PDWQNYTPGPGVRYPLTFGW

QUERY	PDWQNYTPGPGVRYPLTFGW
CONSENSUS_A	----------?--------
A.FR.HIV232956	----------T--------
A.FR.HIV232957	----------T-F------
A.FR.HIV232959	----------T-F------
A.KE.Q23-CXC-CG	----------T-F------
A.SE.SE6594	----------I-F------
A.SE.SE7253	----------
A.SE.SE7535	----------I--------
A.SE.SE8131	---H-------I--------
A.SE.SE8538	----------
A.SE.SE8891	----------T-F------
A.UG.92UG037	----------I--------
A.UG.U455	----------I--------
CONSENSUS_B	----------i--------
B.-.E90NEF	----------T--------
B.-.HIV232997	----------I-F---xx-
B.-.HIV233002	---K-------T-----L--
B.-.HIV233009	----------T--------
B.-.HIV233016	----------I--------
B.-.HIV233020	----------I----C---
B.-.HIV233023	----------T---VC---
B.-.HIV233029	----------I--------
B.-.HIV233030	----------T-F------
B.-.HIV233032	----S------T-C--CL--
B.-.HIV233037	----------
B.-.HIV233038	----------T-F------
B.-.HIV233043	----------I--------
B.-.HIV233045	----------I--------
B.-.HIV233046	----------F--CL--
B.AU.1062-1-NEF	----------T--------
B.AU.93JW-3	----------P-F------
B.AU.93LW-3	----------P-F------
B.AU.AF064660	---H-------I--------
B.AU.AF064667	----------P-F------
B.AU.AF064676	----------I----C---
B.AU.MBC200	----------T-W------
B.AU.MBC925	----------I---I----
B.CN.AF033570	----------T-F------
B.CN.AF033572	----------T-F------
B.CN.PRC8	----------T-F------
B.CN.RL42	----------T-F------
B.DE.D31	----------T-F------
B.DE.HAN	----------
B.DE.HEI28CS	----------W------
B.DE.HEI3BL	----------
B.DE.HEI4BL	----------F------
B.DE.HIVU52491	--R-S------T-F------
B.DE.NEFCC	----------T-----L--
B.DE.NEFCG	----------I--------
B.DE.NH53	----------I--------
B.ES.89SP061	----------I--------
B.ES.AF082355	----------I--------
B.ES.AF082357	----------I--------
B.ES.AF082358	----------T-F------
B.ES.AF082359	----------I--------
B.ES.AF082363	----------C---
B.ES.AF082364	----------I-----L--
B.ES.AF082366	-------..--I--------
B.ES.AF082368	----------T-F------
B.ES.AF082370	-------..--T-F------
B.ES.AF082375	----------I--------
B.ES.AF082376	----------T--------
B.ES.AF082377	----------I--------
B.ES.AF082378	----------I--------
B.ES.AF082380	----------T-F------
B.ES.AF082383	----------
B.ES.AF082386	----G--..----F------
B.FR.HIV232961	----------F------
B.FR.HIV232962	----------I--------
B.FR.HIV232963	----------T-F------
B.FR.HIV232964	----------T-F------
B.FR.HIV232965	---H-------T----C---
B.FR.HXB2	--$----------
B.FR.NE100	----------I-W---L--
B.FR.SWB884	----------I-W---P--
B.GA.OYI	----------I----C---
B.GB.001GH-93(1)	----------I--------
B.GB.002EM-93(1)	----------H------
B.GB.003PW-93(1)	----------
B.GB.005PF1-93(1)	----------I-F---S--
B.GB.006DC-93(1)	----------
B.GB.010JW-93(1)	----------T-F------
B.GB.011JR-93(4)	--------R----F------
B.GB.012WM-93(1)	----------I--------
B.GB.013PP-94(2)	-------K---T-F---Y--
B.GB.016GB-93(1)	----K------TT-------
B.GB.023PA-93(1)	----------
B.GB.025JN-93(1)	----------
B.GB.027SL-93(1)	---H-------I--------
B.GB.028JH-94(1)	----------I--------
B.GB.030JG-93(1)	----------I--------
B.GB.031DA-93(1)	----------I--------
B.GB.032AN-93(1)	----------W------
B.GB.037BS-94(2)	----------
B.GB.039NM-94(1)	----------T--------
B.GB.044C1-94(2)	----------I--------
B.GB.046JM-94(1)	----------I--------
B.GB.048AD-94(1)	----------T--------
B.GB.056RP-94B(1)	----------I--------
B.GB.057DR-94(1)	----------I--------
B.GB.065RK-94(1)	----------T-F------
B.GB.067MM-94(2)	----------
B.GB.068JB-94(1)	----G----------
B.GB.098MS-94(1)	----------I-----Y--
B.GB.103CD-94(1)	----------I--------
B.GB.104RT-94(1)	----------I--------
B.GB.105AS-94(1)	----------T--------
B.GB.112CR-94(2)	----------I--------
B.GB.117CH-94(2)	----------I--------
B.GB.122PS-95(1)	----------F------
B.GB.124PD-95(1)	----------T-F-I----
B.GB.127RG-96(1)	----------L--
B.GB.130WDC-95(1)	------A----T-F--C---
B.GB.131MVS-95(1)	----------T--------
B.GB.143PL-95(1)	-------K---I--------
B.GB.151DH-95(1)	----------I----
B.GB.157GT-95(1)	----------T--------
B.GB.160KO-95(1)	----------I-----L--
B.GB.161KC-95(1)	----------I--------
B.GB.162BB-95(1)	--------R--TKF------
B.GB.163NG-95(1)	----------T-F------
B.GB.164SZ-95(1)	----------
B.GB.165DH-95(1)	----------
B.GB.166PW-95(1)	----------I--------
B.GB.167RW-95(1)	----------R-
B.GB.168MB-95(1)	----------
B.GB.CAM1	----------I--------
B.GB.GLNEF1	--$----------
B.GB.MANC	-------R---I----A---
B.GB.NEF2	----------
B.GB.NEF3	-------S-----F------
B.GB.NEF5	----KD----------
B.IN.HIVP35A	----------I--------
B.IT.AF011471	----------I--------
B.IT.AF011474	----------
B.IT.AF011477	----------I--------
B.IT.AF011478	----------I--------
B.IT.AF011480	----------
B.IT.AF011482	-------S---I--------
B.IT.AF011483	----------T-F------
B.IT.AF011486	----C------I-----Y--
B.IT.AF011488	----------T-----YE-
B.IT.AF011492	----------C---
B.IT.AF047080	----------I--------
B.IT.AF047081	----------I--------
B.IT.B.IT-L1	----------x-x------
B.IT.B.IT-L2	----------T--------
B.IT.B.IT-L3	----x--S---I---x-L--
B.IT.B.IT-L4	----------T-----Y--
B.IT.B.IT-L5	----------T--------
B.IT.B.IT-R1	-Nx--------P-F------
B.IT.B.IT-R2	----------T-F------
B.IT.B.IT-R3	----------I--------
B.IT.B.IT-R4	----------I--------
B.IT.B.IT-R5	----------T--------
B.KR.AF063915	----------I--------
B.KR.AF063916	----M--------F------
B.KR.AF063919	----------T--------
B.KR.AF063921	----------#-
B.KR.AF063926	----------I--------
B.KR.AF063927	----------T-F------
B.KR.AF063931	----------L------
B.KR.HIVZ98019	----------T-F------
B.KR.HIVZ98022	----------I--------
B.KR.HIVZ98024	----------F------
B.KR.HIVZ98025	----G------I--------
B.KR.HIVZ98027	----------I--------
B.KR.HIVZ98029	----------T-F------
B.KR.HIVZ98030	----------T-F------

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B.KR.HIVZ98032        -----------I--------
B.KR.HIVZ98034        -------Q---T-F------
B.NL.3202A21          -----------I--------
B.NL.NEFA             ---H-------P-F------
B.NL.NEFD             -----------T-F------
B.NL.NEFE             -----------T--------
B.SE.AF047082         -----------T-F------
B.SE.AF047083         -----------T--------
B.SE.AF047085         -----------T-F------
B.TH.28-19            --------------------
B.TH.AF082838         -----------T--------
B.TH.AF082839         ---H-------I--------
B.TH.AF082841         -----------I--------
B.TW.LM49             --------------------
B.US.HIV1U03375       -----------I--------
B.US.005PF-96(1)      -----------I-F------
B.US.AD-93(1)         -E---------I--------
B.US.AD8              --------------------
B.US.BC               -----------I--------
B.US.BIB              --------------------
B.US.BJ-93(1)         -------K---T-F------
B.US.BO1              --------------------
B.US.BRVA             --------------------
B.US.BT-94(1)         -------Q---T-F------
B.US.CD1              -----------I--------
B.US.D8511            -----------T--------
B.US.DH1              --------R-RTGF--C-R-
B.US.DH123            -----------I--------
B.US.DJ-93(1)         -----------I----C---
B.US.E1               ----C------I--------
B.US.E81NEF           -----------I--------
B.US.E88NEF           -----------T--------
B.US.EP-94(1)         ---D-------T----C---
B.US.FA-93(1)         --------------------
B.US.HIV1U16893       -----------T-F--C---
B.US.HIV1U24455       -----------I--------
B.US.HIV1U26074       -----------T-W------
B.US.HIV1U26098       -----------I--------
B.US.HIV1U26112       -----------I--------
B.US.HIV1U26119       -----------I--------
B.US.HIV1U26141       ---S-------I--------
B.US.HIVU44444        -----------T--------
B.US.HIVU44450        -----------I--------
B.US.HIVU44456        --------R--I--------
B.US.HIVU44465        ----------------C---
B.US.HIVU44468        -----------A-F------
B.US.HP87B1           -----------------L--
B.US.HS-93(1)         -----------T--------
B.US.JRCSF            -------A-----F------
B.US.JRFL             -----------I-F------
B.US.LM1              -----------T--------
B.US.LT-87-1(1)       ---H----------------
B.US.MB-94(1)         ----------------C---
B.US.MNCG             -----------I--------
B.US.NC7              -----------I--------
B.US.NEF              --------------------
B.US.NEF164B          -----------I--------
B.US.NEF166E          -----------I--------
B.US.NEF179C          --------------------
B.US.NEF226B          -----------I--------
B.US.P102A13          -----------I--------
B.US.P233A17          -----------I--------
B.US.P248A01          -----------I--------
B.US.P357A01          -----------I--------
B.US.P896             -----------I--------
B.US.PC-93(1)         -----------T-----L--
B.US.PRISO(1)         --------------------
B.US.RF               -----------T--------
B.US.RP12             -----------T-F------
B.US.RR1              -----------I--------
B.US.SC               -----------I----C---
B.US.SF2              -----------I--------
B.US.U16917           -----------I--------
B.US.WEAU160          -----------T----C---
B.US.WR27             -----------T--------
B.US.YU2              ---------.-T-W------

CONSENSUS_C           --------------------
C.BR.92BR025          -------------F------
C.BW.96BW01B21        --------------------
C.BW.96BW0402         --------------------
C.BW.96BW0502         ------------K-------
C.BW.96BW1104         ---H----------------
C.BW.96BW1210         ----C---------------
C.BW.96BW15B03        ---H----------------
C.BW.96BW16B01        ---------------V----
C.BW.96BW17A09        --------------------
C.ET.ETH2220          --------------------
C.FR.HIV232966        --------------------
C.FR.HIV232967        -----------T--------
C.FR.HIV232968        --------------------
C.FR.HIV232969        -------S------------
C.FR.HIV232970        ----C--------F------
C.FR.HIV232971        --------------------
C.FR.HIV232972        --------------------
C.FR.HIV232973        -------------L------
C.FR.HIV232976        --------------------
C.FR.HIV232977        ----C--------F------
C.FR.HIV232978        --------------------
C.FR.HIV232979        --------------------
C.FR.HIV232980        --------------------
C.FR.HIV232996        -------------H-I----
C.IN.21068            -------------F------
C.IN.301904           --------------------
C.IN.301999           -------------F------
C.IN.94IN11246        -----------T-F------
C.IN.HIVY15117        -------------F------
C.IN.HIVY17884        -----------T-F------
C.IN.HIVY17891        --------------------
C.IN.HIVY17892        -----------T-F------

CONSENSUS_D           -----------I--------
D.CD.84ZR085          -----------I--------
D.CD.ELI              -----------I--------
D.CD.NDK              -----------I--------
D.UG.94UG1141         -----------I--------

CONSENSUS_F           -----------i-f------
F.CM.HIV232985        -----------I-----L--
F.CM.HIV232986        -----------P-F------
F.FR.HIV232987        -----------I-F------

CONSENSUS_F1          -----------i--------
F1.BE.VI850           -----------I-----L--
F1.BR.93BR020.1       -----------I-----M--
F1.FI.FIN9363         --------------------
F1.FR.MP411           -----------I-F------

CONSENSUS_F2          -----------?-?---?--
F2.CM.MP255           -----------I-----L--
F2.CM.MP257           -----------P-F------

CONSENSUS_G           -----------t-f------
G.BE.DRCBL            -----------T-V------
G.FI.HH8793           -----------T-F------
G.ML.HIV232990        -----------T-F------
G.NG.92NG083          -----------T-L------
G.NG.HIV232991        -E---------I-F------
G.NG.HIV232992        -----------I-F------
G.SE.SE6165           -----------T-F------

CONSENSUS_H           -----------e--------
H.BE.VI991            ---H-------E--------
H.BE.VI997            -----------EG-------
H.CD.HIV232994        --------------------
H.CD.HIV232995        ----K---------------
H.CF.90CF056          -----------E-F------

CONSENSUS_J           -----------??-------
J.SE.SE9173           -----------Tx-------
J.SE.SE9280           -----------I--------

CONSENSUS_K           -----------I--------
K.CD.EQTB11C          -----------I--------
K.CM.MP535            -----------I--------
N.CM.YBF30            ---H-------I---V----

CONSENSUS_O           ----?------?-F------
O.CM.ANT70C           -----------T-F------
O.CM.MVP5180          ----C------P-F------
CRF01_AE.CF.90CF402   ----------------C---
CRF01_AE.FR.232982    -----------I----C---
CRF01_AE.FR.232983    ---H-------I-F--C---
CRF01_AE.FR.232984    -----------I----C---
CRF01_AE.TH.1-2       -----------I----C---
CRF01_AE.TH.1-3       -----------I----C---
CRF01_AE.TH.11-25     ---H-------I-F--C---
CRF01_AE.TH.11-31     ---H-------I-F--C---
CRF01_AE.TH.122-21    ---H---S---I----C---
CRF01_AE.TH.18-47     -----------I----C---
CRF01_AE.TH.235-3     -----------I----C---
CRF01_AE.TH.235-32    -----------I----C---
CRF01_AE.TH.24-54     ---H-------I----C---
CRF01_AE.TH.240-12    -----------I-F--C---
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CRF01_AE.TH.26-3      ---H-------I----C---
CRF01_AE.TH.35-6      ---H-------I----C---
CRF01_AE.TH.6-9       -----------I-F--C---
CRF01_AE.TH.73-44     ----------------C---
CRF01_AE.TH.74-26     -----------I----C---
CRF01_AE.TH.89-30     -----------I----C---
CRF01_AE.TH.9-3       ---DD------I----C---
CRF01_AE.TH.93TH253   ---H-------I----C---
CRF01_AE.TH.98-4      ---H-------I----C---
CRF01_AE.TH.CM240     -----------I-F--C---
CRF01_AE.TH.TH022     -------------L--C---
CRF01_AE.TH.TH047     -----------I-F--C---
CRF02_AG.FR.DJ263     -----------T--------
CRF02_AG.FR.DJ264     -----------T--------
CRF02_AG.NG.IBNG      -----------T-F------
CRF03_AB.RU.KAL1532   ----.......--I-F------
CRF04_cpx.CY.94CY03   ---D-------E-F--C---
CRF04_cpx.GR.97PVCH   -----------E-F--C---
CRF04_cpx.GR.97PVMY   -----------T-F--C---
AC.IN.21301           ---H----------------
AC.RW.92RW009         --------------------
AC.SE.SE9488          -----------I--------
AC.ZM.ZAM184          -----------T-F------
ACD.SE.SE8603         -----------T--------
AD.SE.SE6954          -----------I----I---
AD.SE.SE7108          ----C------T-F------
ADHU.NO.NOGIL3        -----------E-F------
ADU.CD.MAL            -----------I-F------
AF.GA.HIV232981       -----------I-----S--
AG.NG.G3              -----------T-F----R-
AG.SE.SE7812          -----------T-F------
AGHU.GA.VI354         -----------I----C---
AGJ.AU.BFP90          -----------T-F------
AGJ.ML.95ML84         -----------I--------
AGU.CD.Z321           ---H-------T----C---
BF.BR.93BR029.4       -----------T-----L--
DF.BE.VI961           -----------T--------
GH.GA.HIV232993       ----C---------------
GU.FR.HIV232974       ---H-------T-F------
U.CD.VI1126           ---H-------I----C---
U.CM.HIV232988        -----------I--------
U.FR.HIV232958        -----------I----C---
U.FR.HIV232960        -----------I----C---

CONSENSUS_CPZ         -------?---?-?--??--
CPZ.GA.CPZGAB         -------T---T-F--C---
CPZ.US.CPZUS          -----------------Y--
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GVRYPLTFGWCYKLVPVEPD

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QUERY                GVRYPLTFGWCYKLVPVEPD

CONSENSUS_A          -?---------f-----d--
A.FR.HIV232956       -T---------F-----D-V
A.FR.HIV232957       -T-F-------F-----D-S
A.FR.HIV232959       -T-F-------F-----D-A
A.KE.Q23-CXC-CG      -T-F-------F-----D--
A.SE.SE6594          -I-F-------F-----D--
A.SE.SE7253          -----------F-----D--
A.SE.SE7535          -I---------F-----D--
A.SE.SE8131          -I---------F-----D--
A.SE.SE8538          -----------F-------E
A.SE.SE8891          -T-F-------F-----D--
A.UG.92UG037         -I---------F-----DE-
A.UG.U455            -I---------------D-A

CONSENSUS_B          -i---------f-------e
B.-.E90NEF           -T---------F-------E
B.-.HIV232997        -I-F---xx--F-----PAE
B.-.HIV233002        -T-----L---F-------E
B.-.HIV233009        -T---------FR------E
B.-.HIV233016        -I---------F-------E
B.-.HIV233020        -I----C----F-----S-E
B.-.HIV233023        -T---VC----F-------E
B.-.HIV233029        -I---------F-------E
B.-.HIV233030        -T-F-------F-------E
B.-.HIV233032        -T-C--CL---F-------E
B.-.HIV233037        ------------R------E
B.-.HIV233038        -T-F-------F-------E
B.-.HIV233043        -I---------F-------E
B.-.HIV233045        -I---------F------AE
B.-.HIV233046        ---F--CL---F-----S-E
B.AU.1062-1-NEF      -T---------F-------G
B.AU.93JW-3          -P-F-------F-----D-E
B.AU.93LW-3          -P-F-------F-----D-E
B.AU.AF064660        -I---------F-------E
B.AU.AF064667        -P-F-------F--------
B.AU.AF064676        -I----C----F-------E
B.AU.MBC200          -T-W-------F-------E
B.AU.MBC925          -I---I-----F-------E
B.CN.AF033570        -T-F-------F-----D-K
B.CN.AF033572        -T-F-------F-----D-K
B.CN.PRC8            -T-F-------F-----D-E
B.CN.RL42            -T-F-------F-----D-E
B.DE.D31             -T-F-------F-----K-E
B.DE.HAN             -----------F--------
B.DE.HEI28CS         ---W-------F------xE
B.DE.HEI3BL          -----------F-------x
B.DE.HEI4BL          ---F-------F-----x-E
B.DE.HIVU52491       -T-F-------F-----D-E
B.DE.NEFCC           -T-----L---F--------
B.DE.NEFCG           -I---------F-----D-E
B.DE.NH53            -I---------F-----G--
B.ES.89SP061         -I---------F-------E
B.ES.AF082355        -I---------F------RE
B.ES.AF082357        -I---------F-----D-E
B.ES.AF082358        -T-F-------F-----D--
B.ES.AF082359        -I--------------L-QE
B.ES.AF082363        ------C----F-------G
B.ES.AF082364        -I-----L---F-----D-E
B.ES.AF082366        -I---------F-----D-G
B.ES.AF082368        -T-F-------F--------
B.ES.AF082370        -T-F-------F-------E
B.ES.AF082375        -I---------F-----D--
B.ES.AF082376        -T---------F-----D--
B.ES.AF082377        -I---------F-----D-E
B.ES.AF082378        -I---------F-----D-E
B.ES.AF082380        -T-F-------F-----K-E
B.ES.AF082383        -----------F-----D-E
B.ES.AF082386        ---F-------F--------
B.FR.HIV232961       ---F-------F-----K-N
B.FR.HIV232962       -I---------F------QE
B.FR.HIV232963       -T-F-------F-----D--
B.FR.HIV232964       -T-F-------F-------E
B.FR.HIV232965       -T----C----F-----D--
B.FR.HXB2            --------------------
B.FR.NE100           -I-W---L---F-------E
B.FR.SWB884          -I-W---P---F-------E
B.GA.OYI             -I----C----F----MD--
B.GB.001GH-93(1)     -I---------F-------E
B.GB.002EM-93(1)     ---H-------F-----DQE
B.GB.003PW-93(1)     -----------F------TE
B.GB.005PF1-93(1)    -I-F---S---F-------E
B.GB.006DC-93(1)     -----------F-----D-A
B.GB.010JW-93(1)     -T-F-------F-------E
B.GB.011JR-93(4)     ---F-------F-------E
B.GB.012WM-93(1)     -I---------F----M---
B.GB.013PP-94(2)     -T-F---Y---F--------
B.GB.016GB-93(1)     -TT--------F-------E
B.GB.023PA-93(1)     -----------F------SE
B.GB.025JN-93(1)     -----------F-------E
B.GB.027SL-93(1)     -I---------F-------E
B.GB.028JH-94(1)     -I---------F--------
B.GB.030JG-93(1)     -I---------F-------E
B.GB.031DA-93(1)     -I---------F-------E
B.GB.032AN-93(1)     ---W-------F-------E
B.GB.037BS-94(2)     -----------F-----D-E
B.GB.039NM-94(1)     -T---------F-------E
B.GB.044C1-94(2)     -I---------F--------
B.GB.046JM-94(1)     -I---------F--------
B.GB.048AD-94(1)     -T---------F-------E
B.GB.056RP-94B(1)    -I---------F-----D-E
B.GB.057DR-94(1)     -I---------F------SE
B.GB.065RK-94(1)     -T-F-------F-----D--
B.GB.067MM-94(2)     -----------F-------E
B.GB.068JB-94(1)     -----------F-------E
B.GB.098MS-94(1)     -I-----Y---F-------E
B.GB.103CD-94(1)     -I---------F--------
B.GB.104RT-94(1)     -I---------F-------E
B.GB.105AS-94(1)     -T---------F--------
B.GB.112CR-94(2)     -I---------F-----D--
B.GB.117CH-94(2)     -I---------F--------
B.GB.122PS-95(1)     ---F-------F-----D-E
B.GB.124PD-95(1)     -T-F-I-----F-------E
B.GB.127RG-96(1)     -------L-----------E
B.GB.130WDC-95(1)    -T-F--C----F-------E
B.GB.131MVS-95(1)    -T---------F----LD--
B.GB.143PL-95(1)     -I-----------------E
B.GB.151DH-95(1)     -----I-----F-------E
B.GB.157GT-95(1)     -T---------F-----D-E
B.GB.160KO-95(1)     -I-----L---F-----D--
B.GB.161KC-95(1)     -I---------F-------G
B.GB.162BB-95(1)     -TKF-------F-------E
B.GB.163NG-95(1)     -T-F-------F-----D-E
B.GB.164SZ-95(1)     -----------F-----D--
B.GB.165DH-95(1)     -----------F-------E
B.GB.166PW-95(1)     -I---------F----M---
B.GB.167RW-95(1)     --------R--F-------E
B.GB.168MB-95(1)     -----------F-------E
B.GB.CAM1            -I---------F-------E
B.GB.GLNEF1          --------------------
B.GB.MANC            -I----A----F-----D-E
B.GB.NEF2            -----------F-------G
B.GB.NEF3            ---F-------F--------
B.GB.NEF5            -----------F-------E
B.IN.HIVP35A         -I---------F-----D-E
B.IT.AF011471        -I-----------------E
B.IT.AF011474        -----------F-------E
B.IT.AF011477        -I---------F-------E
B.IT.AF011478        -I---------F-------E
B.IT.AF011480        --------------------
B.IT.AF011482        -I---------F-----N-E
B.IT.AF011483        -T-F-------F--------
B.IT.AF011486        -I-----Y---F--------
B.IT.AF011488        -T-----YE--F-------E
B.IT.AF011492        ------C----F------xx
B.IT.AF047080        -I---------F-------E
B.IT.AF047081        -I---------F-------E
B.IT.B.IT-L1         -x-x-------F-----D--
B.IT.B.IT-L2         -T---------F-----D-E
B.IT.B.IT-L3         -I---x-L---F-------E
B.IT.B.IT-L4         -T-----Y---F------TE
B.IT.B.IT-L5         -T---------F-------E
B.IT.B.IT-R1         -P-F------WC----L-KE
B.IT.B.IT-R2         -T-F-------F------QE
B.IT.B.IT-R3         -I--------SF-----D--
B.IT.B.IT-R4         -I---------F-------E
B.IT.B.IT-R5         -T---------F--E----E
B.KR.AF063915        -I---------F-------E
B.KR.AF063916        ---F-------F-------E
B.KR.AF063919        -T---------F-------E
B.KR.AF063921        --------#--F-------E
B.KR.AF063926        -I---------F-------E
B.KR.AF063927        -T-F-------F-------E
B.KR.AF063931        ---L-------FL------E
B.KR.HIVZ98019       -T-F-------F-------E
B.KR.HIVZ98022       -I---------F-----D-E
B.KR.HIVZ98024       ---F-------F-------E
B.KR.HIVZ98025       -I---------F------KE
B.KR.HIVZ98027       -I---------F--------
B.KR.HIVZ98029       -T-F-------F-----D--
B.KR.HIVZ98030       -T-F-------F-------E
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B.KR.HIVZ98032        -I---------L-------E
B.KR.HIVZ98034        -T-F-------F-------E
B.NL.3202A21          -I---------F------QE
B.NL.NEFA             -P-F-------F-------E
B.NL.NEFD             -T-F-------F--------
B.NL.NEFE             -T---------L-------E
B.SE.AF047082         -T-F-------F-----D-V
B.SE.AF047083         -T---------F------KE
B.SE.AF047085         -T-F-------F-------E
B.TH.28-19            -----------F-------E
B.TH.AF082838         -T---------F-------E
B.TH.AF082839         -I---------F-------E
B.TH.AF082841         -I---------F-I--ID--
B.TW.LM49             -----------F-------E
B.US.HIV1U03375       -I---------F-----DQ-
B.US.005PF-96(1)      -I-F-------F------QE
B.US.AD-93(1)         -I---------F-------E
B.US.AD8              -----------F-------E
B.US.BC               -I---------F-----D-E
B.US.BIB              -----------F-------E
B.US.BJ-93(1)         -T-F-------F-------E
B.US.BO1              -----------F-------E
B.US.BRVA             -----------F-------E
B.US.BT-94(1)         -T-F-------F----M--E
B.US.CD1              -I---------F-------E
B.US.D8511            -T---------F-------E
B.US.DH1              RTGF--C-R--F-----D--
B.US.DH123            -I---------F-----D-E
B.US.DJ-93(1)         -I----C----F--------
B.US.E1               -I---------F-------E
B.US.E81NEF           -I---------F-------E
B.US.E88NEF           -T---------F-------E
B.US.EP-94(1)         -T----C----F-----D--
B.US.FA-93(1)         -----------F-----D-E
B.US.HIV1U16893       -T-F--C----F-----D--
B.US.HIV1U24455       -I---------F-------E
B.US.HIV1U26074       -T-W-------F-------E
B.US.HIV1U26098       -I---------F------KE
B.US.HIV1U26112       -I---------F-------E
B.US.HIV1U26119       -I---------F-------E
B.US.HIV1U26141       -I---------F-------Q
B.US.HIVU44444        -T---------F-------E
B.US.HIVU44450        -I---------F------QE
B.US.HIVU44456        -I---------F-------.
B.US.HIVU44465        ------C----F-----D-E
B.US.HIVU44468        -A-F-------F-----D--
B.US.HP87B1           -------L---F-----D-E
B.US.HS-93(1)         -T--------RF-------E
B.US.JRCSF            ---F-------F-----D-E
B.US.JRFL             -I-F-------F-------E
B.US.LM1              -T---------F----I--E
B.US.LT-87-1(1)       -----------F--A--D--
B.US.MB-94(1)         ------C----F-------E
B.US.MNCG             -I---------F-------E
B.US.NC7              -I---------F--------
B.US.NEF              --------------------
B.US.NEF164B          -I---------------DQE
B.US.NEF166E          -I---------F-------E
B.US.NEF179C          -----------F-----D--
B.US.NEF226B          -I---------F-------E
B.US.P102A13          -I---------F-------E
B.US.P233A17          -I---------F-------E
B.US.P248A01          -I---------F--------
B.US.P357A01          -I--------RF-----D--
B.US.P896             -I------------------
B.US.PC-93(1)         -T-----L---F------TE
B.US.PRISO(1)         -----------F----A--G
B.US.RF               -T---------F--------
B.US.RP12             -T-F-------F------QE
B.US.RR1              -I---------F-------E
B.US.SC               -I----C----F-----K-E
B.US.SF2              -I---------F-------E
B.US.U16917           -I---------F-----D-E
B.US.WEAU160          -T----C----F-------E
B.US.WR27             -T---------F----L---
B.US.YU2              -T-W-------F-------E

CONSENSUS_C           -----------f-----D-r
C.BR.92BR025          ---F-------F-----D-R
C.BW.96BW01B21        -----------F-----D-R
C.BW.96BW0402         -----------------D-K
C.BW.96BW0502         --K--------F-----D-G
C.BW.96BW1104         -----------F-----D-G
C.BW.96BW1210         -----------F-----D-G
C.BW.96BW15B03        -----------------D-R
C.BW.96BW16B01        -----V-----F-----D-R
C.BW.96BW17A09        -----------------D-R
C.ET.ETH2220          -----------F-----D-S
C.FR.HIV232966        -----------F-----D-K
C.FR.HIV232967        -T---------F-----D-G
C.FR.HIV232968        -----------F-----D-G
C.FR.HIV232969        -----------F-----D-S
C.FR.HIV232970        ---F-------F-----D-R
C.FR.HIV232971        ----------PF-----D-R
C.FR.HIV232972        ----------PF-----D-R
C.FR.HIV232973        ---L-------F-----D-R
C.FR.HIV232976        -----------F-----D-E
C.FR.HIV232977        ---F-------F-----D-G
C.FR.HIV232978        -----------V--L--D-R
C.FR.HIV232979        ----------LF-----D-S
C.FR.HIV232980        -----------------D-R
C.FR.HIV232996        ---H-I----LF-----D-K
C.IN.21068            ---F-------F-----D-R
C.IN.301904           -----------F-----D-R
C.IN.301999           ---F-------F-----D-R
C.IN.94IN11246        -T-F-------F-----D-R
C.IN.HIVY15117        ---F-------F-----D-K
C.IN.HIVY17884        -T-F-------F-----D-R
C.IN.HIVY17891        -----------F-----D-R
C.IN.HIVY17892        -T-F-------F-----D-R

CONSENSUS_D           -I---------fe----d-q
D.CD.84ZR085          -I---------FE----D-E
D.CD.ELI              -I----------E----D-Q
D.CD.NDK              -I---------FQ----D-Q
D.UG.94UG1141         -I---------FE---M--K

CONSENSUS_F           -i-f-------F-----D-e
F.CM.HIV232985        -I-----L---F-----D-E
F.CM.HIV232986        -P-F-------F-----D-E
F.FR.HIV232987        -I-F-------F-----D--

CONSENSUS_F1          -i---------F-----d-e
F1.BE.VI850           -I-----L---F-----D-E
F1.BR.93BR020.1       -I-----M---F-----D-E
F1.FI.FIN9363         -----------F-------E
F1.FR.MP411           -I-F-------F-----D--

CONSENSUS_F2          -?-?---?---F-----D-E
F2.CM.MP255           -I-----L---F-----D-E
F2.CM.MP257           -P-F-------F-----D-E

CONSENSUS_G           -t-f-------F----md-a
G.BE.DRCBL            -T-V-------F----M--S
G.FI.HH8793           -T-F-------F--E--D-A
G.ML.HIV232990        -T-F-------F----MD-A
G.NG.92NG083          -T-L-------F----MD-A
G.NG.HIV232991        -I-F-------F----LD-T
G.NG.HIV232992        -I-F-------F----MD-A
G.SE.SE6165           -T-F-------F----MD-A

CONSENSUS_H           -e---------F-----d-q
H.BE.VI991            -E---------F-----D-Q
H.BE.VI997            -EG--------F--I--D-Q
H.CD.HIV232994        -----------F-----D-Q
H.CD.HIV232995        -----------F-----D-L
H.CF.90CF056          -E-F-------F-----N-Q

CONSENSUS_J           -??--------?-----D-S
J.SE.SE9173           -Tx--------F-----D-S
J.SE.SE9280           -I---------------D-S

CONSENSUS_K           -I---------------D-?
K.CD.EQTB11C          -I---------------D-R
K.CM.MP535            -I---------------D-A
N.CM.YBF30            -I---V-----F----LSAE

CONSENSUS_O           -?-F------LF-----S?E
O.CM.ANT70C           -T-F------LF-----SEE
O.CM.MVP5180          -P-F------LF-----SAE
CRF01_AE.CF.90CF402   ------C----F-----D-R
CRF01_AE.FR.232982    -I----C----F-----DTG
CRF01_AE.FR.232983    -I-F--C----F-----D-R
CRF01_AE.FR.232984    -I----C----F-----D-G
CRF01_AE.TH.1-2       -I----C----F-----D-R
CRF01_AE.TH.1-3       -I----C----F-----D-R
CRF01_AE.TH.11-25     -I-F--C----F-----D-K
CRF01_AE.TH.11-31     -I-F--C----F-----D-G
CRF01_AE.TH.122-21    -I----C----F-----D-R
CRF01_AE.TH.18-47     -I----C----F-----D-R
CRF01_AE.TH.235-3     -I----C----F-----D-R
CRF01_AE.TH.235-32    -I----C----F-----D-R
CRF01_AE.TH.24-54     -I----C----F-----D-R
CRF01_AE.TH.240-12    -I-F--C----F-----DQR
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CRF01_AE.TH.26-3      -I----C----F-----D-R
CRF01_AE.TH.35-6      -I----C----F-----DSR
CRF01_AE.TH.6-9       -I-F--C----F-----D-R
CRF01_AE.TH.73-44     ------C----F-----D-R
CRF01_AE.TH.74-26     -I----C----F-----DSG
CRF01_AE.TH.89-30     -I----C----F-----D-R
CRF01_AE.TH.9-3       -I----C----F-----D-R
CRF01_AE.TH.93TH253   -I----C----F-----D-R
CRF01_AE.TH.98-4      -I----C----F-----D-G
CRF01_AE.TH.CM240     -I-F--C----F-----DQR
CRF01_AE.TH.TH022     ---L--C----F-----D-R
CRF01_AE.TH.TH047     -I-F--C----F-----D-R
CRF02_AG.FR.DJ263     -T---------FN-E-ID-A
CRF02_AG.FR.DJ264     -T---------F--E-MD-A
CRF02_AG.NG.IBNG      -T-F-------F----MD-A
CRF03_AB.RU.KAL1532   -I-F-------------D-A
CRF04_cpx.CY.94CY03   -E-F--C----F-----D-Q
CRF04_cpx.GR.97PVCH   -E-F--C----F-----D-Q
CRF04_cpx.GR.97PVMY   -T-F--C----F-----D-Q
AC.IN.21301           -----------F-----D-R
AC.RW.92RW009         -----------------D-R
AC.SE.SE9488          -I---------F-----N--
AC.ZM.ZAM184          -T-F-------F-----D-S
ACD.SE.SE8603         -T---------F-----D-R
AD.SE.SE6954          -I----I----FE----D-K
AD.SE.SE7108          -T-F-------F-----D--
ADHU.NO.NOGIL3        -E-F-------F-----D-Q
ADU.CD.MAL            -I-F-------F----MS-E
AF.GA.HIV232981       -I-----S---------D-V
AG.NG.G3              -T-F----R--F----MD-A
AG.SE.SE7812          -T-F-------F----MD-A
AGHU.GA.VI354         -I----C----------D-K
AGJ.AU.BFP90          -T-F-------------D-E
AGJ.ML.95ML84         -I---------------D-R
AGU.CD.Z321           -T----C----F-----D-R
BF.BR.93BR029.4       -T-----L---F-----D-E
DF.BE.VI961           -T---------F-----D-E
GH.GA.HIV232993       ----------------LD-T
GU.FR.HIV232974       -T-F-------F----MD-S
U.CD.VI1126           -I----C----F----MD-Q
U.CM.HIV232988        -I---------------D-A
U.FR.HIV232958        -I----C----------D-R
U.FR.HIV232960        -I----C----------D-R

CONSENSUS_CPZ         -?-?--??---F----LTEE
CPZ.GA.CPZGAB         -T-F--C----F----LTEE
CPZ.US.CPZUS          -------Y---F----LTEE
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TSLLHPVSLHGMDDPEREVL

QUERY	TSLLHPVSLHGMDDPEREVL
CONSENSUS_A	N-----icQ-----E-?-?-
A.FR.HIV232956	NC----M-Q-----E---T-
A.FR.HIV232957	NC----ICQ-----E-K---
A.FR.HIV232959	N-----ICQ-----E-K---
A.KE.Q23-CXC-CG	N-----ICQ-----E-----
A.SE.SE6594	N-----ICQ-----E-K---
A.SE.SE7253	N-----MCQ-----E-K-T-
A.SE.SE7535	N-----MCQ-----E-----
A.SE.SE8131	N-----MCQ-----E---T-
A.SE.SE8538	N-----ICQ-----E---T-
A.SE.SE8891	N-----ICQ-----E---T-
A.UG.92UG037	N-----ICQ-----E-K-T-
A.UG.U455	N-----ICQ--V--E-K---
CONSENSUS_B	n-----m---------k---
B.-.E90NEF	NK----------
B.-.HIV232997	N-----ICQ-------K---
B.-.HIV233002	NCWV--M-----E-------
B.-.HIV233009	NC----M-----E-------
B.-.HIV233016	NC----M-Q---E---K---
B.-.HIV233020	N-----M-----E---K---
B.-.HIV233023	NC----I-Q-------K---
B.-.HIV233029	NC----M-----E---K---
B.-.HIV233030	N-----MG----E---K---
B.-.HIV233032	DT----M-----.-T-G--S
B.-.HIV233037	N-W---M---------K---
B.-.HIV233038	NC----M-Q-------K---
B.-.HIV233043	N-----I-----E---K---
B.-.HIV233045	N-----M---------K---
B.-.HIV233046	N-----M-----E---K---
B.AU.1062-1-NEF	S-----MNQ--TE-T-----
B.AU.93JW-3	K-----L-Q-------K---
B.AU.93LW-3	N-----I-Q-----L-----
B.AU.AF064660	N-----I-Q------GK---
B.AU.AF064667	N------CQ--I--------
B.AU.AF064676	N-----M---------K---
B.AU.MBC200	NC----M-Q---------G-
B.AU.MBC925	N-----M-----E-------
B.CN.AF033570	N-----M-Q--T--------
B.CN.AF033572	N-----M-Q--A--------
B.CN.PRC8	------M-Q--T--------
B.CN.RL42	NC----M-Q--A--------
B.DE.D31	N-----M----------
B.DE.HAN	S-----A----TE-T-----
B.DE.HEI28CS	NK----M----------
B.DE.HEI3BL	NC----x-----E-T-G---
B.DE.HEI4BL	x-----I-----E---N---
B.DE.HIVU52491	NC----I-Q---E-------
B.DE.NEFCC	IC--R-M----------
B.DE.NEFCG	NC----M-Q---x---K-x-
B.DE.NH53	S-----A----TE-T-----
B.ES.89SP061	NR----------E---K---
B.ES.AF082355	SY----I-----E---K---
B.ES.AF082357	SY----I-Q-------K---
B.ES.AF082358	NC----I----W----K---
B.ES.AF082359	NC----INQ-------K---
B.ES.AF082363	N-----M-----E---G---
B.ES.AF082364	N-----R-Q---E-------
B.ES.AF082366	N-----M-Q--IE-A-----
B.ES.AF082368	NC----M-----E-------
B.ES.AF082370	NV----M-----E-------
B.ES.AF082375	NC----I-----E---K---
B.ES.AF082376	N-----M-----E---K---
B.ES.AF082377	N-----L-Q--W----K---
B.ES.AF082378	N-----I-----E---K---
B.ES.AF082380	SC----M----------
B.ES.AF082383	N-----M----R----K---
B.ES.AF082386	NC----M-Q---E-------
B.FR.HIV232961	N-----M---------G---
B.FR.HIV232962	NC----M-Q----------
B.FR.HIV232963	NC----M-Q----------
B.FR.HIV232964	NN----M-Q-----L-K---
B.FR.HIV232965	-C--Y---Q-------K---
B.FR.HXB2	----------
B.FR.NE100	N-----M-Q---E---K---
B.FR.SWB884	N-----M-----E---K---
B.GA.OYI	N-----I---------K---
B.GB.001GH-93(1)	N-----M-----E-------
B.GB.002EM-93(1)	NN----M---------G---
B.GB.003PW-93(1)	NR----M----------
B.GB.005PF1-93(1)	NK----I----TE---K---
B.GB.006DC-93(1)	K---D-M---------K---
B.GB.010JW-93(1)	-K----I-----E-------
B.GB.011JR-93(4)	N-----M---------K---
B.GB.012WM-93(1)	N----------E---K---
B.GB.013PP-94(2)	NC----M-Q---E---K---
B.GB.016GB-93(1)	N-----M-----E---K---
B.GB.023PA-93(1)	N-----M-Q----------
B.GB.025JN-93(1)	-C----M-Q----------
B.GB.027SL-93(1)	NC----M-Q----------
B.GB.028JH-94(1)	NC----MNQ-------K---
B.GB.030JG-93(1)	N-----M-----E-T-----
B.GB.031DA-93(1)	NT----M-----E-K-G---
B.GB.032AN-93(1)	N-----M----------
B.GB.037BS-94(2)	N-----M-Q-------K---
B.GB.039NM-94(1)	N-----M---------K---
B.GB.044C1-94(2)	N-----I-----E-T-K---
B.GB.046JM-94(1)	N-----M-Q---E---K---
B.GB.048AD-94(1)	NT----M---------K---
B.GB.056RP-94B(1)	N-----T-----E---K---
B.GB.057DR-94(1)	NC----M-----E-------
B.GB.065RK-94(1)	NC----M-Q-------K---
B.GB.067MM-94(2)	-C----M-Q----------
B.GB.068JB-94(1)	N-----M-----E---K---
B.GB.098MS-94(1)	N-----M---------K---
B.GB.103CD-94(1)	N-----M-Q-------G---
B.GB.104RT-94(1)	N-----M-Q----------
B.GB.105AS-94(1)	N-----I-----E-S-K---
B.GB.112CR-94(2)	N-----M-Q-------K---
B.GB.117CH-94(2)	NC----MHQ----------
B.GB.122PS-95(1)	NK----M---------K-A-
B.GB.124PD-95(1)	NC----MNQ-------K---
B.GB.127RG-96(1)	N-----M------G--K---
B.GB.130WDC-95(1)	NC----MN--------K---
B.GB.131MVS-95(1)	NT----MAQ-------K---
B.GB.143PL-95(1)	N-----M-Q----------
B.GB.151DH-95(1)	N-----M-T-------G---
B.GB.157GT-95(1)	NC----MNQ--I--------
B.GB.160KO-95(1)	N-----M-Q--V----K---
B.GB.161KC-95(1)	N-----M-----E-K-K---
B.GB.162BB-95(1)	N-----M-Q-------K---
B.GB.163NG-95(1)	N-----M-Q----------
B.GB.164SZ-95(1)	NC----M-Q-------K---
B.GB.165DH-95(1)	NC----M-----E-T-G---
B.GB.166PW-95(1)	NC----LNQ-------K---
B.GB.167RW-95(1)	NC----M-----E-A-G---
B.GB.168MB-95(1)	NC----MNQ----------
B.GB.CAM1	A-----M-Q-------K---
B.GB.GLNEF1	----------
B.GB.MANC	N-----M---------K---
B.GB.NEF2	NC----M-Q----------
B.GB.NEF3	----------G--
B.GB.NEF5	N-----M-----E-A-G---
B.IN.HIVP35A	NC----M-Q-------K---
B.IT.AF011471	NC----MTQ-------K---
B.IT.AF011474	N-----M-----E---G---
B.IT.AF011477	N-----M---------K---
B.IT.AF011478	N-----M---------K---
B.IT.AF011480	--------x----------
B.IT.AF011482	N-----M-Q-------K---
B.IT.AF011483	NC----M--x------K---
B.IT.AF011486	N-----M-----E---K---
B.IT.AF011488	N-----M---------K---
B.IT.AF011492	NI----I----------
B.IT.AF047080	NC----MNQ--IE-------
B.IT.AF047081	NC----MNQ--IE-------
B.IT.B.IT-L1	NR--A-M---------K---
B.IT.B.IT-L2	NCx---MNQ-----x-----
B.IT.B.IT-L3	Nx----L-----E---K---
B.IT.B.IT-L4	N-----M-----E-------
B.IT.B.IT-L5	NC----M-Q---E---K---
B.IT.B.IT-R1	NC----M-----E---K---
B.IT.B.IT-R2	N-----M-----E-x-K---
B.IT.B.IT-R3	NC----M---------K---
B.IT.B.IT-R4	NC----M-Q------DND--
B.IT.B.IT-R5	N----------E---K---
B.KR.AF063915	NC----MN----------
B.KR.AF063916	NC----MN----------
B.KR.AF063919	NC----MN----------
B.KR.AF063921	NI----MN----------
B.KR.AF063926	NC----M-Q----------
B.KR.AF063927	NC----MN----------
B.KR.AF063931	NC----MN----------
B.KR.HIVZ98019	NC----MT--------G---
B.KR.HIVZ98022	NC----MNQ----------
B.KR.HIVZ98024	NC----AN--------G---
B.KR.HIVZ98025	S-----M----IE-------
B.KR.HIVZ98027	NC----AN----------
B.KR.HIVZ98029	NC----MNQ----------
B.KR.HIVZ98030	NC----AN----EG------

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B.KR.HIVZ98032        N-----M-Q-------K---
B.KR.HIVZ98034        N-----L---------K---
B.NL.3202A21          N-----M-Q-----------
B.NL.NEFA             N-----I---------G---
B.NL.NEFD             N-----I-------RRE---
B.NL.NEFE             N-----M---------G---
B.SE.AF047082         N-----M-----E---K---
B.SE.AF047083         NN----M-------------
B.SE.AF047085         NC----M-Q---E-------
B.TH.28-19            N-----M-Q-----------
B.TH.AF082838         NC----MN--------K---
B.TH.AF082839         NC----I----I--------
B.TH.AF082841         DR----M-------------
B.TW.LM49             xC----M-Q-------K---
B.US.HIV1U03375       NG----M-Q-------K---
B.US.005PF-96(1)      NK----I-----E-------
B.US.AD-93(1)         N-----M---------K---
B.US.AD8              NC----M-Q-----T-----
B.US.BC               N-----M-Q-----------
B.US.BIB              N-----M---------G---
B.US.BJ-93(1)         NC----MNQ---E-------
B.US.BO1              N-----M-Q-----T-----
B.US.BRVA             N-----M-Q-----------
B.US.BT-94(1)         N-----M---------G---
B.US.CD1              NI----M-----N-------
B.US.D8511            NC----M---------K---
B.US.DH1              N-----M---EV----K---
B.US.DH123            NC----I-----E---K---
B.US.DJ-93(1)         N-----M-----E---G---
B.US.E1               N-----M-----E-S-----
B.US.E81NEF           NR----M------N------
B.US.E88NEF           NK------------------
B.US.EP-94(1)         NC----M-Q---E-E-K---
B.US.FA-93(1)         N-----MNT-----------
B.US.HIV1U16893       N-----L----V----K---
B.US.HIV1U24455       NR----M-----E---K---
B.US.HIV1U26074       R-----M-----E-------
B.US.HIV1U26098       N-----M-----E-T-G---
B.US.HIV1U26112       NC----I-------------
B.US.HIV1U26119       N-----M---------G---
B.US.HIV1U26141       N-----M-----E---K-M-
B.US.HIVU44444        S-----M-Q--V----K---
B.US.HIVU44450        N-----M-------T-----
B.US.HIVU44456        NR----M---K---------
B.US.HIVU44465        NC----INQ-----------
B.US.HIVU44468        N-----M-------T-K---
B.US.HP87B1           N-----M-----K-------
B.US.HS-93(1)         NC----M-Q-----------
B.US.JRCSF            NC----M-Q-------K---
B.US.JRFL             NC----M-Q--IE---K---
B.US.LM1              NC----M-----E---K---
B.US.LT-87-1(1)       N-----I-----E---K---
B.US.MB-94(1)         NI----LNQ-----------
B.US.MNCG             NC----M-Q-#---------
B.US.NC7              NI----MC----E-A-K---
B.US.NEF              --------------------
B.US.NEF164B          N-----M---------G---
B.US.NEF166E          N-----MAQ-------K---
B.US.NEF179C          N-----ICQ--I--------
B.US.NEF226B          NC----MNQ-------K---
B.US.P102A13          NC----MNQ-------K---
B.US.P233A17          NC----MNQ-----------
B.US.P248A01          NR----I---------K---
B.US.P357A01          N---------------K---
B.US.P896             N-----ANQ--VE-S--Q--
B.US.PC-93(1)         NC----M-----E-S-----
B.US.PRISO(1)         NC------Q-------K---
B.US.RF               N-----IC--------K---
B.US.RP12             NR----M-----E---K---
B.US.RR1              N-----M-----E-------
B.US.SC               N-----M-----E-------
B.US.SF2              N-----M-----E-A-K---
B.US.U16917           N-----M-Q-------K---
B.US.WEAU160          N-----M-------H-K---
B.US.WR27             NC----M-Q-------K---
B.US.YU2              NC----M-Q---------G-

CONSENSUS_C           nc----m-q---e-eh----
C.BR.92BR025          N-----M-----E-SH----
C.BW.96BW01B21        NC----M-Q---E-EH----
C.BW.96BW0402         NR----M-----E-ADG---
C.BW.96BW0502         NC----M-Q---E-EHG---
C.BW.96BW1104         NC----IAQ---E-EHK---
C.BW.96BW1210         NC----M-Q--IE-AD----
C.BW.96BW15B03        HC----M-Q----N-DK---
C.BW.96BW16B01        NC----MNQ-----------
C.BW.96BW17A09        NC----M-Q---E-AD----
C.ET.ETH2220          NC----A-----E-ED----
C.FR.HIV232966        NC----M-Q--IE-ED----
C.FR.HIV232967        NC----M-----E-EHG---
C.FR.HIV232968        NC----M-QQ--E-EH----
C.FR.HIV232969        NC----M-----E-EHG---
C.FR.HIV232970        NC----M----IE-EH----
C.FR.HIV232971        SC----MN----E-EH----
C.FR.HIV232972        NC----M-----E-EHG-T-
C.FR.HIV232973        NC----I-----E-EDK---
C.FR.HIV232976        NC----M-Q---E-AHG-T-
C.FR.HIV232977        NC----M-Q---E-ED----
C.FR.HIV232978        NC----MN---IE-AD----
C.FR.HIV232979        NC----M-Q-----ED----
C.FR.HIV232980        NC----M----IE-AHK---
C.FR.HIV232996        NC----M-----E-EHG---
C.IN.21068            NC-----CQ---E-DHN---
C.IN.301904           NC-----CQ-----EH----
C.IN.301999           NC-----CQ---E-EH----
C.IN.94IN11246        NC-----CQ---E-DH----
C.IN.HIVY15117        NC-----CQ---E-EH---F
C.IN.HIVY17884        N------CQ---E-EH----
C.IN.HIVY17891        NC-----CQ---E-EH----
C.IN.HIVY17892        NC-----CQ---E-EH----

CONSENSUS_D           Nc----icQ---E----?--
D.CD.84ZR085          NC----ICQ---E-E-K---
D.CD.ELI              N-----ICQ---E----Q--
D.CD.NDK              NC----MCQQ--E----Q--
D.UG.94UG1141         NC----INQ---E-------

CONSENSUS_F           NC----m-----e-eD----
F.CM.HIV232985        NC----I-----E-ED----
F.CM.HIV232986        NC----M-----E-DDK---
F.FR.HIV232987        NC----M-Q-----ED----

CONSENSUS_F1          NC----M-Q---e-ED----
F1.BE.VI850           NC----M-Q---E-ED----
F1.BR.93BR020.1       NC----M-Q---E-EDK---
F1.FI.FIN9363         NC----M-Q---E-ED----
F1.FR.MP411           NC----M-Q-----ED----

CONSENSUS_F2          NC----?-----E-?D?---
F2.CM.MP255           NC----I-----E-ED----
F2.CM.MP257           NC----M-----E-DDK---

CONSENSUS_G           n-----iCQ---E-eD----
G.BE.DRCBL            N-----ICQ---E-EDG---
G.FI.HH8793           I-----ICQ-E-E-ED----
G.ML.HIV232990        N-----ICQ---E-TD----
G.NG.92NG083          I-----ICQ---E-ED----
G.NG.HIV232991        N------CQ--LE-ED----
G.NG.HIV232992        N-----ICQ---E-ED----
G.SE.SE6165           N-----ICQ---E-ED----

CONSENSUS_H           N-----icq---E-e?----
H.BE.VI991            N-----MCQ--IE-------
H.BE.VI997            NC--Y-ICQ---E-E-G---
H.CD.HIV232994        N-----ICQ---E-ED----
H.CD.HIV232995        N-----ICQ---E-ED----
H.CF.90CF056          N-----M-----E-DG----

CONSENSUS_J           NC----?CQ--IE-E-----
J.SE.SE9173           NC----ACQ--IE-E-----
J.SE.SE9280           NC----ICQ--IE-E-----

CONSENSUS_K           NC----?NQ---E-EH--?-
K.CD.EQTB11C          NC-----NQ---E-EH----
K.CM.MP535            NC----INQ---E-EH--I-
N.CM.YBF30            NA----ICQ--A--DHK---

CONSENSUS_O           A?----AC?--?E-?H?-I-
O.CM.ANT70C           AN----ACA--FE-THK-I-
O.CM.MVP5180          A-----ACN--AE-AHG-I-
CRF01_AE.CF.90CF402   NC----M-Q--I--D-----
CRF01_AE.FR.232982    NC----M-Q--LE-E-----
CRF01_AE.FR.232983    NC----M-Q--IE-E-----
CRF01_AE.FR.232984    NC----M-Q--IE-E-----
CRF01_AE.TH.1-2       NC----M-Q--IE-E-----
CRF01_AE.TH.1-3       NC----M-Q--IE-E--K--
CRF01_AE.TH.11-25     NC----M-Q--I--------
CRF01_AE.TH.11-31     NC----M-Q--I--------
CRF01_AE.TH.122-21    NC----M-Q--IE-EDK---
CRF01_AE.TH.18-47     NC----M-Q--IE-D-----
CRF01_AE.TH.235-3     NC----M-Q--I--E-----
CRF01_AE.TH.235-32    NC----M-Q--I--E-----
CRF01_AE.TH.24-54     NC----M-Q--IE-A-----
CRF01_AE.TH.240-12    NC----M-Q--IE-E-----
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CRF01_AE.TH.26-3      NC----M-Q--IE-E-K---
CRF01_AE.TH.35-6      NC----M-Q--IR-E-----
CRF01_AE.TH.6-9       NC----M-Q--I--E-----
CRF01_AE.TH.73-44     NC----M-Q--IE-E-----
CRF01_AE.TH.74-26     NC----M-Q--IE-E-----
CRF01_AE.TH.89-30     SC----MNQ---E-E-----
CRF01_AE.TH.9-3       NC----M-Q--IE-E-G---
CRF01_AE.TH.93TH253   NC----M-Q--IE-E-----
CRF01_AE.TH.98-4      NC----M-Q--VE-E-----
CRF01_AE.TH.CM240     NC----M-Q--IE-E-----
CRF01_AE.TH.TH022     N-----M-Q--IE-E-----
CRF01_AE.TH.TH047     NC----M-Q---G-G-----
CRF02_AG.FR.DJ263     N-----ICQ---E-ED----
CRF02_AG.FR.DJ264     N-----ICQ---E-ED----
CRF02_AG.NG.IBNG      N-----ICQ---E-DD----
CRF03_AB.RU.KAL1532   N-----ICQ-----E-K---
CRF04_cpx.CY.94CY03   -C----I-Q---E-E-----
CRF04_cpx.GR.97PVCH   NC----I-Q---E-E-----
CRF04_cpx.GR.97PVMY   NC----I-Q---E-E-----
AC.IN.21301           NC-----CQ---E-EYG---
AC.RW.92RW009         NC----L-Q---E-ED----
AC.SE.SE9488          N-----MCQ-----K---T-
AC.ZM.ZAM184          N-----ICQ--IE-A-----
ACD.SE.SE8603         NC----M-Q--IE-EDK---
AD.SE.SE6954          S-----MHQ---E-T-----
AD.SE.SE7108          NT----ICQ-----E-K---
ADHU.NO.NOGIL3        NC----MCQ---E-E-x---
ADU.CD.MAL            NC----I-Q---E-A-----
AF.GA.HIV232981       N-----ICQ--A--E-K---
AG.NG.G3              N-----ICQ--LE-AD----
AG.SE.SE7812          N-----ICQ---E-ED----
AGHU.GA.VI354         NC----ICQQ----G-----
AGJ.AU.BFP90          NC----ICQ--AE-E-----
AGJ.ML.95ML84         NC----M-Q---E-E-----
AGU.CD.Z321           NC----M-Q-----D-----
BF.BR.93BR029.4       NC----M-Q---E-ED--I-
DF.BE.VI961           KC----MHQ-----EDG---
GH.GA.HIV232993       N-----ICQ-----EDG---
GU.FR.HIV232974       N-----ICQ--IE-EHG---
U.CD.VI1126           N-----ICQ--I--T-----
U.CM.HIV232988        NC----INQ---E-EH--I-
U.FR.HIV232958        NC----ICQQ----DDK---
U.FR.HIV232960        NC----M-Q-----E-K---

CONSENSUS_CPZ         N?----?CQ---E-E??---
CPZ.GA.CPZGAB         NC----ICQ---E-EDK---
CPZ.US.CPZUS          NI----MCQ---E-EHG---
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EEEEVGFPVTPQVPLRPMTY

QUERY	EEEEVGFPVTPQVPLRPMTY
CONSENSUS_A	---------r----------
A.FR.HIV232956	-D-------R---------F
A.FR.HIV232957	QD-------R---------F
A.FR.HIV232959	------L--R---------F
A.KE.Q23-CXC-CG	-D-D-----R----------
A.SE.SE6594	---------R----------
A.SE.SE7253	---------R-H--------
A.SE.SE7535	-D-G-----R----------
A.SE.SE8131	-D-------R----------
A.SE.SE8538	-D-------K----------
A.SE.SE8891	---------R----------
A.UG.92UG037	---------R----------
A.UG.U455	--GD-----R----------
CONSENSUS_B	---------r----------
B.-.E90NEF	---------K----------
B.-.HIV232997	-D-------R----------
B.-.HIV233002	-G-------K----------
B.-.HIV233009	---------K----------
B.-.HIV233016	-D--G----R-K--------
B.-.HIV233020	K--------R----------
B.-.HIV233023	-D-N-----R--I-------
B.-.HIV233029	-----R---K----------
B.-.HIV233030	---------K----------
B.-.HIV233032	---------K----------
B.-.HIV233037	---------K----------
B.-.HIV233038	-D-D-----R----------
B.-.HIV233043	---------R----------
B.-.HIV233045	---------R----------
B.-.HIV233046	---------R----------
B.AU.1062-1-NEF	-D-------K----------
B.AU.93JW-3	---------R----------
B.AU.93LW-3	---------R----------
B.AU.AF064660	-D-------R----------
B.AU.AF064667	-D-------R---------F
B.AU.AF064676	K--------R----------
B.AU.MBC200	--G------R----------
B.AU.MBC925	-D-------K----------
B.CN.AF033570	---------R----------
B.CN.AF033572	---G-----R----------
B.CN.PRC8	---------R---------F
B.CN.RL42	---------R----------
B.DE.D31	---------K----------
B.DE.HAN	----E----R----------
B.DE.HEI28CS	-G-------K---------x
B.DE.HEI3BL	-x-x-----R----------
B.DE.HEI4BL	-G-------R----------
B.DE.HIVU52491	-DG------R----------
B.DE.NEFCC	---------R---------S
B.DE.NEFCG	-D-------R---x------
B.DE.NH53	---------R----------
B.ES.89SP061	---------R----------
B.ES.AF082355	---------K----------
B.ES.AF082357	---------K----------
B.ES.AF082358	---------R----------
B.ES.AF082359	-D-------R----------
B.ES.AF082363	---------R----------
B.ES.AF082364	---------R----------
B.ES.AF082366	---------R----------
B.ES.AF082368	---------R----------
B.ES.AF082370	---------R----------
B.ES.AF082375	---------R----------
B.ES.AF082376	---------K----------
B.ES.AF082377	---------R----------
B.ES.AF082378	-D-D-----K----------
B.ES.AF082380	---------K----------
B.ES.AF082383	---------K----------
B.ES.AF082386	-D-D-----R----------
B.FR.HIV232961	---------R----------
B.FR.HIV232962	---------R----------
B.FR.HIV232963	---------R---------F
B.FR.HIV232964	---------R--------S-
B.FR.HIV232965	-D------IR----------
B.FR.HXB2	----------
B.FR.NE100	---------R---------R
B.FR.SWB884	---------R---------R
B.GA.OYI	-D-------R----------
B.GB.001GH-93(1)	---------R----------
B.GB.002EM-93(1)	--K------R----------
B.GB.003PW-93(1)	---------R-------I--
B.GB.005PF1-93(1)	---------R----------
B.GB.006DC-93(1)	---------K----------
B.GB.010JW-93(1)	-D-------K----------
B.GB.011JR-93(4)	K--------R----------
B.GB.012WM-93(1)	----------
B.GB.013PP-94(2)	-D-------R--I-------
B.GB.016GB-93(1)	---------R----V-----
B.GB.023PA-93(1)	---------RL---------
B.GB.025JN-93(1)	---------R----------
B.GB.027SL-93(1)	---------R----------
B.GB.028JH-94(1)	---------R----------
B.GB.030JG-93(1)	Q--------R----------
B.GB.031DA-93(1)	---------R----V-----
B.GB.032AN-93(1)	----------
B.GB.037BS-94(2)	-D-------R----------
B.GB.039NM-94(1)	-G-------K--I-------
B.GB.044C1-94(2)	-K-------R----------
B.GB.046JM-94(1)	---------R----------
B.GB.048AD-94(1)	---------R----------
B.GB.056RP-94B(1)	---------R--------I-
B.GB.057DR-94(1)	---------K----------
B.GB.065RK-94(1)	---------R----------
B.GB.067MM-94(2)	---------R----------
B.GB.068JB-94(1)	---------KL---------
B.GB.098MS-94(1)	---------R----------
B.GB.103CD-94(1)	---------K----------
B.GB.104RT-94(1)	DG-------K----------
B.GB.105AS-94(1)	---------R----------
B.GB.112CR-94(2)	---------R--------I-
B.GB.117CH-94(2)	QD-------R----------
B.GB.122PS-95(1)	--------LR----------
B.GB.124PD-95(1)	---------R----------
B.GB.127RG-96(1)	---------R--------D-
B.GB.130WDC-95(1)	Q--------R----------
B.GB.131MVS-95(1)	---------K----------
B.GB.143PL-95(1)	---------R-H--------
B.GB.151DH-95(1)	-D-------K----------
B.GB.157GT-95(1)	-D-------R--------N-
B.GB.160KO-95(1)	-G-------R----------
B.GB.161KC-95(1)	---------R----------
B.GB.162BB-95(1)	---------K----------
B.GB.163NG-95(1)	---------R-------I--
B.GB.164SZ-95(1)	---------R----------
B.GB.165DH-95(1)	--KK-----R----------
B.GB.166PW-95(1)	Q--------R----------
B.GB.167RW-95(1)	-D----------F
B.GB.168MB-95(1)	---------R----------
B.GB.CAM1	---------R----------
B.GB.GLNEF1	---------K----------
B.GB.MANC	---------R---------F
B.GB.NEF2	-D-------R----V-----
B.GB.NEF3	---------R----------
B.GB.NEF5	----------
B.IN.HIVP35A	-D-D-----R----------
B.IT.AF011471	---------R--E-------
B.IT.AF011474	---------R----------
B.IT.AF011477	-D-------R----------
B.IT.AF011478	-D-------R----------
B.IT.AF011480	----------x----
B.IT.AF011482	---------QT---------
B.IT.AF011483	---------R----------
B.IT.AF011486	---------R----------
B.IT.AF011488	---------Rx---------
B.IT.AF011492	-D-------K----------
B.IT.AF047080	-D-D-----R----------
B.IT.AF047081	---------R----------
B.IT.B.IT-L1	xG--x----R--------x-
B.IT.B.IT-L2	-x-Dx----R----------
B.IT.B.IT-L3	---------R---------H
B.IT.B.IT-L4	---------R----------
B.IT.B.IT-L5	-D-D-----R---x------
B.IT.B.IT-R1	-x----x--R----------
B.IT.B.IT-R2	---------R----------
B.IT.B.IT-R3	-G-------R----------
B.IT.B.IT-R4	-G-------R----------
B.IT.B.IT-R5	-D-------R-------x-C
B.KR.AF063915	---------R----------
B.KR.AF063916	----------
B.KR.AF063919	---------R----------
B.KR.AF063921	---------R----------
B.KR.AF063926	-DN------R----------
B.KR.AF063927	-------L-R----------
B.KR.AF063931	---------R----------
B.KR.HIVZ98019	-D-------R----------
B.KR.HIVZ98022	---------R----------
B.KR.HIVZ98024	G--------R----------
B.KR.HIVZ98025	---------R----------
B.KR.HIVZ98027	---------R----------
B.KR.HIVZ98029	---------R----------
B.KR.HIVZ98030	---------K----------

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B.KR.HIVZ98032        -D-------K----------
B.KR.HIVZ98034        ---------R--------D-
B.NL.3202A21          -D-------K----------
B.NL.NEFA             ---------R----------
B.NL.NEFD             ---------R----------
B.NL.NEFE             -D-------R----------
B.SE.AF047082         ---------R----------
B.SE.AF047083         ---------R----------
B.SE.AF047085         -D-N-----R----------
B.TH.28-19            ---------K----------
B.TH.AF082838         ---------K----------
B.TH.AF082839         ---------R----------
B.TH.AF082841         -D-D-----R----------
B.TW.LM49             ---------R--------D-
B.US.HIV1U03375       ---------R----------
B.US.005PF-96(1)      ---------R----------
B.US.AD-93(1)         ---------R----------
B.US.AD8              ---------R----------
B.US.BC               ---------R-------I--
B.US.BIB              ---------R----------
B.US.BJ-93(1)         --------------------
B.US.BO1              ---------R----------
B.US.BRVA             -D-------K----------
B.US.BT-94(1)         -----------R--------
B.US.CD1              ---------R----------
B.US.D8511            ---------R----------
B.US.DH1              -----S---R----------
B.US.DH123            ---------R--I-------
B.US.DJ-93(1)         --DD-----R----------
B.US.E1               ---------R----------
B.US.E81NEF           --------IR----------
B.US.E88NEF           ---------K----------
B.US.EP-94(1)         ---------R---------W
B.US.FA-93(1)         ---------R----------
B.US.HIV1U16893       ---------R----------
B.US.HIV1U24455       ---------R----------
B.US.HIV1U26074       -D-------K----------
B.US.HIV1U26098       -D-------K----------
B.US.HIV1U26112       -G-------R----------
B.US.HIV1U26119       ---------R----------
B.US.HIV1U26141       -D-------R----------
B.US.HIVU44444        ---------R----------
B.US.HIVU44450        -G-------R----------
B.US.HIVU44456        K-------------------
B.US.HIVU44465        ---------R----------
B.US.HIVU44468        ---------K----------
B.US.HP87B1           ---------R----------
B.US.HS-93(1)         -D-------R----------
B.US.JRCSF            -D-------R----------
B.US.JRFL             -D-------R----------
B.US.LM1              ---------R----------
B.US.LT-87-1(1)       ---------R----------
B.US.MB-94(1)         ---------R-------V--
B.US.MNCG             ---------K----------
B.US.NC7              ---------R----------
B.US.NEF              --------------------
B.US.NEF164B          ---------R----------
B.US.NEF166E          ---------K----------
B.US.NEF179C          -G-------R----------
B.US.NEF226B          ---------R-------V--
B.US.P102A13          ---------R----------
B.US.P233A17          ------L--R----------
B.US.P248A01          ---------R----------
B.US.P357A01          ---------R----------
B.US.P896             --G------R----------
B.US.PC-93(1)         ---------R----------
B.US.PRISO(1)         K--------R-H--------
B.US.RF               -D-------R---------F
B.US.RP12             ---------K----------
B.US.RR1              ---------R----------
B.US.SC               ---------R----------
B.US.SF2              ---------R----------
B.US.U16917           ---------R--------S-
B.US.WEAU160          -D-------R----------
B.US.WR27             ---------R----------
B.US.YU2              ---------R---------H

CONSENSUS_C           ---------r----------
C.BR.92BR025          ---------R----------
C.BW.96BW01B21        --G------R----------
C.BW.96BW0402         ---------R----------
C.BW.96BW0502         --GD-----R----------
C.BW.96BW1104         ---------R----------
C.BW.96BW1210         ---------R----------
C.BW.96BW15B03        -AD------R----------
C.BW.96BW16B01        --D------R----------
C.BW.96BW17A09        -D-------R----------
C.ET.ETH2220          ---------R----------
C.FR.HIV232966        Q--G-----K---------F
C.FR.HIV232967        ---------R---------F
C.FR.HIV232968        Q--------R--------S-
C.FR.HIV232969        --G------R--------S-
C.FR.HIV232970        --G------R--------S-
C.FR.HIV232971        --G------K----------
C.FR.HIV232972        ---------K----------
C.FR.HIV232973        Q--G-----R----------
C.FR.HIV232976        ---------R----------
C.FR.HIV232977        Q-------------------
C.FR.HIV232978        ---------R----------
C.FR.HIV232979        ---------R----------
C.FR.HIV232980        ---------R----------
C.FR.HIV232996        --GG-----R----------
C.IN.21068            ---G-----R---------F
C.IN.301904           ---------R---------F
C.IN.301999           ---------R---------F
C.IN.94IN11246        ---------R---------F
C.IN.HIVY15117        -DG--A---R----------
C.IN.HIVY17884        -D-------R---------F
C.IN.HIVY17891        ---------R---------F
C.IN.HIVY17892        ---G-----R---------F

CONSENSUS_D           -s-------R----------
D.CD.84ZR085          -D-------R----------
D.CD.ELI              -SD------R----------
D.CD.NDK              -S-------R----------
D.UG.94UG1141         ---------R----------

CONSENSUS_F           -D-------R----------
F.CM.HIV232985        -D-------R----------
F.CM.HIV232986        -D-------R----------
F.FR.HIV232987        -D-------R---------F

CONSENSUS_F1          -?-------R----------
F1.BE.VI850           ---------R----V-----
F1.BR.93BR020.1       --D------R----------
F1.FI.FIN9363         -D-------R----------
F1.FR.MP411           -D-------R---------F

CONSENSUS_F2          ---.-----R----------
F2.CM.MP255           ---.-----R----------
F2.CM.MP257           ---.-----R----------

CONSENSUS_G           -dS------R----------
G.BE.DRCBL            -DS------R----------
G.FI.HH8793           -DSD-----R----V-----
G.ML.HIV232990        -DS------R----------
G.NG.92NG083          -DSD-----R----------
G.NG.HIV232991        --S------R--L-------
G.NG.HIV232992        -DSD-----R----------
G.SE.SE6165           -DS------R---------F

CONSENSUS_H           ---------R----------
H.BE.VI991            ---------R----------
H.BE.VI997            -A-------R----------
H.CD.HIV232994        ---------R----------
H.CD.HIV232995        ---------R----V-----
H.CF.90CF056          DG-------R----------

CONSENSUS_J           T--------?--?-------
J.SE.SE9173           T--------R--x-------
J.SE.SE9280           T--------K--I-------

CONSENSUS_K           -?-?-----R---------?
K.CD.EQTB11C          -D-D-----R---------F
K.CM.MP535            ---------R----------
N.CM.YBF30            ---------R-------I--

CONSENSUS_O           ??-?-----?---------?
O.CM.ANT70C           Q--------A----------
O.CM.MVP5180          KD-D-----R---------F
CRF01_AE.CF.90CF402   ---------R----------
CRF01_AE.FR.232982    -D-G-----R----------
CRF01_AE.FR.232983    --------IR----------
CRF01_AE.FR.232984    ---G-----R---------F
CRF01_AE.TH.1-2       ---G-----R---------F
CRF01_AE.TH.1-3       ---G-----R---------F
CRF01_AE.TH.11-25     ---G-----R-H-------F
CRF01_AE.TH.11-31     K--G-----R---------F
CRF01_AE.TH.122-21    ---G-----R----------
CRF01_AE.TH.18-47     ---------R----------
CRF01_AE.TH.235-3     ---------R----------
CRF01_AE.TH.235-32    ---------R----------
CRF01_AE.TH.24-54     -D-G-----R----------
CRF01_AE.TH.240-12    -D-------M----------
```

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

CONSENSUS_CPZ         ??-------R----?-----
CPZ.GA.CPZGAB         DN-------R----T-----
CPZ.US.CPZUS          H-S------R----------
```

PQVPLRPMTYKAAVDLSHFL

QUERY	PQVPLRPMTYKAAVDLSHFL
CONSENSUS_A	----------g-f------
A.FR.HIV232956	---------F-G-L------
A.FR.HIV232957	---------F-G-F---F--
A.FR.HIV232959	---------F-G-F---F--
A.KE.Q23-CXC-CG	----------G--------
A.SE.SE6594	----------
A.SE.SE7253	-H---------G-L------
A.SE.SE7535	----------G-L------
A.SE.SE8131	----------G-L------
A.SE.SE8538	----------G-F------
A.SE.SE8891	----------G--------
A.UG.92UG037	----------F--GF--
A.UG.U455	----------F---F--
CONSENSUS_B	----------
B.-.E90NEF	----------G--------
B.-.HIV232997	----------L------
B.-.HIV233002	----------L------
B.-.HIV233009	----------G-L------
B.-.HIV233016	-K---------V---M----
B.-.HIV233020	----------
B.-.HIV233023	--I----------
B.-.HIV233029	----------G-L------
B.-.HIV233030	----------G--------
B.-.HIV233032	----------G--------
B.-.HIV233037	----------G-L------
B.-.HIV233038	----------
B.-.HIV233043	----------G--------
B.-.HIV233045	----------G-L------
B.-.HIV233046	----------G-L------
B.AU.1062-1-NEF	----------
B.AU.93JW-3	----------P--
B.AU.93LW-3	----------
B.AU.AF064660	----------G-F--N---
B.AU.AF064667	---------FR---------
B.AU.AF064676	----------L-I----
B.AU.MBC200	----------
B.AU.MBC925	----------
B.CN.AF033570	----------G-L------
B.CN.AF033572	----------G-L--N---
B.CN.PRC8	---------F---L------
B.CN.RL42	----------G-L------
B.DE.D31	----------
B.DE.HAN	----------G-L------
B.DE.HEI28CS	---------x-G-x------
B.DE.HEI3BL	----------G-L------
B.DE.HEI4BL	----------
B.DE.HIVU52491	----------G-L------
B.DE.NEFCC	---------SR--R------
B.DE.NEFCG	---x-------G-L------
B.DE.NH53	----------
B.ES.89SP061	----------G-L------
B.ES.AF082355	----------
B.ES.AF082357	----------G-L------
B.ES.AF082358	----------G-L------
B.ES.AF082359	----------F----
B.ES.AF082363	----------M-I----
B.ES.AF082364	----------
B.ES.AF082366	----------G-L------
B.ES.AF082368	----------G-L------
B.ES.AF082370	----------G--------
B.ES.AF082375	----------F---F--
B.ES.AF082376	----------G--------
B.ES.AF082377	----------
B.ES.AF082378	----------
B.ES.AF082380	----------
B.ES.AF082383	----------G-F------
B.ES.AF082386	----------
B.FR.HIV232961	----------
B.FR.HIV232962	----------G--------
B.FR.HIV232963	---------F-G-L------
B.FR.HIV232964	--------S----L------
B.FR.HIV232965	----------
B.FR.HXB2	----------
B.FR.NE100	---------RR--I------
B.FR.SWB884	---------RR--I------
B.GA.OYI	----------G-L------
B.GB.001GH-93(1)	----------G-M------
B.GB.002EM-93(1)	----------G-LN-----
B.GB.003PW-93(1)	-------I-----L------
B.GB.005PF1-93(1)	----------
B.GB.006DC-93(1)	----------G-F------
B.GB.010JW-93(1)	----------G-L------
B.GB.011JR-93(4)	----------G-L------
B.GB.012WM-93(1)	----------F------
B.GB.013PP-94(2)	--I-------Q--L------
B.GB.016GB-93(1)	----V-----R--R-F----
B.GB.023PA-93(1)	L----------F------
B.GB.025JN-93(1)	----------G-F---Y--
B.GB.027SL-93(1)	----------
B.GB.028JH-94(1)	----------G-L------
B.GB.030JG-93(1)	----------L------
B.GB.031DA-93(1)	----V------G-L------
B.GB.032AN-93(1)	----------R--L------
B.GB.037BS-94(2)	----------R---------
B.GB.039NM-94(1)	--I--------G-L------
B.GB.044C1-94(2)	----------G--------
B.GB.046JM-94(1)	----------L------
B.GB.048AD-94(1)	----------G-L------
B.GB.056RP-94B(1)	--------I--G-F------
B.GB.057DR-94(1)	----------G--------
B.GB.065RK-94(1)	----------
B.GB.067MM-94(2)	----------G-F---Y--
B.GB.068JB-94(1)	L----------
B.GB.098MS-94(1)	----------
B.GB.103CD-94(1)	----------G-L------
B.GB.104RT-94(1)	----------G--------
B.GB.105AS-94(1)	----------G-L--T---
B.GB.112CR-94(2)	--------I--G-L------
B.GB.117CH-94(2)	----------
B.GB.122PS-95(1)	----------G-L------
B.GB.124PD-95(1)	----------
B.GB.127RG-96(1)	--------D--G--------
B.GB.130WDC-95(1)	----------L------
B.GB.131MVS-95(1)	----------I----
B.GB.143PL-95(1)	-H----------L------
B.GB.151DH-95(1)	----------
B.GB.157GT-95(1)	--------N--G--------
B.GB.160KO-95(1)	----------
B.GB.161KC-95(1)	----------G-L------
B.GB.162BB-95(1)	----------
B.GB.163NG-95(1)	-------I--R--L------
B.GB.164SZ-95(1)	----------G-I------
B.GB.165DH-95(1)	----------G-L------
B.GB.166PW-95(1)	----------G-L------
B.GB.167RW-95(1)	---------F-G-L------
B.GB.168MB-95(1)	----------G--------
B.GB.CAM1	----------L-I----
B.GB.GLNEF1	----------
B.GB.MANC	---------F-G-L------
B.GB.NEF2	----V----------
B.GB.NEF3	----------
B.GB.NEF5	----------
B.IN.HIVP35A	----------G-L------
B.IT.AF011471	--E----------
B.IT.AF011474	----------G-F------
B.IT.AF011477	----------RG-L------
B.IT.AF011478	----------RGxL------
B.IT.AF011480	-----x----------
B.IT.AF011482	T----------L------
B.IT.AF011483	----------G-L------
B.IT.AF011486	----------Q--L------
B.IT.AF011488	x---------R--R------
B.IT.AF011492	----------G-L------
B.IT.AF047080	----------S--------
B.IT.AF047081	----------G--------
B.IT.B.IT-L1	--------x----L------
B.IT.B.IT-L2	----------
B.IT.B.IT-L3	---------HR--I------
B.IT.B.IT-L4	----------M----
B.IT.B.IT-L5	---x-------S-----x--
B.IT.B.IT-R1	----------L------
B.IT.B.IT-R2	----------G-L------
B.IT.B.IT-R3	----------Q--xN-----
B.IT.B.IT-R4	----------G--------
B.IT.B.IT-R5	-------x-CR--I------
B.KR.AF063915	----------G-L------
B.KR.AF063916	----------
B.KR.AF063919	----------G-F------
B.KR.AF063921	----------I
B.KR.AF063926	----------G-L------
B.KR.AF063927	----------
B.KR.AF063931	----------L------
B.KR.HIVZ98019	----------
B.KR.HIVZ98022	----------G--------
B.KR.HIVZ98024	----------G-L------
B.KR.HIVZ98025	----------
B.KR.HIVZ98027	----------G-L------
B.KR.HIVZ98029	----------G-L------
B.KR.HIVZ98030	----------S-------

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B.KR.HIVZ98032        -----------G-S------
B.KR.HIVZ98034        --------D--SS-------
B.NL.3202A21          -----------G-L------
B.NL.NEFA             -------------L------
B.NL.NEFD             -----------G-L------
B.NL.NEFE             -------------F------
B.SE.AF047082         -------------L------
B.SE.AF047083         -----------G--------
B.SE.AF047085         -------------F------
B.TH.28-19            -----------G-L------
B.TH.AF082838         -----------G-L------
B.TH.AF082839         --------------------
B.TH.AF082841         -------------F------
B.TW.LM49             --------D--G-I------
B.US.HIV1U03375       -----------G-L------
B.US.005PF-96(1)      --------------------
B.US.AD-93(1)         -----------G-L------
B.US.AD8              --------------------
B.US.BC               -------I-------I----
B.US.BIB              -----------G-R---W--
B.US.BJ-93(1)         --------------------
B.US.BO1              --------------------
B.US.BRVA             --------------------
B.US.BT-94(1)         -R------------------
B.US.CD1              --------------------
B.US.D8511            -----------G-L------
B.US.DH1              -----------G-L------
B.US.DH123            --I----------L------
B.US.DJ-93(1)         --------------------
B.US.E1               -----------G-L------
B.US.E81NEF           -----------G--------
B.US.E88NEF           -----------G--------
B.US.EP-94(1)         ---------W---L------
B.US.FA-93(1)         -----------G--------
B.US.HIV1U16893       -------------L------
B.US.HIV1U24455       -----------G--------
B.US.HIV1U26074       --------------------
B.US.HIV1U26098       --------------------
B.US.HIV1U26112       -----------G-L------
B.US.HIV1U26119       --------------------
B.US.HIV1U26141       --------------------
B.US.HIVU44444        ---------------I----
B.US.HIVU44450        -----------G-L------
B.US.HIVU44456        -----------G--------
B.US.HIVU44465        -----------G-L------
B.US.HIVU44468        --------------------
B.US.HP87B1           -----------G-L------
B.US.HS-93(1)         -------------L------
B.US.JRCSF            -------------I------
B.US.JRFL             -----------G--------
B.US.LM1              -----------G-L------
B.US.LT-87-1(1)       -----------G-L------
B.US.MB-94(1)         -------V---G--------
B.US.MNCG             -------------L------
B.US.NC7              ------------GI------
B.US.NEF              --------------------
B.US.NEF164B          -------------I-M----
B.US.NEF166E          -----------G-L------
B.US.NEF179C          -----------G-L------
B.US.NEF226B          -------V------------
B.US.P102A13          --------------------
B.US.P233A17          -----------G-L------
B.US.P248A01          --------------------
B.US.P357A01          -----------G-L------
B.US.P896             --------------------
B.US.PC-93(1)         -----------G--------
B.US.PRISO(1)         -H------------------
B.US.RF               ---------F----------
B.US.RP12             --------------------
B.US.RR1              --------------------
B.US.SC               --------------------
B.US.SF2              -------------L-I----
B.US.U16917           --------S------I----
B.US.WEAU160          -------------H-----#
B.US.WR27             --------------------
B.US.YU2              ---------H---M------

CONSENSUS_C           -----------g-f---f--
C.BR.92BR025          ------------V----F--
C.BW.96BW01B21        -----------G-F--GF--
C.BW.96BW0402         ----------------F--
C.BW.96BW0502         -----------G-F--GF--
C.BW.96BW1104         -------------FG--F--
C.BW.96BW1210         -----------G-F---F--
C.BW.96BW15B03        -----------G-----F--
C.BW.96BW16B01        -----------E-F---F--
C.BW.96BW17A09        -------------F---F--
C.ET.ETH2220          -------------F---L--
C.FR.HIV232966        ---------F-G-F---F--
C.FR.HIV232967        ---------F-G-F--GF--
C.FR.HIV232968        --------S----F---F--
C.FR.HIV232969        --------S--S-F---F--
C.FR.HIV232970        --------S----F---F--
C.FR.HIV232971        -------------F--GF--
C.FR.HIV232972        -------------F-FGF--
C.FR.HIV232973        ----------------W--
C.FR.HIV232976        -------------F---F--
C.FR.HIV232977        ----------------W--
C.FR.HIV232978        -------------F---F--
C.FR.HIV232979        -----------G-F---F--
C.FR.HIV232980        ----------------F--
C.FR.HIV232996        -----------G-F---F--
C.IN.21068            ---------F-G-L---F--
C.IN.301904           ---------F-E-----F--
C.IN.301999           ---------F-G-F---F--
C.IN.94IN11246        ---------F-G-F---F--
C.IN.HIVY15117        -----------G-F---F--
C.IN.HIVY17884        ---------F-G-F---F--
C.IN.HIVY17891        ---------F-G-F---F--
C.IN.HIVY17892        ---------F-G-F---F--

CONSENSUS_D           -----------e--------
D.CD.84ZR085          --------------------
D.CD.ELI              -----------E-L------
D.CD.NDK              -----------E--------
D.UG.94UG1141         -----------E--------

CONSENSUS_F           --------------------
F.CM.HIV232985        --------------------
F.CM.HIV232986        -------------L------
F.FR.HIV232987        ---------F----------

CONSENSUS_F1          -----------?--------
F1.BE.VI850           ----V---------------
F1.BR.93BR020.1       -----------G--------
F1.FI.FIN9363         -----------G-F---Q-x
F1.FR.MP411           ---------F----------

CONSENSUS_F2          -------------?------
F2.CM.MP255           --------------------
F2.CM.MP257           -------------L------

CONSENSUS_G           -------------f---F--
G.BE.DRCBL            -------------F---F--
G.FI.HH8793           ----V--------F---F--
G.ML.HIV232990        -------------L---F--
G.NG.92NG083          -------------F---F--
G.NG.HIV232991        --L--------G-F---F--
G.NG.HIV232992        -----------G-F---F--
G.SE.SE6165           ---------F-G-F---F--

CONSENSUS_H           -----------g-f------
H.BE.VI991            -----------G-F------
H.BE.VI997            -------------L------
H.CD.HIV232994        -----------E-F-F-F--
H.CD.HIV232995        ----V------G-L-F----
H.CF.90CF056          -----------G-F------

CONSENSUS_J           --?--------G-?---F--
J.SE.SE9173           --x--------G-F---F--
J.SE.SE9280           --I--------G-----F--

CONSENSUS_K           ---------?-?-F--GF--
K.CD.EQTB11C          ---------F-G-F--GF--
K.CM.MP535            -------------F--GF--
N.CM.YBF30            -------I---Q-F---F--

CONSENSUS_O           ---------?-?-F---F--
O.CM.ANT70C           -----------G-F---F--
O.CM.MVP5180          ---------F---F---F--
CRF01_AE.CF.90CF402   -----------G-F---F--
CRF01_AE.FR.232982    -----------G-F---F--
CRF01_AE.FR.232983    -----------G-F---F--
CRF01_AE.FR.232984    ---------F-E-F---F--
CRF01_AE.TH.1-2       ---------F-E-F---F--
CRF01_AE.TH.1-3       ---------F-E-F---F--
CRF01_AE.TH.11-25     -H-------F-G-F---F--
CRF01_AE.TH.11-31     ---------F-G-F---F--
CRF01_AE.TH.122-21    -----------G-F---F--
CRF01_AE.TH.18-47     -------------F---F--
CRF01_AE.TH.235-3     -----------G-F---F--
CRF01_AE.TH.235-32    -----------G-F---F--
CRF01_AE.TH.24-54     -----------G-F---F-F
CRF01_AE.TH.240-12    -----------G-F-F-F--
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CRF01_AE.TH.26-3      -----------G-F---F--
CRF01_AE.TH.35-6      -----------G-F---F--
CRF01_AE.TH.6-9       -----------G-F---F--
CRF01_AE.TH.73-44     ---------F-G-F---F--
CRF01_AE.TH.74-26     -------------F---F--
CRF01_AE.TH.89-30     ---------F-G-F---F--
CRF01_AE.TH.9-3       -----------G-F---F--
CRF01_AE.TH.93TH253   -----------G-F---F--
CRF01_AE.TH.98-4      -----------G-F---F--
CRF01_AE.TH.CM240     -----------G-F---F--
CRF01_AE.TH.TH022     -----------G-F---F--
CRF01_AE.TH.TH047     ---------F-E-F---F--
CRF02_AG.FR.DJ263     -------------F--GF--
CRF02_AG.FR.DJ264     -----------G-F--GF--
CRF02_AG.NG.IBNG      -----------G--------
CRF03_AB.RU.KAL1532   -----------G-F------
CRF04_cpx.CY.94CY03   ---------F-G-L------
CRF04_cpx.GR.97PVCH   ---------F---L------
CRF04_cpx.GR.97PVMY   --------------------
AC.IN.21301           -----------G-L---F--
AC.RW.92RW009         -----------------F--
AC.SE.SE9488          -----------G-L------
AC.ZM.ZAM184          -----------G--------
ACD.SE.SE8603         -----------------F--
AD.SE.SE6954          -----------G--------
AD.SE.SE7108          --------------------
ADHU.NO.NOGIL3        --------------------
ADU.CD.MAL            -----------G-F------
AF.GA.HIV232981       -----------G-F------
AG.NG.G3              Q------------F---F--
AG.SE.SE7812          --------------------
AGHU.GA.VI354         --L------F-G-F--GF--
AGJ.AU.BFP90          ----V--------F---F--
AGJ.ML.95ML84         ---------F-G-F---F--
AGU.CD.Z321           ---------F-G-F---F--
BF.BR.93BR029.4       -----------G-L------
DF.BE.VI961           ---------F-G-L------
GH.GA.HIV232993       -----------G-F--GF--
GU.FR.HIV232974       -----------G-F------
U.CD.VI1126           -----------G-F-----I
U.CM.HIV232988        -------------F--GF--
U.FR.HIV232958        -----------G-F--GF--
U.FR.HIV232960        -----------G-F--GF--

CONSENSUS_CPZ         ----?------?-F--??--
CPZ.GA.CPZGAB         ----T--------F------
CPZ.US.CPZUS          -----------Q-F--GF--
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TPKFKLPIQKETWETWWTEY

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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            -------------------
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         -------------------
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-------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             ----------------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         ----------------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    ----------------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--
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ERYLKDQQLLGF

```
QUERY                ERYLKDQQLLGF

CONSENSUS_A          -----------I
A.GB.MA246           ----R---I--I
A.GB.MC108           -----------I
A.KE.K89             ----R------I
A.KE.Q23-CXC-CG      ----R------I
A.NG.NG1935          -----------I
A.RW.KIG93           -----------I
A.RW.SF1703          -----------I
A.SE.SE6594          -----------I
A.SE.SE7253          -----------I
A.SE.SE7535          -----------I
A.SE.SE8131          -----------I
A.SE.SE8538          -----------I
A.SE.SE8891          ----R------I
A.UG.92UG037         ----R------I
A.UG.U455            ----Q------I
A.UG.UG273A          ----R------I
A.UG.UG275A          ----R------I

CONSENSUS_B          -----------i
B.AU.MBC18           ----R------L
B.AU.MBC200          ----R------I
B.AU.MBC925          -----------I
B.AU.MBCC54          ----T------I
B.AU.MBCC98          ----R------I
B.AU.MBCD36          ----M------I
B.BE.SIMI84          -----------I
B.CN.RL42            -----------I
B.DE.D31             ----R------I
B.DE.HAN             ----R------I
B.ES.89SP061         ----R-------
B.FR.HXB2            -----------I
B.FR.PHI120          -----------I
B.FR.PHI133          ----G------I
B.FR.PHI146          -----------I
B.FR.PHI153          ----G------I
B.FR.PHI159          -----------I
B.FR.PIH155          ----Q------I
B.FR.PIH160          ----Q--R---I
B.FR.PIH309          -----------I
B.FR.PIH373          -----------I
B.FR.PIH374          -----------I
B.GA.OYI             -----------I
B.GB.AC-46           -----------I
B.GB.CAM1            -----------I
B.GB.GB8.C1          -----------I
B.GB.JB              -----------I
B.GB.M23470          -----------I
B.GB.M26864          ----R------I
B.GB.M30156          -----------I
B.GB.M737677         ----R------I
B.GB.M737685         ----R------I
B.GB.MANC            ----Q------I
B.GB.MB314           -----------I
B.GB.WB              ----Q--R---I
B.JP.ETR             ---------M-I
B.JP.JH32            -----------I
B.NL.3202A21         -----------I
B.NL.68A             -----------I
B.NL.ENVVA           -----------I
B.NL.ENVVF           -S--R------I
B.NL.ENVVG           -----------I
B.NL.H0320-2A12      -----------I
B.TH.TH936705        -----------I
B.TT.QZ4589          ----R------I
B.TW.LM49            ----R------I
B.US.85WCIPR54       -----------I
B.US.92US657.1       -----------I
B.US.ADA             ----R------I
B.US.ALA1            ----R-----EI
B.US.BC              -----------I
B.US.BRVA            -----------I
B.US.C26-12.1BH      ----R------I
B.US.CDC452          ------------
B.US.DH123           ----Q------I
B.US.ENVUS-R2        -----------I
B.US.JRCSF           ---------M-I
B.US.JRFL            ----G------I
B.US.M02-3.SW        -----------I
B.US.MNCG            ------------
B.US.NC7             -----------I
B.US.NL43E9          -----------I
B.US.NY5CG           ----------RI
B.US.P896            ----R----M-I
B.US.RF              ----R------I
B.US.SC              ----R------I
B.US.SC141           KK--RN-----I
B.US.SC14C           ----R------I
B.US.SF128A          ----R------I
B.US.SF2             ----R------I
B.US.SFMHS1          -----------I
B.US.SFMHS11         -----------I
B.US.SFMHS16         -----------I
B.US.SFMHS17         -----------I
B.US.SFMHS18         -----------I
B.US.SFMHS19         ----R------I
B.US.SFMHS2          ----R------I
B.US.SFMHS20         ----Q------I
B.US.SFMHS21         ----R------I
B.US.SFMHS3          -----------I
B.US.SFMHS4          ---------M-I
B.US.SFMHS5          -----------I
B.US.SFMHS6          -----------I
B.US.SFMHS7          ----V------I
B.US.SFMHS8          -----------I
B.US.SFMHS9          ----R------I
B.US.US1             -----------I
B.US.US2             -----------I
B.US.US3             -----------I
B.US.US4             -----------I
B.US.WC001           -----------I
B.US.WEAU160         -----------I
B.US.WMJ22           ----R------I
B.US.WR27            ----R------I
B.US.YU2             ----R------I

CONSENSUS_C          -----------i
C.BI.BU910112        -----------I
C.BI.BU910213        -----------I
C.BI.BU910316        -----------I
C.BI.BU910423        ----R--R---I
C.BI.BU910518        ----Q------M
C.BI.BU910611        -----------I
C.BI.BU910717        -----------I
C.BI.BU910812        ----R------I
C.BR.92BR025         ----R------I
C.BW.96BW01B03       -----------I
C.BW.96BW0402        -----------I
C.BW.96BW0502        -----------I
C.BW.96BW11B01       -----------I
C.BW.96BW1210        ----R------I
C.BW.96BW15B03       -----------I
C.BW.96BW16B01       -----------I
C.BW.96BW17B05       -----G-----I
C.DJ.DJ259A          -----------I
C.DJ.DJ373A          -----------I
C.ET.ETH2220         --H-R------I
C.IN.21068           -----------I
C.IN.301904          -----------I
C.IN.301905          -----------I
C.IN.301999          -----------I
C.IN.94IN11246       -----------I
C.SN.SE364A          -----------I
C.SO.SM145A          ----E------I
C.UG.UG268A2         ----Q------I

CONSENSUS_D          -?---------i
D.CD.84ZR085         -----------I
D.CD.ELI             -----------I
D.CD.JY1             -S---------I
D.CD.NDK             ----R------I
D.CD.Z2Z6            -----------I
D.SN.SE365A2         ----R------I
D.TZ.87TZ4622        -S--R------I
D.UG.92UG024D        -S---------I
D.UG.94UG1141        -S---------I
D.UG.C971-412        -S---------I
D.UG.UG266A2         -S---------I
D.UG.UG269A          -S--G------I
D.UG.UG274A2         -----------I
D.UG.WHO15-474       ----Q------S
F.BR.BZ126A          ----Q------L

CONSENSUS_F1         -----------?
F1.BE.VI850          -----------I
F1.BR.93BR020.1      -----------L
F1.FI.FIN9363        -----------L
F1.FR.MP411          -----------I

CONSENSUS_F2         -----------I
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F2.CM.MP255          -----------I
F2.CM.MP257          -----------I

CONSENSUS_G          -----------I
G.BE.DRCBL           -----------I
G.FI.HH8793          ----R------I
G.GA.LBV217          ----Q------I
G.NG.92NG083         -----------I
G.NG.NG1928          -----------I
G.NG.NG1929          -----------I
G.NG.NG1937          --F--------I
G.NG.NG1939          -----------I
G.SE.SE6165          -----------I

CONSENSUS_H          -----------I
H.BE.VI991           -----------I
H.BE.VI997           -----------I
H.CF.90CF056         ----R------I

CONSENSUS_J          -----------I
J.SE.SE9173          -----------I
J.SE.SE9280          -----------I

CONSENSUS_K          ----?------I
K.CD.EQTB11C         ----R------I
K.CM.MP535           -----------I
N.CM.YBF30           ----R---I-SL

CONSENSUS_O          -tliqn----nl
O.CM.ANT70C          -TL-QN----SL
O.CM.CM4974          -TLIQN--R-NL
O.CM.HIV1CA9EN       -TLIQN----NL
O.CM.MVP5180         -TLIQN--R-NL
O.GA.VI686           -TLIQN----NL
O.GQ.193HA           -TLIQN----NL
O.GQ.276HA           -TLIQN----NL
O.GQ.341HA           -TLIQN----NL
O.GQ.655HA           ...........
AC.IN.21301          -----------I
AC.RW.92RW009        ----R------I
AC.SE.SE9488         -----------I
AC.ZM.ZAM174         ----Q------I
AC.ZM.ZAM184         ----Q------I
AC.ZM.ZAM716-3       ----Q------I
ACD.SE.SE8603        -----------I
AD.KE.K124A2         -S---------I
AD.SE.SE6954         -----------I
AD.SE.SE7108         -----------I
AD.UG.C6080-10       --C--------I
AD.UG.UG/92/035      -S--R------I
ADHU.NO.NOGIL3       -----------I
ADU.CD.MAL           ----Q--R---M
AG.GA.VI191A2        ----R------I
AG.NG.G3             -----------I
AG.SE.SE7812         -A---------I
AGHU.GA.VI354        -----------I
AGJ.AU.BFP90         -----------I
AGJ.ML.95ML84        -----------I
AGJ.NG.NG3670        ----R------L
AGU.CD.Z321          -----------I
AU.NG.NG3678         -----------I
BF.BR.93BR029.4      -----------L
CD.BI.BU910905       -----------I
CRF01_AE.CF.90CF402  -------KF--L
CRF01_AE.TH.93TH253  -------KF--L
CRF01_AE.TH.A01021.  -------KF--L
CRF01_AE.TH.070703   -----N-KF--L
CRF01_AE.TH.070704   -------KF--L
CRF01_AE.TH.070705   -------KF--L
CRF01_AE.TH.070707   xxT$#--KF--L
CRF01_AE.TH.070708   -------KF--L
CRF01_AE.TH.070709   -------KF--L
CRF01_AE.TH.070710   -------KF--L
CRF01_AE.TH.070711   -------KF--L
CRF01_AE.TH.070713   -------KF--L
CRF01_AE.TH.CM240    -------KF--L
CRF01_AE.TH.E11429.  -------KF--L
CRF01_AE.TH.KH03     -------KF--L
CRF01_AE.TH.KH08     -------RF--L
CRF01_AE.TH.TH022    -------KF--L
CRF01_AE.TH.TH047    -------KF--L
CRF01_AE.TH.TH92014  -------KF--L
CRF01_AE.TH.TH92111  -------KF--L
CRF02_AG.DJ.DJ258A   -S--R------I
CRF02_AG.FR.DJ263    -S--R------I
CRF02_AG.FR.DJ264    ----R------I
CRF02_AG.NG.IBNG     ----R------I
CRF02_AG.NG.NG1921   -G--R------I
CRF02_AG.NG.NG3675   ----R------I
CRF03_AB.RU.KAL1532  -----------I
CRF03_AB.RU.KAL681   -----------I
CRF03_AB.UA.UKR9700  -----------I
CRF04_cpx.CY.94CY03  -S---------I
CRF04_cpx.GR.97PVCH  -S---------I
CRF04_cpx.GR.97PVMY  -S--R------I
DF.BE.VI961          ----R------L
GH.GA.VI525          --F-----P--I
GU.NG.NG3670         -----------I
U.CD.VI1126          -----------I

CONSENSUS_CPZ        ----?---i--L
CPZ.CD.CPZANT        -K--R-----SL
CPZ.GA.CPZGAB        ----Q---I--L
CPZ.US.CPZUS         --------I--L
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Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer0: PDWQNYTPGPGVRYPLTFGW Nef(122–141)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(7-14)	TPGPGVRY	B*35
(9-16)	GPGVRYPL	B*35
(7-16)	TPGPGVRYPL	B*35
(9-18)	GPGVRYPLTF	B*35
(7-14)	TPGPGVRY	B*3501
(9-16)	GPGVRYPL	B*3501
(7-16)	TPGPGVRYPL	B*3501
(9-18)	GPGVRYPLTF	B*3501
(9-16)	GPGVRYPL	Cw*0401
(7-16)	TPGPGVRYPL	Cw*0401
(9-18)	GPGVRYPLTF	Cw*0401

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer1: GVRYPLTFGWCYKLVPVEPD Nef(132–151)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(4-12)	YPLTFGWCY	B*35
(4-12)	YPLTFGWCY	B*3501
(7-14)	TFGWCYKL	Cw*0401

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer2: TSLLHPVSLHGMDDPEREVL Nef(162–181)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(5-12)	HPVSLHGM	B*35
(5-12)	HPVSLHGM	B*3501
(5-12)	HPVSLHGM	B*3503

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer3: EEEEVGFPVTPQVPLRPMTY Nef(62–81)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(7-15)	FPVTPQVPL	B*35
(10-18)	TPQVPLRPM	B*35
(13-20)	VPLRPMTY	B*35
(7-15)	FPVTPQVPL	B*3501
(10-18)	TPQVPLRPM	B*3501
(13-20)	VPLRPMTY	B*3501
(10-18)	TPQVPLRPM	B*3503
(7-15)	FPVTPQVPL	Cw*0401
(6-15)	GFPVTPQVPL	Cw*0401

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer4: PQVPLRPMTYKAAVDLSHFL Nef(72–91)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(9-16)	TYKAAVDL	A24
(3-10)	VPLRPMTY	B*35
(3-10)	VPLRPMTY	B*3501
(9-16)	TYKAAVDL	Cw*0401

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer5: TPKFKLPIQKETWETWWTEY RT(386–405)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(1-8)	TPKFKLPI	B*35
(1-8)	TPKFKLPI	B*3501

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

Study Subject ID:01RCH44
Study Subject Clone:
Study Subject HLA:A24,B35,Cw4
Sequence: Known reactive 20Mer6: ERYLKDQQLLGF gp160(584–595)

Possible HLA

A24	A*2402,A*2403,A*2404,A*2405,A*2406,A*2407,A*2408,A*2413,A*2414
B35	B*35,B*1522,B*3501,B*3502,B*3503,B*3504,B*3505,B*3506,B*3507,B*3508,B*3509,B*3511,B*3512,B*3513,B*3514,B*3515,B*3517,B*3518,B*3519,B*3520
Cw4	C4,Cw*0401,C*0401,Cw*0402

Possible Epitopes based on anchor residues

(2-10)	RYLKDQQLL	A24
(2-9)	RYLKDQQL	A24
(2-10)	RYLKDQQLL	Cw*0401
(2-9)	RYLKDQQL	Cw*0401

Anchor Residues Searched

A24	X[Y]XXXXXX[ILF]
A24	X[Y]XXXXX[ILF]
A24	X[Y]XXXXXXX[ILF]
B*35	X[P]XXXXXX[YFMLI]
B*35	X[P]XXXXX[YFMLI]
B*35	X[P]XXXXXXX[YFMLI]
B*3501	X[P]XXXXXX[YFMLI]
B*3501	X[P]XXXXX[YFMLI]
B*3501	X[P]XXXXXXX[YFMLI]
B*3503	X[P]XXXXXX[M]
B*3503	X[P]XXXXX[M]
B*3503	X[P]XXXXXXX[M]
Cw*0401	X[YPF]XXXXXX[LF]
Cw*0401	X[YPF]XXXXX[LF]
Cw*0401	X[YPF]XXXXXXX[LF]

This table lists epitopes that are experimentally observed to be presented by a HLA type carried by the patient, but the de£ned 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(124–132)	NSSKVSQNY	HSNQVSQNY	NSSQVSQNY	B*3501	
p17(124–132)	NSSKVSQNY	HSNQVSQNY	NSSQVSQNY	B35	
p17-p24(131–6)	NYPIVQNL	NYPIVQNI	NYPIVQNL	A*2402	
p24(122–130)	PPIPVGDIY	PPIPVGEIY	PPIPVGEIY	B*3501	
p24(122–130)	NPVPVGNIY	PPIPVGEIY	PPIPVGEIY	B*3501	
p24(122–130)	PPIPVGDIY	PPIPVGEIY	PPIPVGEIY	B35	
p24(122–130)	PPIPVGDIY	PPIPVGEIY	PPIPVGEIY	B35	
p24(162–172)	RDYVDRFFKTL	RDYVDRFYKTL	RDYVDRFYKTL	A*2402	
RT(118–127)	VPLDKDFRKY	VPLDEDFRKY	VPLDKDFRKY	B*3501	
RT(118–127)	VPLDKDFRKY	VPLDEDFRKY	VPLDKDFRKY	B35	
RT(175–183)	HPDIVIYQY	NPDIVIYQY	NPDIVIYQY	B*3501	
RT(175–183)	HPDIVIYQY	NPDIVIYQY	NPDIVIYQY	B35	
RT(175–183)	HPDIVIYQY	NPDIVIYQY	NPDIVIYQY	B35	
RT(175–183)	HPDIVIYQY	NPDIVIYQY	NPDIVIYQY	B35	
gp160(78–86)	DPNPQEVVL	DPNPQEVEL	DPNPQEVVL	B*3501	
gp160(78–86)	DPNPQEVVL	DPNPQEVEL	DPNPQEVVL	B35	
gp160(78–86)	DPNPQEVVL	DPNPQEVEL	DPNPQEVVL	B35, B51	
gp160(252–260)	RPIVSTQLL	RPVVSTQLL	RPVVSTQLL	B*3501	
gp160(252–260)	RPIVSTQLL	RPVVSTQLL	RPVVSTQLL	B35	
gp160(309–317)	IYIGPGRAF	IHIGPGRAF	IHIGPGRAF	A*2402	
gp160(383–391)	FYCNTTQLF	FYCNTSPLF	FYCNTTQLF	A*2402	
gp160(585–592)	RYLRDQQL	RYLKDQQL	RYLKDQQL	A*2402	
gp160(585–593)	RYLRDQQLL	RYLKDQQLL	RYLKDQQLL	A*2402	
gp160(585–595)	RYLRDQQLLGI	RYLKDQQLLGF	RYLKDQQLLGI	A*2402	
gp160(606–614)	TAVPWNASW	TTVPWNASW	TAVPWNASW	B*3501	
gp160(606–614)	TAVPWNASW	TTVPWNASW	TAVPWNASW	B35	
gp160(680–689)	WYIKIFIFMI	WYIKIFIMIV	WYIKIFIMIV	A*2402	
gp160(767–775)	SYRRLRDLL	SYHH-RDLL	SYHRLRDLL	A*2402	
Nef(68–76)	FPVRPQVPL	FPVTPQVPL	FPVRPQVPL	B*3501	
Nef(68–76)	FPVRPQVPL	FPVTPQVPL	FPVRPQVPL	B35	
Nef(69–79)	RPQVPLRPMTY	TPQVPLRPMTY	RPQVPLRPMTY	B35	
Nef(71–81)	RPQVPLRPMTY	TPQVPLRPMTY	RPQVPLRPMTY	B*3501	
Nef(71–81)	RPQVPLRPMTY	TPQVPLRPMTY	RPQVPLRPMTY	B35	

Nef(73–82)	SVPLRPMTYK	QVPLRPMTYK	QVPLRPMTYK	B35 or C4
Nef(134–143)	RYPLTFGWCF	RYPLTFGWCY	RYPLTFGWCF	A*2402
Nef(135–143)	YPLTFGWCF	YPLTFGWCY	YPLTFGWCF	B35

Table 1: **p17**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
p17(124–132)	p17(124–132 LAI)	NSSKVSQNY	HIV-1 or -2 infection	human(B*3501)	[Brander & Goulder(2001)]
	• Noted by Brander to be B*3501 epitope				
p17(124–132)	p17(124–132 LAI)	NSSKVSQNY	HIV-1 infection	human(B35)	[McMichael & Walker(1994)]
	• Review of HIV CTL epitopes				

Table 2: **p17-p24**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
p17-p24(131–6)	p17-p24(132–140 SF2)	NYPIVQNL	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• The epitope starts in p17 and ends in p24 • De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 1/4 HIV-1+ people tested • NYPIVQNL bound to A*2402 with medium strength, and the epitope can be processed in a vaccinia construct and presented – no CTL clone was obtained				

Table 3: **p24**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
p24(122–130)	p24(260–268 LAI)	PPIPVGDIY	HIV-1 or -2 infection	human(B*3501)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*3501 epitope				
p24(122–130)	p24(245–253 HIV-2)	NPVPVGNIY	HIV-1 infection	human(B*3501)	[Rowland-Jones (1995)]
p24(122–130)	p24(260–268 LAI)	PPIPVGDIY	HIV-1 or -2 infection	human(B35)	[Rowland-Jones (1995)]
	• De£ned as minimal peptide by titration curve, PPIPVGEIY and HIV-2 form NPVPVGNIY are also recognized				
p24(122–130)	p24()	PPIPVGDIY		human(B35)	[Rowland-Jones (1999)]
	• 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 • 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 • HIV-2 version of this epitope is not conserved: NPVPVGNIY, but the CTLs are cross-reactive – one of £ve B35 CTL epitopes that are cross-reactive, see also [Rowland-Jones (1995)]				
p24(162–172)	p24(296–306 Clade A)	RDYVDRFFKTL	HIV-1 infection	human(A*2402)	[Dorrell (1999)]
	• 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 • This epitope is similar to the A24 DYVDRYFKT epitope found for B subtype, but CTL from this A subtype infection required the additional Arg – the B clade sequence change from F to Y diminished CTL reactivity • C. Brander notes that this is an A*2402 epitope in the 1999 database				

Table 4: **RT**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
RT(118–127)	RT(273–282 SF2)	VPLDKDFRKY	HIV-1 infection	human(B*3501)	[Tomiyama (1997), Menendez-Arias (1998)]
	• A CTL clone responsive to this epitope was obtained • 4/7 B35-positive individuals had a CTL response to this epitope • A K to E substitution at position 5 abrogates speci£c lysis, and reduces binding to B*3501 • [Menendez-Arias (1998)], in a review, notes that a Glu to Lys (E to K) change abrogates CTL activity, but that both VPLDEDFRKY and VPLDKDFRKY can serve as HLA-B35 epitopes, so the change must alter T cell receptor binding – residues in this epitope may be important for polymerase activity				
RT(118–127)	()	VPLDKDFRKY	HIV-1 infection	human(B35)	[Kawana (1999)]
	• HLA B35 is associated with rapid disease progression • The sequences of 9 previously described HIV-1 B35 CTL epitopes were obtained in 10 HLA B35+ and 19 HLA B35- individuals • 3/9 CTL epitopes had substitutions that were more common in B35+ individuals than in B35- individuals – only one of these reduced the binding of the peptide to B35 and was shown to be an escape mutation • ——E—- was found in 8/10 of the B35+ individuals, and three of the B35- individuals – the D –> E substituted peptide had similar binding af£nity to B35 and was equally susceptible to a CTL clone				
RT(175–183)	RT(342–350 LAI)	HPDIVIYQY	HIV-1 infection	human(B*3501)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*3501 epitope				
RT(175–183)	RT(342–350 LAI)	HPDIVIYQY	HIV-1 infection	human(B35)	[McMichael & Walker(1994)]
	• Review of HIV CTL epitopes				
RT(175–183)	RT(329–337)	HPDIVIYQY	none	human(B35)	[Lalvani (1997)]
	• A peptide-based protocol was optimized for restimulation of CTLp using optimized peptide and IL-7 concentrations – importantly this protocol does not stimulate a primary response, only secondary – peptide-speci£c CTLp counts could be obtained via staining with peptide-Class I tetramers • This peptide was one of the B35 presented test peptides used in control experiments showing that the assay gave no activity using lymphocytes from 21 healthy B35 seronegative donors				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
RT(175–183)	Pol()	HPDIVIYQY		human(B35)	[Rowland-Jones (1999)]
	• 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 • 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 • HIV-2 version of this epitope is not conserved: NPDVILIQY, but the CTLs are cross-reactive – one of £ve B35 CTL epitopes that are cross-reactive, see also [Rowland-Jones (1995)]				

Table 5: **gp160**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
gp160(78–86)	gp120(77–85)	DPNPQEVVL	HIV-1 infection	human(B*3501)	[Ogg (1998)]
	• This epitope was included to illustrate the speci£city of HIV-tetrameric staining, in a cross-sectional study correlating HLA A*0201 CTL effector cells and low viral load				
gp160(78–86)	Env(77–85)	DPNPQEVVL	HIV-1 infection	human(B35)	[Dyer (1999)]
	• CTL speci£c responses were measured over a 1.3 to 1.5 year period in members of the Sydney Blood Bank Cohort (SBBC) who had been infected with a natural attenuated strain of HIV-1 which was Nef-defective • Some of these patients had prolonged high levels of CTL effector and memory cells despite low viral load				
gp160(78–86)	gp120(77–85 SF2)	DPNPQEVVL	HIV-1 infection	human(B35, B51)	[Shiga (1996)]
	• Binds HLA-B*3501 and B*5101 – binds and kills gp120-vaccinia virus infected cells carrying B35 or B51				
gp160(252–260)	gp120(255–263 SF2)	RPIVSTQLL	HIV-1 infection	human(B*3501)	[Tomiyama (1997)]
	• A CTL clone responsive to this epitope was obtained • Only 1/7 B35-positive individuals had a CTL response to this epitope • An I to V substitution at position 3 reduces speci£c lysis, but not binding to B*3501 • A Q to H substitution at position 7 abrogates speci£c lysis, but not binding to B*3501				
gp160(252–260)	gp120(255–263 SF2)	RPIVSTQLL	HIV-1 infection	human(B35)	[Shiga (1996)]
	• Binds HLA-B*3501				
gp160(309–317)	gp120(310–318 SF2)	IYIGPGRAF	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 1/4 HIV-1+ people tested • IYIGPGRAF bound to A*2402 strongly, the epitope can be processed in a vaccinia construct and presented – no speci£c CTL clones were obtained				
gp160(383–391)	gp120(385–393)	FYCNTTQLF	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 1/4 HIV-1+ people tested • FYCNTTQLF bound to A*2402 strongly, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
gp160(585–592)	gp41(584–591 SF2)	RYLRDQQL	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 2/4 HIV-1+ people tested • RYLRDQQL bound to A*2402 weakly, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				
gp160(585–593)	gp41(584–591 SF2)	RYLRDQQLL	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 4/4 HIV-1+ people tested • RYLRDQQLL bound to A*2402 strongly, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				
gp160(585–595)	gp41(584–591 SF2)	RYLRDQQLLGI	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 4/4 HIV-1+ people tested • RYLRDQQLLGI bound to A*2402 with medium strength, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				
gp160(606–614)	gp41(605–615 LAI)	TAVPWNASW	gp160 vaccinia	human(B*3501)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*3501 epitope				
gp160(606–614)	gp41(605–615 LAI)	TAVPWNASW	gp160 vaccinia	human(B35)	[Johnson (1994)]
	• Epitope for vaccine induced CD8+ clone				
gp160(680–689)	gp41(679–687 SF2)	WYIKIFIFMI	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 1/4 HIV-1+ people tested • WYIKIFIFMI bound to A*2402 strongly, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
gp160(767–775)	gp41(766–774 SF2)	SYRRLRDLL	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 1/4 HIV-1+ people tested • SYRRLRDLL bound to A*2402 moderately, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				

Table 6: **Nef**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(68–76)	Nef(72–80 SF2)	FPVRPQVPL	HIV-1 infection	human(B*3501)	[Tomiyama (1997)]
	• A CTL clone responsive to this epitope was obtained • 3/7 B35-positive individuals had a CTL response to this epitope • An R to T substitution at position 4 abrogates speci£c lysis, but not binding to B*3501				
Nef(68–76)	Nef(72–80 SF2)	FPVRPQVPL	HIV-1 infection	human(B35)	[Shiga (1996)]
	• Binds HLA-B*3501				
Nef(69–79)	()	RPQVPLRPMTY	HIV-1 infection	human(B35)	[Kawana (1999)]
	• HLA B35 is associated with rapid disease progression • The sequences of 9 previously described HIV-1 B35 CTL epitopes were obtained in 10 HLA B35+ and 19 HLA B35- individuals • 3/9 CTL epitopes had substitutions that were more common in B35+ individuals than in B35- individuals – only one of these reduced the binding of the peptide to B35 and was shown to be an escape mutation • ———-F was found in 9/10 of the B35+ individuals, none of the B35- individuals – the Y –> F substituted peptide had a similar binding af£nity with B35 and was recognized by a CTL clone equally with wildtype				
Nef(71–81)	Nef(75–85 SF2)	RPQVPLRPMTY	HIV-1 infection	human(B*3501)	[Tomiyama (1997)]
	• A CTL clone responsive to this epitope was obtained • 4/7 B35-positive individuals had a strong CTL response to this epitope • An R to T substitution at position 1 abrogates speci£c lysis, but not binding to B*3501 • An R to H substitution at position 7 did not alter reactivity				
Nef(71–81)	Nef(75–85 SF2)	RPQVPLRPMTY	HIV-1 infection	human(B35)	[Shiga (1996)]
	• Binds HLA-B*3501				
Nef(73–82)	Nef(73–82 LAI)	SVPLRPMTYK	HIV-1 infection	human(B35 or C4)	[Buseyne (1993)]
	• Vertical transmission of HIV ranges from 13% to 39% • Primary assays showed cytotoxic activity against at least one HIV protein was detected in 70% of infected children • Epitopes recognized in £ve children were mapped using synthetic peptides and secondary cultures • 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				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(134–143)	Nef(138–147 SF2)	RYPLTFGWCF	HIV-1 infection	human(A*2402)	[Ikeda-Moore (1997)]
	• De£ned using reverse immunogenetics – 59 HLA-A*2402 binding peptides were predicted by searching for A*2402 anchors in HIV proteins (Tyr at 2, and Phe, Leu or Ile at the C term) – 53 of the 59 peptides bound A*2402 • This peptide induced CTL in 3/4 HIV-1+ people tested • RYPLTFGWCF bound to A*2402 strongly, the epitope can be processed in a vaccinia construct and presented – two speci£c CTL clones were obtained				
Nef(135–143)	Nef(139–147 SF2)	YPLTFGWCF	HIV-1 infection	human(B35)	[Shiga (1996)]
	• Binds HLA-B*3501				

Table 7: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

Table 8: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

Table 9: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

Table 10: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

Table 11: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

Table 12: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

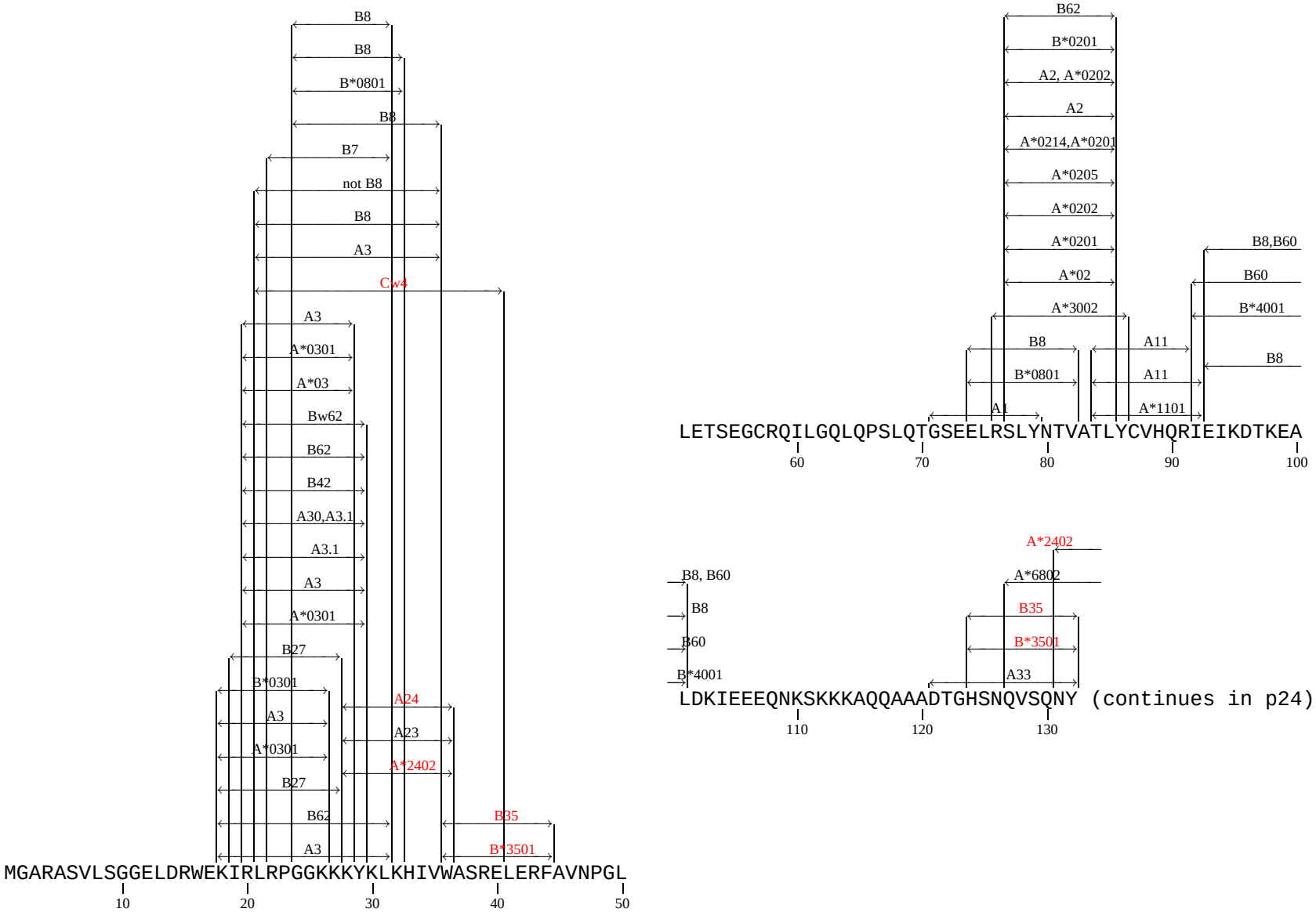
Table 13: **All De£ned Epitopes within the 20mer, regardless of HLA type**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(122–141)	Nef(121–140 SF2)	PDWQNYTPGPGVRYPLTFGW	HIV-1 infection	human()	[Lieberman (1997)]
	• Of 25 patients, most had CTL speci£c for more than 1 HIV-1 protein • Eleven subjects had CTL that could recognize vaccinia-expressed LAI Nef • Three of these 11 had CTL response to this peptide • The responding subjects were HLA-A2, B21; HLA-A3, A24, B7, B38				
Nef(123–137)	Nef(123–137 IIIB)	QWQNYTPGPGVRYPL	HIV-1 infection	human()	[Wilson (1996)]
	• Epitope de£ned in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study • FFPDYTPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in mother and are not recognized • LFPDYKPGPGTRFPL and FFPDYKPGPGTRFPL, naturally occurring variants, were found in infant and are not recognized				
Nef(126–138)	Nef(126–138 BRU)	NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
	• Nef CTL clones from HIV+ donors				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B*0702)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*0702 epitope				
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL		human(B*4201)	[Brander & Goulder(2001)]
	• C. Brander notes this is a B*4201 epitope				
Nef(128–137)	()	TPGPGVRYPL	HIV-1 infection	human(B7)	[Wilson (2000)]
	• Three individuals with highly focused HIV-speci£c CTL responses were studied during acute infection using tetramers – high frequencies of HIV-1-speci£c CD8+ T cells were found prior to seroconversion, and there was a close temporal relationship between the number of circulating HIV-speci£c T cells and viral load was also found • All three patients were B*2705, with HLA alleles: A1, A30/31, B*2705, B35; A1, A*0301, B7, B*2705; and A*0201, A*0301, B*2705, B39 • ELISPOT was used to test a panel of CTL epitopes that had been de£ned earlier and were appropriate for the HLA haplotypes of the study subjects – 3/3 subjects showed a dominant response to the B*2705 epitope KRWIILGGLNK • The subject with A*0201 had a moderatly strong response to SLYNTVATL • Weak responses were observed to A*301-RLRPGGKKK, A*301-QVPLRPMTYK, and B7-TPGPGVRYPL in the subject who was HLA A1, A*0301, B7, B*2705 • No acute response was detected to the following epitopes: A*201-ILKEPVHGV, A*301-KIRLRPGGK, A*301-AIFQSSMTK, A*301-TVYYGVPVWK, B35-EPIVGAETF, B35-HPDIVIYQY, B35-PPIPVGEIY, B35-NSSKVSQNY, B35-VPLRPMTY, B35-DPNPQEVVL				

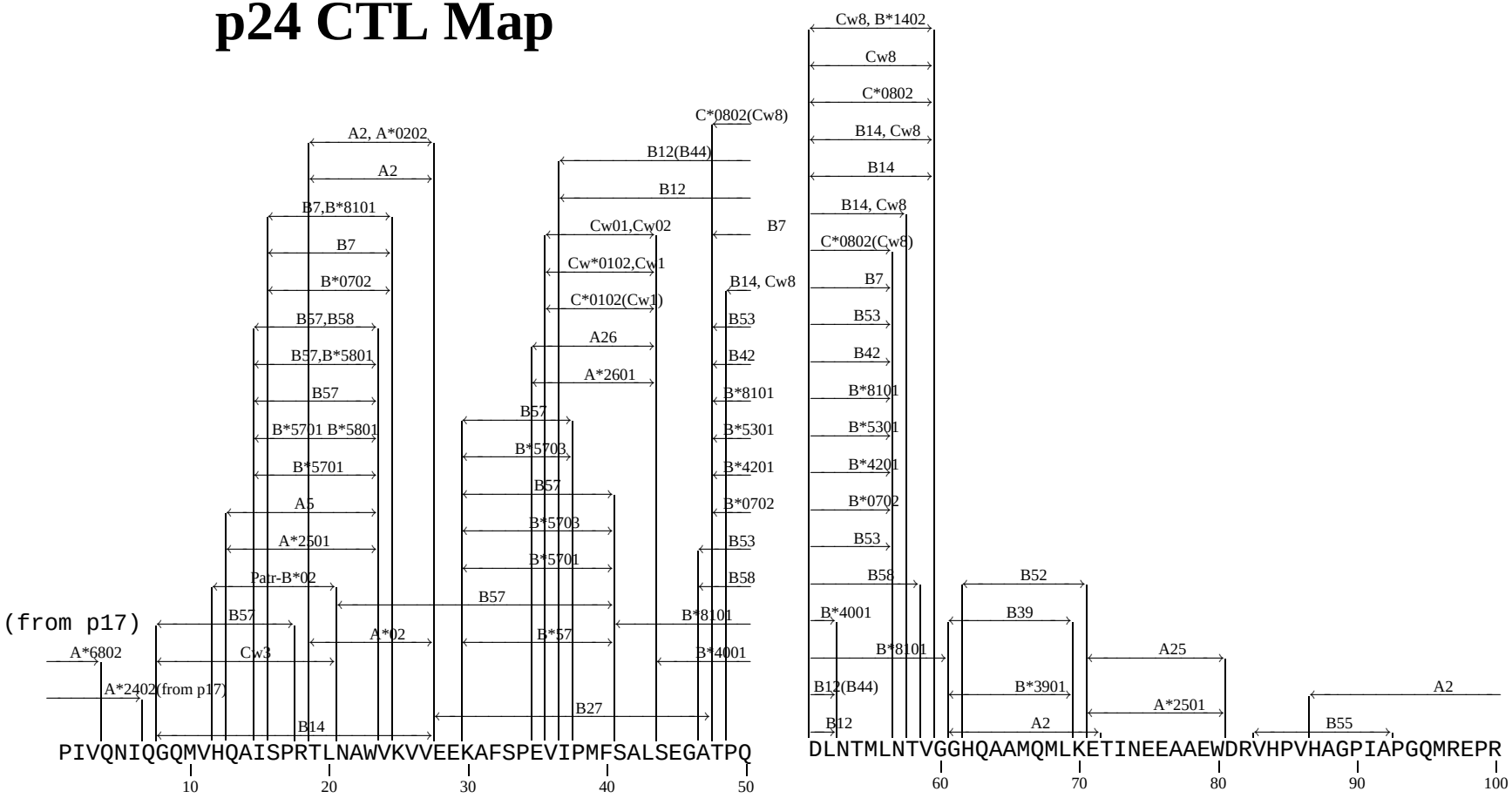
HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 LAI)	TPGPGVRYPL	HIV-1 infection	human(B7)	[Haas (1996), Haas (1997)]
	• There was a high degree of variation in three CTL epitopes in Nef in four slow and non-progressors, and variant speci£c CTLs arose over time to eliminate variants, indicating immune selection • The epitope position was taken from [Haas (1997)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998a)]
	• A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously-de£ned 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 • The D subtype consensus is identical to the B clade epitope • The A subtype consensus is TPGPGIRYPL				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7)	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • This epitope is conserved among B and D clade viruses • The Clade A version of the epitope: TPGPGIRYPL				
Nef(128–137)	Nef(128–137)	TPGPGVRYPL	*in vitro* stimulation	human(B7)	[Wilson (1999)]
	• 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 • Th1-biasing cytokines IL-12 or IFN alpha enhance CTL responses *in vitro* whether the epitope is delivered by pulsing from peptide, or expressed from within • CTL from a B7 donor displayed no reactivity to this epitope, although it had been immunodominant in another study [Haas (1996)]				
Nef(128–137)	Nef()	TPGPGVRYPL	HIV-1 exposure	human(B7(B*8101))	[Rowland-Jones (1998b)]
	• HIV-speci£c CTL were found in exposed seronegative prostitutes from Nairobi – these CTL may confer protection • Seroprevalence in this cohort is 90-95% and their HIV-1 exposure is among the highest in the world • 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 • Clade A version of the epitope: TPGPGIRYPL, clade D version: TPGPGIRYPL				

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Nef(128–137)	Nef(128–137 Clade B)	TPGPGVRYPL	HIV-1 exposed seronegative	human(B7,B*8101)	[Kaul (2000)]
	• 11/16 heavily HIV exposed but persistently seronegative sex-workers in Nairobi had HIV-speci£c 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 • Low risk individuals did not have such CD8+ cells • 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				
Nef(134–141)	Nef(138–147 LAI)	RYPLTFGW	HIV-1 infection	human(A*2402)	[Brander & Goulder(2001)]
	• C. Brander notes this is an A*2402 epitope				
Nef(134–141)	Nef(134–141 LAI)	RYPLTFGW		human(B27)	[Culmann(1998)]
	• Optimal peptide de£ned by titration				

p17 CTL Map


B8
B8
B*0801
B8
B7
not B8
B8
A3
Cw4
A3
A*0301
A*03
Bw62
B62
B42
A30,A3.1
A3.1
A3
A*0301
B27
B*0301
A3
A*0301
B27
B62
A3
A24
A23
A*2402
B35
B*3501
MGARASVLSGGELDRWEKIRLRPGGKKKYKLKHIVWASRELERFAVNPGL
10
20
30
40
50
B62
B*0201
A2, A*0202
A2
A*0214,A*0201
A*0205
A*0202
A*0201
A*02
A*3002
B8
B*0801
A1
A11
A11
A*1101
B8,B60
B60
B*4001
B8
LETSEGCRQILGQLQPSLQTGSEELRSLYNTVATLYCVHQRIEIKDTKEA
60
70
80
90
100
A*2402
B8, B60
A*6802
B8
B35
B60
B*3501
B*4001
A33
LDKIEEEQNKSKKKAQQAAADTGHSNQVSQNY (continues in p24)
110
120
130

p24 CTL Map


(from p17)
A*6802
A*2402(from p17)
B14
Pair-B*02
B57
Cw3
A5
A*2501
B57,B58
B57,B*5801
B57
B*5701 B*5801
B*5701
B7,B*8101
B7
B*0702
A2, A*0202
A2
A*02
B57
B*5703
B*5701
B57
B*5703
B57
B*57
B27
B12(B44)
B12
Cw01,Cw02
Cw*0102,Cw1
C*0102(Cw1)
A26
A*2601
C*0802(Cw8)
B7
B14, Cw8
B53
B42
B*8101
B*5301
B*4201
B*0702
B53
B58
B*8101
B*4001
PIVQNIQGQMVHQAISPRTLNAWVKVVEEKAFSPEVIPMFSALSEGATPQ
10
20
30
40
50
Cw8, B*1402
Cw8
C*0802
B14, Cw8
B14
B14, Cw8
C*0802(Cw8)
B7
B53
B42
B*8101
B*5301
B*4201
B*0702
B53
B58
B*4001
B*8101
B12(B44)
B12
B52
B39
B*3901
A2
A25
A*2501
A2
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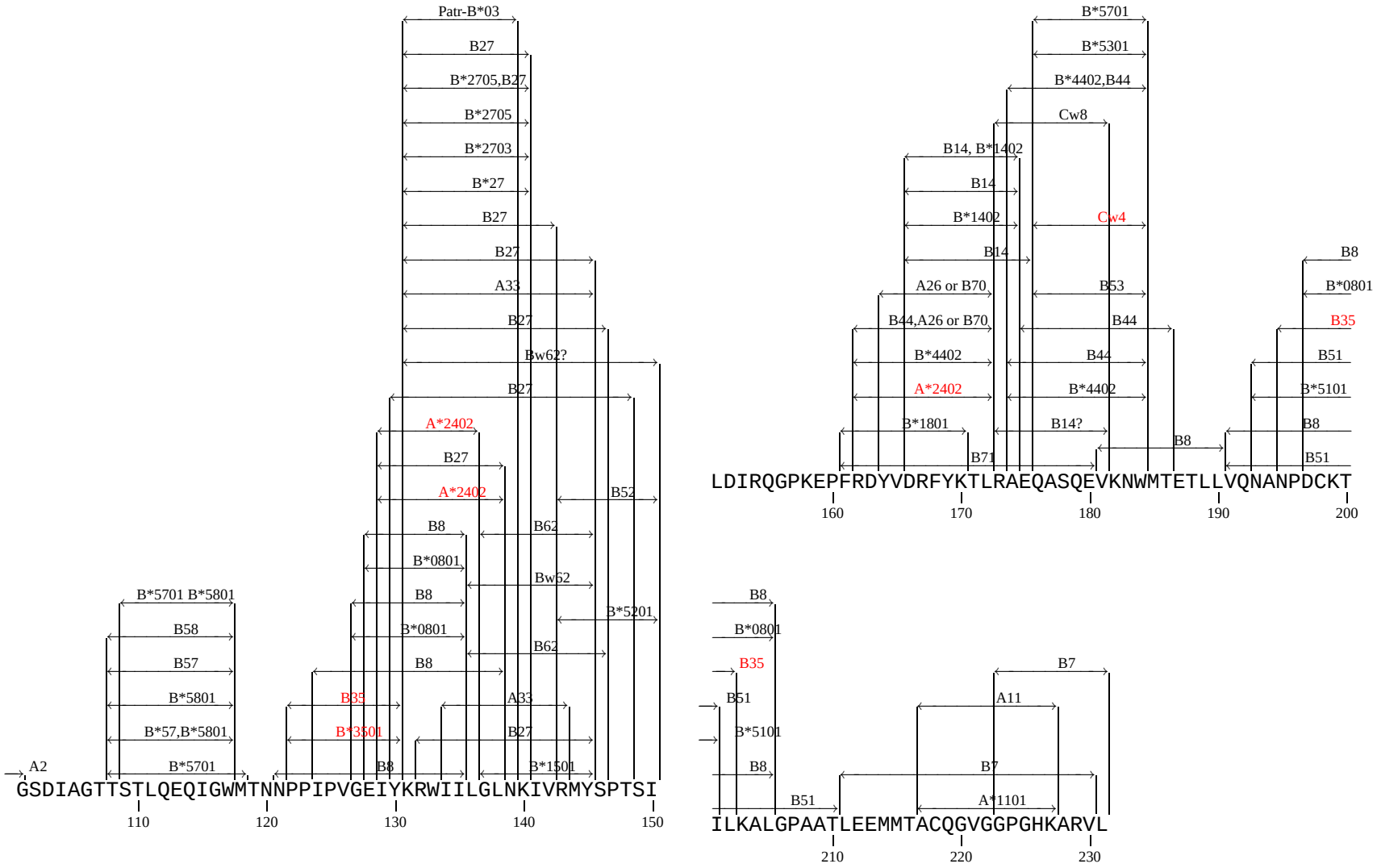
70
80
90
100


Patr-B*03
B27
B*2705,B27
B*2705
B*2703
B*27
B27
B27
A33
B27
Bw62?
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A*2402
B27
A*2402
B52
B8
B62
B*0801
Bw62
B8
B*5201
B*0801
B62
B8
B*5701 B*5801
B58
B57
B*5801
B*57,B*5801
B*5701
A2
B35
A33
B*3501
B27
B8
B*1501
GSDIAGTTSTLQEQIGWMTNNPPIPVGEIYKRWIILGLNKIVRMYSPTSI
110
120
130
140
150
B*5701
B*5301
B*4402,B44
Cw8
B14, B*1402
B14
B*1402
Cw4
B14
A26 or B70
B53
B44,A26 or B70
B44
B*4402
B44
A*2402
B*4402
B*1801
B14?
B71
B8
B8
B*0801
B35
B51
B*5101
B8
B51
LDIRQGPKEPFRDYVDRFYKTLRAEQASQEVKNWMTETLLVQNANPDCKT
160
170
180
190
200
B8
B*0801
B35
B51
B*5101
B8
B51
B7
A11
B7
A*1101
ILKALGPAATLEEMMTACQGVGGPGHKARVL
210
220
230

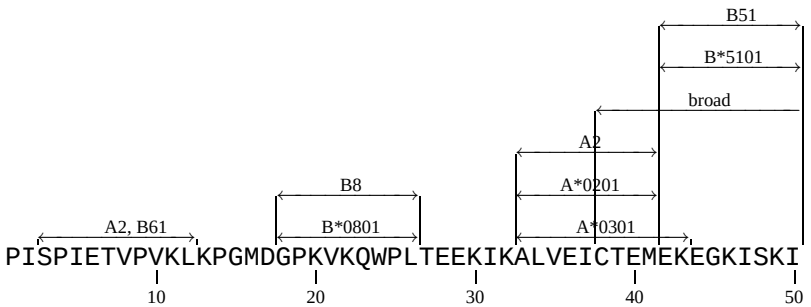
p2p7p1p6 CTL Map

```
    AEAMSQVTNSATIMMQRGNFRNQRKIVKCFNCGKEGHTARNCRAPRKKGC
              |         |         |         |         |
             10        20        30        40        50

 p2 <-            <>
start      p2 end  p7 start


        A2                        A2
    WKCGKEGHQMKDCTERQANFLGKIWPSYKGRPGNFLQSRPEPTAPPEESF
              |         |         |         |         |
             60        70        80        90       100

                  <>                  <>
             p7 end  p1 start    p1  p6 start
                                end


                         B7
    RSGVETTTPPQKQEPIDKELYPLTSLRSLFGNDPSSQ
              |         |         |
            110       120       130
                                p6 end ->
```

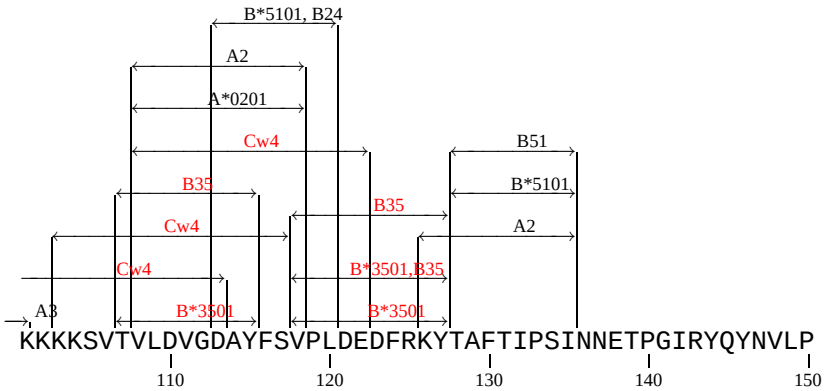
Protease CTL Map

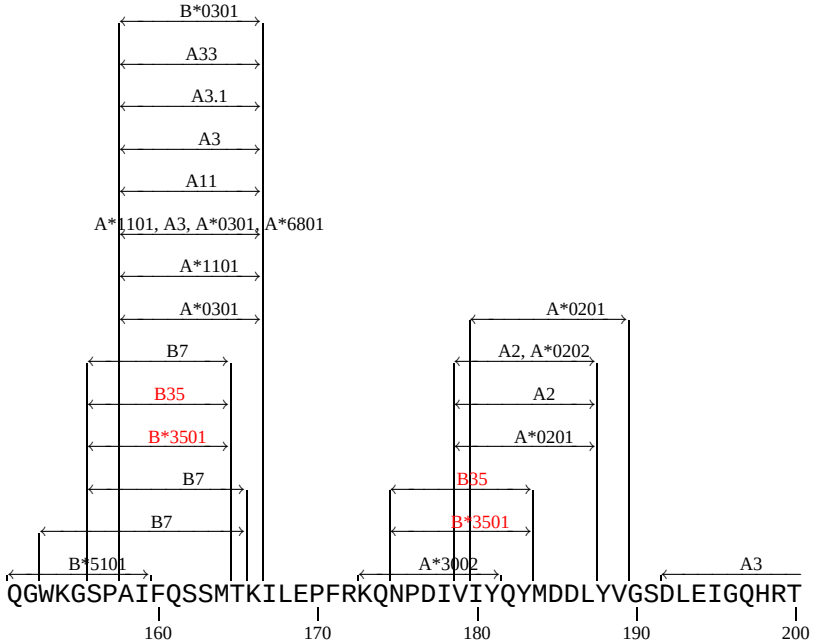
```
A*7401
A*6802,A*7401,A19
A*6802                                  A*6802
PQVTLWQRPLVTIKIGGQLKEALLDTGADDTVLEEMSLPGRWKPKMIGGI
          |         |         |         |         |
         10        20        30        40        50

                                  A*0201
GGFIKVRQYDQILIEICGHKAIGTVLVGPTPVNIIGRNLLTQIGCTLNF
          |         |         |         |
         60        70        80        90
```

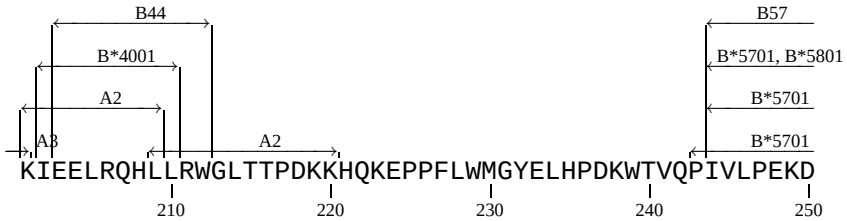
RT CTL Map

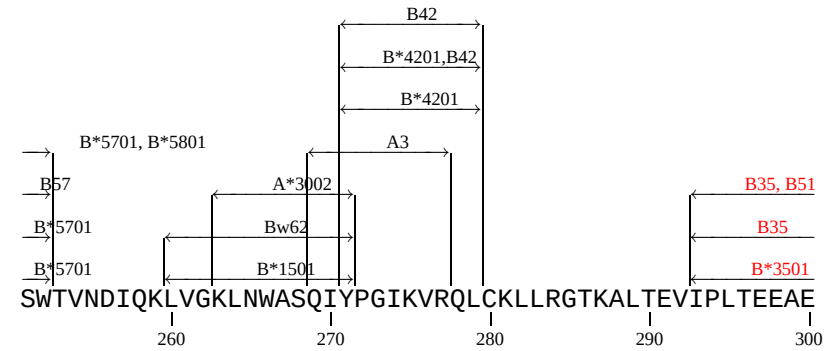

B51
B*5101
broad
A2
B8
A*0201
A2, B61
B*0801
A*0301
PISPIETVPVKLKPGMDGPKVKQWPLTEEKIKALVEICTEMEKEGKISKI
10
20
30
40
50

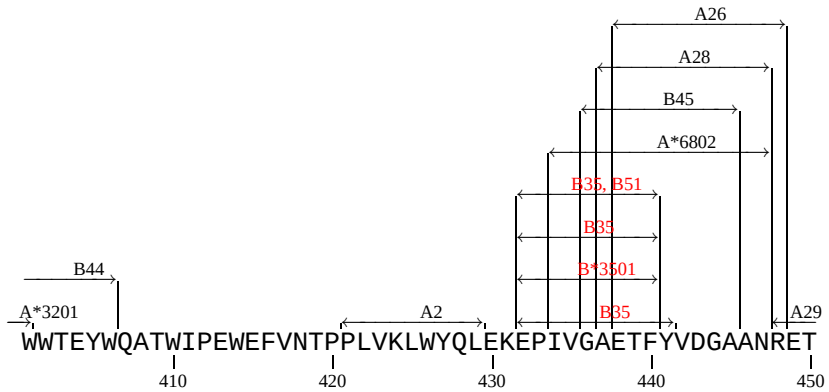
Cw4
broad
A3
GPENPYNTPVFAIKKKDSTKWRKLVDFRELNKRTQDFWEVQLGIPHPAGL
60
70
80
90
100


B*5101, B24
A2
A*0201
Cw4
B51
B35
B*5101
B35
Cw4
A2
Cw4
B*3501,B35
A3
B*3501
B*3501
KKKKSVTVLDVGDAYFSVPLDEDFRKYTAFTIPSINNETPGIRYQYNVLP
110
120
130
140
150

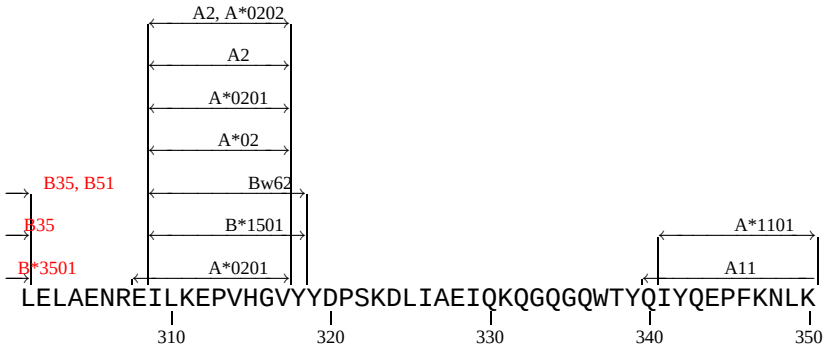

B*0301
A33
A3.1
A3
A11
A*1101, A3, A*0301, A*6801
A*1101
A*0301
B7
B35
B*3501
B7
B7
B*5101
A*0201
A2, A*0202
A2
A*0201
B35
B*3501
A*3002
A3
QGWKGSPAIFQSSMTKILEPFRKQNPDIVIYQYMDDLYVGSDLEIGQHRT
160
170
180
190
200

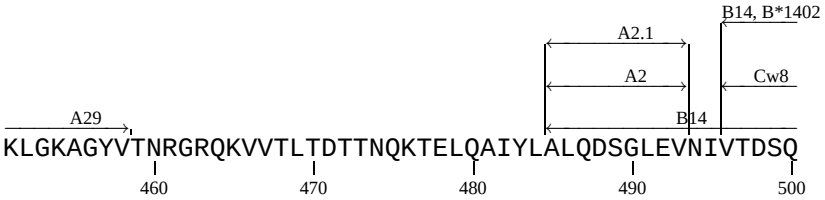

B44
B57
B*4001
B*5701, B*5801
A2
B*5701
A3
A2
B*5701
KIEELRQHLLRWGLTTPDKKHQKEPPFLWMGYELHPDKWTVQPIVLPEKD
210
220
230
240
250

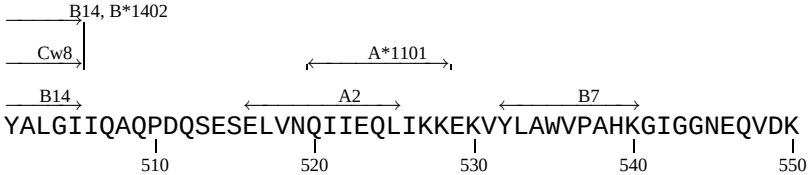


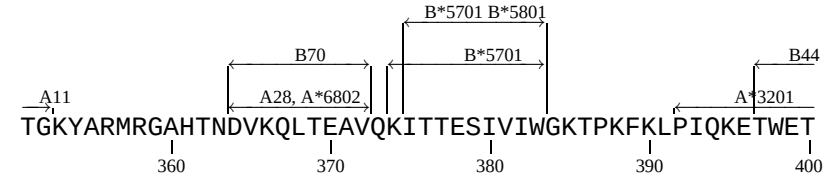


p15 RNase start <-









LVSAGIRKVL

-> p15 RNase end

Integrase CTL Map

B*5101

FLDGIDKAQDEHEKYHSNWRAMASDFNLPPVVAKEIVASCDKCQLKGEAM

10 20 30 40 50

A*2402 A*6802

HGQVDCSPGIWQLDCTHLEGKVILVAVHVASGYIEAEVIPAETGQETAYF

60 70 80 90 100

A*6802

LLKLAGRWPVKTIHTDNGSNFTGATVRAACWWAGIKQEFGIPYNPQSQGV

110 120 130 140 150

A*1101

B57

B*5701

VESMNKELKKIIGQVRDQAEHLKTAVQMAVFIHNFKRKGGIGGYSAGERI

160 170 180 190 200

A2

A*0201

VDIIATDIQTKELQKQITKIQNFRVYYRDSRNPLWKGPAKLLWKGEGAVV

210 220 230 240 250

IQDNSDIKVVPRRKAKIIRDYGKQMAGDDCVASRQDED

260 270 280

Rev CTL Map

B*5801

B*5701

MAGRSGDSDEELIRTVRLIKLLYQSNPPPNPEGTRQARRNRRRRWRERQR

10 20 30 40 50

Cw5

B14, Cw8

A1

B14

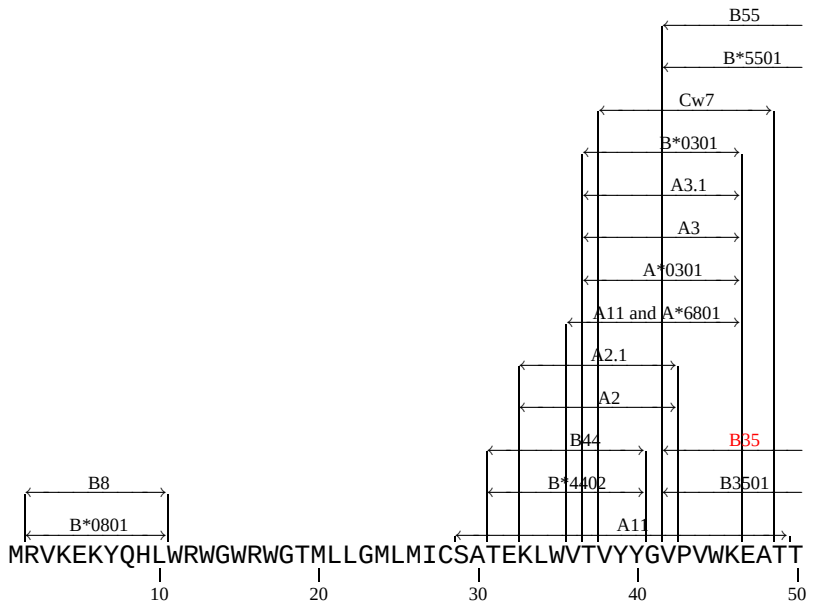
QIHSISERILGTYLGRSAEPVPLQLPPLERLTLDCNEDCGTSGTQGVGSP

60 70 80 90 100

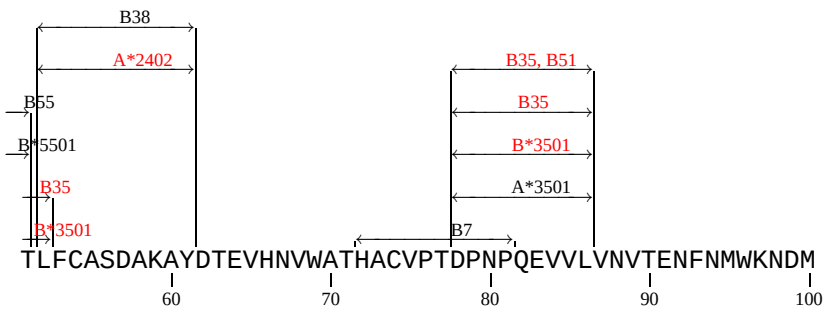
QILVESPTVLESGTKE

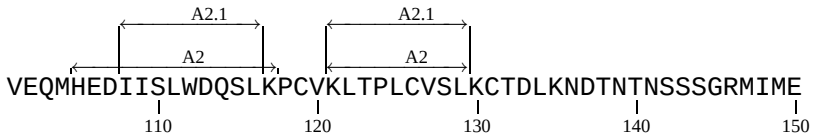
110

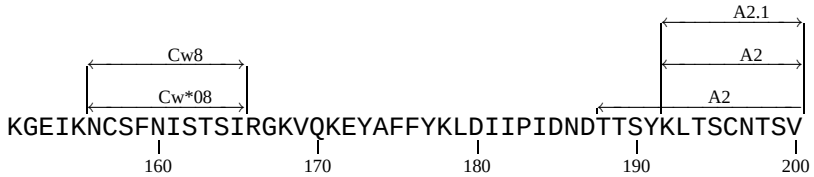
gp160 CTL Map

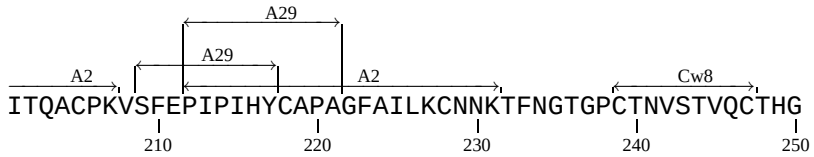


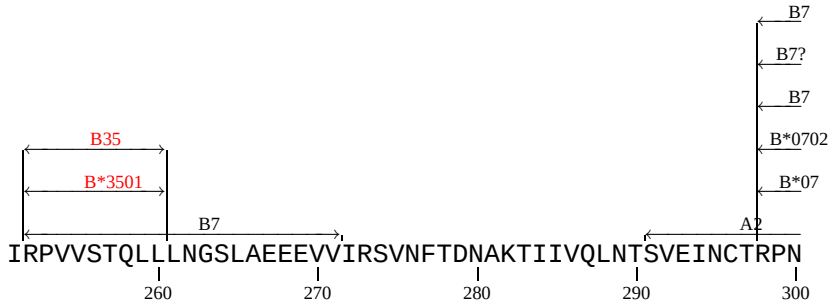
<- gp120 start

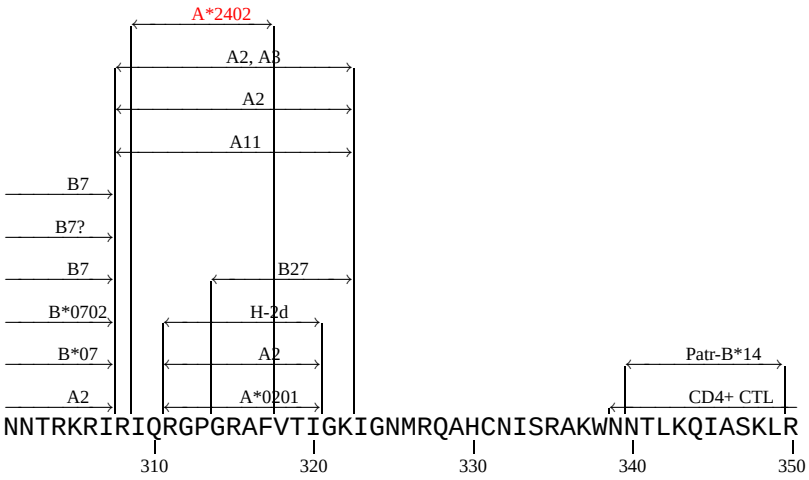


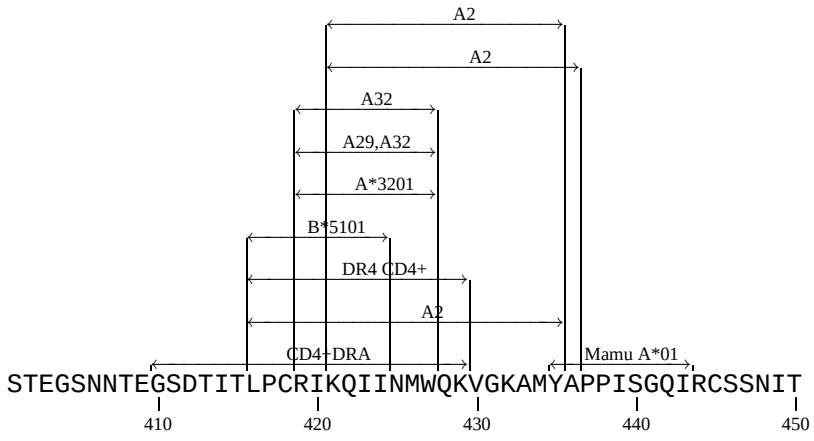


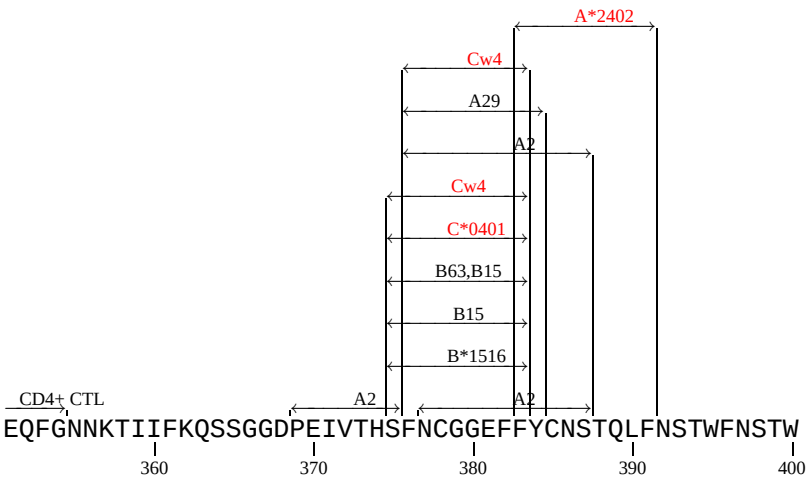


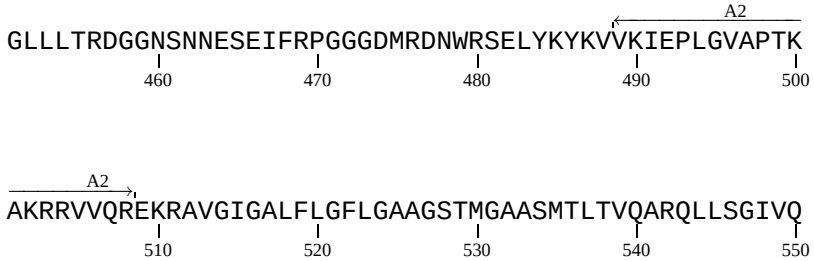




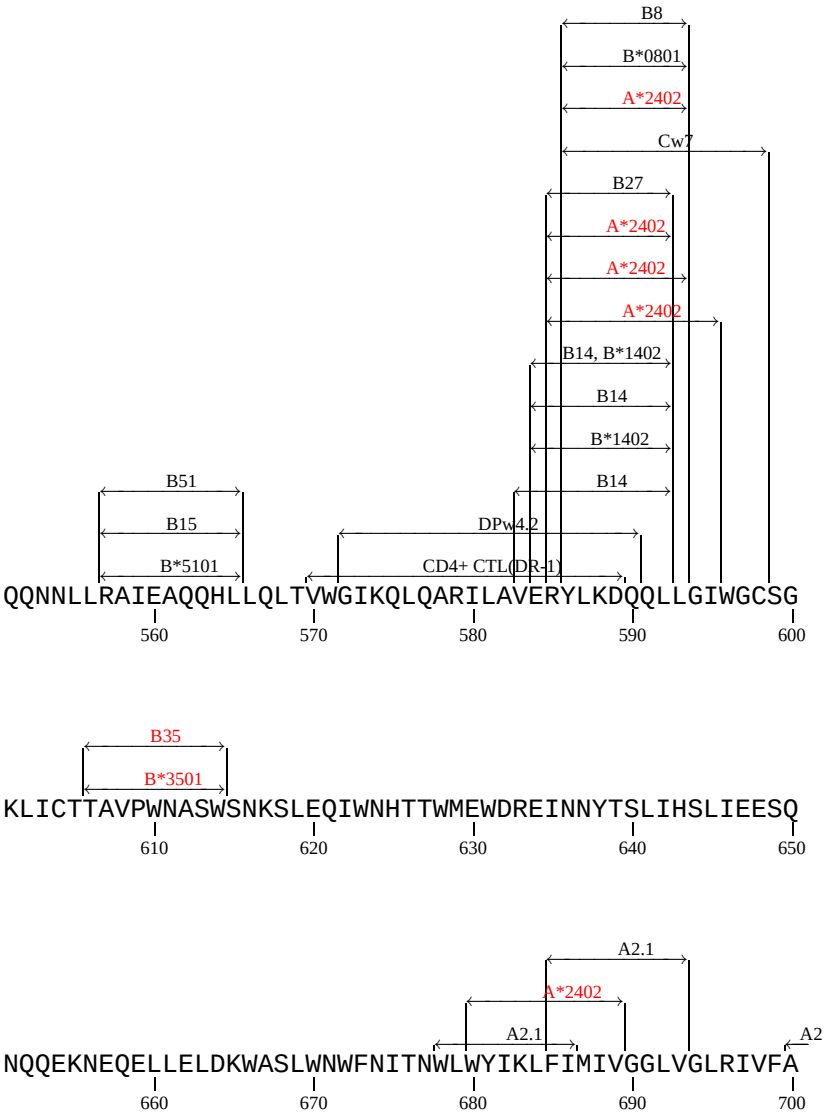


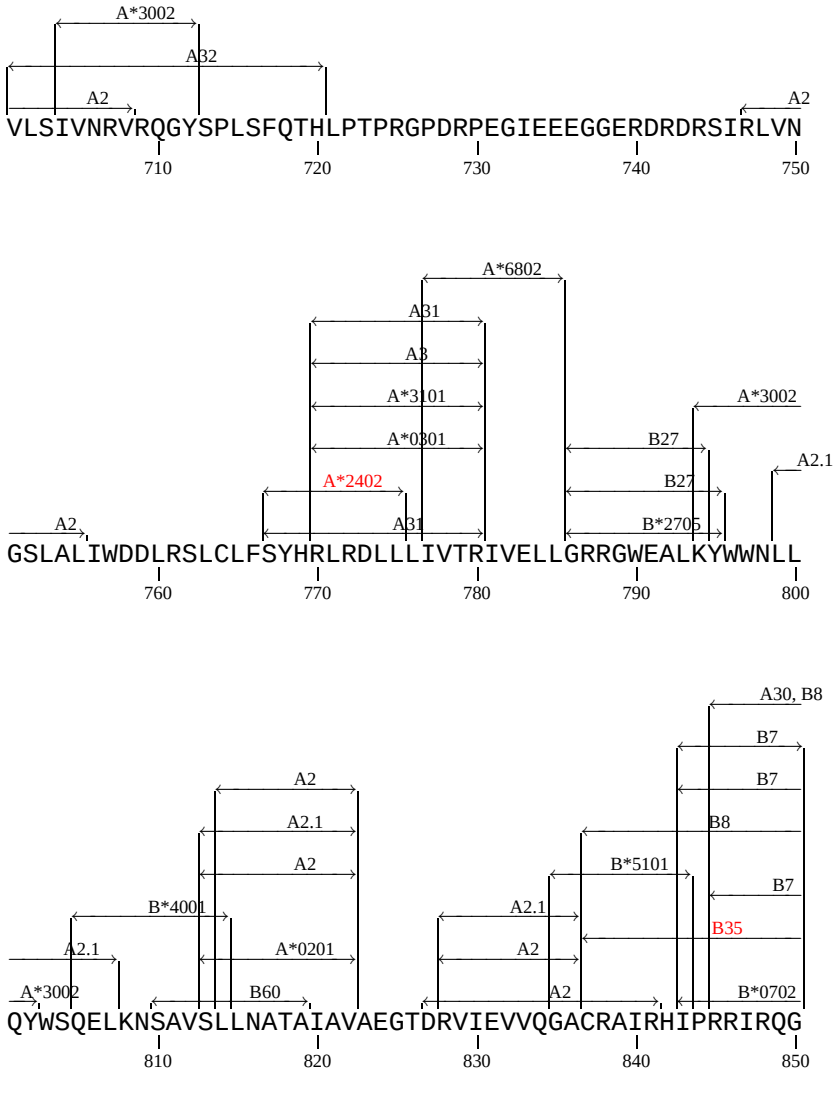


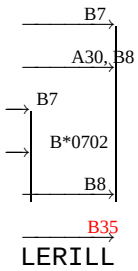




gp120 end <> gp41 start

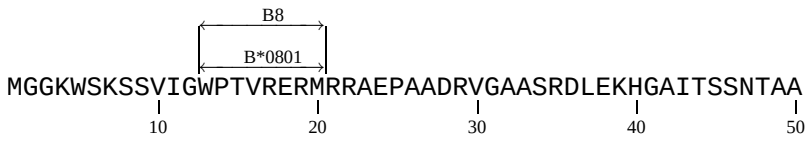

B8
B*0801
A*2402
Cw7
B27
A*2402
A*2402
A*2402
B14, B*1402
B14
B*1402
B14
B51
B15
B*5101
DPw4.2
CD4+ CTL(DR-1)
QQNNLLRAIEAQQHLLQLTVWGIKQLQARILAVERYLKDQQLLGIWGCSG
560
570
580
590
600
B35
B*3501
KLICTTAVPWNASWSNKSLEQIWNHTTWMEWDREINNYTSLIHSLIEESQ
610
620
630
640
650
A2.1
A*2402
A2.1
A2
NQQEKNEQELLELDKWASLWNWFNITNWLWYIKLFIMIVGGLVGLRIVFA
660
670
680
690
700

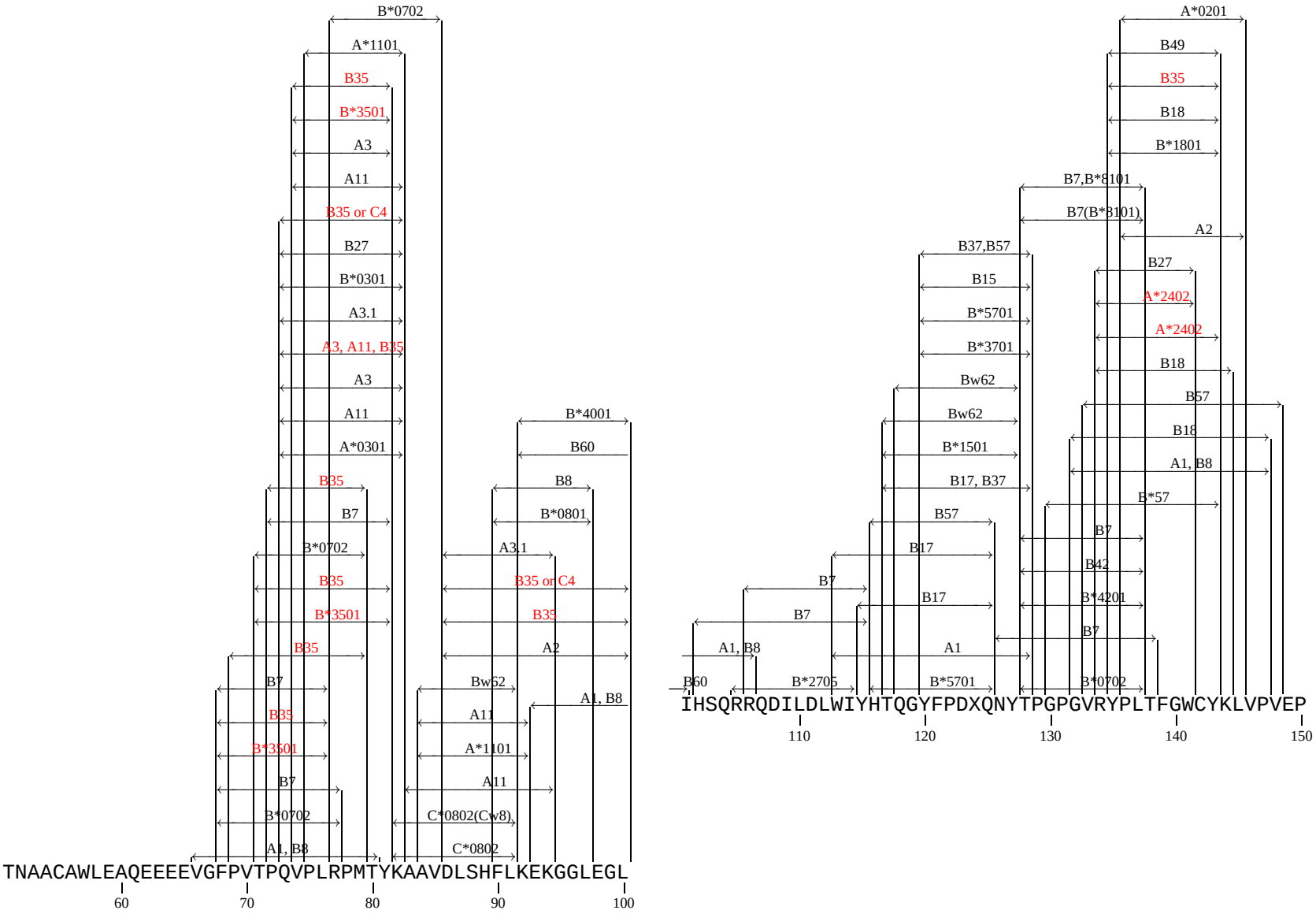

A*3002
A32
A2
A2
VLSIVNRVRQGYSPLSFQTHLPTPRGPDRPEGIEEEGGERDRDRSIRLVN
710
720
730
740
750
A*6802
A31
A3
A*3101
A*0301
A*2402
A31
A*3002
B27
B27
B*2705
A2.1
A2
GSLALIWDDLRSLCLFSYHRLRDLLLIVTRIVELLGRRGWEALKYWWNLL
760
770
780
790
800
A30, B8
B7
B7
A2
A2.1
A2
B8
B*5101
B7
B*4001
A2.1
B35
A2.1
A*0201
A2
A*3002
B60
A2
B*0702
QYWSQELKNSAVSLLNATAIAVAEGTDRVIEVVQGACRAIRHIPRRIRQG
810
820
830
840
850

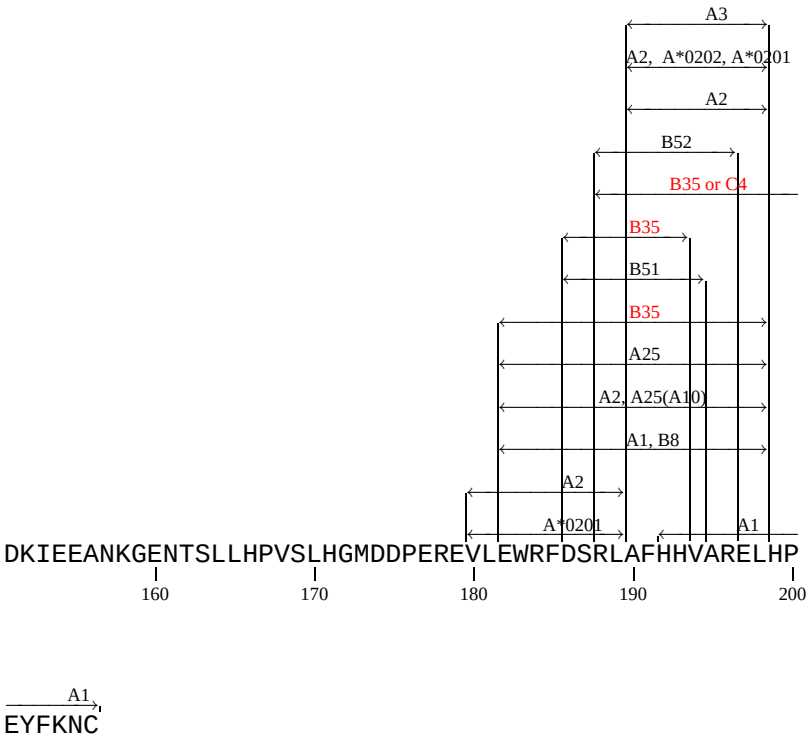


-> gp41 end

Nef CTL Map




B*0702
A*1101
B35
B*3501
A3
A11
B35 or C4
B27
B*0301
A3.1
A3, A11, B35
A3
A11
A*0301
B35
B7
B*0702
B35
B*3501
B35
B7
B35
B*3501
B7
B*0702
A1, B8
B*4001
B60
B8
B*0801
A3.1
B35 or C4
B35
A2
Bw62
A1, B8
A11
A*1101
A11
C*0802(Cw8)
C*0802
TNAACAWLEAQEEEEVGFPVTPQVPLRPMTYKAAVDLSHFLKEKGGLEGL
60
70
80
90
100
A*0201
B49
B35
B18
B*1801
B7,B*8101
B7(B*3101)
A2
B37,B57
B27
B15
A*2402
B*5701
A*2402
B*3701
B18
Bw62
B57
Bw62
B18
B*1501
A1, B8
B17, B37
B*57
B57
B7
B17
B42
B7
B17
B*4201
B7
B7
A1, B8
A1
B60
B*2705
B*5701
B*0702
IHSQRRQDILDLWIYHTQGYFPDXQNYTPGPGVRYPLTFGWCYKLVPVEP
110
120
130
140
150



[Brander & Goulder(2001)] C. Brander & P. Goulder. The evolving £eld of HIV CTL epitope mapping: New approaches to the identi£cation of novel epitopes. *HIV Molecular Immunology Database* pages IV–1, 2001. Notes: This review article in the annual HIV Molecular Immunology Compendium presents the table of Optimal CTL Epitopes that has been curated by Brander and others for several years.

[Buseyne (1993)] F. Buseyne, S. Blanche, D. Schmitt, C. Griscelli and, & Y. Riviere. Detection of HIV-speci£c cell-mediated cytotoxicity in the peripheral blood from infected children. *J. Immunol.* **150**:3569–3581, 1993. (Medline: 93224764).

[Culmann(1998)] B. Culmann. 1998. Notes: Personal communication.

[Culmann (1991)] B. Culmann, E. Gomard, M.-P. Kieny, B. Guy, F. Dreyfus, A.-D. Saimot, D. Sereni, D. Sicard, & J.-P. Levy. Six epitopes with human cytotoxic CD8+ cells in the central region of the HIV-1 Nef protein. *J Immunol* **146**:1560–1565, 1991. (Medline: 91132023) Notes: Nef-speci£c CTL were generated from six seropositive donors. Six epitopes were de£ned, all localized to two regions in the central part of Nef. Some epitopes could be recognized in the contexts of several HLA class I molecules. Peptides were based on BRU epitopes: QVPLRPMTYK, HLA A3, A11, B35; AAVDLSHFLKEK, HLA A11; HTQGYFPQWQ, HLA B17;TQGYFPQWQNYT, HLA B17, B37, NYTPGPGVRYPLT, HLA B7; and GVRYPLTFGWCYKLVP, HLA B18).

[Dorrell (1999)] L. Dorrell, T. Dong, G. S. Ogg, S. Lister, S. McAdam, T. Rostron, C. Conlon, A. J. McMichael, & S. L. Rowland-Jones. Distinct recognition of non-clade B human immunode£ciency virus type 1 epitopes by cytotoxic T lymphocytes generated from donors infected in Africa. *J Virol* **73**:1708–14, 1999. (Medline: 99099071).

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[Haas (1996)] G. Haas, U. Plikat, P. Debre, M. Lucchiari, C. Katlama, Y. Dudoit, O. Bonduelle, M. Bauer, H. Ihlenfeldt, G. Jung, B. Maier, A. Meyerhans, & B. Autran. Dynamics of viral variants in HIV-1 Nef and speci£c cytotoxic T lymphocytes in vivo. *J Immunol* **157**:4212–4221, 1996. (Medline: 97047818).

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of multiple HLA-A24-restricted HIV-1 CTL epitopes: strong epitopes are derived from V regions of HIV-1. *J Immunology* **159**:6242–6252, 1997. (Medline: 98209798).

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[Kaul (2000)] R. Kaul, F. A. Plummer, J. Kimani, T. Dong, P. Kiama, T. Rostron, E. Njagi, K. S. MacDonald, J. J. Bwayo, A. J. McMichael, & S. L. Rowland-Jones. HIV-1-speci£c mucosal CD8+ lymphocyte responses in the cervix of HIV-1- resistant prostitutes in Nairobi. *J Immunol* **164**:1602–11, 2000. (Medline: 20109119).

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[Menendez-Arias (1998)] L. Menendez-Arias, A. Mas, & E. Domingo. Cytotoxic T-lymphocyte responses to HIV-1 reverse transcriptase (review). *Viral Immunol* **11**:167–81, 1998. (Medline: 99203068).

[Ogg (1998)] G. S. Ogg, X. Jin, S. Bonhoeffer, P. R. Dunbar, M. A. Nowak, S. Monard, J. P. Segal, Y. Cao, S. L. Rowland-Jones, V. Cerundolo, A. Hurley, M. Markowitz, D. D. Ho, D. F. Nixon, & A. J. McMichael. Quantitation of HIV-1-speci£c cytotoxic T lymphocytes and plasma load of viral RNA. *Science* **279**:2103–6, 1998. (Medline: 98182444).

[Rowland-Jones (1998a)] S. Rowland-Jones, T. Dong, P. Krausa, J. Sutton, H. Newell, K. Ariyoshi, F. Gotch, S. Sabally, T. Corrah, J. Kimani, K. MacDonald, F. Plummer, J. Ndinya-Achola, H. Whittle, & A. McMichael. The role of cytotoxic T cells in HIV infection. *Dev Biol Stand* **92**:209–14, 1998a. (Medline: 98214896) Notes: In this paper CTL response to previously de£ned conserved epitopes was found in exposed but uninfected prostitutes in Nairobi. Subtypes A and D are circulating in this regions, and the reactive epitopes tended to be conserved. Similarly previous studies in the Gambia showed that exposed but uninfected prostitutes tended to have B35 presented CTL epitopes conserved between HIV-1 and HIV-2. It was suggested that what was special about B35 is simply that it presents epitopes found both in HIV-1 and HIV-2.

[Rowland-Jones (1999)] S. L. Rowland-Jones, T. Dong, L. Dorrell, G. Ogg, P. Hansasuta, P. Krausa, J. Kimani, S. Sabally, K. Ariyoshi, J. Oyugi, K. S. MacDonald, J. Bwayo, H. Whittle, F. A. Plummer, & A. J. McMichael. Broadly cross-reactive HIV-speci£c cytotoxic T lymphocytes in highly-exposed persistently seronegative donors. *Immunol Lett* **66**:9–14, 1999. (Medline: 99217678).

[Rowland-Jones (1998b)] S. L. Rowland-Jones, T. Dong, K. R. Fowke, J. Kimani, P. Krausa, H. Newell, T. Blanchard, K. Ariyoshi, J. Oyugi, E. Ngugi, J. Bwayo, K. S. MacDonald, A. J. McMichael, & F. A. Plummer. Cytotoxic T cell responses to multiple conserved HIV epitopes in HIV- resistant prostitutes in Nairobi [see comments]. *J Clin Invest* **102**:1758–65, 1998b. (Medline: 99021675).

[Rowland-Jones (1995)] S. L. Rowland-Jones, J. Sutton, K. Ariyoshi, T. Dong and , F. Gotch, S. McAdam, D. Whitby, S. Sabally, A. Gallimore, T. Corrah, M. Takiguchi, T. Schultz, A. McMichael, & H. Whittle. HIV-speci£c cytotoxic T cells in HIV-exposed but uninfected Gambian women. *Nature Medicine* **1**:59–64, 1995. (Medline: 96071373) Notes: Four HIV-1 and -2 cross-reactive epitopes that are presented to CTL from HIV-infected Gambians by HLA-35 were identi£ed. These peptides could elicit HIV-speci£c CTLs from 3 of 6 repeatedly exposed but seronegative sex workers who carry the HLA-B35 allele. Most CTL derived from HIV-2 positive donors also recognized the HIV-2 peptide and the analogous HIV-1 peptide.

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