HIV	
CTL Epitopes	

		Table	l'able 4: IN I		
Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(71-79 LAI)	RT(59-67) NOTES: • Predicted • Clade A/B	 ITLWQRPLV TES: Predicted on binding motif, no truncations analyzed Clade A/B/D consensus, HLA-A28 subtype, S. Rowland-Jones, pers. comm 	d wland-Jones, pers. comm	human(A*6802, A*7401)	[Dong98]
RT(71-79 LAI)	RT(59-67) NOTES: • Clade A/B	59-67) ITLWQRPLV TES: Clade A/B/D consensus, HLA-A*7401, S. Rowland-Jones, pers. comm.	d-Jones, pers. comm.	human(A19)	[Dong98]
Pr(85-93 Clade D)	RT(86-94) NOTES: • Predicted	 T(86-94) DTVLEEMNL OTES: Predicted on binding motif, no truncations analyzed 	d	human(A*6802)	[Dong98]
Pr(75-84 MN)	RT(131-140) NOTES: Peptide pr Peptide co Peptide lo Both 9-me Binding at MAL varia	131-140)VLVGPTPVNIIn vitrostimulationhuman(A*0201)[Konya97 TES: Peptide predicted to be reactive based on HLA-A*0201 binding motifPeptide could stimulate CTL in PBMC from 5/6 seronegative donorsPeptide located in a highly conserved region of proteaseBoth 9-mer and 10-mer could stimulate CTL: VLVGPTPVNI and LVGPTPVNIBinding affinity to A*0201 was measured, $C_{1/2max}\mu M = 6$ for 10-mer, 3 for 9-merMAL variant of Pr(75-84 MN), with substitutions V77, G78, and P79 gave reduced binding and CTL recognition	In vitro stimulation 0201 binding motif ronegative donors tease GPTPVNI and LVGPTP $_x\mu M = 6$ for 10-mer, 3 ft V77, G78, and P79 gave 1	human(A*0201) VNI vr 9-mer reduced binding and CTL	[Konya97] recognition
RT(LAI)	RT(158-167) NOTES: • Recognize • Highly co	(158-167)SPIETVPVKLHIV-1 infectionhuman(TTES:Recognized by CTL from a long term survivor, EILKEPVGHGV was also recognizedHighly conserved across clades	HIV-1 infection _KEPVGHGV was also r	human(A2,B61) ecognized	[vanderBurg97]
RT(160-184 HXB2)	RT(160-184) NOTES: • One of fiv	160-184) IETVPVKLKPGMDGPKV- HIV-1 infection KQWPLTEE TES: One of five epitopes defined for RT specific CTL clones in this study	HIV-1 infection lones in this study	human(B8)	[Walker89]
RT(18-26)	RT(173-181) NOTES: • HIV prote	173-181) GPKVKQWPL HIV-1 infection hur TES: HIV proteins with mutations in this epitope allowed transactive inhibition of speci	HIV-1 infection d transactive inhibition of	human(B8) [specific CTL mediated lysis	[Meier95] ysis

Table 4: RT

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(173-181)	RT(173-181) NOTES:	GPKVKQWPL		human(B8)	[Goulder97c]
	• Included in	• Included in a study of the B8 binding motif			
RT(185-193 LAI)	RT(173-181)	GPKVKQWPL	no CTL shown	human(B8)	[Sutton93]
	Predicted e	• Predicted epitope based on B8 binding motifs, from larger peptide IETVPVKL)	from larger peptide IETVPV	'KLKPGMDGPKVKQWPLTEE	PLTEE
RT(185-193 LAI)	RT(173-181) NOTES:	GPKVKQWPL	HIV-1 infection	human(B8)	[Klenerman95]
	• Naturally o	• Naturally occurring antagonist GPRVKQWPL found in viral PBMC DNA and	found in viral PBMC DNA	and RNA	
RT(33-41)	RT(188-196) NOTES:	ALVICTEM	HIV-1 infection	human(A2)	[Haas98]
	Of 98 paties Protease (8	Of 98 patients in cross-sectional analysis, 78% had CTL against pol - RT was more immunogenic than Integrase and			
RT(33-43)	New clusterThis epitop	Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules This epitope was defined as optimal by peptide titration assays (per. comm., G.	had CTL against pol – KI' w espectively) ; different HLA molecules ; titration assays (per. comm	as more immunogenic tha , G. Haas)	n Integrase and
	This epitop RT(188-198)	1%, 51%, and 24% of 37 patients, r rs of epitopes were defined utilizing e was defined as optimal by peptide ALVICTEMEK	had CTL against pol – RT w espectively) ; different HLA molecules ; titration assays (per. comm HIV-1 infection	as more immunogenic tha , G. Haas) human(A3)	In Integrase and [Haas98]
	Thew cluster This epitop RT(188-198) NOTES:	1%, 51%, and 24% of 37 patients, r rs of epitopes were defined utilizing e was defined as optimal by peptide ALVICTEMEK	had CTL against pol – RT w espectively) ; different HLA molecules ; titration assays (per. comm HIV-1 infection	as more immunogenic tha , G. Haas) human(A3)	n Integrase and [Haas98]
RT(191-215)	 New cluster This epitop RT(188-198) NOTES: Of 98 patier Protease (8 New cluster This epitop 	Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules This epitope was defined as optimal by peptide titration assays (per. comm., G. Haas) 188-198) ALVICTEMEK HIV-1 infection human(A3) IB8-198) ALVICTEMEK HIV-1 infection IB8-198) ALVICTEMEK HIV-1 infection IB8-198) ALVICTEMEK HIV-1 infection Protease (81%, 51%, and 24% of 37 patients, respectively) Haas more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules This epitope was defined as optimal by peptide titration assays (per. comm., G. Haas)	had CTL against pol – RT w espectively) different HLA molecules titration assays (per. comm HIV-1 infection had CTL against pol – RT w espectively) different HLA molecules titration assays (per. comm	as more immunogenic tha , G. Haas) human(A3) as more immunogenic tha , G. Haas)	n Integrase and [Haas98] In Integrase and
	 New Cluster This epitop RT(188-198) NOTES: Of 98 patier Protease (8 New cluster This epitop RT(?) NOTES: 	1%, 51%, and 24% of 37 patients, r rs of epitopes were defined utilizing e was defined as optimal by peptide ALVICTEMEK in cross-sectional analysis, 78% 1%, 51%, and 24% of 37 patients, r rs of epitopes were defined utilizing e was defined as optimal by peptide	had CTL against pol – RT w espectively) ; different HLA molecules ; titration assays (per. comm HIV-1 infection had CTL against pol – RT w espectively) ; different HLA molecules ; titration assays (per. comm HIV-1 infection	as more immunogenic tha , G. Haas) human(A3) as more immunogenic tha , G. Haas) human(polyclonal)	ın İntegrase and [Haas98] ın İntegrase and [Haas97]
RT(205-219 BRU)	 New Cluster This epitop RT(188-198) NOTES: Of 98 patier Protease (8 New cluster This epitop RT(?) NOTES: Polyclonal mutation, a 	 Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules This epitope was defined as optimal by peptide titration assays (per. comm., G. Haas) r(188-198) ALVICTEMEK HIV-1 infection human(A3) [Haas98] OTES: Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules This epitope was defined as optimal by peptide titration assays (per. comm., G. Haas) r(?) HIV-1 infection human(polyclonal) [Haas97] Polyclonal CTL recognition switched from RT 191-215 to RT 514-524 when AZT therapy selected for the resistance mutation, and presumably escape variant RT 215 T to Y 	had CTL against pol – RI'w espectively) (different HLA molecules) titration assays (per. comm HIV-1 infection had CTL against pol – RT w espectively) (different HLA molecules) (different HLA molecules) titration assays (per. comm HIV-1 infection 191-215 to RT 514-524 whe 15 T to Y	as more immunogenic tha , G. Haas) human(A3) as more immunogenic tha as more immunogenic tha , G. Haas) human(polyclonal) n AZT therapy selected fo	n Integrase and [Haas98] n Integrase and [Haas97] or the resistance
	 New Cluster This epitop RT(188-198) NOTES: Of 98 patier Protease (8) New cluster This epitop RT(?) NOTES: Polyclonal mutation, a RT(193-207) NOTES: 	 1%, 51%, and 24% of 37 patients, r s of epitopes were defined utilizing e was defined as optimal by peptide ALVICTEMEK nts in cross-sectional analysis, 78% 1%, 51%, and 24% of 37 patients, r s of epitopes were defined utilizing e was defined as optimal by peptide cTL recognition switched from RT nd presumably escape variant RT 2 CTEMEKEGKISKIGP 	had CTL against pol – RT w espectively) different HLA molecules titration assays (per. comm HIV-1 infection had CTL against pol – RT w espectively) different HLA molecules titration assays (per. comm HIV-1 infection 191-215 to RT 514-524 whe 15 T to Y recRT injection	as more immunogenic tha , G. Haas) human(A3) as more immunogenic tha as more immunogenic tha , G. Haas) human(polyclonal) human(polyclonal) n AZT therapy selected for murine(H2 ^k)	In Integrase and [Haas98] In Integrase and [Haas97] or the resistance [DeGroot91]

I-A-44 DEC 98

HIV
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RT(205-219)	RT(193-207) NOTES: • Murine and	(193-207) CTEMEKEGKISKIGP TES: Murine and human helper and CTL epitope	HIV-1 infection	human(broad)	[Hosmalin90]
RT(206-214)	RT(194-202)	TEMEAEGKI	peptide on pulsed irradiated splenocytes	C3H/HeJ mice	[Leggatt97]
	 NOTES: Ala substituted nona class I complexes The new assay is CT upon TCR triggering 	TES: Ala substituted nonamer-peptide used to test a non-radioactive assay for murine CTL recognised class I complexes The new assay is CTL adherence assay (CAA), and is based on the discovery that CTL development of the transfer of the	n-radioactive assay for n nd is based on the discove	nurine CTL recognition of peptide-MHC rry that CTL develop adhesive properties	f peptide-MHC ssive properties
RT(42-50)	RT(197-205) NOTES:	EKEGKISKI	HIV-1 infection	human(B51)	[Haas98]
	 Of 98 patie Protease (8 New cluste This epitop	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules This epitope was defined as optimal by peptide titration assays (per. comm., G. Haas)	d CTL against pol – RT w vectively) fferent HLA molecules ration assays (per. comm	as more immunogenic tha ., G. Haas)	n Integrase and
RT(262-270 IIIB)	RT(262-270) NOTES:	TVLDVGDAY	HIV-1 infection	human(B35)	[Walkerpercom96]
	Epitope de studyTVLDMG	Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project, study TVLDMGDAC is a naturally occurring variant that is less reactive	DS Foundation ARIEL P at is less reactive	roject, a mother-infant HIV transmission	V transmission
RT(267-277)	RT(263-273) NOTES:	VLDVGDAYFSV	in vitro stimulation	human(A*0201)	[vanderBurg96]

Location	WEAU	Sequence	Immunogen	Species(HLA)	Keterences
RT(267-277)	RT(263-273) NOTES:	VLDVGDAYFSV	HIV-1 infection	human(A2)	[Kundu98]
	 Allogenei HIV-1 epi 1/6 showe 	Allogeneic dendritic cells (DCs) were obtained from HLA-identical siblings, pulsed with rgp160 MN or A2 restricted HIV-1 epitope peptides, and infused monthly into six HIV-infected patients 1/6 showed increased env-specific CTL and increased lymphoproliferative responses, 2/6 showed increase only in	om HLA-identical sibling six HIV-infected patient assed lymphoproliferativ	s, pulsed with rgp 160 MN s responses, 2/6 showed	or A2 restricted increase only in
	proliferati	proliferative responses, and 3/6 showed no change – pulsed DCs were well tolerated	e – pulsed DCs were wel	tolerated	
	VLDVGL HIV directed	VLDVGDAYFSV is a conserved HLA-A2 epitope included in this study – 4/6 patients had this sequence as their HIV direct sequence, but only one of these had a detectable CTL response – the other two had the sequences	pe included in this study 1 a detectable CTL resp	-4/6 patients had this sequence as their onse – the other two had the sequences	equence as their 1 the sequences
	EEDVGD	EEDVGDAYFSV and ELDVGDAYFSV and no detectable CTL response	letectable CTL response		
RT(267-277)	RT(263-273) NOTES:	VLDVGDAYFSV	in vitro stimulation	human(A2)	[vanderBurg95]
	Binds HLVLDVGL	 Binds HLA-A*0201 – CTL generated by <i>in vitro</i> stimulation of PBMC from an VLDVGDAYFSV is in a functional domain 	stimulation of PBMC frc	om an HIV negative donor	
RT(273-282 IIIB)	RT(273-282) VPLDH NOTES: • Binds HLA-B*3501	RT(273-282) VPLDEDFRKY NOTES: • Binds HLA-B*3501	HIV-1 infection	human(B35)	[Shiga96]
RT(273-282 SF2)	RT(273-282) NOTES:	VPLDKDFRKY	HIV-1 infection	human(B*3501)	[Tomiyama97]
	 A CTL cli 4/7 B35 p A K to E : 	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 specific lysis, and reduces binding	ned to this epitope ific lysis, and reduces bir	iding to B*3501	
RT(273-282 IIIB)	RT(273-282) NOTES:	VPLDEDFRKY	HIV-1 infection	human(B35)	[Sipsas97]
	HIV IIIB protein with HIV-1 IIIB	HIV IIIB proteins were used to define the range of CTL epitopes recognized by three lab workers accidentally infected with HIV-1 IIIB	CTL epitopes recognized	by three lab workers acci	lentally infected
	 VPHDED This epito 	This epitope was type-specific and conserved in only one other B subtype sequence	as not recognized	sequence	

		Deduciice			
RT(295-302 IIIB)	RT(283-290) NOTES:	TAFTIPSI	HIV-1 infection	human(B51)	[Sipsas97]
	• HIV IIIB protein with HIV-1 IIIB	HIV IIIB proteins were used to define the range of CTL epitopes recognized by with HIV-1 IIIB	of CTL epitopes recogniz	red by 3 lab workers accidentally infected	lentally infected
	TAFTIPSTTAFTIPSVTVFTIPSI	TAFTIPST, a variant found in HIV-1 CAM1, was also recognized TAFTIPSV, a variant found in HIV-1 VE1RT, was also recognized TVFTIPSI, a variant found in HIV-1 MANC, was also recognized	as also recognized 'as also recognized as also recognized		
RT(308-320)	RT(308-320) NOTES:	WKGSPAIFQSSMT	HIV-1 infection	human(B7)	[Brander95a]
	• Epitope de study	Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project, study	AIDS Foundation ARIEL	Project, a mother-infant HIV transmission	IV transmission
RT(311-319 SF2)	RT(311-319) SPAIF(NOTES: • Binds HLA-B*3501	SPAIFQSSM 1-B*3501	HIV-1 infection	human(B35)	[Shiga96]
RT(311-319 SF2)	RT(311-319) NOTES:	SPAIFQSSM	HIV-1 infection	human(B*3501)	[Tomiyama97]
	A CTL clo Only 1/7 B	A CTL clone responsive to this epitope was obtained Only 1/7 B35 positive individuals had a CTL response to this epitope	ained sponse to this epitope		
RT(311-319 SF2)	RT(311-319) NOTES:	SPAIFQSSMT		human(B7)	[Brander97]
	• Per. comm	Per. comm. from C. Hey and D. Ruhl to C. Brander and B. Walker	nder and B. Walker		
RT(325-333 IIIB)	RT(313-321)	AIFQSSMTK	HIV-1 infection	human(A3)	[Walkerpercom96]
			AIDS Foundation ARIEL	Project, a mother-infant HIV transmission	IV transmission
	 Epitope de 	TES: Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project,			

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT	RT(313-321)	AIFQSSMTK	HIV-1 infection	human(A11)	[Wagner98b]
	• CTL speci the marker responses a	CTL specific for HIV epitopes were used to show that the mediators of both the cytolytic (granzyme A was used as the marker) and non-cytolytic (HIV-1 inhibitory chemokines MIP-1 α and RANTES were used as markers) anti-viral responses are localized within the CTL's cytotoxic granules	x that the mediators of bo themokines MIP-1 α and 1 ic granules	th the cytolytic (granzyme A was used as RANTES were used as markers) anti-viral	ıe A was used as arkers) anti-viral
RT(325-333)	RT(313-321)	AIFQSSMTK	HIV-1 infection	human(A11, A3, A*6801)	[Threlkeld97]
	• Study of th A*3301, a	TES: Study of the fine specificity of an A3-like super-type epitope (the A3 super-type includes A*0301, A*1101, A*3101, A*3301, and A*6801)	ype epitope (the A3 super	-type includes A*0301, A	*1101, A*3101,
	• A3 super-t charge in t	A3 super-type is characterized by a hydrophobic or hydroxyl containing anchor residue at position 2, and a positive charge in the C-term position	or hydroxyl containing a	nchor residue at position	2, and a positive
	While mos recognize	While most lines were specific, promiscuous cloned CTL lines were also derived from HIV+ donors that could recognize epitope presented by either A3 or A11 or A*6801	or A*6801	o derived from HIV+ d	onors that could
	• Alanine su critical for	Alanine substitutions throughout the epitope and natural variants indicate that critical for presentation by either MHC molecule, A3 or A11	d natural variants indicat , A3 or A11	e that the same amino acid positions are	cid positions are
RT(325-333 LAI)	RT(313-321) NOTES:	AIFQSSMTK	HIV-1 infection	human(A3)	[Cao97]
	The consetThe consetThe conset	The consensus peptide of B and D clade viruses is AIFQSSMTK The consensus peptide of a subset of As is AIFQASMTK and it is less able to stimulate the CTL clone The consensus peptide of a subset of As is SIFQSSMTK and is as reactive as the originally defined epitope	is AIFQSSMTK ASMTK and it is less abl SSMTK and is as reactive	e to stimulate the CTL cl as the originally defined	one epitope
RT(325-333)	RT(313-321) NOTES:	AIFQSSMTK	HIV-1 infection	human(A3.1)	[Brander95a]
	• Enitone de	Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study	IDS Foundation ARIEL I		IIV transmission
RT(325-333 LAI)	 Epitope de study 			roject, a mother-infant F	[Zhang93]
	RT(313-321) NOTES:	AIFQSSMTK	No CTL shown	roject, a mother-infant F human(A11)	

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(325-333 LAI)	RT(313-321) NOTES: • Review of	T(313-321) AIFQSSMTK OTES: • Review of HIV CTL epitopes	HIV-1 infection	human(A11)	[McMichael94]
RT(325-333 LAI)	RT(313-321) NOTES: • Defined as	313-321) AIFQSSMTK TES: Defined as minimal peptide by titration curve, S. Rowland-Jones, per. comm.	towland-Jones, per. comm	human(A33) 1.	[Rowland-JonesPerCom95]
RT(325-349 PV22)	RT(313-337) NOTES: • HIV-1 spec	(313-337) AIFQSSMTKILEPFRKQ- HI NPDIVIYQ TES: HIV-1 specific CTLs release γ -IFN, and α - and β -TNF	HIV-1 infection TNF	human(A11)	[Jassoy93]
RT(325-349)	RT(313-337) NOTES: • Study of cy	313-337) AIFQSSMTKILEPFRKQ- HIV-1 ; NPDIVIYQ TES: Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection vated CTL	human(A11)	[Price95]
RT(342-366 LAI)	RT(330-354) NOTES: • One of five	 NPDIVIYQYMDDLYVGS-HIV-1 infection DLEIGQHR OTES: One of five epitopes defined for RT specific CTL clones in this study 	HIV-1 infection	human(A11)	[Walker89]
RT(342-350 LAI)	RT(330-338) NOTES: • Review of	T(330-338) HPDIVIYQY OTES: • Review of HIV CTL epitopes	HIV-1 infection	human(B35)	[McMichael94]
RT(329-337)	RT(330-338) NOTES: • NPDIVIY(T(330-338) HPDIVIYQY HIV infection human(B35) OTES: NPDIVIYQY preferred sequence for some CTL clones, HIV-2 NPDVILJQY is also recognized 	HIV infection lones, HIV-2 NPDVILJQY	human(B35) is also recognized	[RowlandJones95]

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(329-337)	RT(330-338) NOTES:	HPDIVIYQY	none	human(B35)	[Lalvani97]
	• A peptide – importar	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-specific CTLp counts	ulation of CTLp using c rimary response, only s	ptimized peptide and IL- econdary – peptide-speci	7 concentrations fic CTLp counts
	 could be o This peptie activity us 	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	I tetramers ptides used in control ex eronegative donors	periments showing that tl	he assay gave no
RT(328-336 IIIB)	RT(330-338) NOTES:	NPDIVIYQY	HIV-1 infection	human(B35)	[Shiga96]
	• Binds HLA-B*3501	A-B*3501			
RT(328-336 IIIB)	RT(330-338) NOTES:	NPDIVIYQY	HIV-1 infection	human(B*3501)	[Tomiyama97]
	 A CTL clc 3/7 B35 pc D to E, or 	A CTL clone responsive to this epitope was obtained 3/7 B35 positive individuals had a CTL response to this epitope D to E, or V to I, substitutions at positions 3 or 5, respectively, reduces CTL activity and binding to B*3501	ned to this epitope respectively, reduces CT	'L activity and binding to	B*3501
RT(328-336 IIIB)	RT(330-338)	NPDIVIYQY	HIV-1 infection	human(B35)	[Sipsas97]
	HIV IIIB protein with HIV-1 IIIB	HIV IIIB proteins were used to define the range of CTL epitopes recognized by with HIV-1 IIIB	f CTL epitopes recogniz	ed by 3 lab workers accidentally infected	dentally infected
	NPDIIIYQNPEIVIYQNPDLVIY	NPDIIIYQY, a variant found in HIV-1 JRCSF, was also recognized NPEIVIYQY, a variant found in HIV-1 JRU2RF, was also recognized NPDLVIYQY, was also recognized	s also recognized was also recognized		
RT	RT(330-338) NOTES:	NPDIVIYQY	HIV-1 exposure	human(B35)	[RowlandJones98]
	 A CTL reepitopes the and conference of the A sub The A sub The D sub 	A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously defined B clade epitopes that tended to be conserved in A and D clades – such cross-reactivity could protect against both A and D and confer protection in Nairobi where both subtypes are circulating The A subtype consensus is HPDIVIYQY The D subtype consensus is NPEIVIYQY	ected prostitutes from l clades – such cross-reac pes are circulating	Vairobi using previously defined B clade tivity could protect against both A and D	defined B clade st both A and D

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Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT	RT(334-342) NOTES:	VIYQYMMDL	HIV-1 exposure	human(A2)	[RowlandJones98]
	 A CTL reserve of the epitopes the and conference of the A and the epitope of the the term of the term of the term of the term of the term of the term of the term of	A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously defined B clade epitopes that tended to be conserved in A and D clades – such cross-reactivity could protect against both A and D and confer protection in Nairobi where both subtypes are circulating The A and D consensus sequences are both VIYQYMMDL	fected prostitutes from N clades – such cross-reacti ypes are circulating QYMMDL	airobi using previously defined B clade vity could protect against both A and D	efined B clade both A and D
RT	RT(334-342)	VIYQYMDDL	Multi-epitope gene in VVA	human(A*0201)	[Hanke98c, Hanke98b]
	• This epitop	TES: This epitope was shown to be processed and presented to appropriate CTL clones upon infection of human target cells with vaccinia virue Ankara (VVA) carrying 20 HIV-1 entropes recomized by humans	sented to appropriate CTI	clones upon infection of the humans	^f human target
RT(346-354 LAI)	RT(334-342) NOTES:	VIYQYMDDL	HIV infection	human(A2)	[Harrer96]
	• The substit	• The substitution VIYQYVDDL abrogates CTL response and confers drug resistance	esponse and confers drug 1	esistance	
RT(179-187)	RT(334-342) NOTES:	VIYQYMDDL	HIV infection	human(A2)	[Haas98]
	 Of 98 patie Protease (8 New cluster 	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	d CTL against pol – RT wi pectively) ifferent HLA molecules	as more immunogenic that	1 Integrase and
RT(LAI)	RT(335-344) NOTES:	IYQYMDDLYV	HIV-1 infection	human(A*0201)	[vanderBurg97]
	• Recognize• A previous	 Recognized by CTL from a progressor, spans important RT functional domain A previous study determined that this was an epitope recognized by a long term survivor 	oortant RT functional dom ope recognized by a long	ain term survivor	
RT(191-215)	RT(347-371)	DLEIGQHRTKIEELRQH- LI RWGFTT?	HIV-1 infection	human(polyclonal)	[Haas97]
	NOTES:				TES: Polyclonal CTL recognition switched from RT 191-215 to RT 514-524 when AZT therapy selected for the resistance

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(359-383 HXB2)	RT(347-371)	DLEIGQHRTKIEELRQH- LLRWGLTT	HIV-1 infection	human(Bw60)	[Walker89]
	• One of five	TES: One of five epitopes defined for RT specific CTL clones in this study	clones in this study		
RT(192-201)	RT(347-356) NOTES:	DLEIGQHRTK	HIV-1 infection	human(A3)	[Haas98]
	 Of 98 patie Protease (8 New cluste	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	1 CTL against pol – RT wa ectively) fferent HLA molecules	s more immunogenic thar	1 Integrase and
RT(201-209)	RT(356-364) NOTES:	KIEELRQHL	HIV-1 infection	human(A2)	[Haas98]
	 Of 98 patie Protease (8) New cluste 	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	l CTL against pol – RT wa ectively) fferent HLA molecules	s more immunogenic thar	1 Integrase and
RT(LAI)	RT(358-367) NOTES:	EELRQHLLRW	HIV-1 infection	human(B44)	[vanderBurg97]
	 The only ep Recognized	The only epitope recognized by CTL from a long term survivor in two samples taken six years apart Recognized by CTL from a progressor, EILKEPVGHGV and TWETWWTEYW were also recognized	term survivor in two samp GHGV and TWETWWT	oles taken six years apart EYW were also recognized	żd
RT(209-220)	RT(364-375) NOTES:	LLRWGLTTPDKK	HIV-1 infection	human(A2)	[Haas98]
	 Of 98 patie Protease (8 New cluste 	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	1 CTL against pol – RT wa ectively) fferent HLA molecules	s more immunogenic thar	1 Integrase and
RT(LAI)	RT(398-407) NOTES:	PIVLPEKDSW	HIV-1 infection	human(B*5701)	[vanderBurg97]
	 Recognized 	Recognized by CTL from a progressor and a long term survivor, KITTESIVIW was also recognized	term survivor, KITTESIV	'IW was also recognized	
RT(415-426 IIIB)	RT(415-426) NOTES: • P. Johnson,	415-426) LVGKLNWASQIY TES: P. Johnson, pers. comm.	HIV-1 infection	human(Bw62)	[Brander96]

I-A-52 DEC 98

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(438-446 IIIB)	RT(426-434) NOTES: • YAGIKVR • YHKIKVR • Epitope de study	426-434) YPGIKVRQL HIV-1 infection human(B TES: YAGIKVRQL and YPGIKVKQL are naturally occurring variants that are both reactive YHKIKVRQL is a naturally occurring variant that has not been tested Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project, a mot study	HIV-1 infection curring variants that are by has not been tested S Foundation ARIEL Pro	human(B42) [Walkerperc oth reactive yject, a mother-infant HIV transmission	[Walkerpercom96] transmission
RT(448-456 SF2)	RT(448-456) NOTES: • Binds HLA	(448-456) IPLTEEAEL (TES: Binds HLA-B*3501 and B*5101	HIV-1 infection	human(B35,B51)	[Shiga96]
RT(448-456 SF2)	RT(448-456) NOTES: • A CTL clo • Only 1/7 B • An E to K • An I to V B*3501 • An I to V s	448-456)IPLTEEAELHIV-1 infectionhuman(B*3501)[Tomiyama6] TES: A CTL clone responsive to this epitope was obtainedOnly 1/7 B35 positive individuals had a CTL response to this epitopeAn E to K substitution at position 5 abrogates specific lysis, but not binding to B*3501An I to V substitution at position 1, P to Q at position 2, and E to K at 5, abrogates specific lysis and binding to B*3501An I to V substitution at position 1 did not alter reactivity	HIV-1 infection ed onse to this epitope ific lysis, but not binding ition 2, and E to K at 5, activity	human(B*3501) to B*3501 abrogates specific lysis ar	[Tomiyama97] nd binding to
RT(461-485 HXB2)	RT(449-473) NOTES: • One of five	 (449-473) PLTEEAELELAENREIL- HIV-1 infection KEPVHGVY OTES: One of five epitopes defined for RT specific CTL clones in this study 	HIV-1 infection lones in this study	human(A2)	[Walker89]
RT(LAI)	RT(463-472) NOTES: • Recognized	463-472) EILKEPVGHV HIV-1 infection human(A*0201) TES: Recognized by CTL from a long term survivor, SPIETVPVKL was also recognized Recognized by CTL from a progressor, EELRQHLLRW and TWETWWTEYW were also recognized	HIV-1 infection IETVPVKL was also reco LRW and TWETWWTE	human(A*0201))gnized YW were also recognized	[vanderBurg97]

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
Pol(476-484)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A*0201)	[Wilson98]
	 HIV+ individuals w and clonal expansic Seven HIV+ people uninfected controls 	HIV+ individuals were followed longitudinally using MHC tetramers in combination with 14 anti-BV chain MAbs, and clonal expansion of HIV-specific T cells was followed <i>in vivo</i> Seven HIV+ people were studied, and all showed expansions of particular TCR BV clones, often several, relative to uninfected controls	sing MHC tetramers in co followed <i>in vivo</i> expansions of particular	mbination with 14 anti-BV chain MAbs, rCR BV clones, often several, relative to	V chain MAbs, /eral, relative to
	• Three patie increases	Three patients were followed in detail, TCR VB expansions persisted for 2 increases	3 expansions persisted for	2 to 3 years, with occasional transient	sional transient
Pol(476-484)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A*0201)	[Ogg98]
	 HLA-tetrameric c revealing an inver Inclusion of both t restricted activity 	 HLA-tetrameric complexes were used in a cross-sectional study of 14 untreated HLA A*0201 positive individuals, revealing an inverse relationship between HIV Gag and Pol specific CTL effector cells (CTLe) and viral load Inclusion of both the p17 SLYNTVATL and RT ILKEPVHGV epitopes gives a good representation of HLA A*0201-restricted activity 	sectional study of 14 untrag and Pol specific CTL et KEPVHGV epitopes give	eated HLA A*0201 posit fector cells (CTLe) and v s a good representation of	ive individuals, viral load HLA A*0201-
RT	RT(464-472)	464-472) ILKEPVHGV Multi-epitope gene human(A*0201) [Hankiin VVA	Multi-epitope gene in VVA	human(A*0201)	[Hanke98c, Hanke98b]
	• This epitop cells with v	STES: This epitope was shown to be processed and presented to appropriate CTL clones upon infection of human target cells with vaccinia virus Ankara (VVA) carrying 20 HIV-1 epitopes recognized by humans	sented to appropriate CTI 20 HIV-1 epitopes recogn	clones upon infection c ized by humans	of human target
RT(476-484)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A2)	[Collins98]
	 Nef down- The anti-R of RT 	 Nef down-regulates MHC class I molecules, which inhibits CTL killing of HIV-infected targets The anti-RT CTL clone killed Nef- cells less efficiently than anti-gag clones, correlated with the reduced expression of RT 	ch inhibits CTL killing of iently than anti-gag clone	HIV-infected targets s, correlated with the redu	aced expression
Pol(476-484 LAI)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A2)	[Fan97]
	 The capaci studied 	The capacity of dendritic cells to process and present antigen and stimulate anti-HIV-1 CTL memory responses was studied	sent antigen and stimulate	anti-HIV-1 CTL memory	y responses was

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(464-472)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A2)	[Kundu98]
	 Allogeneic HIV-1 epit 1/6 showed proliferativ 	Allogeneic dendritic cells (DCs) were obtained from HLA-identical siblings, pulsed with rgp160 MN or A2 restricted HIV-1 epitope peptides, and infused monthly into six HIV-infected patients 1/6 showed increased env-specific CTL and increased lymphoproliferative responses, 2/6 showed increase only in proliferative responses, and 3/6 showed no change – pulsed DCs were well tolerated	m HLA-identical siblings, six HIV-infected patients ased lymphoproliferative pulsed DCs were well	, pulsed with rgp160 MN or A2 restricted responses, 2/6 showed increase only in tolerated	r A2 restricted crease only in
	 ILKEPVHGV j direct sequence detectable CTL 	proliferative responses, and 5/6 snowed no change – pulsed L/Cs were well tolerated ILKEPVHGV is a conserved HLA-A2 epitope included in this study – 5/6 patients had this sequence as their HIV direct sequence, and these had a detectable CTL response– one person carried the form ILREPVHGV and had no detectable CTL	response- one person car	tolerated patients had this sequence as their HIV ried the form ILREPVHGV and had no	e as their HIV V and had no
RT(476-484)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A2)	[Tsomides94]
	CTL clone	CTL clones recognize naturally processed peptide – peptide abundance corresponded to level of CTL killing	 peptide abundance corr 	responded to level of CTL	killing
RT(476-484)	RT(464-472) NOTES:	ILKEPVHGV	In vitro stimulation	human(A*0201)	[Konya97]
	This epitopBinding af	This epitope was included as a positive control Binding affinity to A*0201 was measured, $C_{1/2max}\mu M = 12$	$_{tx}\mu M = 12$		
RT(476-484)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 exposure	human(A2)	[Konya97]
	 A CTL reseption epitopes the and conference The A subsection The D subsection 	A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously defined B clade epitopes that tended to be conserved in A and D clades – such cross-reactivity could protect against both A and D and confer protection in Nairobi where both subtypes are circulating The A subtype consensus is ILKDPVHGV The D subtype consensus is identical to the epitope ILKEPVHGV	ected prostitutes from N Slades – such cross-reacti pes are circulating e ILKEPVHGV	airobi using previously de vity could protect against	fined B clade both A and D
RT(476-484)	RT(464-472)	ILKEPVHGV	HIV-1 infection	human(A2)	[Cao97]
	NOTES:The consetThe conset	TES: The consensus peptide of B and D clade viruses and some As have the sequence ILKEPVHGV The consensus peptide of a subset of A clade viruses, ILKDPVHGV, is not cross-reactive	nd some As have the sequ ses, ILKDPVHGV, is not	ence ILKEPVHGV cross-reactive	

		Dedneree	0		
RT(468-476)	RT(464-472) NOTES:	ILKEPVHGV	in vitro stimulation	human(A*0201)	[vanderBurg96]
	• Immunoge	Immunogenic in humans, slow dissociation rate, associated with immunogenicity in transgenic HLA-A*0201/K ^b	, associated with immuno	genicity in transgenic HI	/A-A*0201/K ^b
	• CTL gene:	mice CTL generated by <i>in vitro</i> stimulation of PBMC derived from uninfected individual	derived from uninfected ir	dividual	
RT(468-476)	RT(464-472)	ILKEPVHGV	in vitro stimulation	human(A*0201)	[vanderBurg95]
	• Binds HL	Binds HLA-A*0201 – CTL generated by <i>in vitro</i> stimulation of PBMC from an	stimulation of PBMC from	n an HIV negative donor	
RT(476-484)	RT(464-472)	ILKEPVHGV	HIV-1 infection	human(A*0201)	[Pogue95]
	NOTES: Mutationa	TES: Mutational study: position 1 I to Y increases complex stability with HLA-A*0201	nplex stability with HLA	A *0201	
pol(476-484)	RT(464-472)	ILKEPVHGV	HIV-1 infection	human(A*0201)	[Goulder97, Goulder97e]
	 Identical t One had a 	ILES: Identical twin hemophiliac brothers were both infected with the same batch of factor VIII One had a response to gag A2 epitope SLYNTVATL, the other to pol A2 epitope ILKEPVHGV	fected with the same batch ATL, the other to pol A2 ep	of factor VIII itope ILKEPVHGV	
	 VIIAL SEQUENCE SLHNAVAVL 	YIAI SEQUENCING HOID THE TWIT THAT HAD TO SEQUESE TO SETTIVE WITH INTERACTIONS THIS VIEW HAD THE SUBSTITUTED FORM			
	• 71% of an VATL	71% of an additional set of 22 HIV-1 infected HLA-A*0201 positive donors preferentially responded to gag SLYNT- VATL	A-A*0201 positive donors	preferentially responded	to gag SLYNT-
	Those indi[Goulder9	Those individuals with a pol ILKEPVHGV response tended to have mutations in or around SLYNTVATL [Goulder97e] is a review of immune escape that summarizes this study	onse tended to have mutati summarizes this study	ons in or around SLYNTV	ATL
RT(476-484)	RT(464-472) NOTES:		HIV-1 infection	human(A2)	[Yang96]
	 CD4+ cell lines acutely infected with HIV were studied to determine their susceptibility to lysis Clones specific for RT lysed HIV-1 infected cells at lower levels than Env or Gag specific clones The distinction was then by the due to lower expression of PT relative to Env and Can 	ILKEPVHGV	CD4+ cell lines acutely infected with HIV were studied to determine their susceptibility to lysis by CTL	merentihility to lycic by (ĨL

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Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(476-484)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A2)	[Yang97]
	• CTL inhibi • CTL produ • CTL suppr	CTL inhibit HIV-1 replication at effector cell concentrations comparable to those CTL produced HIV-1-suppressive soluble factors – MIP-1 α , MIP-1 β , RANTES, CTL suppress HIV replication more efficiently in HLA-matched cells	Intrations comparable to MIP-1 α , MIP-1 β , RAN MIP-1 β , RAN	those found <i>in vivo</i> TES, after antigen-specific activation	c activation
RT(309-317)	RT(464-472) NOTES: • Two clones	464-472) ILKEPVHGV HIV infection TES: Two clones were obtained with different TCR usage, $V_{\beta}1$ and $V_{\beta}21$	HIV infection e, $V_{\beta}1$ and $V_{\beta}21$	human(A2)	[Moss95]
RT(309-317)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A*0201)	[Altman96]
	 This paper sion of spe SLYNTVA The highes patient who not the Pol The A2-Poi phenotype Reviewed i 	This paper introduces the tetramer methodology which permits quantification of specific CTL based on expression of specific TCRs – HLA-A2 tetramers were prepared that can stain CTL lines specific for ILKEPVHGV and SLYNTVATL, and quantitate HIV-specific CD8+ cell lines in freshly isolated PBMCs The highest frequency of tetramer staining was found to the Pol epitope, 0.77% of the CD8+ lymphocytes in one patient who also had cells specific for the Gag epitope (0.28%) – three other patients only stained the Gag epitope, not the Pol The A2-Pol CD8+ clones were CD45RO+ and HLA-DR and CD38 negative, suggesting a memory rather than effector phenotype Reviewed in [McMichael98]	which permits quantifica repared that can stain C all lines in freshly isolate und to the Pol epitope, (ope (0.28%) – three othe ope (0.28%) anegative, (tion of specific CTL based on expres- TL lines specific for ILKEPVHGV and d PBMCs 2.77% of the CD8+ lymphocytes in one patients only stained the Gag epitope, suggesting a memory rather than effector	ed on expres- EPVHGV and locytes in one Gag epitope, r than effector
RT(476-484)	RT(464-472) NOTES: • Cervical C	464-472) ILKEPVHGV HIV-1 infection TES: Cervical CTL clones from an HIV infected woman recognized this epitope	HIV-1 infection recognized this epitope	human(A2)	[Musey97]
RT(476-484)	RT(464-472) NOTES: • HLA-A2 h • The HLA-/ • Suggests th gens	464-472)ILKEPVHGVnonehuman(A*0201)[Walter97] ITES: HLA-A2 heavy chain and β 2-microglobulin expressed in <i>E. coli</i> were refolded in the presence of this peptide The HLA-A2-peptide complex elicited HLA-A2 peptide specific CTL response in cells lacking HLA-A2 Suggests that preformed HLA-peptide complexes could provide an alternate to intracellular processing for immuno- gens	none sed in <i>E. coli</i> were refole ptide specific CTL respc ould provide an alternate	human(A*0201) [Walt led in the presence of this peptide onse in cells lacking HLA-A2 to intracellular processing for imu	[Walter97] peptide -A2 g for immuno-

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(476-484 LAI)	RT(464-472) NOTES:	ILKEPVHGV	HIV-1 infection	human(A2)	[Tsomides91]
	 Precise ide 	Precise identification of the nonamer that binds to A2	A2		
RT(476-484 LAI)	RT(464-472) NOTES:	ILKEPVHGV	no CTL shown	human(A2)	[Connan94]
	• Promotes a	• Promotes assembly of HLA-A2 molecules in T2 cell lysates	ell lysates		
RT(510-518)	RT(464-472) NOTES:	ILKEPVHGV	none	human(A2)	[Parker92]
	Studied in	• Studied in the context of HLA-A2 peptide binding			
RT(476-485 LAI)	RT(464-473) NOTES:	ILKEPVHGVY	HIV-1 infection	human(Bw62)	[McMichael94]
	 Review of Also: P. Jo	Review of HIV CTL epitopes Also: P. Johnson 1991 and pers. comm. P. Johnson	n		
RT(495-515 LAI)	RT(483-507)	EIQKQGQGQWTYQIYQE- PFKNLKTG	HIV-1 infection	human(A11)	[Walker89]
	• One of five	TES: One of five epitopes defined for RT specific CTL clones in this study	clones in this study		
RT(507-519 LAI)	RT(495-507) NOTES:	QIYQEPFKNLKTG	HIV-1 infection	human(A11)	[Johnson94b]
	• This epitop	• This epitope was listed in a review			
RT(507-516)	RT(495-505) NOTES:	QIYQEPFKNLK	HIV-1 infection	human	[Price95]
	 Study of cy 	Study of cytokines released by HIV-1 specific activated CTL	vated CTL		
RT(508-516)	RT(496-505)	IVOEDEVAII 12			[Culmon Dor Com]

I-A-58 DEC 98

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(518-526 U455)	RT(519-527) NOTES:	DVKQLTEVV		human(A*6802)	[Dong98]
	 Predicted of Reacts with	Predicted on binding motif, no truncations analyzed Reacts with clade A consensus (U455), and with the peptide DVKQLAEAV, from	d e peptide DVKQLAEAV	, from the D clade	
RT(518-526 U455)	RT(519-527)	DVKQLTEVV		human(B70)	[Dorrell98]
RT(LAI)	RT(529-538) NOTES:	KITTESIVIW	HIV-1 infection	human(B*5701)	[vanderBurg97]
	 Recognize 	Recognized by CTL from a progressor and a long term survivor, PIVLPEKDSW	erm survivor, PIVLPEKI	OSW was also recognized	
RT(559-568 LAI)	RT(547-556)	PIQKETWETW		human(A32)	[Harrer96b]
RT(LAI)	RT(552-561)	TWETWWTEYW	HIV-1 infection	human(B44)	[vanderBurg97]
	Recognize RETKLGF	Recognized by CTL from two progressors, EILKEPVGHGV and EELRQHLLRW were also recognized by one, and RETKLGKAGY was also recognized by the other	VGHGV and EELRQHI	LRW were also recogniz	ed by one, and
RT(421-429)	RT(576-584) NOTES:	PLVKLWYQL	HIV-1 infection	human(A2)	[Haas98]
	Of 98 patieProtease (8New cluste	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	CTL against pol – RT wa ctively) erent HLA molecules	s more immunogenic tha	n Integrase and
RT(587-597 SF2)	RT(587-596)	EPIVGAETFY	HIV-1 infection	human(B35)	[Shiga96]
	Binds HL/	• Binds HLA-B*3501, but not presented by B51, in contrast to the peptide EPIVGA	contrast to the peptide EF	IVGAETF	
RT(587-597 SF2)	RT(587-595) NOTES:	EPIVGAETF	HIV-1 infection	human(B*3501)	[Tomiyama97]
	 A CTL clo 5/7 B35 pc An E to D 	A CTL clone responsive to this epitope was obtained 5/7 B35 positive individuals had a CTL response to this epitope An E to D substitution at position 1, and V to I at position 4, reduces activity but not binding to B*3501	ed this epitope		2

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(587-596 SF2)	RT(587-595) NOTES:	EPIVGAETF	HIV-1 infection	human(B35,B51)	[Shiga96]
	Binds HLA	Binds HLA-B*3501, and presented by B51 – CTL could not kill RT-vaccinia virus infected cells that expressed B51	TL could not kill RT-vaccir	ia virus infected cells that	expressed B51
RT(LAI)	RT(589-602) NOTES:	IVGAETFYVDGAAS	HIV-1 infection	human(A*6802)	[vanderBurg97]
	 Recognize FYVDGA A*6802 is 	Recognized by CTL from a long term survivor that recognized a set of 5 FYVDGAAS as well as PIVLPEKDSW and KITTESIVIW A*6802 is a subset of HLA-A28		overlapping peptides spanning IVGAET-	ining IVGAET-
RT(591-600 IIIB)	RT(591-600)	GAETFYVDGA	HIV-1 infection	human(B45)	[Walkerpercom96]
	Epitope de study	 Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study 	AIDS Foundation ARIEL F	roject, a mother-infant H	V transmission
RT(592-602 LAI)	RT(592-602) AETFYVI NOTES: • P. Johnson pers. comm	AETFYVDGAAN		human(A28)	[Brander96]
RT(593-603 IIIB)	RT(593-603) NOTES:	ETFYVDGAANR	HIV-1 infection	human(A26)	[Walkerpercom96]
	 Epitope de study ETYYVN(Epitope defined in the context of the Pediatric AIDS Foundation ARIEL Project, a mother-infant HIV transmission study ETYYVNGAANR. a naturally occurring variant. was found in non-transmitting mother and is recognized but less 	AIDS Foundation ARIEL F	roject, a mother-infant Hi nitting mother and is reco	V transmission
	TEACTIVE				
RT(648-672 PV22)	RT(636-660) NOTES:	AIYLALQDSGLEVNIVT- DSQYALGI	HIV-1 infection	human(B14)	[Kalams94]

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(648-672)	RT(636-660) NOTES: • Study of c	(636-660) AIYLALQDSGLEVNIVT- HIV-1 ; DSQYALGI TES: Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection vated CTL	human	[Price95]
RT(648-672)	RT(640-660) NOTES: • Unpublish	r(640-660) ALQDSGLEVVTDSQYALGI OTES: • Unpublished, S. Kalams	HIV-1 infection	human(B14)	[Brander95a]
RT(640-648 HXB2R)	RT(640-648) NOTES:	(640-648) ALQDSGLEV no CTL sh (TES:	no CTL shown	human(A2)	[Brander95]
RT(640-648 HXB2R)	RT(640-648) NOTES: • This epitop • This epitop vaccine • This vaccin	540-648)ALQDSGLEVpeptide vaccinehuman(A2.1)[Brander96] TES: This epitope was recognized by PBMC from 3/14 HIV+ asymptomatic patients This epitope was used along with Env CTL epitope TLTSCNTSV and a tetanus toxin T helper epitope for a synthetic vaccine This vaccine failed to induce a CTL response, although a helper response was evident	peptide vaccine HIV+ asymptomatic pati TLTSCNTSV and a teta ough a helper response w	human(A2.1) ents nus toxin T helper epitope zas evident	[Brander96b, Brander95b] 9 for a synthetic
RT(663-672 IIIB)	RT(651-660)	VTDSQYALGI	HIV-1 infection	human(Cw8)	[Brander96]

NOTES:

• Unpublished, P. Johnson

• Published in this database in 1995 as B14, but B14 transfected cells did not present the peptide and it is thought to

be presented by the genetically linked Cw8 molecule instead [Brander96]

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT	RT(651-660) NOTES:	VTDSQYALGI	HIV-1 exposure	human(Cw8)	[RowlandJones98]
	 A CTL res epitopes th and confer The A and 	A CTL response was found in exposed but uninfected prostitutes from Nairobi using previously defined B clade epitopes that tended to be conserved in A and D clades – such cross-reactivity could protect against both A and D and confer protection in Nairobi where both subtypes are circulating. The A and D subtype consensus are identical to the B clade epitope	ected prostitutes from P clades – such cross-reaci pes are circulating	Nairobi using previously livity could protect again	defined B clade st both A and D
	The A andThought to personal cc	The A and D subtype consensus are identical to the B clade epitope Thought to be HLA-Cw8 restricted, not B14 as originally reported (C. Brander, personal communication)	e B clade epitope riginally reported (C. Br	ander, B. Walker, and S. Rowland-Jones,	Rowland-Jones,
RT(516-525)	RT(671-680) NOTES:	ELVNQIIEQL	HIV-1 infection	human(A2)	[Haas98]
	 Of 98 patie Protease (8 New cluste	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	l CTL against pol – RT w ectively) ferent HLA molecules	as more immunogenic th	an Integrase and
RT(532-540)	RT(687-695) NOTES:	YLAWVPAHK	HIV-1 infection	human(B7)	[Haas98]
	Of 98 patieProtease (8New cluste	Of 98 patients in cross-sectional analysis, 78% had CTL against pol – RT was more immunogenic than Integrase and Protease (81%, 51%, and 24% of 37 patients, respectively) New clusters of epitopes were defined utilizing different HLA molecules	l CTL against pol – RT w ectively) ferent HLA molecules	as more immunogenic th	an Integrase and
RT(797-804 SF2)	RT(797-804) NOTES:	GYIEAEVI	HIV-1 infection	human(A*2402)	[IkedaMoore97]
	 Defined usi anchors in This peptic 	Defined 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	A*2402 binding peptide r Ile at the C term) – 53 ested	s were predicted by search of the 59 peptides bound	ning for A*2402 A*2402
	• GYIEAEV specific CT	GYIEAEVI bound to A*2402 weakly, the epitope can be processed in a vaccinia construct and presented – two specific CTL clones were obtained	e can be processed in a	vaccinia construct and	presented – two
In(823-831)	RT(811-819) NOTES:	811-819) ETAYFILKL hui TES:	· · · · · · · · · · · · · · · · · · ·	human(A*6802)	[Rowland-JonesPerCom98]

Location	WEAU	Sequence	Immunogen	Species(HLA)	References
RT(956-964)	RT(956-964) NOTES:	LLWKGEGAV	HIV-1 infection	human(A2)	[Kundu98]
	 Allogeneic HIV-1 epit 1/6 showe proliferativ LLWKGE direct sequ 	Allogeneic dendritic cells (DCs) were obtained from HLA-identical siblings, pulsed with rgp160 MN or A2 restricted HIV-1 epitope peptides, and infused monthly into six HIV-infected patients 1/6 showed increased env-specific CTL and increased lymphoproliferative responses, 2/6 showed increase only in proliferative responses, and 3/6 showed no change – pulsed DCs were well tolerated LLWKGEGAV is a conserved HLA-A2 epitope included in this study – 6/6 patients had this sequence as their HIV direct sequence, but only four of these had a detectable CTL response	rom HLA-identical siblings to six HIV-infected patients reased lymphoproliferative ge – pulsed DCs were well included in this study – 6/0 ectable CTL response	, pulsed with rgp160 MN responses, 2/6 showed : tolerated 5 patients had this sequer	or A2 restricted increase only in nce as their HIV
RT(956-964 HXR2R)	RT(956-964)	LLWKGEGAV	no CTL shown	human(A2)	[Parker92, Parker94]
	NOTES: • Studied in	TES: Studied in the context of HLA-A2 peptide binding	ng		
RT(956-964 HXB2R)	RT(956-964)	LLWKGEGAV	no CTL shown	human(A2)	[Brander95]
	• No CTL a	OTES: No CTL activity found in HIV infected subjects, epitope studied in the context of 	, epitope studied in the cont	ext of inclusion in a synthetic vaccine	thetic vaccine
RT(576-584)	RT(956-964) NOTES: • Slow dissc	(956-964) LLWKGEGAV <i>in vitro</i> stimulation human(A*020) TES: Slow dissociation rate, associated with immunogenicity in transgenic HLA-A*0201/K ^b mice	<i>in vitro</i> stimulation genicity in transgenic HLA.	human(A*0201) -A*0201/K ^b mice	[vanderBurg96]
	 CTL gener 	CTL generated by in vitro stimulation of PBMC derived from uninfected individual	derived from uninfected in	dividual	
RT(gag/pol)	RT		DNA gag/pol, vif,	murine	[Kim97]

NOTES:

A gag/pol, vif or gp160 DNA vaccine, when delivered in conjuction with the plasmid encoding the co-stimulatory molecules B7 and IL-12, gave a dramatic increase in both the cytotoxic and proliferative responses in mice
When IL-12 was present, CTL response could be detected even without *in vitro* stimulation

and env vaccine

Location	WEAU Sequence	Immunogen	Species(HLA)	References
RT(pol)	RT(pol) NOTES:	HIV infection	human	[Trickett98]
	 12 HIV-1 infected patients were re-infused with their own lymphocytes, cryopreserved from an earlier time point in the infection Improvement in CD4+ and CD8+ T cells were seen in 7/12, and an increase in the CTL response to Pol was seen in one patient 	ed with their own lymphocytes s were seen in 7/12, and an inc	, cryopreserved from an earlier time point in rease in the CTL response to Pol was seen in	earlier time poin to Pol was seen
RT(gag/pol)	RT NOTES:	DNA gag/pol, and env vaccine	murine	[Kim97b]
	 A gag/pol or env DNA vaccine, when delivered in conjuction with the plasmid encoding the co-stimulatory molecules CD86, gave a dramatic increase in both the cytotoxic and proliferative responses in mice When CD86 was present, CTL response could be detected even without <i>in vitro</i> stimulation 	ivered in conjuction with the plathe cytotoxic and proliferative to could be detected even withou	asmid encoding the co-sti responses in mice t <i>in vitro</i> stimulation	mulatory molecu
Pol	RT NOTES:	HIV-1 infection	human	[Froebel97]
	• Two HIV-1 infected children with contrasting disease courses were followed longitudinally – one died of AIDS, the other is a long term non-progressor	sting disease courses were foll	owed longitudinally – one	e died of AIDS, t
	 Reactivity against Gag, Pol, Env and Tat proteins was tested by PBMC bulk cultured cells reacting with protein expressed in vaccinia constructs in autologous EBV transformed B cells The child who progressed consistently had CTL against Pol and Tat 	at proteins was tested by PBM ogous EBV transformed B cell ad CTL against Pol and Tat	IC bulk cultured cells re s	acting with prote
	 The long term non-progressing child had no detectable CTL, but was heterozygous for a mutation in the CCR5 receptor and for HLA-B49, which has been shown to be associated with slower progression 	ad no detectable CTL, but was en shown to be associated wit	s heterozygous for a mut h slower progression	tation in the CCI
Pol(Pol IIIB)	NOTES:	HIV-1 infection	human	[Betts97]
	 6/8 individuals from Zambia infected with C clade virus had CTL that were ab IIIB vaccinia expressed Gag, Pol and Env proteins 	th C clade virus had CTL that v v proteins	vere able to make response to B clade HIV-1	se to B clade HIV
	• A vigorous cross-clade response was not limited to a particular protein, and proteins varied among the six patients	ot limited to a particular prote	in, and the level of recognition of different	gnition of differ
Pol	NOTES:	HIV-1 infection	human	[DeMaria97]
	 CD3+ cells that also carry a natural killer cell receptor (NKR+) can exhibit down regulation of T-cell function Anti-NKR IgM MAb masked this inhibitory function and increased HIV-1 specific CTL activit phytohemagglutinin-activated PBMC cultured in the presence of IL-2 from 3/5 patients, and in one other anti-NKR MAb brought HIV-1 specific CTL activity to detectable levels 	r cell receptor (NKR+) can exhibitory function and included in the presence of L-	ibit down regulation of T-cell function reased HIV-1 specific CTL activity in 2 from 3/5 patients, and in one other case	n regulation of T-cell function HIV-1 specific CTL activity in 3/5 patients, and in one other case