.SE.SE9173	-IE-E-----K-K---S--R
B.US.HIV1U24455	--E-----V-K-----	C.FR.HIV232970	--E-EH---K-K---Q--H	J.SE.SE9280	-IE-E-----Q-K---S--R
B.US.HIV1U26074	--E-T-G--M-K---L---	C.FR.HIV232971	--E-EH---M-K---L--R		
B.US.HIV1U26098	-----G--K-----	C.FR.HIV232972	-IE-AD---M-K---L--R	CONSENSUS_K	--E-EH---?-?--K---S--R
B.US.HIV1U26112	--E--K-M-V-----	C.FR.HIV232973	---ED---K-K---H--H	K.CD.EQTB11C	--E-EH---K-K---S--R
B.US.HIV1U26119	-----T--V-K---T---	C.FR.HIV232976	-IE-AHK---Q-K---L--H	K.CM.MP535	--E-EH---I-M-K---S--R
B.US.HIV1U26141	K-----K-----	C.FR.HIV232977	--E-EHG---M-K---S--R	N.CM.YBF30	-A--DHK---V-----S--R
B.US.HIVU44444	-----Q-K-----	C.FR.HIV232978	--E-DHN---V-K---S--H		
B.US.HIVU44445	----T-K--V-K---T---	C.FR.HIV232979	--E-EH---Q-K---L--H	CONSENSUS_O	-?E-?H?-I-?-?--RS-G?
B.US.HIVU44456	--K-----	C.FR.HIV232980	--E-EH---Q-K---H--H	O.CM.ANT70C	-FE-THK-I-M-K---RS-GN
B.US.HIVU44465	-----M-K-----	C.FR.HIV232981	--E-EH---M-K---S--H	O.CM.MVP5180	-AE-AHG-I-K-Q---RS-GL
B.US.HIVU44468	-----K--V-K---K--L	C.IN.21068	--E-DH---M-K..#Q--H	CRF01_AE.CF.90CF402	-I--D-----M-K---S--R
B.US.HP87B1	-----K--V-K---K--L	C.IN.301904	--E-EH---Q-K---L--H	CRF01_AE.FR.232982	-LE-E-----M-K---A--R
B.US.HS-93(1)	-IE--K-----K---	C.IN.301999	--E-EH---Q-K---H--H	CRF01_AE.FR.232983	-IE-E-----M-K---A--R
B.US.JRCSF	--E--K--V-K-----	C.IN.94IN11246	--E-EH---M-K..#Q--R	CRF01_AE.FR.232984	-IE-E-----M-K---A--R
B.US.JRFL	--E--K--V-K-----	C.IN.HIVY15117	--E-EH---FM-K---Q--R	CRF01_AE.TH.1-2	-IE-E-----M-K---A--R
B.US.LM1	--E--K--V-K-----	C.IN.HIVY17884	--E-EH---K-K---Q--R	CRF01_AE.TH.1-3	-IE-E--K--M-K---IA--R
B.US.LT-87-1(1)	-----Q-K-----	C.IN.HIVY17891	--E-EH---Q-K---Q--H	CRF01_AE.TH.11-25	-I-----I-K---A--R
B.US.MB-94(1)	#-----V-KS--H---	C.IN.HIVY17892	--E-EH---R-K---Q--L	CRF01_AE.TH.11-31	-I-----I-K---A--R
B.US.MNCG	--E-A-K--V---K---			CRF01_AE.TH.122-21	-IE-EDK---M-K---A--R
B.US.NC7	-----G--M-K-----	CONSENSUS_D	--E-----?--v---N----	CRF01_AE.TH.122-21	-IE-D-----M-K---A--R
B.US.NEF	-----K--V-----	D.CD.84ZR085	--E-E-K--V---N----	CRF01_AE.TH.18-47	-IE-D-----M-K---A--R
B.US.NEF164B		D.CD.ELI	--E-----Q--K---N----	CRF01_AE.TH.235-3	-I-----L-K---A--R
B.US.NEF166E		D.CD.NDK	--E-----Q--M---N----L	CRF01_AE.TH.235-32	-I-----L-K---A--R
		D.UG.94UG1141	--E-----V---N----	CRF01_AE.TH.24-54	-IE-A-----M-K---S--R
				CRF01_AE.TH.240-12	-IE-E-----M-K---A--R

CRF01_AE.TH.26-3	-IE-E-K--M-K---A--R
CRF01_AE.TH.35-6	-IR-E-----M-K---A--R
CRF01_AE.TH.6-9	-I--E-----M-K---A--R
CRF01_AE.TH.73-44	-IE-E-----M-K---S--R
CRF01_AE.TH.74-26	-IE-E-----L-K--GT--R
CRF01_AE.TH.89-30	--E-E-----M-K---A--R
CRF01_AE.TH.9-3	-IE-E-G---M-K---A--R
CRF01_AE.TH.93TH253	-IE-E-----I-K---A--R
CRF01_AE.TH.98-4	-VE-E-----M-K---A--R
CRF01_AE.TH.CM240	-IE-E-----M-K---A--R
CRF01_AE.TH.TH022	-IE-E-----I-K---S--R
CRF01_AE.TH.TH047	--G-G-----M-K---A--R
CRF02_AG.FR.DJ263	--E-ED---V-----S--R
CRF02_AG.FR.DJ264	--E-ED---V-----S--R
CRF02_AG.NG.IBNG	--E-DD---I-----
CRF03_AB.RU.KAL1532	----E-K---M-K-----L
CRF04_cpx.CY.94CY03	--E-E-----K-K-----Y
CRF04_cpx.GR.97PVCH	--E-E-----K-K-----
CRF04_cpx.GR.97PVMY	--E-E-----K-K---L--Y
AC.IN.21301	--E-EYG--Q-K---H--Y
AC.RW.92RW009	--E-ED---K-K---H--H
AC.SE.SE9488	----K---T-V-----L
AC.ZM.ZAM184	-IE-A-----R-K---H--L
ACD.SE.SE8603	-IE-EDK--R-K---Q--R
AD.SE.SE6954	--E-T-----M---N-----
AD.SE.SE7108	----E-K---K-Q-----L
ADHU.NO.NOGIL3	--E-E-x--M-----
ADU.CD.MAL	--E-A-----K-K---S--L
AF.GA.HIV232981	-A--E-K---M-K---H--R
AG.NG.G3	-LE-AD---V-----S--R
AG.SE.SE7812	--E-ED---V-----
AGHU.GA.VI354	----G-----M-K---S--R
AGJ.AU.BFP90	-AE-E-----K-K---S--R
AGJ.ML.95ML84	--E-E-----M-K---S--R
AGU.CD.Z321	----D-----M-K---S--R
BF.BR.93BR029.4	--E-ED--I-Q-----
DF.BE.VI961	----EDG--R-K---S--L
GH.GA.HIV232993	----EDG--V-----S--R
GU.FR.HIV232974	-IE-EHG--V-----L
U.CD.VI1126	-I--T-----V-K-----L
U.CM.HIV232988	--E-EH--I-M-K---S--R
U.FR.HIV232958	----DDK--M-K---S--R
U.FR.HIV232960	----E-K---K-Q---S--R
CONSENSUS_CPZ	--E-E??-??-??-??-??
CPZ.GA.CPZGAB	--E-EDK--V-----L
CPZ.US.CPZUS	--E-EHG---I-Q--TE--R

# EWRFD SRLAFHHVARELHPE

## QUERY

CONSENSUS\_A  
 A.FR.HIV232956  
 A.FR.HIV232957  
 A.FR.HIV232959  
 A.KE.Q23-CXC-CG  
 A.SE.SE6594  
 A.SE.SE7253  
 A.SE.SE7535  
 A.SE.SE8131  
 A.SE.SE8538  
 A.SE.SE8891  
 A.UG.92UG037  
 A.UG.U455

## CONSENSUS\_B

B.-.E9ONEF  
 B.-.HIV232997  
 B.-.HIV233002  
 B.-.HIV233009  
 B.-.HIV233016  
 B.-.HIV233020  
 B.-.HIV233023  
 B.-.HIV233029  
 B.-.HIV233030  
 B.-.HIV233032  
 B.-.HIV233037  
 B.-.HIV233038  
 B.-.HIV233043  
 B.-.HIV233045  
 B.-.HIV233046  
 B.AU.1062-1-NEF  
 B.AU.93JW-3  
 B.AU.93LW-3  
 B.AU.AF064660  
 B.AU.AF064667  
 B.AU.AF064676  
 B.AU.MBC200  
 B.AU.MBC925  
 B.CN.AF033570  
 B.CN.AF033572  
 B.CN.PRC8  
 B.CN.RL42  
 B.DE.D31  
 B.DE.HAN  
 B.DE.HEI28CS  
 B.DE.HEI3BL  
 B.DE.HEI4BL  
 B.DE.HIVU52491  
 B.DE.NEFCC  
 B.DE.NEFCCG  
 B.DE.NH53  
 B.ES.89SP061  
 B.ES.AF082355  
 B.ES.AF082357

## EWRFD SRLAFHHVARELHPE

m-k-----lk-r-?------  
 I-K-----LR-I-Q-M-----  
 M-K---S---RR-I-L-K-----  
 M-K---S---RK-R-L-M-----  
 K-K-----LK-R-----  
 K-K-----LK-L-C-K-----  
 R-----LR-R-Q-M-----  
 K-K-----LK-R-Q-----  
 M-K--PH--K-R-F-----  
 M-K--K--LK-R-H-----  
 M-K-----LT-R-----  
 R-K---S---RV-K-----  
 M-K---T--LK-R-Y-----

## CONSENSUS\_B

v-k-----m-----  
 V-----  
 M-K--x-----M-----  
 L-K-----MV---Y--  
 M-K-----M-----  
 I-K-----K-----  
 V-----R-M-----  
 V-----I-Q-----  
 M-K-----M--K---  
 M-K-----K---  
 RGS--T-----  
 Q-K--T---R---M---  
 M-K-----M---  
 -K-----M-----  
 K-KL-----M-----  
 V-K--H--R-M-----  
 M-K--K-----K---  
 V--L--H--R-----Y---  
 V-K--H--R-----  
 M-K-----LR-F--K---  
 V-K-----T-----  
 -----I---I---  
 -----  
 -----M-----  
 M-K-----M--K---  
 M-K-----M--K---  
 M-K-----M--K---  
 M-K-----I--M--M---  
 V-----K-M-----  
 K-K--H--K-----  
 V-K-----Y--M-----  
 R-K--x-----  
 -----M-----  
 V-K--H-----M--K---  
 Q-K--S-----  
 M-K-----x-xx-M---x---  
 K-----H-----M---  
 V-----VLR-M-----  
 -----R-M-----  
 -----K-----

B.ES.AF082358  
 B.ES.AF082359  
 B.ES.AF082363  
 B.ES.AF082364  
 B.ES.AF082366  
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 B.ES.AF082370  
 B.ES.AF082375  
 B.ES.AF082376  
 B.ES.AF082377  
 B.ES.AF082378  
 B.ES.AF082380  
 B.ES.AF082383  
 B.ES.AF082386  
 B.FR.HIV232961  
 B.FR.HIV232962  
 B.FR.HIV232963  
 B.FR.HIV232964  
 B.FR.HIV232965  
 B.FR.HXB2  
 B.FR.NE100  
 B.FR.SWB884  
 B.GA.OYI  
 B.GB.001GH-93(1)  
 B.GB.002EM-93(1)  
 B.GB.003PW-93(1)  
 B.GB.005PF1-93(1)  
 B.GB.006DC-93(1)  
 B.GB.010JW-93(1)  
 B.GB.011JR-93(4)  
 B.GB.012WM-93(1)  
 B.GB.013PP-94(2)  
 B.GB.016GB-93(1)  
 B.GB.023PA-93(1)  
 B.GB.025JN-93(1)  
 B.GB.027SL-93(1)  
 B.GB.028JH-94(1)  
 B.GB.030JG-93(1)  
 B.GB.031DA-93(1)  
 B.GB.032AN-93(1)  
 B.GB.037BS-94(2)  
 B.GB.039NM-94(1)  
 B.GB.044C1-94(2)  
 B.GB.046JM-94(1)  
 B.GB.048AD-94(1)  
 B.GB.056RP-94B(1)  
 B.GB.057DR-94(1)  
 B.GB.065RK-94(1)  
 B.GB.067MM-94(2)  
 B.GB.068JB-94(1)  
 B.GB.098MS-94(1)  
 B.GB.103CD-94(1)  
 B.GB.104RT-94(1)  
 B.GB.105AS-94(1)  
 B.GB.112CR-94(2)  
 B.GB.117CH-94(2)  
 B.GB.122PS-95(1)  
 B.GB.124PD-95(1)

V-K--H--R-M--\$-----  
 --K-----  
 --K-----M-----  
 M-K-----M-----  
 V-K-----Q-M-----  
 V-K-----M-----  
 V-K-----M-----  
 V-K--H--HR-M--I---  
 V-----M-----  
 M-K-----M--K---  
 --K-----  
 V-----M-----  
 Q-K-----Y--M-----  
 M-K--H--R--D---  
 -----Q-M-----  
 M-K-----K---  
 M-K-----M--K---  
 V-----M-----  
 V-----M-----  
 -----  
 V-K--S---K-----  
 V-K--S---K-----  
 V-K-----R-M--V---  
 V-K-----M-----  
 Q-K-----M--Q---  
 -----M--M---  
 Q-K-----M-----  
 Q-K-----M-----  
 M-K--H--R-M-----  
 V-Q-----M-----  
 V-----M--R-M-----  
 -----M---  
 A-K--L-----  
 K-K-----M-----  
 --K-----L--M--G---  
 -----R-M-----  
 Q-K--H--R-M--K---  
 V-K-----M-----  
 -----M--K---  
 --K--K-----  
 --K-----M-----  
 M-K-----M--K---  
 V-K-----M-----  
 V-K--S---R-----  
 --K-----L--M-----  
 Q-----H--K-M-----  
 V-K--H--K-M--V---  
 -----M-----  
 -----K---  
 L-K--H--K-----  
 M-K-----M--K---  
 -----M-----  
 -----H--R-M-----  
 V-K--H--R-M-----

B.GB.127RG-96(1)  
 B.GB.130WDC-95(1)  
 B.GB.131MVS-95(1)  
 B.GB.143PL-95(1)  
 B.GB.151DH-95(1)  
 B.GB.157GT-95(1)  
 B.GB.160KO-95(1)  
 B.GB.161KC-95(1)  
 B.GB.162BB-95(1)  
 B.GB.163NG-95(1)  
 B.GB.164SZ-95(1)  
 B.GB.165DH-95(1)  
 B.GB.166PW-95(1)  
 B.GB.167RW-95(1)  
 B.GB.168MB-95(1)  
 B.GB.CAM1  
 B.GB.GLNEF1  
 B.GB.MANC  
 B.GB.NEF2  
 B.GB.NEF3  
 B.GB.NEF5  
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 B.IT.AF011492  
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 B.IT.AF047081  
 B.IT.B.IT-L1  
 B.IT.B.IT-L2  
 B.IT.B.IT-L3  
 B.IT.B.IT-L4  
 B.IT.B.IT-L5  
 B.IT.B.IT-R1  
 B.IT.B.IT-R2  
 B.IT.B.IT-R3  
 B.IT.B.IT-R4  
 B.IT.B.IT-R5  
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 B.KR.AF063926  
 B.KR.AF063927  
 B.KR.AF063931  
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 B.KR.HIV298022  
 B.KR.HIV298024  
 B.KR.HIV298025  
 B.KR.HIV298027  
 B.KR.HIV298029  
 B.KR.HIV298030

M-K-----  
 Q-K-----Q-M-----  
 V-K-----M-K-----  
 V-K--H--M-----  
 M-K-----M-----  
 V-K-----  
 M-K--S---R---Y---  
 V-K-----M--K---  
 -----R-M-----  
 -----M-----  
 V-K--H--R-M-----  
 M-K-----M-----  
 M-K-----I---  
 M-K-----  
 M-K-----R--  
 M-K-----M--K---  
 -----RM--K---  
 V-K-----PD-----  
 V-K--CH--R-----  
 -----  
 --K-----M--K---  
 Q-K-----  
 V-K--K--C--V---  
 M-K-----L--M--I---  
 V-----M--K---  
 V-----x--M--K---  
 -----  
 V-K-----M-----  
 x-K--S-----  
 A-Q-----Q---  
 A-K--L-----  
 V-----x---  
 V-K-----  
 M-Q-----M--K---  
 V-----R-----T---  
 V-K--H--K-----Q---  
 A-----x-----M---  
 A-K-----  
 M-K-----  
 M-K--N---I-----  
 --K--G-----  
 -----  
 V-----SC-CVF---  
 -----M--K---  
 -----M--K---  
 M-K-----M-----  
 -----K---  
 -----H--R-M-----  
 V-K-----M--K---  
 -----M--GK---  
 V-----I--K---  
 V-K-----M--KY---  
 -----M--K---  
 M-K-----D---  
 V-----K---  
 V-----M--K---  
 V-K--S---M--K---

B.KR.HIVZ98032	V-K-----L-----K---	B.US.NEF179C	M-K-----M-Q-K---	CONSENSUS_F	r-?-----lR-i-----r---
B.KR.HIVZ98034	V-----M-----	B.US.NEF226B	Q---G---Q-M---K---	F.CM.HIV232985	R-K---S--LR-I-----R---
B.NL.3202A21	-----M-----	B.US.P102A13	M-K-----Y-T---K---	F.CM.HIV232986	K-Q-----Lk-I-----R---
B.NL.NEFA	V-K-----M-----	B.US.P233A17	Q-K-----M-----	F.FR.HIV232987	R-E-----R-I---K---
B.NL.NEFD	V-K-----V-M-----	B.US.P248A01	Q-K-----M-----		
B.NL.NEFE	--K--S---Q-K---Y--	B.US.P357A01	-----K---		
B.SE.AF047082	Q-K---H--YR-M-----	B.US.P896	V-----M-----	CONSENSUS_F1	?-?-----lR-I-----r---
B.SE.AF047083	Q-K-----M-----	B.US.PC-93(1)	Q-----M-----	F1.BE.VI850	R-K---S--LR-I-----R---
B.SE.AF047085	M-K-----I-----	B.US.PRISO(1)	M-K-----M---K---	F1.BR.93BR020.1	K-E-----LR-I-----R---
B.TH.28-19	M-K-----M-----	B.US.RF	V-K-----K---	F1.FI.FIN9363	K-K-----Lk-I-----R---
B.TH.AF082838	--K--K---R-----	B.US.RP12	A-----S---R---K---D	F1.FR.MP411	R-E-----R-I---K---
B.TH.AF082839	Q-K-----M-----	B.US.RR1	-----N---M---D---		
B.TH.AF082841	M-K-----M-----	B.US.SC	V---K---M-----	CONSENSUS_F2	?-?---?--LR-?---R---
B.TW.LM49	V---T---R-----	B.US.SF2	Q-K-----M-----	F2.CM.MP255	R-K---S--LR-----R---
B.US.HIV1U03375	Q-K-----M-----	B.US.U16917	M-K---K-----	F2.CM.MP257	K-Q-----LR-I-----R---
B.US.005PF-96(1)	Q-K-----K---	B.US.WEAU160	V-K-----K-----		
B.US.AD-93(1)	-----Q---	B.US.WR27	-----K-----	CONSENSUS_G	v-----S--Rr-l-----
B.US.AD8	Q-K-----M-----	B.US.YU2	-----K-----	G.BE.DRCBL	V-----S--RR-L-----
B.US.BC	-----M-----			G.FI.HH8793	R-#---S--RR-L-Q-----
B.US.BIB	--K--S---R-----	CONSENSUS_C	k-k---h--rr-m-----	G.ML.HIV232990	V-----S--RR-I-----
B.US.BJ-93(1)	M-K-----M-Q---Y--	C.BR.92BR025	Q-K---L--RR-M-----	G.NG.92NG083	V---N-S--RR-L-----
B.US.BO1	-----M-Q---Y--	C.BW.96BW01B21	K-K---Q--RR-M-----	G.NG.HIV232991	V-----S--RR-I-----L-
B.US.BRVA	Q-----M-----	C.BW.96BW0402	R-K---H--HR-M-----	G.NG.HIV232992	V-----S--RR-L-----
B.US.BT-94(1)	V-K-----M-----	C.BW.96BW0502	K-K--Q--RR-M---Y--	G.SE.SE6165	V-----S--RR-I-----
B.US.CD1	--K-----M-----	C.BW.96BW1104	K-K---Q--RR-L-----		
B.US.D8511	Q-K-----M-----	C.BW.96BW1210	K-K---S--RR-LT--K---	CONSENSUS_H	m-k-----?r-r-----
B.US.DH1	M-K-----M-----	C.BW.96BW15B03	M-K--H--RR-M-----	H.BE.VI991	M-K-----LR-R-K-----
B.US.DH123	L-K-----Y--M-----	C.BW.96BW16B01	K-K---H--RR-M-----	H.BE.VI997	M-K-----T-T---K---
B.US.DJ-93(1)	M-K-----M-----	C.BW.96BW17A09	K-V--H--RK-M-----	H.CD.HIV232994	K-T-----RR-M-----
B.US.E1	-----M-----	C.ET.ETH2220	K-K--H--RR-M-----	H.CD.HIV232995	M-K---H--R-R-----
B.US.E81NEF	-----M-----	C.FR.HIV232966	M-K--H--HR-M-----	H.CF.90CF056	M-K-----LT-L--VK---
B.US.E88NEF	V-----M-----	C.FR.HIV232967	R-K---E--RR-----		
B.US.EP-94(1)	M-K--S-----K---	C.FR.HIV232968	K-K---L--RR-M-----	CONSENSUS_J	?-K---S--RR-I-----
B.US.FA-93(1)	Q-----M---	C.FR.HIV232969	K-K---S--RR-----	J.SE.SE9173	K-K---S--RR-I-----
B.US.HIV1U16893	M-K-----Q-M-----	C.FR.HIV232970	R-K---H--HR-M-----	J.SE.SE9280	Q-K---S--RR-I-----
B.US.HIV1U24455	-----M-----	C.FR.HIV232971	K-K--Q--HR-M-----		
B.US.HIV1U26074	V-K-----M---P---	C.FR.HIV232972	M-K--H--RR-M-----	CONSENSUS_K	?-K---S--R?-----?--?
B.US.HIV1U26098	M-K---L--R-M---K---	C.FR.HIV232973	R-K---H--RR-L---I---	K.CD.EQTB11C	K-K---S--RK-----M---
B.US.HIV1U26112	V-K-----L--M-----	C.FR.HIV232976	R-K--Q--RR-I-----	K.CM.MP535	M-K---S--RR-----D
B.US.HIV1U26119	--K-----M-----	C.FR.HIV232977	K-K--H--HR-M-----	N.CM.YBF30	V-----S--RR-----
B.US.HIV1U26141	V-----K---	C.FR.HIV232978	M-K--L--RK-L-----		
B.US.HIVU44444	M-K-----M-----	C.FR.HIV232979	K-K--H--HK-M-----	CONSENSUS_O	?-?-RS-G?T-?--??----
B.US.HIVU44450	V-K-----T-----	C.FR.HIV232980	Q-K---L--HR-M-----	O.CM.ANT70C	M-K--RS-GNT---MIT---
B.US.HIVU44456	--K-----M-----	C.FR.HIV232996	M-K--S--HR-----	O.CM.MVP5180	K-Q--RS-GLT-I-LQK---
B.US.HIVU44465	Q-K-----I---	C.IN.21068	V-K--Q--HK-R-----	CRF01_AE.CF.90CF402	M-K---S--RR-I-----
B.US.HIVU44468	V-K--T---K-----	C.IN.301904	Q-K---L--HR-R-----	CRF01_AE.FR.232982	M-K---A--RK-I-----D
B.US.HP87B1	-----M-----	C.IN.301999	Q-K--H--HR-M-----	CRF01_AE.FR.232983	M-K---A--RT-T-----
B.US.HS-93(1)	M-K-----R-M-----	C.IN.94IN11246	M-K..#Q--HR-I-----	CRF01_AE.FR.232984	M-K---A--RK-I-----
B.US.JRCSF	V-K---K--L-----	C.IN.HIVY15117	M-K---Q--RR-MG-G---	CRF01_AE.TH.1-2	M-K---A--RK-I---M---
B.US.JRFL	-----K-----	C.IN.HIVY17884	K-K---Q--RR-W-----	CRF01_AE.TH.1-3	M-K---IA--RK-I---M---
B.US.LM1	V-K-----N-M-----	C.IN.HIVY17891	Q-K--Q--HR-R-----	CRF01_AE.TH.11-25	I-K---A--RR-I---R---
B.US.LT-87-1(1)	M-K-----Q---	C.IN.HIVY17892	R-K--Q--LR-T-----	CRF01_AE.TH.11-31	I-K---A--RR-I-----
B.US.MB-94(1)	Q-K-----M-----			CRF01_AE.TH.122-21	M-K---A--RK-I-----
B.US.MNCG	V-KS--H---Q-Y-----	CONSENSUS_D	v---N-----E-K-?-k---	CRF01_AE.TH.18-47	M-K---A--RK-I---Q---
B.US.NC7	V-----K-----	D.CD.84ZR085	V---N-----E-K-K-KY--	CRF01_AE.TH.235-3	M-K---A--RK-I-----
B.US.NEF	-----M-----	D.CD.ELI	K---N-----E-K---M---	CRF01_AE.TH.235-32	L-K---A--RK-I-----
B.US.NEF164B	M-K-----I---K---	D.CD.NDK	M---N-----LE-K-----	CRF01_AE.TH.24-54	M-K---S--RK-I---Q---
B.US.NEF166E	V-----M---K---	D.UG.94UG1141	V---N-----E-K-KMK---	CRF01_AE.TH.240-12	M-K---A--RK-I---Q---

CRF01_AE.TH.26-3	M-K---A--RR-I----R--
CRF01_AE.TH.35-6	M-K---A--RK-I----Q---
CRF01_AE.TH.6-9	M-K---A--RK-I----R--
CRF01_AE.TH.73-44	M-K---S--RR-I----Q---
CRF01_AE.TH.74-26	L-K--GT--RQ-T-----
CRF01_AE.TH.89-30	M-K---A--RK-I----Q---
CRF01_AE.TH.9-3	M-K---A--RK-T-----
CRF01_AE.TH.93TH253	I-K---A--RR-I----R--
CRF01_AE.TH.98-4	M-K---A--RR-I----R--
CRF01_AE.TH.CM240	M-K---A--RK-----Q---
CRF01_AE.TH.TH022	I-K---S--RK-L-----
CRF01_AE.TH.TH047	M-K---A--RK-I---M---
CRF02_AG.FR.DJ263	V-----S--RT-R-----
CRF02_AG.FR.DJ264	V-----S--RR-I---R---
CRF02_AG.NG.IBNG	I-----R-T-----
CRF03_AB.RU.KAL1532	M-K-----LT-R-----
CRF04_cpx.CY.94CY03	K-K-----YK-----
CRF04_cpx.GR.97PVCH	K-K-----K-I-----
CRF04_cpx.GR.97PVMY	K-K---L--YR-M-----
AC.IN.21301	Q-K---H--YK-Q---R---
AC.RW.92RW009	K-K---H--HR-M-----
AC.SE.SE9488	V-----LK-L---K---
AC.ZM.ZAM184	R-K---H--LR-R-----D
ACD.SE.SE8603	R-K---Q--RR-M---M---
AD.SE.SE6954	M---N-----E-K-HQ---
AD.SE.SE7108	K-Q-----LK-L---K---
ADHU.NO.NOGIL3	M-----K-R-----
ADU.CD.MAL	K-K---S--LR-R---Q---
AF.GA.HIV232981	M-K---H--RK-L---K---
AG.NG.G3	V-----S--RR-I---Q---
AG.SE.SE7812	V-----T-K---M---
AGHU.GA.VI354	M-K---S--RE---K-Y--
AGJ.AU.BFP90	K-K---S--RR-I---K---
AGJ.ML.95ML84	M-K---S--RR-T---M---
AGU.CD.Z321	M-K---S--RK-L---M---
BF.BR.93BR029.4	Q-----M-----
DF.BE.VI961	R-K---S--LK-I---RR--
GH.GA.HIV232993	V-----S--RR-----
GU.FR.HIV232974	V-----LK-R-----
U.CD.VI1126	V-K-----LK-L---K---
U.CM.HIV232988	M-K---S--RR-----D
U.FR.HIV232958	M-K---S--RR-I---M---
U.FR.HIV232960	K-Q---S--RR-I-----D
CONSENSUS_CPZ	?-?-??-?R-?-?-?---
CPZ.GA.CPZGAB	V-----LR-I---Q---
CPZ.US.CPZUS	I-Q--TE--RR-R-K-----

# KAADVLSHFLKEKGGLEGLI

## QUERY

CONSENSUS\_A  
 A.FR.HIV232956  
 A.FR.HIV232957  
 A.FR.HIV232959  
 A.KE.Q23-CXC-CG  
 A.SE.SE6594  
 A.SE.SE7253  
 A.SE.SE7535  
 A.SE.SE8131  
 A.SE.SE8538  
 A.SE.SE8891  
 A.UG.92UG037  
 A.UG.U455

## CONSENSUS\_B

B.-.E9ONEF  
 B.-.HIV232997  
 B.-.HIV233002  
 B.-.HIV233009  
 B.-.HIV233016  
 B.-.HIV233020  
 B.-.HIV233023  
 B.-.HIV233029  
 B.-.HIV233030  
 B.-.HIV233032  
 B.-.HIV233037  
 B.-.HIV233038  
 B.-.HIV233043  
 B.-.HIV233045  
 B.-.HIV233046  
 B.AU.1062-1-NEF  
 B.AU.93JW-3  
 B.AU.93LW-3  
 B.AU.AF064660  
 B.AU.AF064667  
 B.AU.AF064676  
 B.AU.MBC200  
 B.AU.MBC925  
 B.CN.AF033570  
 B.CN.AF033572  
 B.CN.PRC8  
 B.CN.RL42  
 B.DE.D31  
 B.DE.HAN  
 B.DE.HEI28CS  
 B.DE.HEI3BL  
 B.DE.HEI4BL  
 B.DE.HIVU52491  
 B.DE.NEFCC  
 B.DE.NEFCCG  
 B.DE.NH53  
 B.ES.89SP061  
 B.ES.AF082355  
 B.ES.AF082357

## KAADVLSHFLKEKGGLEGLI

-g-f-----d---  
 -G-L-----D---  
 -G-F--F-----D---  
 -G-F--F-----D---  
 -G-----K---D--V  
 -----D---  
 -G-L-----D---  
 -G-L-----D--V  
 -G-L-----D---  
 -G-F-----D---  
 -G-----D---  
 -F--GF-----D---  
 --F--F-----D---  
 -----  
 -G-----V  
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 --L-----E--V---  
 -G-L-----E--D---  
 -V--M---RG-----  
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 -G-L-----E-----  
 -G-----R-----  
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 -G-L-----R-----D---  
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 -----P-----V  
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 R--I-----D-----V  
 --L-I-----  
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 -L-----  
 -G-L-----R-----V  
 -G-x-----R-----V  
 -G-L-----I-----  
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 -G-L-----N-----V  
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 -G-L-----D---

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 B.KR.HIV298030

-G-----D---  
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 -G-L--R-----V  
 -G-L-----  
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 ---L-I-----I-  
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 -G-L--R-----V  
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 -----V  
 B.GB.NEF3  
 -----V  
 B.GB.NEF5  
 -----T  
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 -----V  
 -G-F-----  
 RG-L-----  
 RGxL-----K--P---  
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 ---L-----R-----  
 -G-L-----D---  
 Q--L-----  
 R--R-----D---  
 -G-L-----  
 -S-----V  
 -G-----  
 ---L-----V  
 -----E-----V  
 R--I-----  
 ---M-----  
 -S-----x-----x-  
 ---L-----  
 -G-L-----  
 Q--xN-----  
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 R--I-----V  
 -G-L-----  
 -----  
 -G-F--D-----  
 B.KR.AF063921  
 -G-L-----I-----D-I-  
 -----KA-  
 -----V  
 ---L-----  
 -----V  
 -G-----R-----  
 -G-L-----  
 -----G--V  
 -G-L-----V  
 -G-L-----  
 --S-----V

B.KR.HIVZ98032	-G-S-----R-----V	B.US.NEF179C	-G-L-----P----		
B.KR.HIVZ98034	--SS-----V	B.US.NEF226B	-----M---M-	CONSENSUS_F	-----
B.NL.3202A21	-G-L-----L-----	B.US.P102A13	-----L-----	F.CM.HIV232985	-----
B.NL.NEFA	--L-----	B.US.P233A17	-G-L-----D---	F.CM.HIV232986	---L-----
B.NL.NEFD	-G-L-----	B.US.P248A01	-----D---	F.FR.HIV232987	-----
B.NL.NEFE	---F-----	B.US.P357A01	-G-L-----V		
B.SE.AF047082	---L-----	B.US.P896	-----V	CONSENSUS_F1	-?-----
B.SE.AF047083	-G-----	B.US.PC-93(1)	-G-----	F1.BE.VI850	-----
B.SE.AF047085	---F-----Q-----	B.US.PRISO(1)	-----D--V	F1.BR.93BR020.1	-G-----
B.TH.28-19	-G-L-----	B.US.RF	-----D--V	F1.FI.FIN9363	-G-F---Q-xx-----x
B.TH.AF082838	-G-L-----V	B.US.RP12	-----V	F1.FR.MP411	-----
B.TH.AF082839	---F-----IV	B.US.RR1	-----#		
B.TH.AF082841	---F-----RKE-----V	B.US.SC	-----Q-----	CONSENSUS_F2	---?-----
B.TW.LM49	-G-I-----	B.US.SF2	---L-I-----	F2.CM.MP255	-----
B.US.HIV1U03375	-G-L-----Q-----	B.US.U16917	---I-----	F2.CM.MP257	---L-----
B.US.005PF-96(1)	---L-----	B.US.WEAU160	---H---#-----		
B.US.AD-93(1)	-G-L-----V	B.US.WR27	-----	CONSENSUS_G	---f---F-----D---
B.US.AD8	-----	B.US.YU2	---M-----	G.BE.DRCBL	---F---F-----D--V
B.US.BC	---I-----			G.FI.HH8793	---F---F-----D---
B.US.BIB	-G-R---W-----	CONSENSUS_C	-g-f---f-----	G.ML.HIV232990	---L---F-----D---
B.US.BJ-93(1)	-----	C.BR.92BR025	--V---F--E-----	G.NG.92NG083	---F---F-----D---
B.US.BO1	-----	C.BW.96BW01B21	-G-F--GF-----	G.NG.HIV232991	-G-F---F-----D--V
B.US.BRVA	-----	C.BW.96BW0402	---F-----I-	G.NG.HIV232992	-G-F---F-----D--V
B.US.BT-94(1)	-----V	C.BW.96BW0502	-G-F--GF-----V	G.SE.SE6165	-G-F---F-----D---
B.US.CD1	-----V	C.BW.96BW1104	---FG--F-----		
B.US.D8511	-G-L-----	C.BW.96BW1210	-G-F---F-----D---	CONSENSUS_H	-g-f-----
B.US.DH1	-G-L-----	C.BW.96BW15B03	-G---F-----D---	H.BE.VI991	-G-F-----
B.US.DH123	---L-----	C.BW.96BW16B01	-E-F---F-----D---	H.BE.VI997	---L-----D---
B.US.DJ-93(1)	-----	C.BW.96BW17A09	---F---F-----D---	H.CD.HIV232994	-E-F-F-F-----
B.US.E1	-G-L-----	C.ET.ETH2220	---F---L-----	H.CD.HIV232995	-G-L-F-----D---
B.US.E81NEF	-G-----	C.FR.HIV232966	-G-F---F-----	H.CF.90CF056	-G-F-----D---
B.US.E88NEF	-G-----V	C.FR.HIV232967	-G-F--GF--R-----		
B.US.EP-94(1)	---L-----P----	C.FR.HIV232968	---F---F-----	CONSENSUS_J	-G-?---F-----D---
B.US.FA-93(1)	-G-----	C.FR.HIV232969	-S-F---F-----	J.SE.SE9173	-G-F---F-----D---
B.US.HIV1U16893	---L-----V	C.FR.HIV232970	---F---F-----	J.SE.SE9280	-G---F-----D---
B.US.HIV1U24455	-G-----	C.FR.HIV232971	---F--GF-----		
B.US.HIV1U26074	-----	C.FR.HIV232972	---F-FGF-----D---	CONSENSUS_K	-?-F--GF-----D---
B.US.HIV1U26098	-----	C.FR.HIV232973	---W-----	K.CD.EQTB11C	-G-F--GF-----D---
B.US.HIV1U26112	-G-L-----R-----V	C.FR.HIV232976	---F---F-----	K.CM.MP535	---F--GF-----D---
B.US.HIV1U26119	---L-----V	C.FR.HIV232977	---W-----	N.CM.YBF30	-Q-F---F---D-----V
B.US.HIV1U26141	-----V	C.FR.HIV232978	---F---F-----		
B.US.HIVU44444	---I-----	C.FR.HIV232979	-G-F---F-----	CONSENSUS_O	-?-F---F-----?---
B.US.HIVU44450	-G-L-----V	C.FR.HIV232980	---F-----D--T	O.CM.ANT70C	-G-F---F-----
B.US.HIVU44456	-G-----DR--	C.FR.HIV232986	-G-F---F-----	O.CM.MVP5180	---F---F-----D---
B.US.HIVU44465	-G-L-----	C.IN.21068	-G-L---F-----	CRF01_AE.CF.90CF402	-G-F---F-----D---
B.US.HIVU44468	-----	C.IN.301904	-E---F-----	CRF01_AE.FR.232982	-G-F---F-----D---
B.US.HP87B1	-G-L-----	C.IN.301999	-G-F---F-----	CRF01_AE.FR.232983	-G-F---F-----D---
B.US.HS-93(1)	---L-----	C.IN.94IN11246	-G-F---F-----	CRF01_AE.FR.232984	-E-F---F-----
B.US.JRCSF	---I-----	C.IN.HIVY15117	-G-F---F---E---A--	CRF01_AE.TH.1-2	-E-F---F-----
B.US.JRFL	-G-----	C.IN.HIVY17884	-G-F---F-----	CRF01_AE.TH.1-3	-E-F---F-----
B.US.LM1	-G-L-----E-----	C.IN.HIVY17891	-G-F---F-----	CRF01_AE.TH.11-25	-G-F---F-----D---
B.US.LT-87-1(1)	-G-L-----N---D---	C.IN.HIVY17892	-G-F---F-----	CRF01_AE.TH.11-31	-G-F---F-----D---
B.US.MB-94(1)	-G-----I-			CRF01_AE.TH.122-21	---F---F--R---D---
B.US.MNCG	---L-----D---	CONSENSUS_D	-e-----?---	CRF01_AE.TH.18-47	---F---F---G---D---
B.US.NC7	--GI-----V	D.CD.84ZR085	-----RK-----V	CRF01_AE.TH.235-3	-G-F---F-----
B.US.NEF	-----	D.CD.ELI	-E-L-----	CRF01_AE.TH.235-32	-G-F---F-----
B.US.NEF164B	---I-M-----D---	D.CD.NDK	-E-----	CRF01_AE.TH.24-54	-G-F---F-F-----D---
B.US.NEF166E	-G-L-----	D.UG.94UG1141	-E-----V	CRF01_AE.TH.240-12	-G-F-F-F-----D---

CRF01_AE.TH.26-3	-G-F---F-----
CRF01_AE.TH.35-6	-G-F---F-----D--V
CRF01_AE.TH.6-9	-G-F---F---N---D---
CRF01_AE.TH.73-44	-G-F---F-----N---
CRF01_AE.TH.74-26	--F---F-----D---
CRF01_AE.TH.89-30	-G-F---F-----
CRF01_AE.TH.9-3	-G-F---F--R-----D---
CRF01_AE.TH.93TH253	-G-F---F-----V
CRF01_AE.TH.98-4	-G-F---F--R-----D--V
CRF01_AE.TH.CM240	-G-F---F-----D---
CRF01_AE.TH.TH022	-G-F---F--E-----D--V
CRF01_AE.TH.TH047	-E-F---F-----D---
CRF02_AG.FR.DJ263	--F--GF-----D--V
CRF02_AG.FR.DJ264	-G-F--GF-----D---
CRF02_AG.NG.IBNG	-G-----D---
CRF03_AB.RU.KAL1532	-G-F-----#---D---
CRF04_cpx.CY.94CY03	-G-L-----D---
CRF04_cpx.GR.97PVCH	--L-----D---
CRF04_cpx.GR.97PVMY	-----
AC.IN.21301	-G-L--F-----D---
AC.RW.92RW009	-----F-----
AC.SE.SE9488	-G-L-----D---
AC.ZM.ZAM184	-G-----D---
ACD.SE.SE8603	-----F-----P---
AD.SE.SE6954	-G-----V
AD.SE.SE7108	-----D---
ADHU.NO.NOGIL3	-----D---
ADU.CD.MAL	-G-F-----D--V
AF.GA.HIV232981	-G-F-----D---
AG.NG.G3	--F---F-----D---
AG.SE.SE7812	-----
AGHU.GA.VI354	-G-F--GF-----D---
AGJ.AU.BFP90	--F---F-----D---
AGJ.ML.95ML84	-G-F---F-----D---
AGU.CD.Z321	-G-F---F-----D---
BF.BR.93BR029.4	-G-L-----
DF.BE.VI961	-G-L-----D---
GH.GA.HIV232993	-G-F--GF-----D--V
GU.FR.HIV232974	-G-F-----
U.CD.VI1126	-G-F-----I-----D---
U.CM.HIV232988	--F--GF-----D---
U.FR.HIV232958	-G-F--GF-----D---
U.FR.HIV232960	-G-F--GF-----D---
CONSENSUS_CPZ	-?-F--??-----V
CPZ.GA.CPZGAB	--F-----V
CPZ.US.CPZUS	-Q-F--GF-----V



B.KR.HIVZ98032	R-----VY--K-----	B.US.NEF179C	-----P---Y--Q-----		
B.KR.HIVZ98034	-----VY--K-----	B.US.NEF226B	--M-----M---Q-----	CONSENSUS_F	-----Y-kk--E----
B.NL.3202A21	-----Y-----	B.US.P102A13	--L-----Y---E-----	F.CM.HIV232985	-----Y-KK--E----
B.NL.NEFA	-----Y--K-K----	B.US.P233A17	-----Y--K-----	F.CM.HIV232986	-----Y-RK--E----
B.NL.NEFD	-----Y--K-K----	B.US.P248A01	-----D--Y--K-----	F.FR.HIV232987	-----Y-KK--E----
B.NL.NEFE	-----Y-----	B.US.P357A01	-----K---K-G-----		
B.SE.AF047082	-----Y--K-RE----	B.US.P896	-----V--K-----	CONSENSUS_F1	-----Y-Kk--e----
B.SE.AF047083	-----Y--K-----	B.US.PC-93(1)	-----Y--K-----	F1.BE.VI850	-----Y-KK-G-T----
B.SE.AF047085	--Q-----	B.US.PRISO(1)	-----Q-----	F1.BR.93BR020.1	-----Y-K--E----
B.TH.28-19	-----K--E----	B.US.RF	-----D--VF--K-----	F1.FI.FIN9363	x-----xY-KK--E----
B.TH.AF082838	-----VY--K-----	B.US.RP12	-----Y--K-----	F1.FR.MP411	-----Y-KK--E----
B.TH.AF082839	-----HK-----	B.US.RR1	-----VY--K-----		
B.TH.AF082841	-----IVF--K-----	B.US.SC	--Q-----#-----	CONSENSUS_F2	-----Y-?K--E----
B.TW.LM49	RKE-----VY--KKE----	B.US.SF2	-----W-----E----	F2.CM.MP255	-----Y-KK--E----
B.US.HIV1U03375	-----Y-----E	B.US.U16917	-----K-----	F2.CM.MP257	-----Y-RK--E----
B.US.005PF-96(1)	--Q-----Y--Q--E----	B.US.WEAU160	-----Y--K-----		
B.US.AD-93(1)	-----VY--R----	B.US.WR27	-----Y--K-----	CONSENSUS_G	-----D--y-Kk-----
B.US.AD8	-----K--E----	B.US.YU2	-----Q-----	G.BE.DRCBL	-----D--VY-KK--E----
B.US.BC	-----F-----			G.FI.HH8793	-----D---Y-KK-----
B.US.BIB	-----Y--N-----	CONSENSUS_C	-----Y-kk--e----	G.ML.HIV232990	-----D---KQ-----
B.US.BJ-93(1)	-----Y--Q-----	C.BR.92BR025	E-----Y-KK-----	G.NG.92NG083	-----D---Y-K-----
B.US.BO1	-----	C.BW.96BW01B21	-----Y-KK--E----	G.NG.HIV232991	-----D--VY-KQ-----P-
B.US.BRVA	-----Q-----	C.BW.96BW0402	-----I--Y-KK-----	G.NG.HIV232992	-----D--VY-KK--E----
B.US.BT-94(1)	-----VY--Q-R----	C.BW.96BW0502	-----VY-KK--E----	G.SE.SE6165	-----D---Y-KK--E----
B.US.CD1	-----VY--K-----N	C.BW.96BW1104	-----Y-RK--E----		
B.US.D8511	-----Y--K-----	C.BW.96BW1210	-----D--Y-KK--E----	CONSENSUS_H	-----Y-Kk--e----
B.US.DH1	-----Y-----	C.BW.96BW15B03	-----D--Y-PK--E----	H.BE.VI991	-----Y-KK--E----
B.US.DH123	-----Y--K-----	C.BW.96BW16B01	-----D--Y-KK-----	H.BE.VI997	-----D---Y-KK--E----
B.US.DJ-93(1)	-----K-----	C.BW.96BW17A09	-----D--Y-KK--E----	H.CD.HIV232994	-----Y-KK--E----
B.US.E1	-----Y--K-----	C.ET.ETH2220	-----Y-KK--E----	H.CD.HIV232995	-----Y-KK--E----
B.US.E81NEF	-----	C.FR.HIV232966	-----Y--R-----	H.CF.90CF056	-----D---Y-KQ-----
B.US.E88NEF	-----V-----	C.FR.HIV232967	R-----Y-KK-KE----		
B.US.EP-94(1)	-----P---Y-RK--E----	C.FR.HIV232968	-----Y-KK--E----	CONSENSUS_J	-----D---Y-KK--E----
B.US.FA-93(1)	-----Y--K-----	C.FR.HIV232969	-----Y-KK--E----	J.SE.SE9173	-----D---Y-KK--E----
B.US.HIV1U16893	-----VY-----	C.FR.HIV232970	-----Y-KK--E----	J.SE.SE9280	-----D---Y-KK--E----
B.US.HIV1U24455	-----Y--K-----	C.FR.HIV232971	-----Y-KN--E----		
B.US.HIV1U26074	-----K-----	C.FR.HIV232972	-----D--Y-RK--E----	CONSENSUS_K	-----D---Y-K?--E----
B.US.HIV1U26098	-----Y--K-----	C.FR.HIV232973	-----Y-KK--E----	K.CD.EQTB11C	-----D---Y-K--E----
B.US.HIV1U26112	R-----VY--K-----	C.FR.HIV232974	-----Y-KQ-----	K.CM.MP535	-----D---Y-KK--E----
B.US.HIV1U26119	-----VY--K-R----	C.FR.HIV232975	-----Y-KK--E----	N.CM.YBF30	-D-----VW-RK-----
B.US.HIV1U26141	-----VY-----	C.FR.HIV232976	-----Y-KK--E----		
B.US.HIVU44444	-----	C.FR.HIV232977	-----Y-KK--E----	CONSENSUS_O	-----?---Y-HK-AE----
B.US.HIVU44450	-----VY--K-----	C.FR.HIV232978	-----Y-KK--E----	O.CM.ANT70C	-----Y-HK-AE----
B.US.HIVU44456	-----DR--K-----	C.FR.HIV232979	-----D--TY--K-----	O.CM.MVP5180	-----D---Y-HK-AE----
B.US.HIVU44465	-----DR--Y-----E----	C.FR.HIV232980	-----Y--K--E----	CRF01_AE.CF.90CF402	-----D---K--E----
B.US.HIVU44468	-----K-----	C.IN.21068	-----Y-KK--E----	CRF01_AE.FR.232982	-----D---Y-K--E----
B.US.HP87B1	-----Y-RK--E----	C.IN.301904	-----Y-KK--E----	CRF01_AE.FR.232983	-----D---Y-KK--E----
B.US.HS-93(1)	-----Y--K--E----	C.IN.301999	-----Y-KK--E----	CRF01_AE.FR.232984	-----D---Y-KK--E----
B.US.JRCSF	-----Y--K-----	C.IN.94IN11246	-----Y-KK--E----	CRF01_AE.TH.1-2	-----Y-K--E----
B.US.JRFL	-----K-----	C.IN.HIVY15117	--E-----A--Y-KK--E----	CRF01_AE.TH.1-3	-----Y-K--E----
B.US.LM1	--E-----Y-----	C.IN.HIVY17884	-----Y-KK--E----	CRF01_AE.TH.11-25	-----D---Y-K--E----
B.US.LT-87-1(1)	N-----D--Y--K-R----	C.IN.HIVY17891	-----Y-KK--E----	CRF01_AE.TH.11-31	-----D---Y-K--E----
B.US.MB-94(1)	-----I--Y--K-----	C.IN.HIVY17892	-----Y-KK--E----	CRF01_AE.TH.122-21	R-----D---Y-K--E----
B.US.MNCG	-----D--Y--K-----	CONSENSUS_D	-----?w-kk--e----	CRF01_AE.TH.18-47	-G---D---Y-KK--E----
B.US.NC7	-----VW-----	D.CD.84ZR085	RK-----VY--K-----	CRF01_AE.TH.235-3	-----Y-K--E----
B.US.NEF	-----	D.CD.ELI	-----W-KK--E----	CRF01_AE.TH.235-32	-----Y-K--E----
B.US.NEF164B	-----D--Y--K--E----	D.CD.NDK	-----W-KK--E----	CRF01_AE.TH.24-54	-----D---KK--E----
B.US.NEF166E	-----Y--K-----	D.UG.94UG1141	-----VW-PK--E----	CRF01_AE.TH.240-12	-----D---Y-KK--E----

CRF01_AE.TH.26-3	-----Y-K---E---
CRF01_AE.TH.35-6	-----D--VY-K---E---
CRF01_AE.TH.6-9	--N---D--Y-K---E---
CRF01_AE.TH.73-44	-----N---Y-KK--E---
CRF01_AE.TH.74-26	-----D--Y-KK--E---
CRF01_AE.TH.89-30	-----D--Y-KK--E---
CRF01_AE.TH.9-3	R-----D--Y-K---E---
CRF01_AE.TH.93TH253	-----VY-KK--E---
CRF01_AE.TH.98-4	R-----D--VY-KK--E---
CRF01_AE.TH.CM240	-----D--Y-KK--E---
CRF01_AE.TH.TH022	E-----D--VY-KK--E---
CRF01_AE.TH.TH047	-----D--Y-KK--E---
CRF02_AG.FR.DJ263	-----D--VY-KK--E---
CRF02_AG.FR.DJ264	-----D--Y-KK--E---
CRF02_AG.NG.IBNG	-----D--Y-KK--E---
CRF03_AB.RU.KAL1532	-#----D--Y-KK--E---
CRF04_cpx.CY.94CY03	-----D--Y-KK--E---
CRF04_cpx.GR.97PVCH	-----D--Y-KQ-----
CRF04_cpx.GR.97PVMY	-----Y-KK--E---
AC.IN.21301	-----D--Y-RK--E---
AC.RW.92RW009	-----D--Y-KK-----
AC.SE.SE9488	-----D--Y--Q-----
AC.ZM.ZAM184	-----D--Y-----E---
ACD.SE.SE8603	-----P--Y-KK-----
AD.SE.SE6954	-----VW-PK--E---
AD.SE.SE7108	-----D--Y-RK-A-----
ADHU.NO.NOGIL3	-----D--Y-KK--E---
ADU.CD.MAL	-----D--VW-PK--E---
AF.GA.HIV232981	-----D--Y-RK--E---
AG.NG.G3	-----D--Y-KK-----
AG.SE.SE7812	-----Y-KK--E---
AGHU.GA.VI354	-----D-----K-----
AGJ.AU.BFP90	-----D--Y-KK--E---
AGJ.ML.95ML84	-----D--Y-KK-----
AGU.CD.Z321	-----D--Y-KK--E---
BF.BR.93BR029.4	-----Y-KK--E---
DF.BE.VI961	-----D--W-RK--K---
GH.GA.HIV232993	-----D--VY-KK--E---
GU.FR.HIV232974	-----Y-KK--E---
U.CD.VI1126	-----D--Y-KK--E---
U.CM.HIV232988	-----D--Y-KK--E---
U.FR.HIV232958	-----D--Y-KK--E---
U.FR.HIV232960	-----D--Y-KK--E---
CONSENSUS_CPZ	-----VY-R---E---
CPZ.GA.CPZGAB	-----VY-R---E---
CPZ.US.CPZUS	-----VY-R---E---

# TPKFKLPIQKETWETWWTEY

**QUERY** **TPKFKLPIQKETWETWWTEY**  
 CONSENSUS\_A -----md-  
 A.KE.Q23-CXC-CG ----R-----D---MD-  
 A.SE.SE6594 -----MD-  
 A.SE.SE7253 -----MD-  
 A.SE.SE7535 --RS-----ID-  
 A.SE.SE8131 -----D-D---MD-  
 A.SE.SE8538 -----V-----M--  
 A.SE.SE8891 -----MD-  
 A.UG.92UG037 -----MD-  
 A.UG.U455 I---R-----A--M--  
 CONSENSUS\_B -----a-----  
 B.-.NL43E9 -----A-----  
 B.AU.MBC18 ----R-----DA-----  
 B.AU.MBC200 ----R-----  
 B.AU.MBC925 I-----  
 B.AU.MBCC54 -----R---A-----  
 B.AU.MBCC98 -----A-----  
 B.AU.MBCD36 -----A---K-  
 B.CN.RL42 -----A-----  
 B.DE.D31 -----A-----  
 B.DE.HAN ----R-----A-----  
 B.FR.HXB2 -----A-----  
 B.GA.OYI -----A-----  
 B.GB.CAM1 -----DA--ID-  
 B.GB.MANC I-----DA-----  
 B.NL.3202A21 -----A-----  
 B.TW.LM49 -----A-----  
 B.US.AD8 -----A--M--  
 B.US.BC ----R-----  
 B.US.DH123 ----R-----  
 B.US.JRCSF I-----  
 B.US.JRFL I-----  
 B.US.MNCG ----R-----  
 B.US.NY5CG -----A-----  
 B.US.P896 -----A--D-  
 B.US.RF -----A-----  
 B.US.SF2 I-----A--M--  
 B.US.WEAU160 -----I-----  
 B.US.WR27 --xI-----SR-----  
 B.US.YU2 -----  
 CONSENSUS\_C ----R-----d-  
 C.BR.92BR025 ----R-----A--D-  
 C.BW.96BW01B03 #---R-----D-  
 C.BW.96BW0402 ----R-----D-----  
 C.BW.96BW0502 ----R-----D-----  
 C.BW.96BW1104 I---R-----A--A--D-  
 C.BW.96BW1210 ----R-----A--D-  
 C.BW.96BW15B03 ----R-----D-----  
 C.BW.96BW1626 ----R-----D-----  
 C.BW.96BW17A09 ----R-----D-----  
 C.ET.ETH2220 ----R-----A--D-  
 C.IN.21068 ----R-----D-----

C.IN.301904 ----R-----D-  
 C.IN.301905 ----R-----D-  
 C.IN.301999 ----R-----A--D-  
 C.IN.94IN11246 ----R-----D-  
 CONSENSUS\_D ----r-----i--  
 D.CD.84ZR085 ----R-----ID-  
 D.CD.ELI ----R-----A--  
 D.CD.NDK ----R-----I--  
 D.CD.Z2Z6 ----R-----V--  
 D.UG.94UG1141 ----R-----  
 CONSENSUS\_F1 ----?---l---d---?-  
 F1.BE.VI850 S-----L---D---D-  
 F1.BR.93BR020.1 ----R---L---D-----  
 F1.FI.FIN9363 ----L---D-----  
 F1.FR.MP411 S---R-----A--D-  
 CONSENSUS\_F2 ?---R-----I-----  
 F2.CM.MP255 I---R-----I-----  
 F2.CM.MP257 V---R-----I-----  
 CONSENSUS\_G ?-----r---v-----  
 G.BE.DRCBL I-----K---V-----  
 G.FI.HH8793 ----R---V-----  
 G.NG.92NG083 I-----R---V-----  
 G.SE.SE6165 ----R---I---D-  
 CONSENSUS\_H I---r-----h-  
 H.BE.VI991 I---R-----H-  
 H.BE.VI997 I-----H-  
 H.CF.90CF056 I---R-----  
 CONSENSUS\_J ----R---?-----D-  
 J.SE.SE9173 ----R-----D-  
 J.SE.SE9280 ----R---R-----D-  
 CONSENSUS\_K ----R-----  
 K.CD.EQTB11C ----R-----G-----  
 K.CM.MP535 ----R-----  
 N.CM.YBF30 ----R--V--V--A--DH-  
 CONSENSUS\_O L---?--VTR-----A?-  
 O.CM.ANT70C L-----VTR-----AD-  
 O.CM.MVP5180 L---R--VTR-----A--  
 AC.ET.E3099G ----R-----  
 AC.IN.21301 ----R-----D-  
 AC.RW.92RW009 ----R-----D-  
 AC.SE.SE9488 ----R-----MD-  
 AC.ZM.ZAM184 PK.-R-----D-  
 ACD.SE.SE8603 A-----MD-  
 AD.SE.SE6954 ----R-----  
 AD.SE.SE7108 ----R-----  
 ADU.CD.MAL ----R-----A-----  
 AG.NG.G3 V-----R---V-----  
 AG.SE.SE7812 ----R---R---A--M--  
 AGHU.GA.VI354 I-----DH-  
 AGHU.NO.NOGIL3 ----R-----

AGJ.AU.BFP90 ----R-----  
 AGJ.ML.95ML8 I---R-----  
 AGU.CD.Z321 ----R-----AD-  
 BF.BR.93BR029.4 I-----A--I--  
 CRF01\_AE.CF.90CF40 ----R---R-----M--  
 CRF01\_AE.TH.93TH25 ----R---R-----M--  
 CRF01\_AE.TH.CM240 ----R---R-----M--  
 CRF01\_AE.TH.TH022 ----R-----M--  
 CRF01\_AE.TH.TH047 ----R-----M--  
 CRF02\_AG.FR.DJ263 ----R---R---A--M--  
 CRF02\_AG.FR.DJ264 ----S---R---A--M--  
 CRF02\_AG.NG.IBNG ----R---R-----M--  
 CRF03\_AB.RU.KAL153 -----  
 CRF04\_CPX.CY.94CY0 ----R-----D-----  
 CRF04\_CPX.GR.97PVC ----R-----D-----  
 CRF04\_CPX.GR.97PVM ----R-----D--M--  
 DF.CD.VI961 ----R-----  
 U.CD.VI1126 ----R-----  
 CONSENSUS\_CPZ v---?--v---?--a--s--  
 CPZ.CD.CPZANT V---Q---TR---DA--SD-  
 CPZ.GA.CPZGAB ----R--V---S--A--A--  
 CPZ.US.CPZUS V-----LV---V-----S--

# WQATWIPEWEFVNTPLVVKL

QUERY WQATWIPEWEFVNTPLVVKL

CONSENSUS\_A -----  
 A.KE.Q23-CXC-CG -----L-----  
 A.SE.SE6594 -----LW  
 A.SE.SE7253 -----  
 A.SE.SE7535 -----  
 A.SE.SE8131 -----  
 A.SE.SE8538 -----  
 A.SE.SE8891 -----  
 A.UG.92UG037 ---\$-----  
 A.UG.U455 -----  
  
 CONSENSUS\_B -----  
 B.-.NL43E9 -----  
 B.AU.MBC18 -----  
 B.AU.MBC200 -----  
 B.AU.MBC925 -----  
 B.AU.MBCC54 -----  
 B.AU.MBCC98 -----  
 B.AU.MBCD36 -----K-----  
 B.CN.RL42 -----I--S-----  
 B.DE.D31 -----  
 B.DE.HAN -----  
 B.FR.HXB2 -----  
 B.GA.OYI -----  
 B.GB.CAM1 -----  
 B.GB.MANC -----  
 B.NL.3202A21 -----  
 B.TW.LM49 -----  
 B.US.AD8 -----  
 B.US.BC -----  
 B.US.DH123 -----  
 B.US.JRCSF -----  
 B.US.JRFL -----  
 B.US.MNCG T\$-----V-----  
 B.US.NY5CG -----  
 B.US.P896 -----  
 B.US.RF -----  
 B.US.SF2 -----  
 B.US.WEAU160 -----  
 B.US.WR27 -----x-----  
 B.US.YU2 -----  
  
 CONSENSUS\_C -----  
 C.BR.92BR025 ---\$-----  
 C.BW.96BW01B03 -----A-----  
 C.BW.96BW0402 -----  
 C.BW.96BW0502 -----  
 C.BW.96BW1104 -----  
 C.BW.96BW1210 -----  
 C.BW.96BW15B03 -----  
 C.BW.96BW1626 -----K-----  
 C.BW.96BW17A09 -----  
 C.ET.ETH2220 -----  
 C.IN.21068 -----

C.IN.301904 -----  
 C.IN.301905 -----  
 C.IN.301999 -----  
 C.IN.94IN11246 -----  
  
 CONSENSUS\_D -----  
 D.CD.84ZR085 -----  
 D.CD.ELI -----  
 D.CD.NDK -----  
 D.CD.Z2Z6 -----  
 D.UG.94UG1141 -----Y-----  
 CONSENSUS\_F1 -----  
 F1.BE.VI850 -----  
 F1.BR.93BR020.1 -----  
 F1.FI.FIN9363 -----  
 F1.FR.MP411 -----  
 CONSENSUS\_F2 -----  
 F2.CM.MP255 -----  
 F2.CM.MP257 -----  
  
 CONSENSUS\_G -----  
 G.BE.DRCBL -----  
 G.FI.HH8793 -----D-----  
 G.NG.92NG083 ---A-----  
 G.SE.SE6165 -----  
  
 CONSENSUS\_H -----H-----  
 H.BE.VI991 -----H-----  
 H.BE.VI997 -----S-----H-----  
 H.CF.90CF056 -----H-----  
 CONSENSUS\_J -----  
 J.SE.SE9173 -----  
 J.SE.SE9280 -----  
 CONSENSUS\_K -----  
 K.CD.EQTB11C -----  
 K.CM.MP535 -----  
 N.CM.YBF30 -----  
  
 CONSENSUS\_O -----S---I---  
 O.CM.ANT70C -----S---I---  
 O.CM.MVP5180 -----S---I---  
 AC.ET.E3099G -----D-----  
 AC.IN.21301 -----  
 AC.RW.92RW009 -----  
 AC.SE.SE9488 -----  
 AC.ZM.ZAM184 -----  
 ACD.SE.SE8603 -----  
 AD.SE.SE6954 -----  
 AD.SE.SE7108 -----  
 ADU.CD.MAL -----  
 AG.NG.G3 -----D-----  
 AG.SE.SE7812 -----  
 AGHU.GA.VI354 -----H-----  
 AGHU.NO.NOGIL3 -----  
 AGJ.AU.BFP90 -----  
 AGJ.ML.95ML8 -----  
 AGU.CD.Z321 -----L-----  
 BF.BR.93BR029.4 -----

CRF01\_AE.CF.90CF40 -----  
 CRF01\_AE.TH.93TH25 -----  
 CRF01\_AE.TH.CM240 -----  
 CRF01\_AE.TH.TH022 -----  
 CRF01\_AE.TH.TH047 -----  
 CRF02\_AG.FR.DJ263 -----D-----  
 CRF02\_AG.FR.DJ264 -----D-----  
 CRF02\_AG.NG.IBNG -----  
 CRF03\_AB.RU.KAL153 -----  
 CRF04\_CPX.CY.94CY0 -----  
 CRF04\_CPX.GR.97PVC -----  
 CRF04\_CPX.GR.97PVM -----  
 DF.CD.VI961 -----  
 U.CD.VI1126 -----  
  
 CONSENSUS\_CPZ -----  
 CPZ.CD.CPZANT -----IR-----  
 CPZ.GA.CPZGAB -----I-----  
 CPZ.US.CPZUS -----D-----

# YKTLRAEQASQEVKNWMTET

## QUERY

## YKTLRAEQASQEVKNWMTET

CONSENSUS\_A F-----t---g-----  
 A.KE.Q23-CXC-CG F--F-----T-D-----D-  
 A.SE.SE6594 F-V-----T---G-----  
 A.SE.SE7253 F-----T-D-----  
 A.SE.SE7535 F-----D-----  
 A.SE.SE8131 F-A-----T---G---D-  
 A.SE.SE8538 F-A-----T---G-----  
 A.SE.SE8891 F-----T---G-----  
 A.UG.92UG037 F-----T---G-----  
 A.UG.U455 F-----T-D-----  
  
 CONSENSUS\_B -----  
 B.AU.AF128998 -----D-----  
 B.-.NL43E9 -----  
 B.AU.MBC18 -----T-----  
 B.AU.MBC200 -----  
 B.AU.MBC925 -----D-----  
 B.AU.MBCC54 -----  
 B.AU.MBCC98 -----  
 B.AU.MBCD36 -----  
 B.CN.RL42 -----D-----  
 B.DE.D31 -----T-----  
 B.DE.HAN -----T-----  
 B.ES.89SP061 -----  
 B.FR.HXB2 -----  
 B.GA.OYI -----D-----  
 B.GB.CAM1 -----  
 B.GB.MANC -----  
 B.JP.JH31 -----  
 B.NL.3202A21 -----  
 B.TW.LM49 -----T---D-----  
 B.US.85WCIPR54 -----  
 B.US.AD8 -----  
 B.US.BC -----  
 B.US.DH123 -----  
 B.US.JRCSF -----T-----  
 B.US.JRFL -----  
 B.US.MNCG -----RT---  
 B.US.NC7 -----  
 B.US.NY5CG -----  
 B.US.P896 -----  
 B.US.RF -----D-----  
 B.US.SF2 -----D-----  
 B.US.WC001 -----  
 B.US.WEAU160 -----T-----  
 B.US.WR27 -----  
 B.US.YU2 -----  
  
 CONSENSUS\_C F-----t-d-----d-  
 C.BR.92BR025 F-----T-D-----D-  
 C.BW.96BW01B22 F-----T-D-----D-  
 C.BW.96BW0402 F-----ST-----D-  
 C.BW.96BW0502 F-----T-D-----D-  
 C.BW.96BW1104 F-----S-----D-

C.BW.96BW1210 F-----T-D-----D-  
 C.BW.96BW15B03 F-----T-D-----D-  
 C.BW.96BW1626 F-----T-D-----D-  
 C.BW.96BW17A09 F-----T-D-----D-  
 C.ET.ETH2220 F-----T-D-----D-  
 C.IN.93IN904 F-----T-D-----D-  
 C.IN.93IN905 F-----T-D-----D-  
 C.IN.93IN999 FR-----T-D-----D-  
 C.IN.94IN11246 F-----T-D-----D-  
 C.IN.95IN21068 F-----T-D-----D-  
  
 CONSENSUS\_D -----d-----  
 D.CD.84ZR085 -----  
 D.CD.ELI -----D-----  
 D.CD.NDK -----D-----  
 D.CD.Z2Z6 -----G-----  
 D.UG.94UG1141 -----D-----  
  
 CONSENSUS\_F F-----T---G---D-  
 F.BR.BZ162 F-----T---G---D-  
 F.CD.VI174 F-----T---G---D-  
 F.RW.VI69 F-----E-T---G---D-  
  
 CONSENSUS\_F1 F-----?---g---d-  
 F1.BE.VI850 F-V-----D---G---D-  
 F1.BR.93BR020.1 F-----T---G---D-  
 F1.FI.FIN9363 F-A-----T---G---D-  
 F1.FR.MP411 F-----T---G---D-S  
  
 CONSENSUS\_F2 F-----T---?---  
 F2.CM.MP255 F-----T-----  
 F2.CM.MP257 F-----T---G---  
  
 CONSENSUS\_G F-----T---G---D-  
 G.BE.DRCBL F-----T---S---D-  
 G.FI.HH8793 F-----T---G---D-  
 G.NG.92NG083 F-----T---G---D-  
 G.SE.SE6165 F-C-----D---G---D-  
  
 CONSENSUS\_H F-----T-D-----D-  
 H.BE.VI991 FRV-----T-D-----D-  
 H.BE.VI997 F-----T-----D-  
 H.CF.90CF056 F-----T-D-----  
  
 CONSENSUS\_J F-A-----T-D-----D-  
 J.SE.SE9173 F-A-----T-D-----D-  
 J.SE.SE9280 F-A-----T-D-----D-  
  
 CONSENSUS\_K f-----T---G---?---  
 K.BE.VI325 F-----T-----D-  
 K.CD.EQTB11C FRV-----T-----D-  
 K.CM.MP535 F-----T-----D-  
 N.CM.YBF30 -----T-----  
  
 CONSENSUS\_O -----T-----  
 O.CM.ANT70C -----T-----  
 O.CM.MVP5180 -----T-----  
 CRF01-AE.CF.90CF40 F-----T-----

CRF01-AE.TH.93TH25 --V-----T-----  
 CRF01-AE.TH.CM240 -----T-----  
 CRF01-AE.TH.TH022 -----T-----  
 CRF01-AE.TH.TH047 -----T-----  
 CRF02\_AG.FR.DJ263 F-----T-----R---  
 CRF02\_AG.FR.DJ264 F-----T-----  
 CRF02\_AG.NG.IBNG F-----T-----  
 CRF03\_AB.RU.KAL15 F-----T-D-----  
 CRF04\_cpx.CY.94CY0 F-C-----T-----  
 CRF04\_cpx.GR.97PVC F-C-----T-----  
 CRF04\_cpx.GR.97PVM F-C-----T-D-----  
 AC.ET.E3099G F-A-----T-D-----  
 AC.IN.21301 F-----T-D-----D-  
 AC.RW.92RW009 F-----D-----D-  
 AC.SE.SE9488 F-----T-D-----D-  
 AC.ZM.ZAM174-21 F-----T-----D-  
 AC.ZM.ZAM184 F-----T-----D-  
 AC.ZM.ZAM716-17 F-----T-D-----D-  
 ACD.SE.SE8603 F-----T-----  
 AD.SE.SE6954 -----RD-----  
 AD.SE.SE7108 F-----T---G---D-  
 ADHU.NO.NOGIL3 F-----T-----D-  
 ADU.CD.MAL F-----T-----  
 AG.NG.G3 F-----T-----D-  
 AG.SE.SE7812 F-----T-D-----  
 AGHU.GA.VI354 F-----T-----  
 AGJ.AU.BFP90 F-----T-----D-  
 AGJ.ML.95ML8 F-----T-----D-  
 AGU.CD.Z321 F-----T---G---D-  
 BF.BR.93BR029.4 -----T---D-----  
 DF.CD.VI961 -----D-----  
 U.CD.VI1126 F-----T-----D-  
  
 CONSENSUS\_CPZ -----?-----  
 CPZ.CD.CPZANT ---I---P---A---  
 CPZ.GA.CPZGAB -----D-----  
 CPZ.US.CPZUS -----P---T-----

# LKETINEEAAEWDRVHPVHA

## QUERY

## LKETINEEAAEWDRVHPVHA

CONSENSUS\_A --D-----l-----  
 A.KE.Q23-CXC-CG --D-----L-----  
 A.SE.SE6594 --D-----L-----  
 A.SE.SE7253 --D-----L--A--  
 A.SE.SE7535 --D-----L-----  
 A.SE.SE8131 --D-----T--I--  
 A.SE.SE8538 --D-----L-----  
 A.SE.SE8891 --D-----L-----  
 A.UG.92UG037 --D-----L-----  
 A.UG.U455 --D-----L-----  
  
 CONSENSUS\_B -----l-----  
 B.AU.AF128998 -----L--A--  
 B.-.NL43E9 -----L-----  
 B.AU.MBC18 -----L--AQ-  
 B.AU.MBC200 -----L-----  
 B.AU.MBC925 -----L-----  
 B.AU.MBCC54 -----G--L--AQ-  
 B.AU.MBCC98 -----L-----  
 B.AU.MBCD36 -----L--Q-  
 B.CN.RL42 -----L-----  
 B.DE.D31 -----L-----  
 B.DE.HAN -----L-----  
 B.ES.89SP061 -----L-----  
 B.FR.HXB2 -----L-----  
 B.GA.OYI -----L-----  
 B.GB.CAM1 -----L-----  
 B.GB.MANC -----L-----  
 B.JP.JH31 -----L--AQ-  
 B.NL.3202A21 -----L-----  
 B.TW.LM49 -----L-----  
 B.US.85WCIPR54 -----L-----  
 B.US.AD8 -----L-----  
 B.US.BC -----L--Q-  
 B.US.DH123 -----L-----  
 B.US.JRCSE -----L-----  
 B.US.JRFL -----L-----  
 B.US.MNCG -----L-----  
 B.US.NC7 -----L--Q-  
 B.US.NY5CG -----L-----  
 B.US.P896 -----L--Q-  
 B.US.RF -----L-----  
 B.US.SF2 -----L-----  
 B.US.WC001 -----L--Q-  
 B.US.WEAU160 -----L-----  
 B.US.WR27 -----D-----L--Q-  
 B.US.YU2 -----L-----  
  
 CONSENSUS\_C --D-----l-----  
 C.BR.92BR025 --D-----L-----  
 C.BW.96BW01B22 --D-----T-----  
 C.BW.96BW0402 --D-----L-----  
 C.BW.96BW0502 --D-----L--Q-  
 C.BW.96BW1104 --D-----L-----

C.BW.96BW1210 --D-----G--L-----  
 C.BW.96BW15B03 --D-----L-----  
 C.BW.96BW1626 --D-----L-----  
 C.BW.96BW17A09 --D-----L-----  
 C.ET.ETH2220 --D-----L-----  
 C.IN.93IN904 --D-----L--I--  
 C.IN.93IN905 --D-----L-----  
 C.IN.93IN999 --D-----L-----  
 C.IN.94IN11246 --D-----I-----  
 C.IN.95IN21068 --D-----L--P-  
  
 CONSENSUS\_D -----L-----  
 D.CD.84ZR085 -----L--Q-  
 D.CD.ELI -----L-----  
 D.CD.NDK -----D-----L-----  
 D.CD.Z2Z6 -----L-----  
 D.UG.94UG1141 --D-----L-----  
  
 CONSENSUS\_F --D-----L--q-  
 F.BR.BZ162 --D-----L--AQ-  
 F.CD.VI174 --D-----L--Q-  
 F.RW.VI69 --D-----L-----  
  
 CONSENSUS\_F1 --D-----L-----  
 F1.BE.VI850 --D-----L-----  
 F1.BR.93BR020.1 --D-----L--TQ-  
 F1.FI.FIN9363 --D-----L-----  
 F1.FR.MP411 --D-----L--A--  
  
 CONSENSUS\_F2 --D-----L-----  
 F2.CM.MP255 --D-----L-----  
 F2.CM.MP257 --D-----L-----  
  
 CONSENSUS\_G --D--x-----x-xQ-  
 G.BE.DRCBL -----D-----L--QQ-  
 G.FI.HH8793 --D-----M--PQ-  
 G.NG.92NG083 --D--D-----I--QQ-  
 G.SE.SE6165 --D-----M--QQ-  
  
 CONSENSUS\_H --D-----L-----  
 H.BE.VI991 --D-----L-----  
 H.BE.VI997 --D-----L-----  
 H.CF.90CF056 --D-----L-----  
  
 CONSENSUS\_J --D-----L-----  
 J.SE.SE9173 --D-----L-----  
 J.SE.SE9280 --D-----L-----  
  
 CONSENSUS\_K --d-----l-----  
 K.BE.VI325 --D-----L-----  
 K.CD.EQTB11C --D-----M--Q-  
 K.CM.MP535 --D--D-----L-----  
 N.CM.YBF30 --V-----D--T--PV

CRF01-AE.TH.93TH25 -----P-----  
 CRF01-AE.TH.CM240 -----P-----  
 CRF01-AE.TH.TH022 -----P-----  
 CRF01-AE.TH.TH047 -----P-----  
 CRF02\_AG.FR.DJ263 --D-----L-----  
 CRF02\_AG.FR.DJ264 --D-----L-----  
 CRF02\_AG.NG.IBNG --D-----L-----  
 CRF03\_AB.RU.KAL15 --D-----L--AQ-  
 CRF04\_cpx.CY.94CY0 --D-----D--T--  
 CRF04\_cpx.GR.97PVC --D-----S--A--  
 CRF04\_cpx.GR.97PVM --D-----A--  
 AC.ET.E3099G -----L-----  
 AC.IN.21301 --D-----L--AQ-  
 AC.RW.92RW009 --D-----L--Q-  
 AC.SE.SE9488 --D-----L--AQ-  
 AC.ZM.ZAM174-21 --D-----L--Q-  
 AC.ZM.ZAM184 --D-----L-----  
 AC.ZM.ZAM716-17 --D-----L--Q-  
 ACD.SE.SE8603 --D-----I-----  
 AD.SE.SE6954 --D-----D--L-----  
 AD.SE.SE7108 --D-----L-----  
 ADHU.NO.NOGIL3 --D-----D--L-----  
 ADU.CD.MAL --D-----D-----  
 AG.NG.G3 --DS-----L--QQ-  
 AG.SE.SE7812 --D-----L-----  
 AGHU.GA.VI354 --D-----I--Q-  
 AGJ.AU.BFP90 --D-----L-----  
 AGJ.ML.95ML8 --D-----M--Q-  
 AGU.CD.Z321 --D-----PQ-  
 BF.BR.93BR029.4 -----L-----  
 DF.CD.VI961 -----AQ-  
 U.CD.VI1126 --D-----L-----  
  
 CONSENSUS\_CPZ ---v-----l--t--  
 CPZ.CD.CPZANT ---V-----L--T--  
 CPZ.GA.CPZGAB ---V-----L--T--  
 CPZ.US.CPZUS ---A-----D\$--T--L--

# EWDRVHPVHAGPIAPGQMRE

## QUERY

## EWDRVHPVHAGPIAPGQMRE

CONSENSUS\_A ----l-----p-----  
 A.KE.Q23-CXC-CG ----L-----P-----  
 A.SE.SE6594 ----L-----P-----  
 A.SE.SE7253 ----L--A---V-----  
 A.SE.SE7535 ----L-----P-----  
 A.SE.SE8131 ----T--I---V-----  
 A.SE.SE8538 ----L-----P-----  
 A.SE.SE8891 ----L-----P-----  
 A.UG.92UG037 ----L-----V-----  
 A.UG.U455 ----L-----P-----  
  
 CONSENSUS\_B ----l-----  
 B.AU.AF128998 ----L--A---N-----  
 B.-.NL43E9 ----L-----  
 B.AU.MBC18 ----L--AQ---V-----D  
 B.AU.MBC200 ----L-----  
 B.AU.MBC925 ----L-----  
 B.AU.MBCC54 ----L--AQ-----  
 B.AU.MBCC98 ----L-----  
 B.AU.MBCD36 ----L--Q---V---K-  
 B.CN.RL42 ----L-----V-----  
 B.DE.D31 ----L-----  
 B.DE.HAN ----L-----  
 B.ES.89SP061 ----L-----HP-----  
 B.FR.HXB2 ----L-----  
 B.GA.OYI ----L-----  
 B.GB.CAM1 ----L-----  
 B.GB.MANC ----L-----V-----  
 B.JP.JH31 ----L--AQ-----  
 B.NL.3202A21 ----L-----  
 B.TW.LM49 ----L-----  
 B.US.85WCIPR54 ----L-----  
 B.US.AD8 ----L-----  
 B.US.BC ----L--Q---V-----  
 B.US.DH123 ----L-----  
 B.US.JRCSF ----L-----  
 B.US.JRFL ----L-----  
 B.US.MNCG ----L-----T-----  
 B.US.NC7 ----L-----Q--L-----  
 B.US.NY5CG ----L-----  
 B.US.P896 ----L--Q---V-----  
 B.US.RF ----L-----  
 B.US.SF2 ----L-----  
 B.US.WC001 ----L--Q---V-----  
 B.US.WEAU160 ----L-----  
 B.US.WR27 ----L--Q---V-----  
 B.US.YU2 ----L-----  
  
 CONSENSUS\_C ----l-----  
 C.BR.92BR025 ----L-----V-----  
 C.BW.96BW01B22 ----T-----V---L-G  
 C.BW.96BW0402 ----L-----  
 C.BW.96BW0502 ----L--Q---V-----D  
 C.BW.96BW1104 ----L-----V-----

C.BW.96BW1210 G---L-----V-----  
 C.BW.96BW15B03 ----L-----  
 C.BW.96BW1626 ----L-----  
 C.BW.96BW17A09 ----L-----  
 C.ET.ETH2220 ----L-----V-----D  
 C.IN.93IN904 ----L--I-----  
 C.IN.93IN905 ----L-----  
 C.IN.93IN999 ----L-----I--  
 C.IN.94IN11246 ----I-----  
 C.IN.95IN21068 ----L--P-----L--  
  
 CONSENSUS\_D ----L-----v-----  
 D.CD.84ZR085 ----L--Q---V-----  
 D.CD.ELI ----L-----  
 D.CD.NDK ----L-----V-----  
 D.CD.Z2Z6 ----L-----  
 D.UG.94UG1141 ----L-----V---L--  
  
 CONSENSUS\_F ----L--q---P---i--  
 F.BR.BZ162 ----L--AQ---P---I--  
 F.CD.VI174 ----L--Q---P---I--  
 F.RW.VI69 ----L-----NP-----  
  
 CONSENSUS\_F1 ----L-----p-----  
 F1.BE.VI850 ----L-----AP-----  
 F1.BR.93BR020.1 ----L--TQ---P---I--  
 F1.FI.FIN9363 ----L-----P-----  
 F1.FR.MP411 ----L--A---L-----  
  
 CONSENSUS\_F2 ----L-----P-----  
 F2.CM.MP255 ----L-----P-----  
 F2.CM.MP257 ----L-----P-----  
  
 CONSENSUS\_G ----x--xQ---P--xI--  
 G.BE.DRCBL ----L--QQ-----I-D  
 G.FI.HH8793 ----M--PQ---P---I--  
 G.NG.92NG083 ----I--QQ---P---I--  
 G.SE.SE6165 ----M--QQ---FP---I--  
  
 CONSENSUS\_H ----L-----P-----  
 H.BE.VI991 ----L-----P-----  
 H.BE.VI997 ----L-----P-----  
 H.CF.90CF056 ----L-----P-----  
  
 CONSENSUS\_J ----L-----?---V--  
 J.SE.SE9173 ----L-----V---V--  
 J.SE.SE9280 ----L-----V--  
  
 CONSENSUS\_K ----l-----p-----  
 K.BE.VI325 ----L-----p-----  
 K.CD.EQTB11C ----M---Q---P---I--  
 K.CM.MP535 ----L-----p-----  
 N.CM.YBF30 D---T---PV--LP---L-D  
  
 CONSENSUS\_O ----T--P??--LP---I--  
 O.CM.ANT70C ----T--PPV--LP---I--  
 O.CM.MVP5180 ----T--PAM--LP---I--  
 CRF01-AE.CF.90CF40 ----L-----P-----

CRF01-AE.TH.93TH25 ----L-----P-----  
 CRF01-AE.TH.CM240 ----L-----P-----  
 CRF01-AE.TH.TH022 ----L-----P-----  
 CRF01-AE.TH.TH047 ----L-----P---I--  
 CRF02\_AG.FR.DJ263 ----L-----P-----  
 CRF02\_AG.FR.DJ264 ----L-----P-----  
 CRF02\_AG.NG.IBNG ----L-----P-----  
 CRF03\_AB.RU.KAL15 ----L--AQ---FP-----  
 CRF04\_cpx.CY.94CY0 D---T-----P-----  
 CRF04\_cpx.GR.97PVC ----A-----P-----  
 CRF04\_cpx.GR.97PVM ----A---NPA-----  
 AC.ET.E3099G ----L-----  
 AC.IN.21301 ----L--AQ-----  
 AC.RW.92RW009 ----L-----Q---V---I--  
 AC.SE.SE9488 ----L--AQ---V-----  
 AC.ZM.ZAM174-21 ----L--Q---V-----D  
 AC.ZM.ZAM184 ----L-----P-----  
 AC.ZM.ZAM716-17 ----L--Q---V-----  
 ACD.SE.SE8603 ----I-----L-----  
 AD.SE.SE6954 D---L-----N-----  
 AD.SE.SE7108 ----L-----P-----  
 ADHU.NO.NOGIL3 D---L-----P-----  
 ADU.CD.MAL D-----P-----  
 AG.NG.G3 ----L--QQ---P---I--  
 AG.SE.SE7812 ----L-----P-----  
 AGHU.GA.VI354 ----I--Q---P---I--  
 AGJ.AU.BFP90 ----L-----P---I--  
 AGJ.ML.95ML8 ----M--Q---MP-----  
 AGU.CD.Z321 ----L--PQ---P---I--  
 BF.BR.93BR029.4 ----L-----P-----  
 DF.CD.VI961 ----L--AQ-----I--  
 U.CD.VI1126 ----L-----  
  
 CONSENSUS\_CPZ ----l--t-----l--  
 CPZ.CD.CPZANT ----L--T---VQA--L--  
 CPZ.GA.CPZGAB ----L--T---L-----  
 CPZ.US.CPZUS D\$--T--L-----

# HQMKDCTERQANFLGKIWPS

## QUERY

## HQMKDCTERQANFLGKIWPS

CONSENSUS\_A ----- .ERQANFLGki  
 A.KE.Q23-CXC-CG ----- .ERQANFLGKI  
 A.SE.SE6594 ----- .ERQANFLGKI  
 A.SE.SE7253 ----- .ERQANFLGKM  
 A.SE.SE7535 ----- .ERQANFLGRI  
 A.SE.SE8131 ----- .ERQANFLGKI  
 A.SE.SE8538 ----- .ERQANFLGKI  
 A.SE.SE8891 ----- .ERQANFLGKI  
 A.UG.92UG037 ----- .ERQANFLGKI  
 A.UG.U455 ----- .ERQANFLGKI  
  
 CONSENSUS\_B ----- ?? .eRQAnFLGki  
 B.AU.AF128998 ----- .ERQANFLGKI  
 B.-.NL43E9 ----- .ERQANFLGKI  
 B.AU.MBC18 ----- .ERQANFLGKI  
 B.AU.MBC200 ----- .ERQANFLGKI  
 B.AU.MBC925 ----- .ERQANFLGKI  
 B.AU.MBCC54 -H-T---- .DRQANFLGKI  
 B.AU.MBCC98 ---I---- .ERQANFLGKI  
 B.AU.MBCD36 ----- .ERQANFLGKI  
 B.CN.RL42 -L----- .ERQANFLGKI  
 B.DE.D31 ----- .ERQANFLGKI  
 B.DE.HAN ----- .ERQANFLGKI  
 B.ES.89SP061 ----- .ERQANFLGKI  
 B.FR.HXB2 ----- .ERQANFLGKI  
 B.GA.OYI ----- .ERQANFLGKI  
 B.GB.CAM1 -----N. .ERQANFLGKI  
 B.GB.MANC ----- .ERQANFLGKI  
 B.JP.JH31 -----N. .ERQANFLGKI  
 B.NL.3202A21 ----- .ERQANFLGKI  
 B.TW.LM49 ----- .ERQANFLGKI  
 B.US.85WCIPR54 ----- .ERQANFLGKI  
 B.US.AD8 ----- .ERQANFLGKI  
 B.US.BC ----- .ERQANFLGKI  
 B.US.DH123 ----- .ERQANFLGKI  
 B.US.JRC5F ----E---- .ERQANFLGKI  
 B.US.JRFL ----- .ERQANFLGKI  
 B.US.MNCG ----- .ERQANFLGKI  
 B.US.NC7 -----I. .ERQANFLGKI  
 B.US.NY5CG ----- .ERQANFLGKI  
 B.US.P896 ----- .ERQANFLGKI  
 B.US.RF -----NE. GRQANFLGKI  
 B.US.SF2 ----- .ERQANFLGKI  
 B.US.WC001 ----- .ERQANFLGKI  
 B.US.WEAU160 ----- .ERQANFLGKI  
 B.US.WR27 ---x-xx. .ERQAxFLGxI  
 B.US.YU2 ----- .ERQANFLGKI  
  
 CONSENSUS\_C ----- .ErqAnFLGki  
 C.BR.92BR025 --V---- .ERQANFLGKI  
 C.BW.96BW01B22 ----- .ERQANFLGKI  
 C.BW.96BW0402 ----- .ERQANFLGKI  
 C.BW.96BW0502 ----- .ERQANFLGKI  
 C.BW.96BW1104 ----- .ERANFLGKI

C.BW.96BW1210 -----S. .EGQANFLGKI  
 C.BW.96BW15B03 ----- .ERQANFLGKI  
 C.BW.96BW1626 ----- .ERQADFLGKI  
 C.BW.96BW17A09 ----E--- .ERQANFLGKI  
 C.ET.ETH2220 ----- .ERQANFLGRl  
 C.IN.93IN904 ----- .ERQANFLGKI  
 C.IN.93IN905 ----- .ERQANFLGKI  
 C.IN.93IN999 ----- .ERQANFLGKI  
 C.IN.94IN11246 ----- .ERQANFLGKI  
 C.IN.95IN21068 ----- .ERQANFLGKI  
  
 CONSENSUS\_D ----- .ERQANFLGki  
 D.CD.84ZR085 ----- .ERQANFLGKI  
 D.CD.ELI --L----- .ERQANFLGRI  
 D.CD.NDK ----- .ERQANFLGKI  
 D.CD.Z2Z6 --L----- .ERQANFLGKI  
 D.UG.94UG1141 ----- .ERQANFLGKI  
  
 CONSENSUS\_F ----- .ErQANFLGKI  
 F.BR.BZ162 ----- .EGQANFLGKI  
 F.CD.VI174 ----- .ERQANFLGKI  
 F.RW.VI69 ----- .ERQANFLGKI  
  
 CONSENSUS\_F1 ----- .ERQANFLGKI  
 F1.BE.VI850 ----- .ERQANFLGKI  
 F1.BR.93BR020.1 ----- .ERQANFLGKI  
 F1.FI.FIN9363 ----- .ERQANFLGKI  
 F1.FR.MP411 ----- .ERQANFLGKI  
  
 CONSENSUS\_F2 ----- .ERQANFLGK?  
 F2.CM.MP255 ----- .ERQANFLGKI  
 F2.CM.MP257 ----- .ERQANFLGKM  
  
 CONSENSUS\_G ----x---- .ERQANFLGKI  
 G.BE.DRCBL ----E---- .ERQANFLGKI  
 G.FI.HH8793 ----- .ERQANFLGKI  
 G.NG.92NG083 ----E--- .ERQANFLGKI  
 G.SE.SE6165 ----- .ERQANFLGKI  
  
 CONSENSUS\_H ----- .ERQANFLGKI  
 H.BE.VI991 ----- .GRQANFLGKI  
 H.BE.VI997 ----- .ERQANFLGKI  
 H.CF.90CF056 ----- .ERQANFLGKI  
  
 CONSENSUS\_J ----- .ERQANFLGKI  
 J.SE.SE9173 ----- .ERQANFLGKI  
 J.SE.SE9280 ----- .ERQANFLGKI  
  
 CONSENSUS\_K ----- ?? .eRQANFLGki  
 K.BE.VI325 ----- .ERQANFLGKI  
 K.CD.EQTB11C -----S. .ERQANFLGKF  
 K.CM.MP535 ----- .ERQANFLGKI  
 N.CM.YBF30 -----KNE. GRQANFLGK-  
  
 CONSENSUS\_O ----- ?N. .G?QANFLGKY  
 O.CM.ANT70C -----RN. .GKQANFLGKY  
 O.CM.MVP5180 -----KN. .GRQANFLGKY  
 CRF01-AE.CF.90CF40 ----- .ERQANFLGKI

CRF01-AE.TH.93TH25 ----- .ERQANFLGKI  
 CRF01-AE.TH.CM240 ----- .ERQANFLGKI  
 CRF01-AE.TH.TH022 ----- .ERQANFLGKI  
 CRF01-AE.TH.TH047 ----- .ERQANFLGKI  
 CRF02\_AG.FR.DJ263 ----- .EGQANFLGKI  
 CRF02\_AG.FR.DJ264 ----- .ERQANFLGKI  
 CRF02\_AG.NG.IBNG ----- .ERQANFLGKI  
 CRF03\_AB.RU.KAL15 ----- .ERQANFLGRI  
 CRF04\_cpx.CY.94CY0 ----- .ERQANFLGRM  
 CRF04\_cpx.GR.97PVC ----- .ERQANFLGRM  
 CRF04\_cpx.GR.97PVM -----P. .ERQANSLGRM  
 AC.ET.E3099G ----- .ERQANFLGKI  
 AC.IN.21301 ----- .ERQANFLGKI  
 AC.RW.92RW009 ----- .ERQANFLGKI  
 AC.SE.SE9488 ----- .ERQANFLGKI  
 AC.ZM.ZAM174-21 ----- .ERQANFLGKI  
 AC.ZM.ZAM184 ----- .ERQANFLGKI  
 AC.ZM.ZAM716-17 ----- .ERQANFLGKI  
 ACD.SE.SE8603 ----- .ERQANFLGKI  
 AD.SE.SE6954 ----- .ERQANFLGKI  
 AD.SE.SE7108 ----- .ERQANFLGKI  
 ADHU.NO.NOGIL3 ----- .ERQANFLGKI  
 ADU.CD.MAL ----- .ERQANFLGKI  
 AG.NG.G3 ----- .ERQANFLGKI  
 AG.SE.SE7812 ----- .ERQANFLGKI  
 AGHU.GA.VI354 ----- .ERQANFLGKI  
 AGJ.AU.BFP90 ----- .ERQANFLGKI  
 AGJ.ML.95ML8 ----- .ERQANFLGRI  
 AGU.CD.Z321 ----- .ERQANFLGKI  
 BF.BR.93BR029.4 ----- .ERQANFLGKI  
 DF.CD.VI961 -----I. .EGQANFLGRV  
 U.CD.VI1126 ----- .ERQANFLGKI  
  
 CONSENSUS\_CPZ -----a?n?rqvNFLGK?  
 CPZ.CD.CPZANT --L-N-PATNTGKVNFLGKP  
 CPZ.GA.CPZGAB ----- .GRQVNFLGKG  
 CPZ.US.CPZUS -----AGN. RQANFLGKH



A\*0205 X[VLIMQ]XXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXXXX[L]  
A\*0206 X[V]XXXXXX[V]  
A\*0206 X[V]XXXXXX[V]  
A\*0206 X[V]XXXXXXXX[V]  
A\*0207 X[L][D]XXXXXX[L]  
A\*0207 X[L][D]XXXX[L]  
A\*0207 X[L][D]XXXXXXXX[L]  
A\*0214 X[VQL]XXXXXXXX[LV]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXXXX[LV]  
A\*3101 XXXXXXXXX[R]  
A\*3101 XXXXXXXXX[R]  
A\*3101 XXXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]



A\*0214 X[VQL]XXXXXXXX[LV]  
A\*3101 XXXXXXXXX[R]  
A\*3101 XXXXXXXXX[R]  
A\*3101 XXXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]



A\*0207 X[L][D]XXXXXX[L]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]



A\*0207 X[L][D]XXXXXX[L]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]

**Study Subject ID:01RCH59**

**Study Subject Clone:**

**Study Subject HLA:A2,A31,B61,B53,Cw2,Cw4**

**Sequence: Known reactive 20Mer4: TPKFKLPIQKETWETWWTEY RT(386-405)**

**Possible HLA**

A2 A2.1,A\*0201,A\*0202,A\*0203,A\*0204,A\*0205,A\*0206,A\*0207,A\*0208,A\*0209,A\*0210,A\*0211,A\*0212,A\*0213,A\*0214,A\*0216,A\*0217,A\*0218,A\*0220,A\*0221,A\*0222,A\*0223,A\*0224,A\*0225,A\*0226,A\*0227,A\*0228,A\*0229,A\*0230,A\*0231,A\*0232,A\*0233,A\*0234,A\*0235,A\*0236,A\*0237,A\*0238,A\*0239,A\*0240,A\*0241,A\*0242,A\*0243,A\*0244,A\*0245,A\*0246,A\*0247,A\*0248,A\*0249,A\*0250,A\*0251,A\*0252,A\*0253,A\*0254,A\*0255,A\*0256,A\*0257,A\*0258,A\*0259,A\*0260,A\*0261,A\*0262,A\*0263,A\*0264,A\*0265,A\*0266,A\*0267,A\*0268,A\*0269,A\*0270,A\*0271,A\*0272,A\*0273,A\*0274,A\*0275,A\*0276,A\*0277,A\*0278,A\*0279,A\*0280,A\*0281,A\*0282,A\*0283,A\*0284,A\*0285,A\*0286,A\*0287,A\*0288,A\*0289,A\*0290,A\*0291,A\*0292,A\*0293,A\*0294,A\*0295,A\*0296,A\*0297,A\*0298,A\*0299,A\*0300,A\*0301,A\*0302,A\*0303,A\*0304,A\*0305,A\*0306,A\*0307,A\*0308,A\*0309,A\*0310,A\*0311,A\*0312,A\*0313,A\*0314,A\*0315,A\*0316,A\*0317,A\*0318,A\*0319,A\*0320,A\*0321,A\*0322,A\*0323,A\*0324,A\*0325,A\*0326,A\*0327,A\*0328,A\*0329,A\*0330,A\*0331,A\*0332,A\*0333,A\*0334,A\*0335,A\*0336,A\*0337,A\*0338,A\*0339,A\*0340,A\*0341,A\*0342,A\*0343,A\*0344,A\*0345,A\*0346,A\*0347,A\*0348,A\*0349,A\*0350,A\*0351,A\*0352,A\*0353,A\*0354,A\*0355,A\*0356,A\*0357,A\*0358,A\*0359,A\*0360,A\*0361,A\*0362,A\*0363,A\*0364,A\*0365,A\*0366,A\*0367,A\*0368,A\*0369,A\*0370,A\*0371,A\*0372,A\*0373,A\*0374,A\*0375,A\*0376,A\*0377,A\*0378,A\*0379,A\*0380,A\*0381,A\*0382,A\*0383,A\*0384,A\*0385,A\*0386,A\*0387,A\*0388,A\*0389,A\*0390,A\*0391,A\*0392,A\*0393,A\*0394,A\*0395,A\*0396,A\*0397,A\*0398,A\*0399,A\*0400,A\*0401,A\*0402,A\*0403,A\*0404,A\*0405,A\*0406,A\*0407,A\*0408,A\*0409,A\*0410,A\*0411,A\*0412,A\*0413,A\*0414,A\*0415,A\*0416,A\*0417,A\*0418,A\*0419,A\*0420,A\*0421,A\*0422,A\*0423,A\*0424,A\*0425,A\*0426,A\*0427,A\*0428,A\*0429,A\*0430,A\*0431,A\*0432,A\*0433,A\*0434,A\*0435,A\*0436,A\*0437,A\*0438,A\*0439,A\*0440,A\*0441,A\*0442,A\*0443,A\*0444,A\*0445,A\*0446,A\*0447,A\*0448,A\*0449,A\*0450,A\*0451,A\*0452,A\*0453,A\*0454,A\*0455,A\*0456,A\*0457,A\*0458,A\*0459,A\*0460,A\*0461,A\*0462,A\*0463,A\*0464,A\*0465,A\*0466,A\*0467,A\*0468,A\*0469,A\*0470,A\*0471,A\*0472,A\*0473,A\*0474,A\*0475,A\*0476,A\*0477,A\*0478,A\*0479,A\*0480,A\*0481,A\*0482,A\*0483,A\*0484,A\*0485,A\*0486,A\*0487,A\*0488,A\*0489,A\*0490,A\*0491,A\*0492,A\*0493,A\*0494,A\*0495,A\*0496,A\*0497,A\*0498,A\*0499,A\*0500

A31 A\*3101,A\*3104,A\*3201,A\*3202

B53 B\*5301

B61 B\*4002,B\*4006,B\*4009,B\*4010,B\*4016

Cw2 Cw\*0202

Cw4 C4,Cw\*0401,C\*0401,Cw\*0402

**Possible Epitopes based on anchor residues**

(1-8) TPKFKLPI B\*5301

**Anchor Residues Searched**

A\*0201 X[LM]XXXXXX[VL]  
A\*0201 X[LM]XXXXXX[VL]  
A\*0201 X[LM]XXXXXXXX[VL]  
A\*0202 X[L]XXXXXX[LV]  
A\*0202 X[L]XXXXXX[LV]  
A\*0202 X[L]XXXXXXXX[LV]  
A\*0204 X[L]XXXXXX[L]  
A\*0204 X[L]XXXXXX[L]  
A\*0204 X[L]XXXXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXXXX[L]  
A\*0206 X[V]XXXXXX[V]  
A\*0206 X[V]XXXXXX[V]  
A\*0206 X[V]XXXXXXXX[V]  
A\*0207 X[L][D]XXXXXX[L]  
A\*0207 X[L][D]XXXX[L]  
A\*0207 X[L][D]XXXXXXXX[L]  
A\*0214 X[VQL]XXXXXXXX[LV]  
A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXXXX[LV]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]

B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]

**Study Subject ID:01RCH59**

**Study Subject Clone:**

**Study Subject HLA:A2,A31,B61,B53,Cw2,Cw4**

**Sequence: Known reactive 20Mer5: WQATWIPEWEFVNTTPPLVKL RT(406-425)**

**Possible HLA**

A2 A2.1,A\*0201,A\*0202,A\*0203,A\*0204,A\*0205,A\*0206,A\*0207,A\*0208,A\*0209,A\*0210,A\*0211,A\*0212,A\*0213,A\*0214,A\*0216,A\*0217,A\*0218,A\*0220,A\*0221,A\*0222,A\*0223,A\*0224,A\*0225,A\*0226,A\*0227,A\*0228,A\*0229,A\*0230,A\*0231,A\*0232,A\*0233,A\*0234,A\*0235,A\*0236,A\*0237,A\*0238,A\*0239,A\*0240,A\*0241,A\*0242,A\*0243,A\*0244,A\*0245,A\*0246,A\*0247,A\*0248,A\*0249,A\*0250,A\*0251,A\*0252,A\*0253,A\*0254,A\*0255,A\*0256,A\*0257,A\*0258,A\*0259,A\*0260,A\*0261,A\*0262,A\*0263,A\*0264,A\*0265,A\*0266,A\*0267,A\*0268,A\*0269,A\*0270,A\*0271,A\*0272,A\*0273,A\*0274,A\*0275,A\*0276,A\*0277,A\*0278,A\*0279,A\*0280,A\*0281,A\*0282,A\*0283,A\*0284,A\*0285,A\*0286,A\*0287,A\*0288,A\*0289,A\*0290,A\*0291,A\*0292,A\*0293,A\*0294,A\*0295,A\*0296,A\*0297,A\*0298,A\*0299,A\*0300,A\*0301,A\*0302,A\*0303,A\*0304,A\*0305,A\*0306,A\*0307,A\*0308,A\*0309,A\*0310,A\*0311,A\*0312,A\*0313,A\*0314,A\*0315,A\*0316,A\*0317,A\*0318,A\*0319,A\*0320,A\*0321,A\*0322,A\*0323,A\*0324,A\*0325,A\*0326,A\*0327,A\*0328,A\*0329,A\*0330,A\*0331,A\*0332,A\*0333,A\*0334,A\*0335,A\*0336,A\*0337,A\*0338,A\*0339,A\*0340,A\*0341,A\*0342,A\*0343,A\*0344,A\*0345,A\*0346,A\*0347,A\*0348,A\*0349,A\*0350,A\*0351,A\*0352,A\*0353,A\*0354,A\*0355,A\*0356,A\*0357,A\*0358,A\*0359,A\*0360,A\*0361,A\*0362,A\*0363,A\*0364,A\*0365,A\*0366,A\*0367,A\*0368,A\*0369,A\*0370,A\*0371,A\*0372,A\*0373,A\*0374,A\*0375,A\*0376,A\*0377,A\*0378,A\*0379,A\*0380,A\*0381,A\*0382,A\*0383,A\*0384,A\*0385,A\*0386,A\*0387,A\*0388,A\*0389,A\*0390,A\*0391,A\*0392,A\*0393,A\*0394,A\*0395,A\*0396,A\*0397,A\*0398,A\*0399,A\*0400,A\*0401,A\*0402,A\*0403,A\*0404,A\*0405,A\*0406,A\*0407,A\*0408,A\*0409,A\*0410,A\*0411,A\*0412,A\*0413,A\*0414,A\*0415,A\*0416,A\*0417,A\*0418,A\*0419,A\*0420,A\*0421,A\*0422,A\*0423,A\*0424,A\*0425,A\*0426,A\*0427,A\*0428,A\*0429,A\*0430,A\*0431,A\*0432,A\*0433,A\*0434,A\*0435,A\*0436,A\*0437,A\*0438,A\*0439,A\*0440,A\*0441,A\*0442,A\*0443,A\*0444,A\*0445,A\*0446,A\*0447,A\*0448,A\*0449,A\*0450,A\*0451,A\*0452,A\*0453,A\*0454,A\*0455,A\*0456,A\*0457,A\*0458,A\*0459,A\*0460,A\*0461,A\*0462,A\*0463,A\*0464,A\*0465,A\*0466,A\*0467,A\*0468,A\*0469,A\*0470,A\*0471,A\*0472,A\*0473,A\*0474,A\*0475,A\*0476,A\*0477,A\*0478,A\*0479,A\*0480,A\*0481,A\*0482,A\*0483,A\*0484,A\*0485,A\*0486,A\*0487,A\*0488,A\*0489,A\*0490,A\*0491,A\*0492,A\*0493,A\*0494,A\*0495,A\*0496,A\*0497,A\*0498,A\*0499,A\*0500

A31 A\*3101,A\*3104,A\*3201,A\*3202

B53 B\*5301

B61 B\*4002,B\*4006,B\*4009,B\*4010,B\*4016

Cw2 Cw\*0202

Cw4 C4,Cw\*0401,C\*0401,Cw\*0402

**Possible Epitopes based on anchor residues**

(11-20) FVNTTPPLVKL A\*0205  
(11-18) FVNTTPPLV A\*0206  
(11-18) FVNTTPPLV A\*0214  
(11-20) FVNTTPPLVKL A\*0214  
(9-18) WEFVNTTPPLV B\*4006  
(10-17) EFVNTTPPL Cw\*0401

**Anchor Residues Searched**

A\*0201 X[LM]XXXXXX[VL]  
A\*0201 X[LM]XXXXXX[VL]  
A\*0201 X[LM]XXXXXX[VL]  
A\*0202 X[L]XXXXXX[LV]  
A\*0202 X[L]XXXXXX[LV]  
A\*0202 X[L]XXXXXX[LV]  
A\*0202 X[L]XXXXXX[LV]  
A\*0204 X[L]XXXXXX[L]  
A\*0204 X[L]XXXXXX[L]  
A\*0204 X[L]XXXXXX[L]  
A\*0204 X[L]XXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXX[L]  
A\*0205 X[VLIMQ]XXXXXX[L]  
A\*0206 X[V]XXXXXX[V]  
A\*0206 X[V]XXXXXX[V]  
A\*0206 X[V]XXXXXX[V]  
A\*0207 X[L][D]XXXXXX[L]  
A\*0207 X[L][D]XXXXXX[L]  
A\*0207 X[L][D]XXXXXX[L]  
A\*0214 X[VQL]XXXXXX[LV]

A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXXXX[LV]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]



B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]



A\*0214 X[VQL]XXXXXX[LV]  
A\*0214 X[VQL]XXXXXXXX[LV]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
A\*3101 XXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]



A\*0214 X[VQL]XXXXXXXX[LV]  
A\*3101 XXXXXXXXX[R]  
A\*3101 XXXXXXXXX[R]  
A\*3101 XXXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]



A\*3101 XXXXXXXXX[R]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXX[LIVMY]  
B\*5301 X[P]XXXXXXXX[LIVMY]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXX[V]  
B\*4006 X[E]XXXXXXXX[V]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXX[LF]  
Cw\*0401 X[YPF]XXXXXXXX[LF]

**This table lists epitopes that are experimentally observed to be presented by a HLA type carried by the patient, but the defined epitope has substitutions relative to the peptides from your reference strains and so might be missed by your reagents: in HXB2 for Gag, Pol; MN for Env; BRU for Nef, relative to most B clade Sequences in the database:**

Protein	Epitope in Database	Epitope in Ref. strain	Epitope in Consensus B	HLA	Notes
p17(77-85)	SLFNTVATL	SLYNTVATL	SLYNTVATL	A*0201	
p24(47-56)	ATPQDLNMML	ATPQDLNTML	ATPQDLNTML	B53	
p24(48-56)	TPYDINQML	TPQDLNTML	TPQDLNTML	B*5301	
p24(48-56)	TPQDLNQML	TPQDLNTML	TPQDLNTML	B53	
p24(48-56)	TPYDINQML	TPQDLNTML	TPQDLNTML	B53	
RT(179-187)	VIYQYMMDL	VIYQYMDDL	VIYQYMDDL	A2	
RT(179-187)	VIYQYMMDL	VIYQYMDDL	VIYQYMDDL	A2, A*0202	
RT(308-317)	EILKEPVGHV	EILKEPVHGV	EILKEPVHGV	A*0201	
gp160(121-129)	KLTPLCVSL	KLTPLCVTL	KLTPLCVTL	A2	
gp160(192-200)	KLTSCNTSV	RLISCNTSV	RLISCNTSV	A2	
gp160(192-200)	TLTSCNTSV	RLISCNTSV	RLISCNTSV	A2	
gp160(192-200)	TLTSCNTSV	RLISCNTSV	RLISCNTSV	A2.1	
gp160(311-320)	RGPGRAFVTI	IGPGRAFYTT	IGPGRAFYTT	A*0201	
gp160(311-320)	RGPGRAFVTI	IGPGRAFYTT	IGPGRAFYTT	A2	
gp160(311-320)	MGPKRAFYAT	IGPGRAFYTT	IGPGRAFYTT	A2	
gp160(369-375)	PEIVTHS	PEIVMHS	PEIVMHS	A2	
gp160(377-387)	NSGGEFFYSNS	NCGGEFFYCNT	NCGGEFFYCNT	A2	
gp160(419-427)	RIKQIINMW	KIKQIINMW	RIKQIINMW	A*3201	
gp160(700-708)	AVLSVVNRV	AVLSIVNRV	AVLSIVNRV	A2	
gp160(747-755)	RLVNGSLAL	RLVHGFLAI	RLVDGFLAL	A2	
gp160(770-778)	RLRDLLIV	HHRDLLLIA	RLRDLLIV	A*0201	
gp160(770-780)	RLRDLLIVTR	HHRDLLLIAAR	RLRDLLIVTR	A*3101	
gp160(770-780)	RLRDLLIVTR	HHRDLLLIAAR	RLRDLLIVTR	A31	
gp160(813-822)	SLLNATDIAV	SLLNATAIAV	SLLNATAIAV	A*0201	
gp160(813-822)	SLLNATDIAV	SLLNATAIAV	SLLNATAIAV	A2	
gp160(813-822)	SLLNATDIAV	SLLNATAIAV	SLLNATAIAV	A2.1	
gp160(814-822)	LLNATDIAV	LLNATAIAV	LLNATAIAV	A2	
Nef(73-82)	SVPLRPMTYK	QVPLRPMTYK	QVPLRPMTYK	B35 or C4	
Nef(136-145)	PLTFGWCFKL	PLTFGWCYKL	PLTFGWCFKL	A2	

Table 1: **p17**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
p17(77–85)	p17(77–85 Clade A)	SLFNTVATL	HIV-1 infection	human(A*0201)	[Dorrell (1999)]
		<ul style="list-style-type: none"> <li>• Epitope SL9: CTL responses in three individuals with non-clade B infections were studied, 2 with subtype A infections, 1 with subtype C – their infections all originated in East Africa</li> <li>• This epitope is most commonly SLYNTVATL in B subtype, and CTL from the C subtype infection did not recognize B clade gag or the 3Y form of the epitope, but do recognize the predominant A and C clade form, SLFNTVATL</li> </ul>			

Table 2: **p24**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
p24(47–56)	p24()	ATPQDLNMML	HIV-1 exposed seronegative	human(B53)	[Kaul (2000)]
		<ul style="list-style-type: none"> <li>• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-specific CD8 gamma-IFN responses in the cervix – systemic CD8+ T cell responses tended to be to the same epitopes but at generally lower levels than cervical CD8+ T cell responses</li> <li>• Low risk individuals did not have such CD8+ cells</li> <li>• CD8+ epitopes T cell DTVLEDINL (3 individuals), SLYNVATL (4 individuals), LSPRTLNAW (3 individuals) and YPLTFGWCF (4 individuals) were most commonly recognized by the HIV-resistant women</li> </ul>			
p24(48–56)	Gag(173–181 HIV-2)	TPYDINQML	HIV-2	human(B*5301)	[Brander & Goulder(2001)]
		<ul style="list-style-type: none"> <li>• C. Brander notes this is a B*5301 epitope</li> </ul>			
p24(48–56)	p24()	TPQDLNQML		human(B53)	[Rowland-Jones (1999)]
		<ul style="list-style-type: none"> <li>• CTL responses in seronegative highly HIV-exposed African female sex workers in Gambia and Nairobi were studied – these women had no delta 32 deletion in CCR5</li> <li>• In Gambia there is exposure to both HIV-1 and HIV-2, CTL responses to B35 epitopes in exposed, uninfected women are cross-reactive, and the B35 allele seems to be protective</li> <li>• HIV-2 sequence: TPYDINQML, no cross-reactivity, [Gotch (1993)]</li> </ul>			
p24(48–56)	Gag(173–181 HIV-2)	TPYDINQML	HIV-2	human(B53)	[Gotch (1993)]

Table 3: **RT**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
RT(179–187)	RT()	VIYQYMMDL	HIV-1 exposure	human(A2)	[Rowland-Jones (1998a)]
		<ul style="list-style-type: none"> <li>• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-defined B clade epitopes that tended to be conserved in A and D clades – such cross-reactivity could protect against both A and D and confer protection in Nairobi where both subtypes are circulating</li> <li>• The A and D consensus sequences are both VIYQYMMDL</li> </ul>			
RT(179–187)	Pol()	VIYQYMMDL	HIV-1 exposure	human(A2, A*0202)	[Rowland-Jones (1998b)]
		<ul style="list-style-type: none"> <li>• HIV-specific CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection</li> <li>• Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world</li> <li>• Most isolated HIV strains are clade A in Nairobi, although clades C and D are also found – B clade epitopes are often cross-reactive, however stronger responses are frequently observed using A or D clade versions of epitopes</li> <li>• This epitope is conserved among A, B and D clade viruses</li> </ul>			
RT(308–317)	RT()	EILKEPVGHV	HIV-1 infection	human(A*0201)	[van der Burg (1997), Menendez-Arias (1998)]
		<ul style="list-style-type: none"> <li>• Recognized by CTL from a long-term survivor, SPIETVPVKL was also recognized</li> <li>• Recognized by CTL from a progressor, EELRQHLLRW and TWETWWTEYW were also recognized</li> </ul>			

Table 4: **gp160**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
gp160(121–129)	gp120(121–129)	KLTPLCVSL	<i>in vitro</i> stimulation	human(A2)	[Zarling (1999)]
	<ul style="list-style-type: none"> <li>• This study compares the ability of macrophages and dendritic cells to stimulate primary responses in CD8+ lymphocytes isolated from HLA-appropriate HIV-uninfected donors using peptide-pulsed APC – the dendritic cells performed better as APC for the stimulation of primary responses</li> <li>• Strong CTL responses were elicited by the epitopes DRFYKTLRA and GEIYKRWII when presented by either immature or mature dendritic cells – macrophages were not able to prime a CTL response against DRFYKTLRA</li> <li>• A weak response to KLTPLCVSL was stimulated using macrophages as the APC</li> <li>• No detectable response was observed for the following previously-defined HIV epitopes: KIRLRPGGK, ILKEPVHGV, IRLRPGGK, GPKVKQWPL</li> </ul>				
gp160(192–200)	gp120(192–199 HXB2R)	KLTSNTSV	HIV-1 infection	human(A2)	[Brander (1995)]
	<ul style="list-style-type: none"> <li>• Epitope predicted on HLA binding motif, and studied in the context of inclusion in a synthetic vaccine</li> </ul>				
gp160(192–200)	gp120(197–205)	TLTSCNTSV	no CTL shown	human(A2)	[Garboczi (1992)]
	<ul style="list-style-type: none"> <li>• Crystallization of HLA-A2 molecules complexed with antigenic peptides – refers to Dadaglio <i>et al</i> 1991</li> </ul>				
gp160(192–200)	gp120(199–207)	TLTSCNTSV	peptide immunization and HIV-1 infection	human(A2.1)	[Brander (1996)]
	<ul style="list-style-type: none"> <li>• This epitope was recognized by PBMC from 6/14 HIV+ asymptomatic patients</li> <li>• This epitope was used along with pol CTL epitope ALQDSGLEV and a tetanus toxin T helper epitope for a synthetic vaccine</li> <li>• This vaccine failed to induce a CTL response, although a helper response was evident</li> </ul>				
gp160(311–320)	gp160(318–327 IIIB)	RGPGRAFVTI	CTL line from HIV-donor	human(A*0201)	[Alexander-Miller (1996)]
	<ul style="list-style-type: none"> <li>• This immunogenic peptide does not have the known binding motif for A2.1</li> <li>• The same optimal peptide for this human HLA-A2.1 epitope was observed for a murine H-2 D<sup>d</sup> epitope</li> </ul>				
gp160(311–320)	gp160(318–327 IIIB)	RGPGRAFVTI	vaccinia IIIB gp160	human(A2)	[Achour (1996)]
	<ul style="list-style-type: none"> <li>• Individual was immunized with rec vaccinia gp160 IIIB and boosted with purified gp160</li> <li>• Lysis only occurs with IIIB P18 peptide pulsed onto autologous targets; MN, RF, SIMI P18 peptides fail to stimulate CTL</li> <li>• Restimulating immune cells from gp160 IIIB vaccinees with MN, RF, or SIMI P18 did not enhance the MN, RF, or SIMI specific CTL response</li> </ul>				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
gp160(311–320)	gp160(318–327 SIMI)	MGPKRAFYAT	vaccinia SIMI gp160	human(A2)	[Achour (1996)]
					<ul style="list-style-type: none"> <li>• Individual was immunized with rec vaccinia gp160 SIMI and boosted with purified recombinant gp160 SIMI</li> <li>• P18 MN and RF peptides were able to stimulate the HIV-specific CTL that arose in response to the SIMI vaccination, thus the P18 MN peptide (IGPGRAFYTT) and the P18 RF peptide (KGPRVIYAT) could cross-react</li> <li>• The P18 IIIB peptide does not cross-react (RGPGRAFVTI in the epitope region)</li> <li>• gp160 SIMI primed immune cells could generate a significantly broader specificity when stimulated with P18 MN or P18RF peptides, but not P18 IIIB</li> </ul>
gp160(369–375)	gp120(374–380 BRU)	PEIVTHS	HIV-1 infection	human(A2)	[Dadaglio (1991)]
					<ul style="list-style-type: none"> <li>• Defined through blocking CTL activity, and Env deletions</li> </ul>
gp160(377–387)	gp120(377–387)	NSGGEFFYSNS		human(A2)	[Hickling (1990)]
					<ul style="list-style-type: none"> <li>• Peptides recognized by class I restricted CTL can bind to class II</li> </ul>
gp160(419–427)	gp120(424–432 HXB2)	RIKQIINMW		human(A*3201)	[Harrer (1996)]
					<ul style="list-style-type: none"> <li>• C. Brander notes that this is an A*3201 epitope in the 1999 database</li> </ul>
gp160(700–708)	gp41(705–714)	AVLSVVNRV	HIV-1 infection	human(A2)	[Ferris (1999)]
					<ul style="list-style-type: none"> <li>• This epitope is processed by a TAP1/2 dependent mechanism</li> </ul>
gp160(747–755)	gp41(747–755)	RLVNGSLAL	HIV-1 infection	human(A2)	[Parker (1992)]
					<ul style="list-style-type: none"> <li>• Studied in the context of HLA-A2 peptide binding</li> </ul>
gp160(770–778)	Env(679–777)	RLRDLLLIV	HIV-1 infection	human(A*0201)	[Kmieciak (1998)]
					<ul style="list-style-type: none"> <li>• CTL responses in six patients to four Env epitopes were studied: D2: LLNATAIAV, 5.3: RLRDLLLIV, D1: KLTPLCVTL, and 4.3: QMHEDIISL – all have A2 anchor residues</li> <li>• The C terminal epitopes (D2 and 5.3) were highly variable and the variability was considered responsible for limited CTL response, while D1 and 4.3, N-terminal epitopes, were much more conserved and gave evidence of high levels of CTL response <i>in vitro</i></li> <li>• Peptides 5.3 and D2 bound to HLA A*0201 with low affinity and were variable, particularly D2;</li> </ul>
gp160(770–780)	gp41(770–780 BH10)	RLRDLLLIVTR	HIV-1 infection	human(A*3101)	[Safrit (1994a), Safrit (1994b)]
					<ul style="list-style-type: none"> <li>• Recognized by CTL derived from acute seroconverter</li> <li>• C. Brander notes that this is an A*3101 epitope in the 1999 database</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
gp160(770–780)	gp41(770–780)	RLRDLIIIIVTR	HIV-1 infection	human(A31)	[Ferris (1999), Hammond (1995)]
		<ul style="list-style-type: none"> <li>This epitope is processed by a TAP1/2 dependent mechanism</li> </ul>			
gp160(813–822)	gp41(814–823 LAI)	SLLNATDIAV	MN rec gp160	human(A*0201)	[Dupuis (1995)]
		<ul style="list-style-type: none"> <li>Of two CTL clones, one reacted only with 815-823, the other with 814-823 and 815-823</li> <li>Noted to be A*0201 in Brander <i>et al.</i>, 1999 database</li> </ul>			
gp160(813–822)	gp41(814–823)	SLLNATDIAV	HIV-1 infection	human(A2)	[Kundu (1998b)]
		<ul style="list-style-type: none"> <li>Allogeneic dendritic cells (DCs) were obtained from HLA-identical siblings, pulsed with rgp160 MN or A2-restricted HIV-1 epitope peptides, and infused monthly into six HIV-infected patients</li> <li>1/6 showed increased env-specific CTL and increased lymphoproliferative responses, 2/6 showed increase only in proliferative responses, and 3/6 showed no change – pulsed DCs were well tolerated</li> <li>SLLNATDIAV is a conserved HLA-A2 epitope included in this study – 4/6 patients had this sequence as their HIV direct sequence, and 3 of these had a detectable CTL response – the other two had either the sequence SLFNAIDIAV or SLLNTTDIVV and no detectable CTL response</li> <li>CTL demonstrated against peptide-coated target, epitope is naturally processed and enhancible with vaccine</li> </ul>			
gp160(813–822)	Env(814–823 Clade B)	SLLNATDIAV	HIV-1 MN rgp160	human(A2.1)	[Kundu (1998a)]
		<ul style="list-style-type: none"> <li>Ten HIV-1+ HLA A2 asymptomatic individuals were given two courses of HIV-1 MN rgp160 vaccine over a 2 year period</li> <li>Two hundred and fifty three HIV-1 peptides of 9 or 10 aa possessing the HLA-A2.1 binding motif (Leu at position 2, Val at the C terminus) were identified in gp160, of which 25 had a high or intermediate binding affinity</li> <li>Eleven peptides were studied that had high HLA-A2 binding affinity – a CTL response was detected to 9/11 peptides in at least 1 individual</li> <li>CTL responses after reimmunization may include recall responses – only individuals with vaccine cross-reactive sequences prior to vaccination showed detectable CTL responses</li> <li>CTL to overlapping peptides in this region gave a positive response in the greatest number of patients</li> <li>ALTERNATIVE EPITOPES: LLNATDIAV and LLNATDIAVA – CTL were induced by vaccine in those that had the sequence SLLNATAIAVA in their own infection, but not in those with: NLLNTAIAVA or NLFNTTIAIVA or SLLNATAITVA</li> </ul>			
gp160(814–822)	gp41(815–823 LAI)	LLNATDIAV	MN rec gp160	human(A2)	[Dupuis (1995)]
		<ul style="list-style-type: none"> <li>Of two CTL clones, one reacted only with 815-823, the other with 814-823 and 815-823</li> </ul>			

Table 5: **Nef**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(73–82)	Nef(73–82 LAI)	SVPLRPMTYK	HIV-1 infection	human(B35 or C4)	[Buseyne (1993)]
		<ul style="list-style-type: none"> <li>• Vertical transmission of HIV ranges from 13% to 39%</li> <li>• Primary assays showed cytotoxic activity against at least one HIV protein was detected in 70% of infected children</li> <li>• Epitopes recognized in five children were mapped using synthetic peptides and secondary cultures</li> <li>• Patient EM13, who had a CTL response to three epitopes in Nef, was infected via blood transfusion after birth and went from CDC stage P2A to P2E during the study</li> </ul>			
Nef(136–145)	Nef(136–145)	PLTFGWCFKL	HIV-1 infection	human(A2)	[Durali (1998)]
		<ul style="list-style-type: none"> <li>• Cross-clade CTL response was studied by determining the CTL activity in seven patients from Bangui, (6 A subtype, and 1 AG recombinant infections) and one A subtype infection from a person living in France originally from Togo, to different antigens expressed in vaccinia</li> <li>• Pol reactivity: 8/8 had CTL to A subtype, and 7/8 to B subtype, and HIV-2 Pol was not tested</li> <li>• Gag reactivity: 7/8 reacted with A or B subtype gag, 3/8 with HIV-2 Gag</li> <li>• Nef reactivity: 7/8 reacted with A subtype, and 5/8 with B subtype, none with HIV-2 Nef</li> <li>• Env reactivity: 3/8 reacted with A subtype, 1/8 with B subtype, none with HIV-2 Env</li> <li>• Patient B18 had the greatest breadth and diversity of response, and recognized Gag SLYNTVATL and Nef PLTFGWCFKL</li> </ul>			

Table 6: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 7: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
	<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>				
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
	<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>				
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
	<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>				
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
	<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>				
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
	<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 8: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 9: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
	<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>				
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
	<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>				
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
	<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>				
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
	<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>				
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
	<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
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- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 10: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWICYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 11: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFD SRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFD SRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFD SRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFD SRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGW CYKL greater than VLEWRFD SRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 12: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 13: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

Table 14: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFDLSRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFDLSRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFDLSRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGWYCYKL greater than VLEWRFDLSRL which was much greater than AFHHVAREL</li> </ul>

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

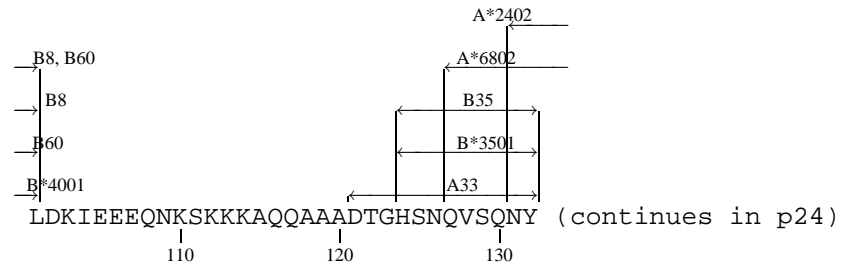
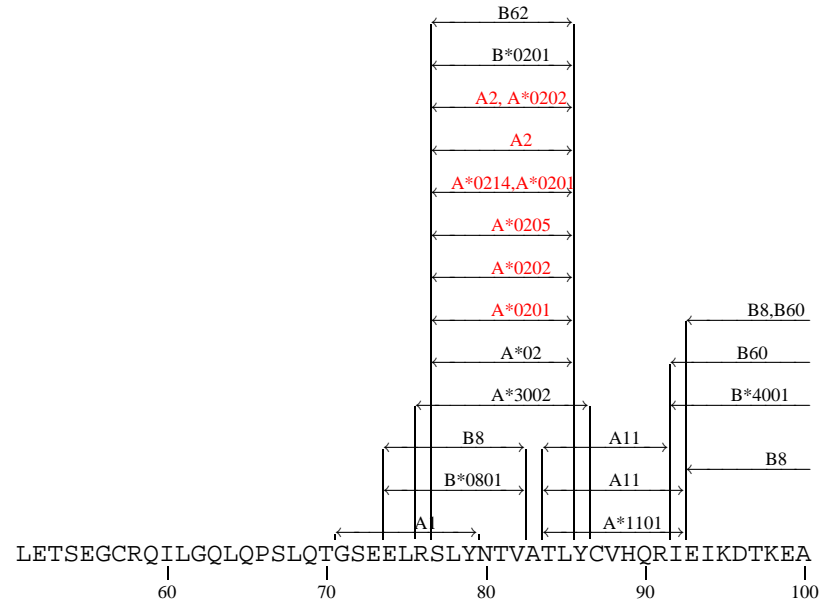
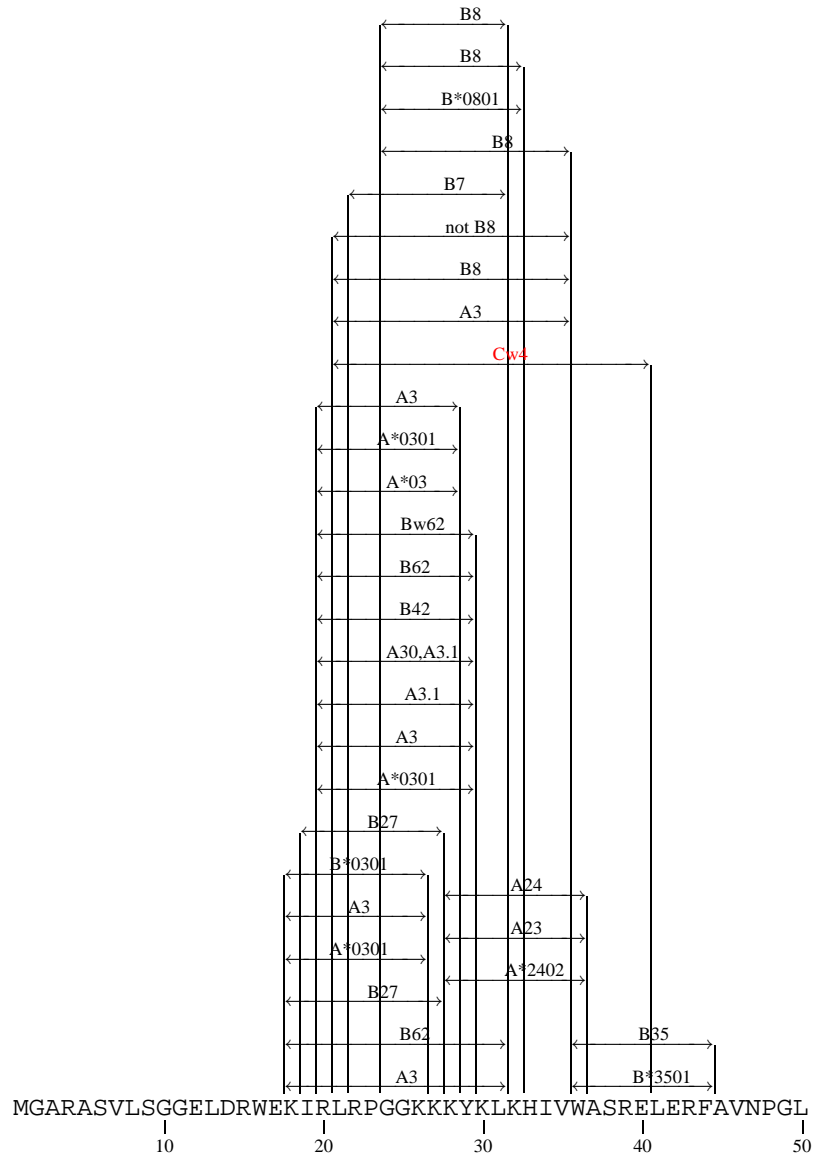
Table 15: **All Defined Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(172–191)	Nef(171–190 SF2)	GMDDPEREVLEWRFD SRLAF	HIV-1 infection	human()	[Lieberman (1997)]
					<ul style="list-style-type: none"> <li>• Of 25 patients, most had CTL specific for more than 1 HIV-1 protein</li> <li>• Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef</li> <li>• One of these 11 had CTL response to this peptide</li> <li>• The responding subject was HLA-A2, B21</li> </ul>
Nef(175–184)	Nef(175–184)	DPEKEVLQWK	HIV-1 infection	human(B7)	[Jin (2000)]
					<ul style="list-style-type: none"> <li>• This a B7 epitope, a subdominant CTL response, was defined by an un-conventional approach used to predict epitopes in an HLA B7+ long-term non-progressor</li> <li>• Three additional sub-dominant HLA B7 epitopes were defined using EpiMatrix, a non-anchor based strategy for defining potential epitopes, which highlighted 2078 possible epitopes in the autologous HIV-1 derived from the study subject, followed by B7 anchor residue prediction which narrowed the set to 55 peptides, three of which could serve as functional CTL epitopes</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFD SRL	HIV-1 infection	human(A*0201)	[Haas (1996), Haas (1997)]
					<ul style="list-style-type: none"> <li>• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant specific CTLs arose over time to eliminate variants, indicating immune selection</li> <li>• Noted in Brander <i>et al.</i>, 1999 this database, to be A*0201</li> </ul>
Nef(180–189)	Nef(180–189 LAI)	VLEWRFD SRL	Nef(180-189)	human(A*0201)	[Brander & Goulder(2001)]
					<ul style="list-style-type: none"> <li>• C. Brander notes this is an A*0201 epitope</li> </ul>
Nef(180–189)	Nef(180–189)	VLEWRFD SRL	<i>in vitro</i> stimulation	human(A2)	[Wilson (1999)]
					<ul style="list-style-type: none"> <li>• Dendritic cells are the most potent for priming T cell responses – DCs can stimulate autologous CTL responses from T cells cultured from HIV negative donors</li> <li>• Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses <i>in vitro</i> whether the epitope is delivered by pulsing from peptide, or expressed from within</li> <li>• B7 and A2 Nef epitopes were studied and the relative binding affinity of A2 epitopes for A2 was: PLTFGW CYKL greater than VLEWRFD SRL which was much greater than AFHHVAREL</li> </ul>

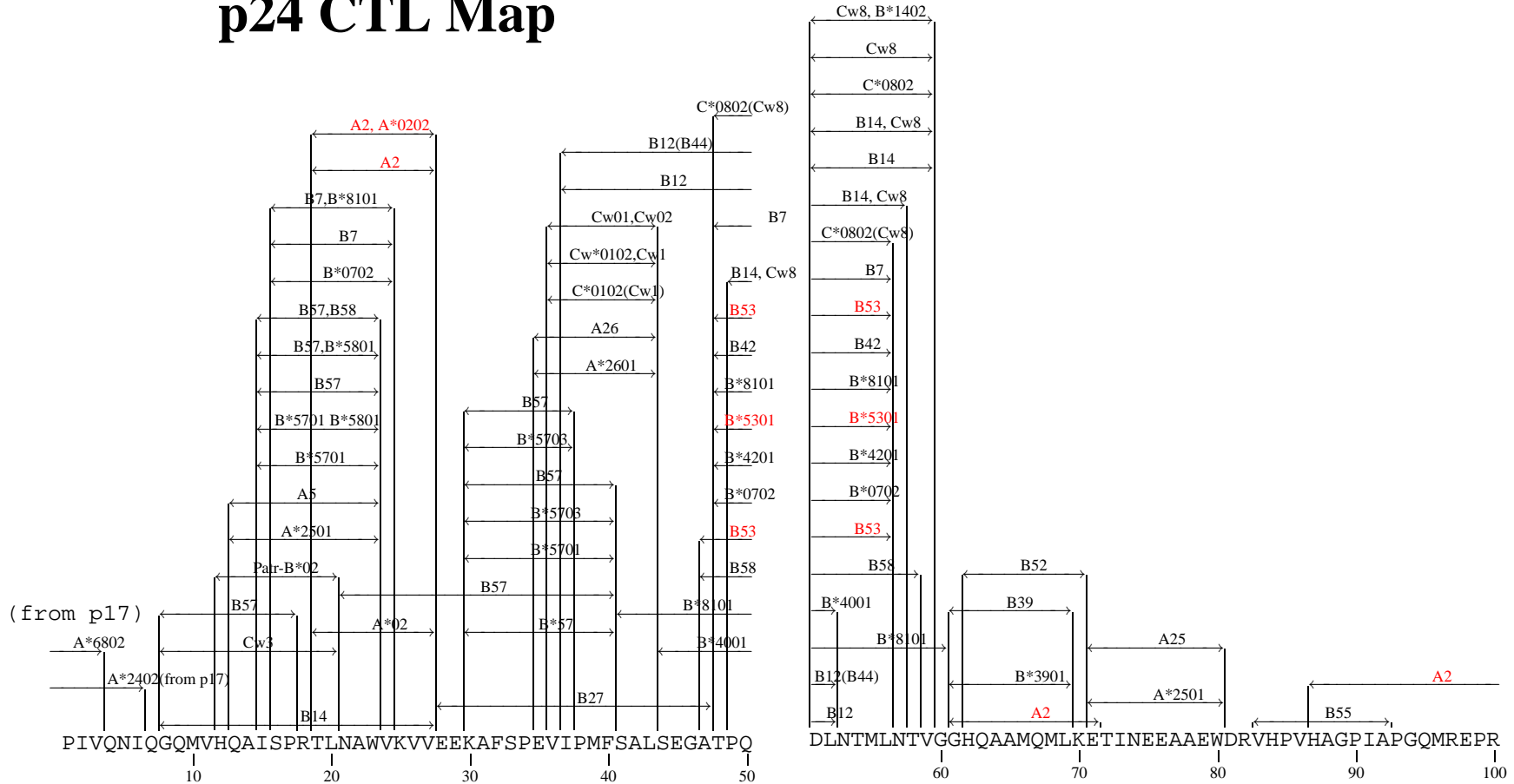
HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(180–189)	Nef(180–189)	VLEWRFDSRL	HIV-1 infection (human) or HIV A2-polyepitope (polytope) DNA vaccine with vaccinia boost (rVV.HIV.pt) (mouse)	human(A2)	[Woodberry (1999)]

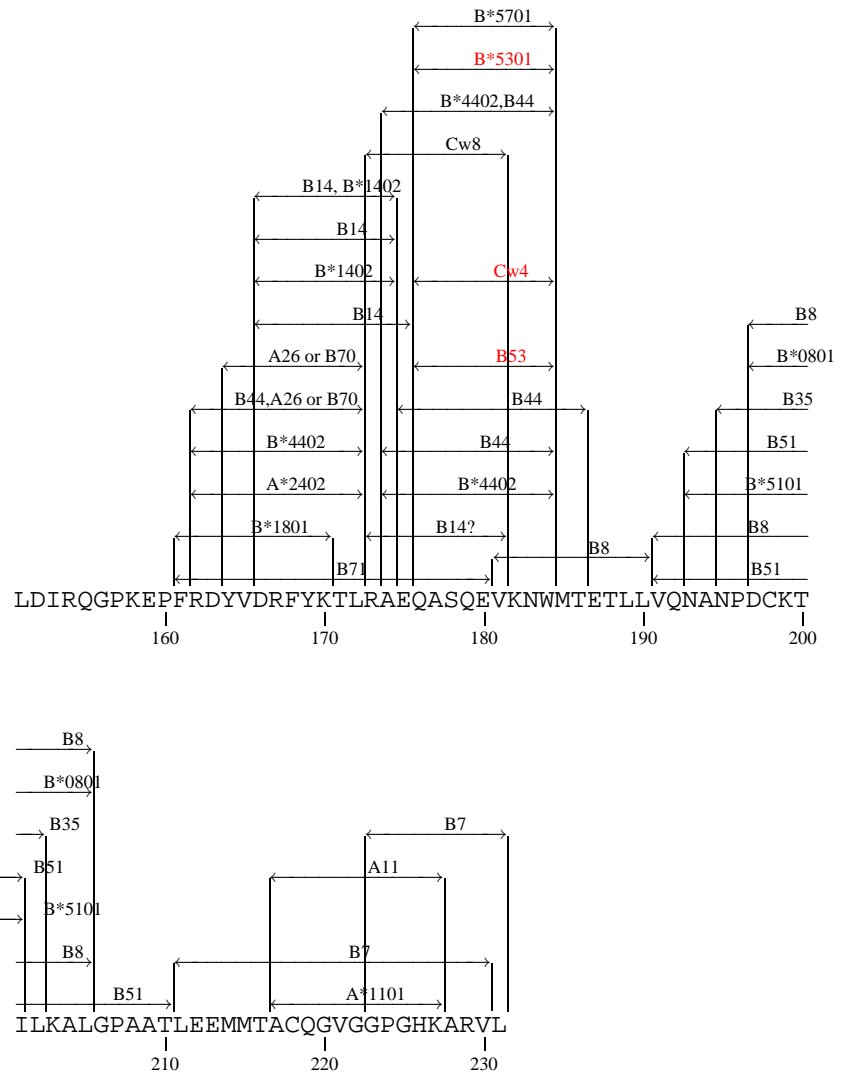
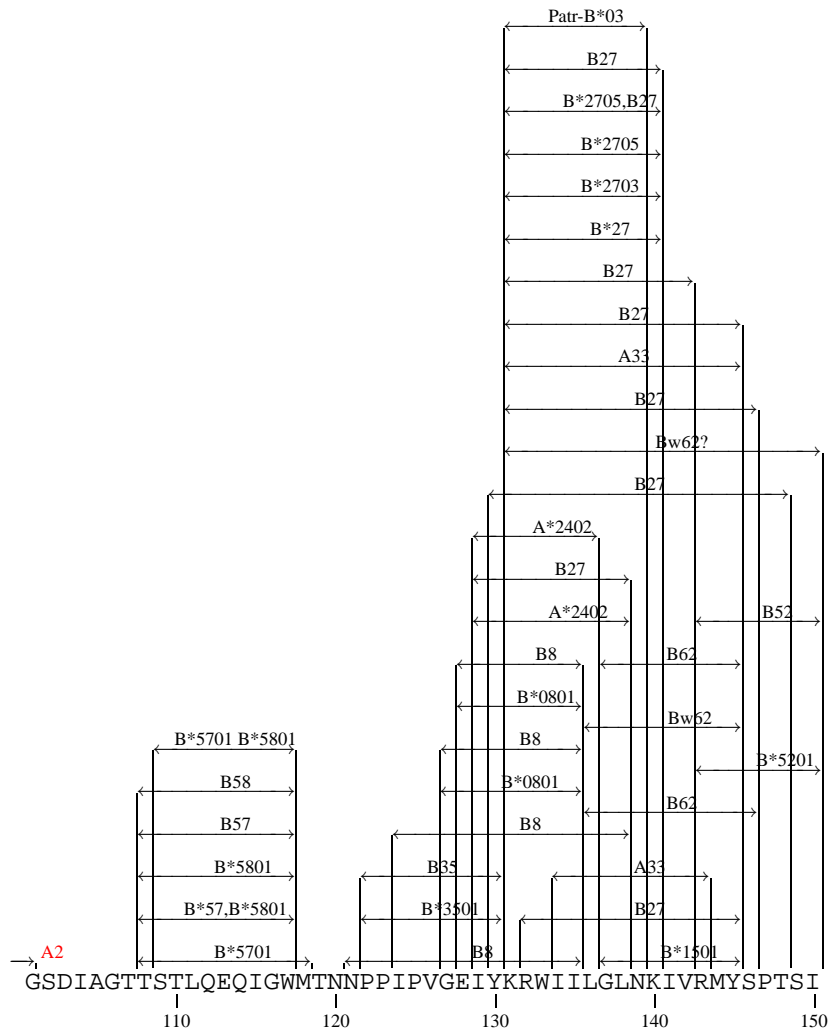
- A polyepitope vaccine was generated in a vaccinia construct that contiguously encoded seven epitopes, all presented by HLA A-2
- HHD mice have a transgene of HLA A2 linked to the transmembrane and cytotoxic domains of H-2D<sup>d</sup> – this transgene is the only MHC molecule expressed in the mice
- CTL responses to Gag (77-85) SLYNTVATL, Pol (476-484) ILKEPVHGV, gp120 (120-128) KLTPLCVTL, and Nef (190-198) AFHHVAREL were observed in HIV polytope HHD-vaccinated mice, and these responses were enhanced with vaccinia boost
- No CTL immune responses were generated against HLA A2-restricted HIV epitopes Nef 157-166 (PLTFGWCYKL), Pol 346-354 (VIYQYMDDL), and Nef 180-189 (VLEWRFDSRL)
- Sixteen HLA A2+ patients were tested for their ability to make CTL responses by peptide restimulation in culture with the epitopes selected for inclusion in the polytope – one individual recognized all seven of these epitopes; 7 patients had CTL cultures able to recognize at least one of the epitopes, and 6 of those 7 recognized more than one epitope, but they were not able to test all peptides for all patients; many patients only had three peptides tested
- VLEWRFDSRL was recognized by 2 of the HLA-A2 patients

# p17 CTL Map

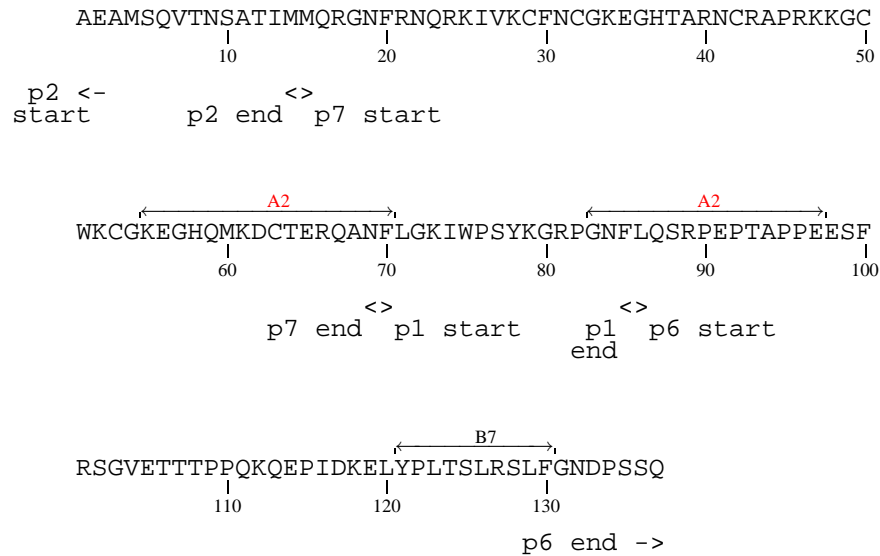


# p24 CTL Map

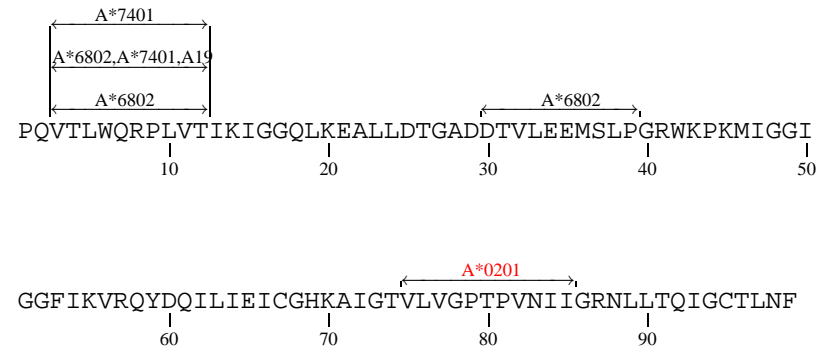




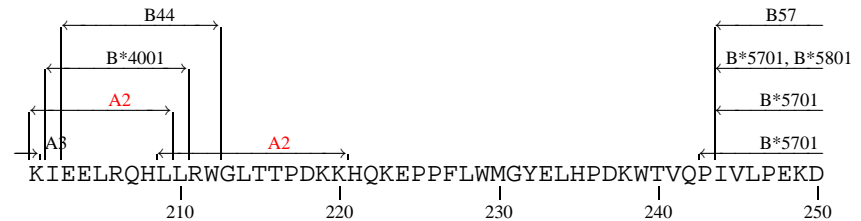
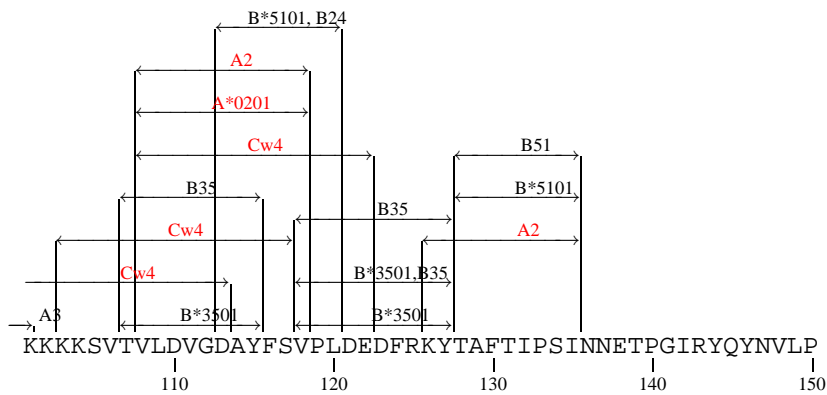
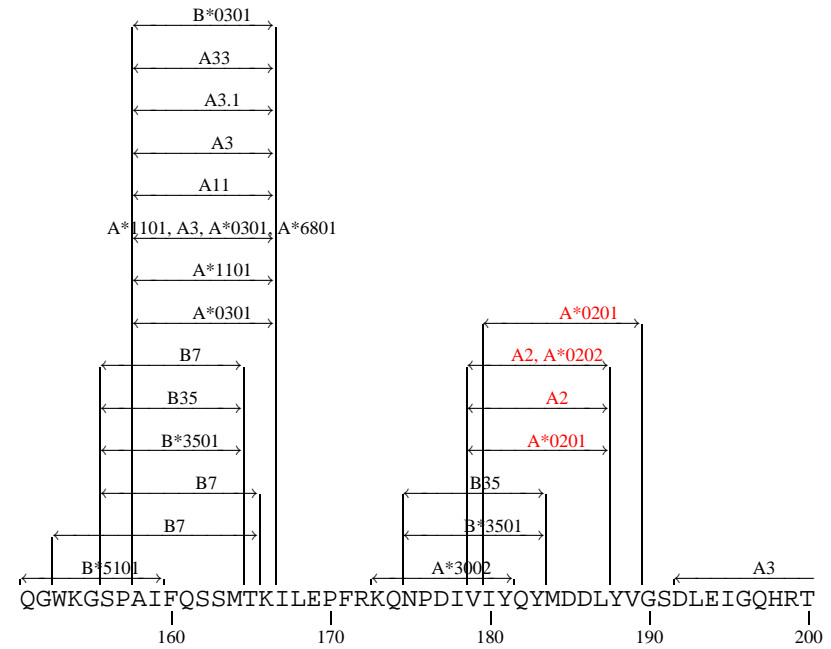
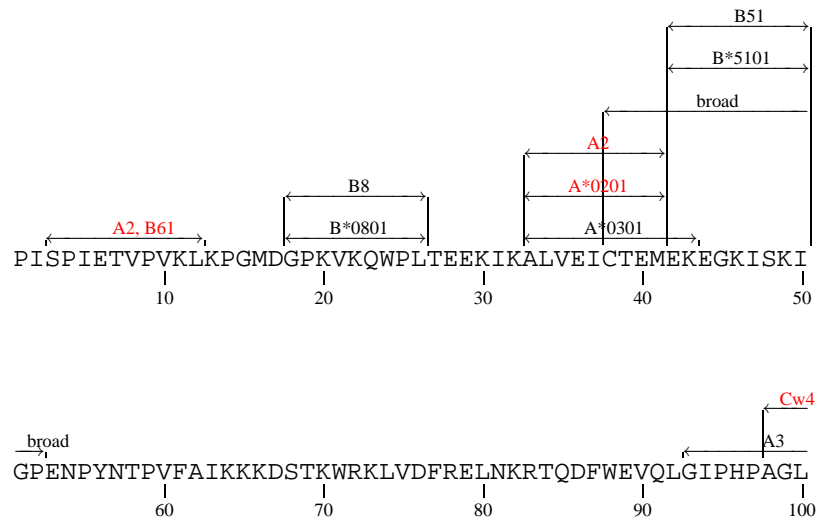
# p2p7p1p6 CTL Map

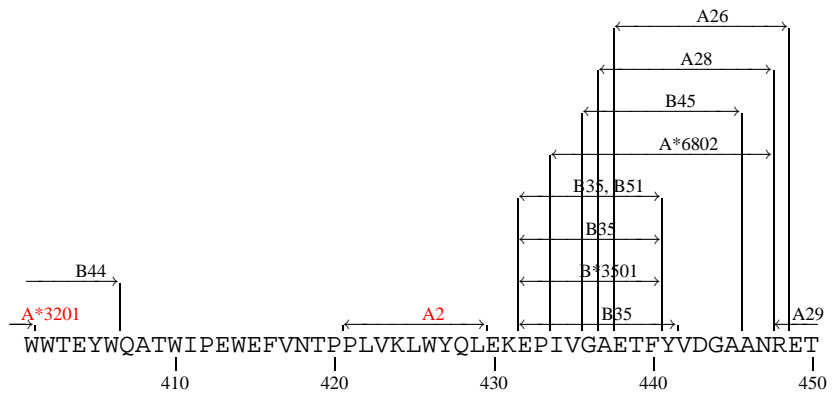
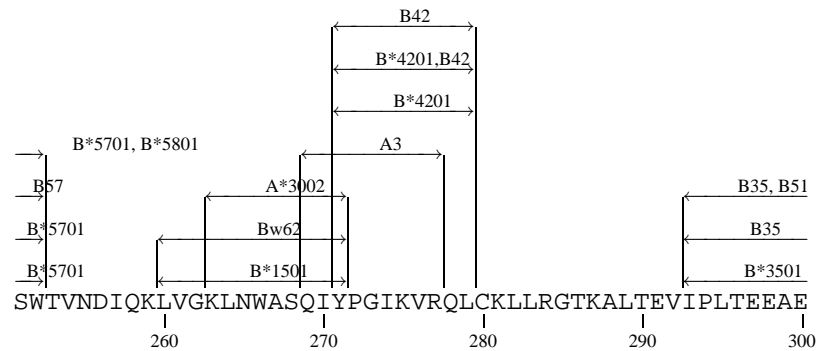


# Protease CTL Map

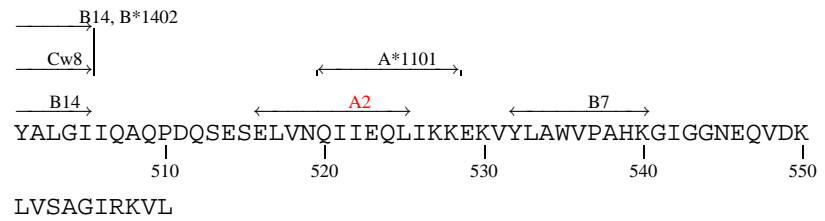
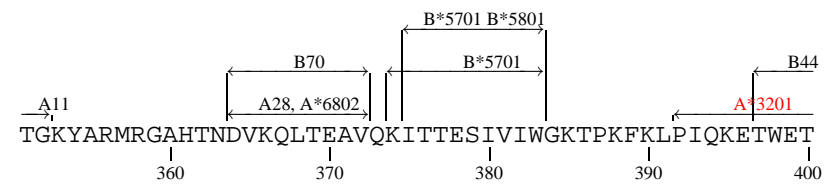
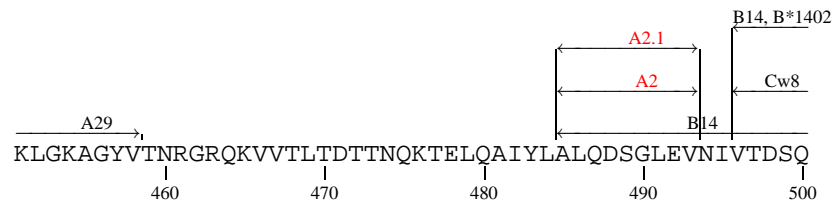
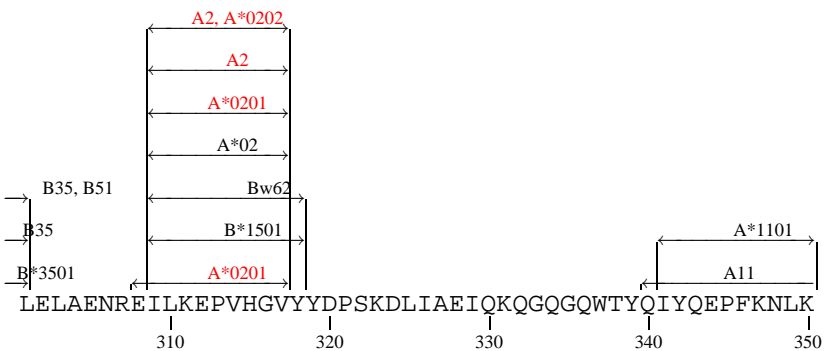


# RT CTL Map



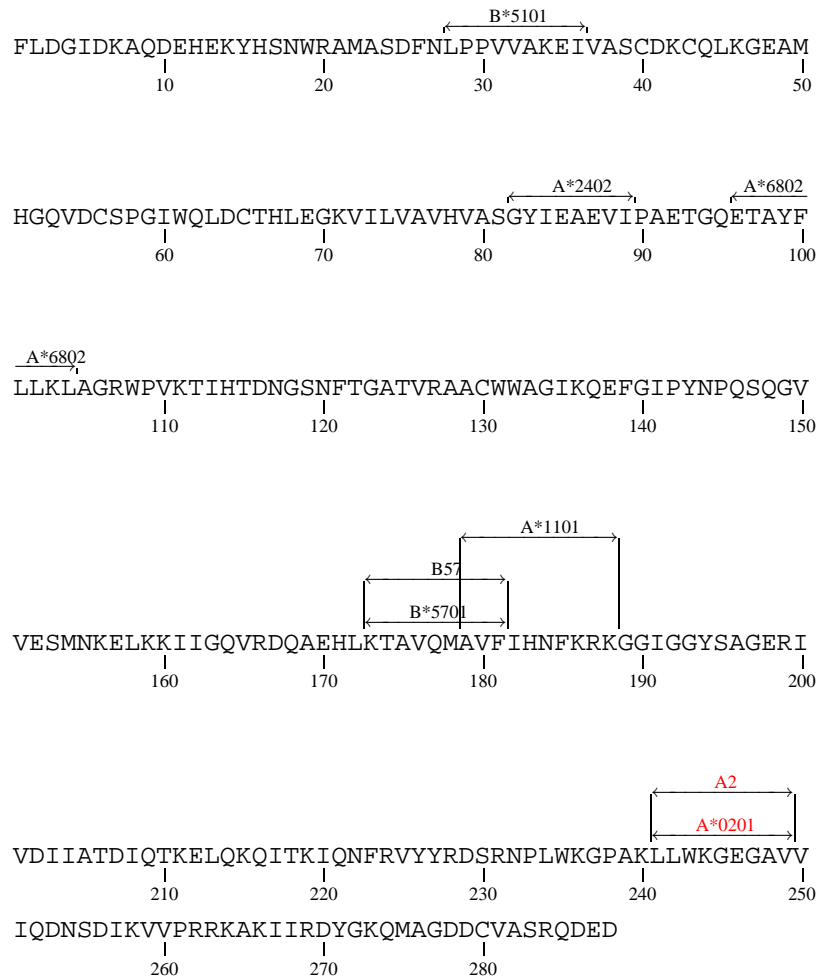


p15 RNase start <-

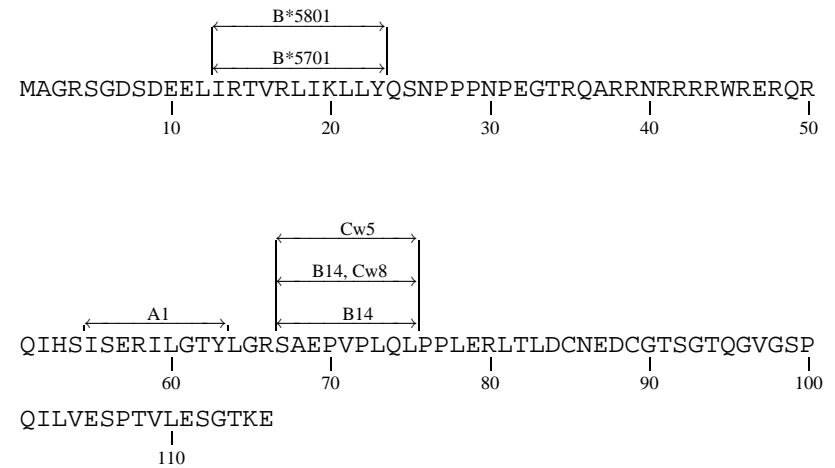


-> p15 RNase end

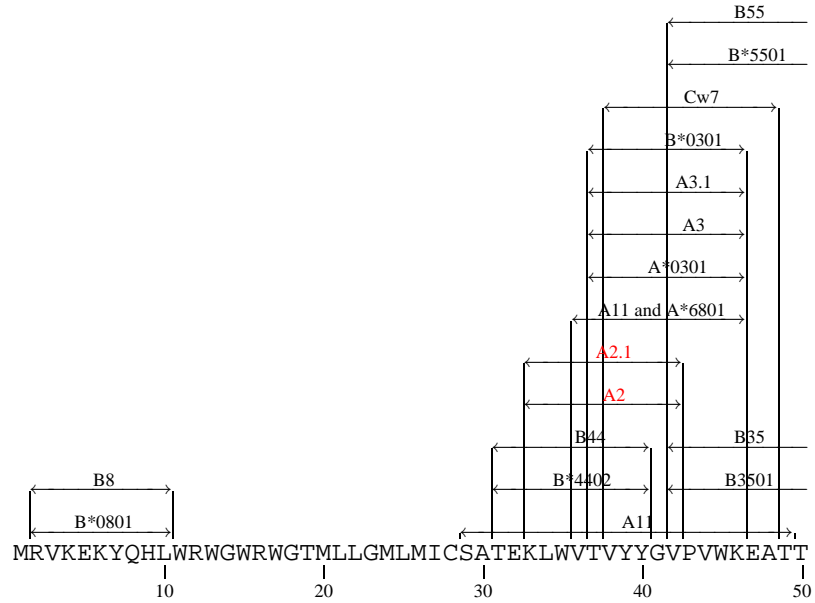
# Integrase CTL Map



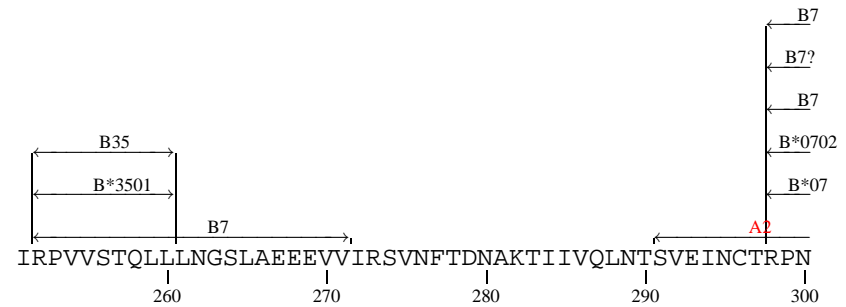
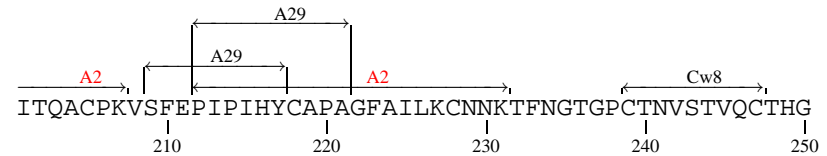
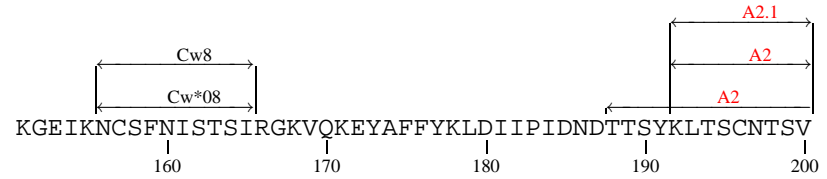
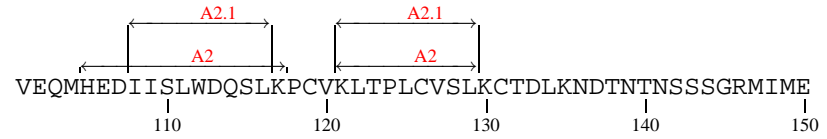
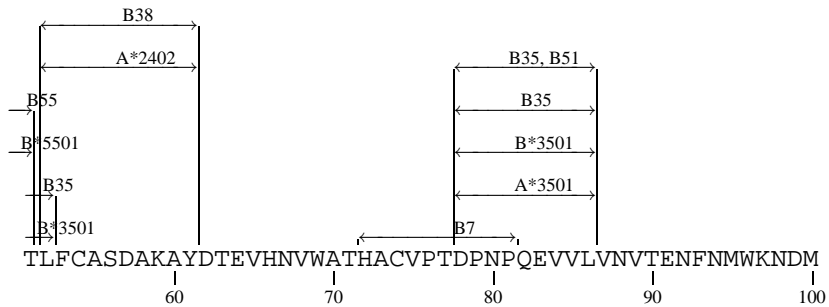
# Rev CTL Map

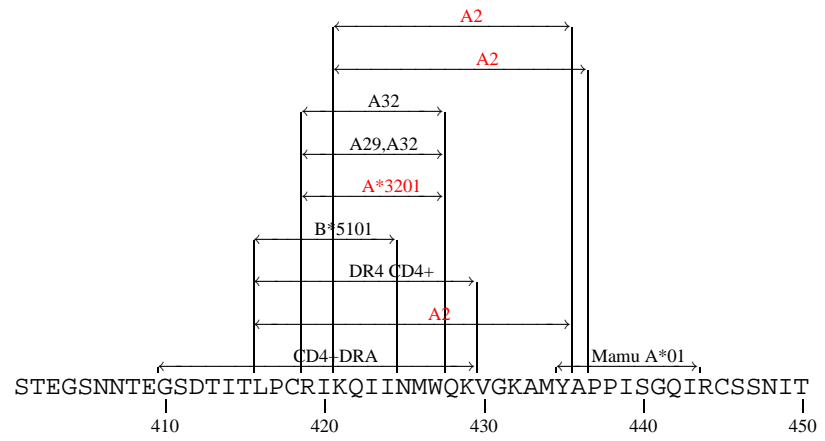
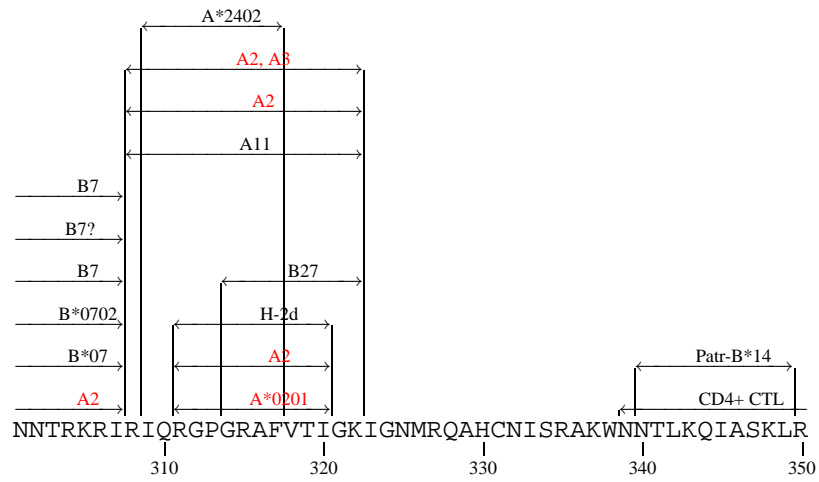


# gp160 CTL Map

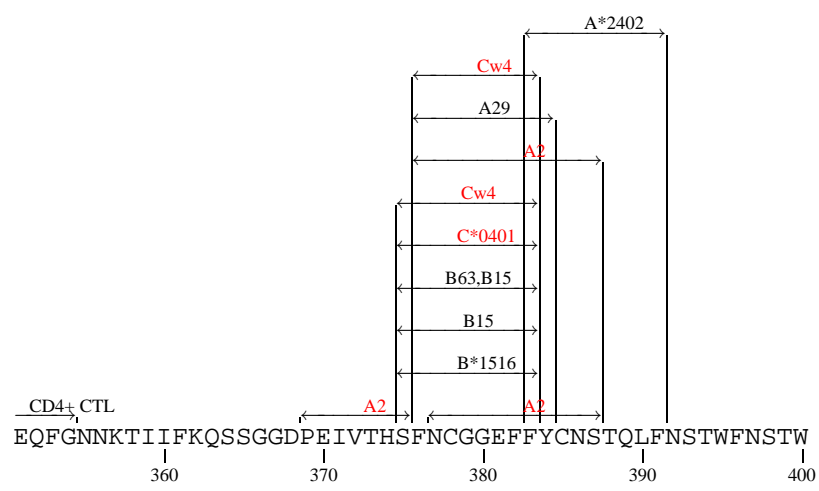


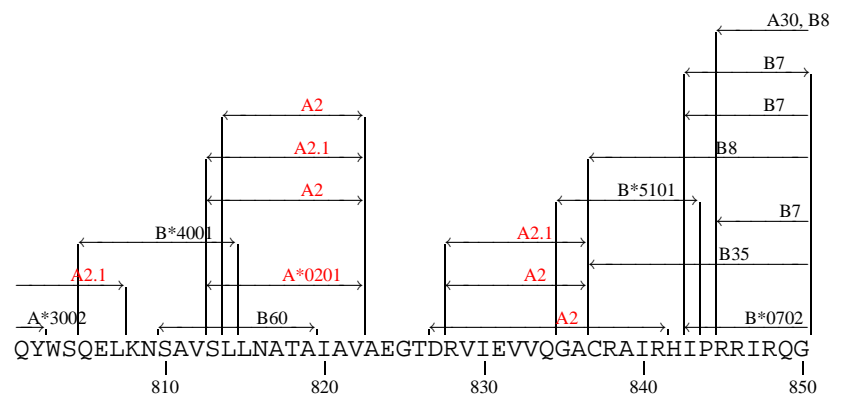
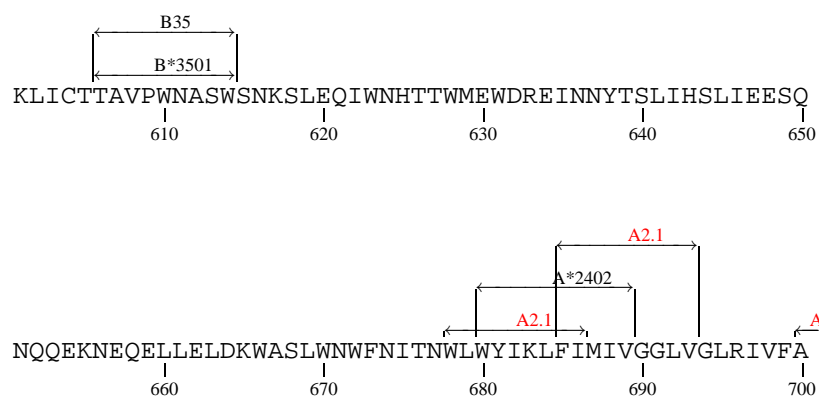
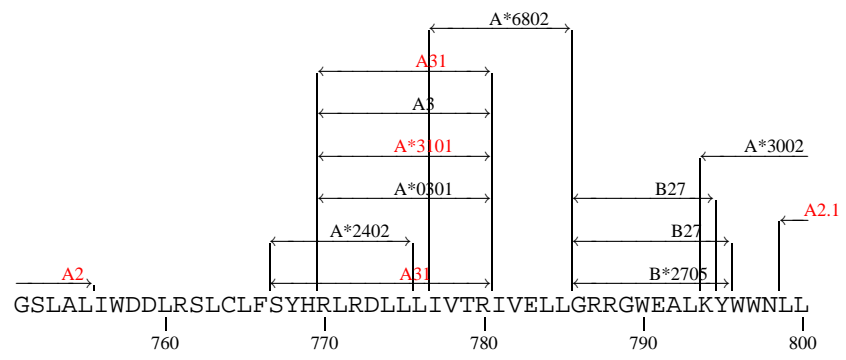
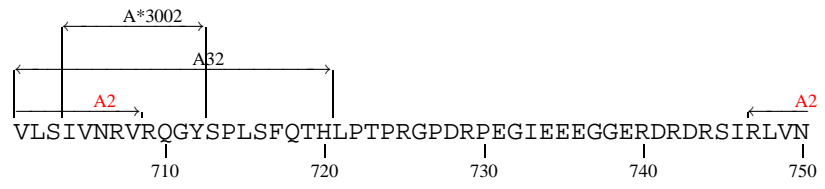
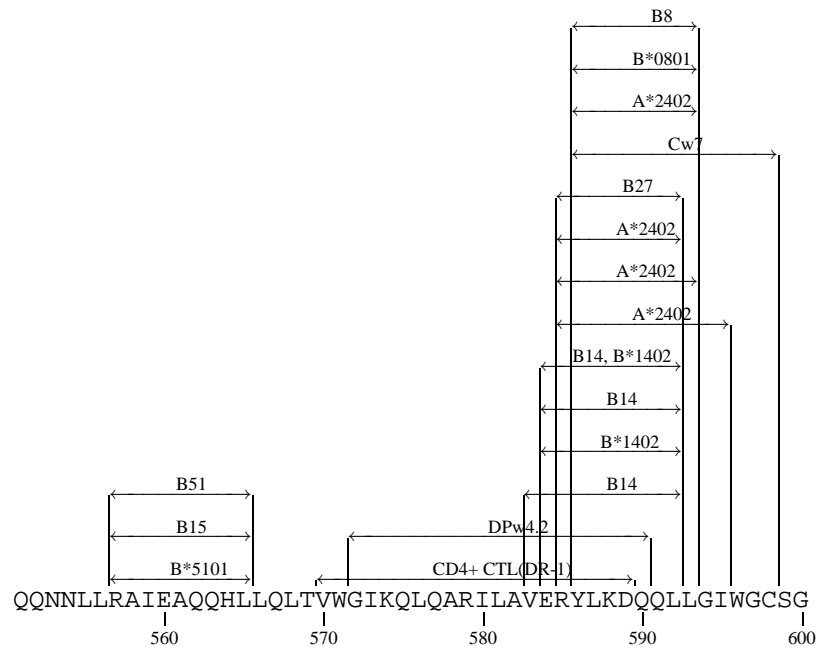
<- gp120 start



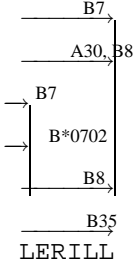


gp120 end <> gp41 start

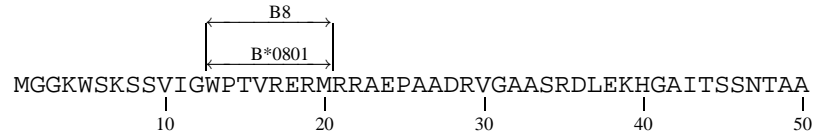




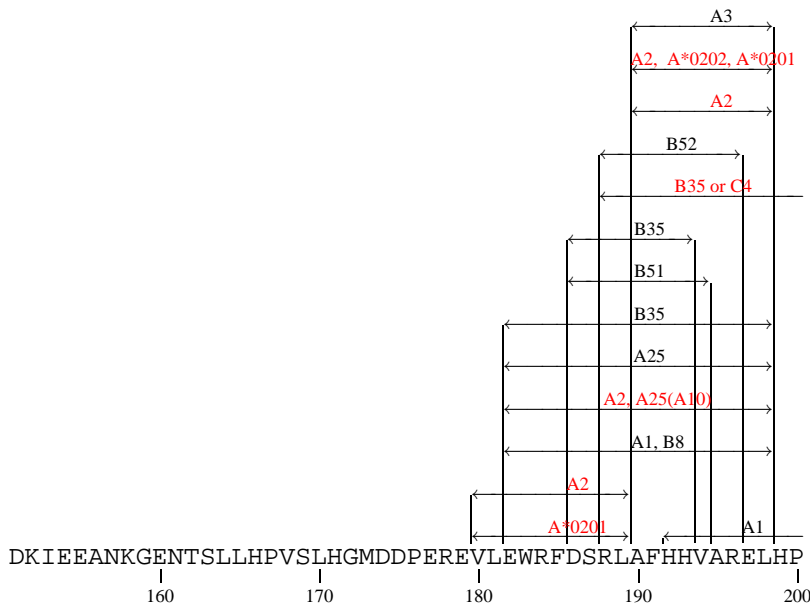
# Nef CTL Map



-> gp41 end







— A1 —  
EYFKNC

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- Notes: Two peptide-processing pathways are utilized for MHC class I presentation of HIV-1 Env epitopes. The previously characterized TAP-1 and TAP-2 dependent pathway can generate all Env epitopes and uses Env protein mislocalized in the cytosol to produce peptides. The second, novel pathway uses a TAP-1/2 independent pathway, and allows a subset of MHC-restricted epitopes to be processed in the endoplasmic reticulum or a Golgi compartment.
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