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T-Cell Antigen Receptors in Multiple Sclerosis

Lisa Lanée Keyes Jones
Old Dominion University, hisdove1010@gmail.com

T-CELL ANTIGEN RECEPTORS IN MULTIPLE SCLEROSIS

by

Lisa Lanée Keyes Jones
B.S., May 2002, Virginia Polytechnic Institute and State University
M.S., December 2007, Virginia Commonwealth University

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Approved by:

Emilia Oleszak (Advisor)

Chris Platsoucas (Co-Advisor)

Piotr Kraj (Member)

Alvin Holder (Member)

ABSTRACT

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Lisa Lanée Keyes Jones
Old Dominion University, 2022
Co-Advisors: Dr. Emilia Oleszak
Dr. Chris Platsoucas

Multiple Sclerosis (MS) is T-cell mediated autoimmune disease characterized by inflammation, demyelination, and degeneration of axons in the brain and spinal cord. A T cell-mediated immune response in MS is directed against myelin components and possibly other antigens in genetically susceptible individuals and is triggered by a viral infection. The T-cell antigen receptor (TCR) on T cells is responsible for antigen recognition and determines specificity. Our overall hypothesis is to determine whether clonally expanded T cells in patients with MS recognize viral or self-antigens and to determine whether molecular mimicry is involved in the development of the disease. To study TCR in MS we have developed/optimized a single-cell PCR/single-cell sequencing approach of both alpha- and beta-chain TCR, designated as Variable Region Multiplex Reverse Transcription PCR (VRM RT-PCR). We applied VRM RT-PCR for the single-cell PCR/sequencing of peripheral blood mononuclear cell (PBMC) populations and primarily memory T cells (CD3+CD8+CD45RO+, CD3+CD4+CD45RO+, and CD3+CD20+) from normal donors and patients with MS with the objective to identify clonally expanded T-cell populations. Unique TCR transcripts, when compared to each other, were

observed in PBMC from normal donors in over 80% of the experiments carried out, typical of polyclonal populations of T cells. In contrast, clonally expanded T cells were identified in these T-cell populations from PBMC from patients with MS.

In other studies, we used bioinformatics approaches to determine whether there are substantial CDR3 homologies between 254 alpha- and beta-chain TCR transcripts from brain autopsy specimens or cerebrospinal fluid (CSF), previously obtained in our laboratory from six patients with MS, to alpha- and beta-chain TCR transcripts already reported in the GenBank/EMBL database. We identified extensive CDR3 region homologies between TCR expressed in brain autopsies or CSF of these six MS patients and those TCR expressed in T cells from MS patients or normal donors stimulated with myelin antigens, as well as those from patients with autoimmune diseases, Sjogren's Syndrome, cancer, and viral infections reported in the GenBank/EMBL.

Additional studies revealed sequence homologies between myelin oligodendrocyte glycoprotein and viral peptides from several viruses, suggesting a mechanism of molecular mimicry that may be involved in MS.

This dissertation is dedicated to my family, including my mom and my kids who patiently endured with me after late work nights, long commutes, and time- consuming schedules.

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NOMENCLATURE

BLAST	Basic Local Alignment Search Tool
CD	Cluster of Differentiation
cDNA	Complementary Deoxyribonucleic Acid
CDR	Complementarity Determining Region
CNS	Central Nervous System
CSF	Cerebrospinal fluid
DNA	deoxyribonucleic acid
dNTP	deoxyribonucleotide triphosphate
HEPES	4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid
HLA	Human Leukocyte Antigen
ILs	Interleukin
min	Minutes
M	Molarity
mab	Monoclonal antibody
MHC	Major Histocompatibility Complex
µl	Microliters

μM	Micromolar
MS	Multiple Sclerosis
NPA	Non-Palindromic Adaptor
PBMC	Peripheral Blood Mononuclear Cells
PCR	Polymerase Chain Reaction
RRMS	Relapsing-Remitting Multiple Sclerosis
sec	Seconds
TCR	T Cell Receptor

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CHAPTER 1

INTRODUCTION

Multiple Sclerosis (MS) is an autoimmune disease characterized by inflammation, disseminated demyelination, and degeneration of axons in the brain and spinal cord. The reported incidence of MS in the United States is 3.2 incidents per 100,000 and prevalence estimates are 90-135 per 100,000 with higher incidence associated with increasing latitudes [1, 2]. About 2-10.5% of patients with MS have clinical onset before age 18 [3], but MS is more prevalent in adults between the ages of 20-50 years. Two major forms of MS have been characterized as relapsing-remitting MS (RRMS) with intermittent episodes of neurological dysfunction, or progressive MS with gradual neurological decline [4]. Patients with MS suffer both physical and emotional disabilities, some of which include an unsteady gait, lack of coordination, spasticity, pain, vision impairments, depression, and fatigue [5].

PROBLEM

It is believed that both environmental (such as a virus) and genetic factors contribute to the development of MS. It has been hypothesized that a viral infection is responsible for initiating MS, but the putative virus(es) that may be involved are very likely cleared when patients have developed clinical symptoms for the first time.

HYPOTHESIS

The hypothesis to be tested in this research project is whether clonally expanded T cells in patients with inflammatory demyelinating diseases, such as MS, recognize viral or self-antigens and whether molecular mimicry is involved in the pathogenesis of the disease.

OBJECTIVES AND SPECIFIC AIMS

The purpose of our research is to identify clonally expanded T cells in patients with MS, and determine whether they recognize viral or self-antigens and through molecular mimicry between self-antigen(s) (presumably myelin/neuroantigens) and non-self (viral) antigens. Our specific aims are:

1. To develop a single-cell polymerase chain reaction (PCR) and single-cell sequencing method to identify at the single-cell level clonal expansions of alpha/beta TCR+ T cells and identify the sequences of the alpha- and beta-chain TCR transcripts employed at the single cell level.

2. To determine whether T cells from the peripheral blood of patients with MS contain clonally expanded populations of alpha/beta TCR+ T cells.

3. To determine whether there are extensive amino acid CDR3 TCR sequence homologies of alpha- and beta-chain TCR transcripts in autopsy brain plaques and CSF from patients with MS and MS-like disease with amino acid CDR3 TCR sequences,

preferably with identified specificity, previously reported in the GenBank/EMBL/SWISSProt databases.

4. To determine whether certain MOG peptides exhibit sequence homologies with viral antigens reported in the GenBank/EMBL databases.

CHAPTER 2

BACKGROUND OF THE STUDY

REVIEW OF THE LITERATURE

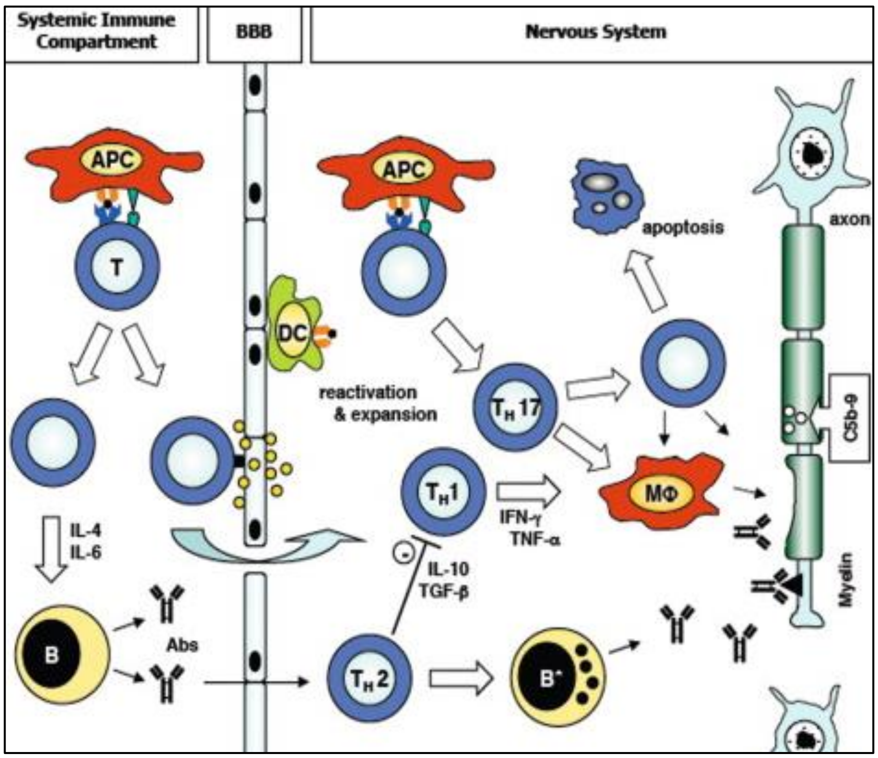
The molecular mimicry hypothesis suggests that virally-induced autoimmunity could be initiated by viruses which have epitopes that cross-react with self-antigens (likely myelin) [6, 7]. Exposure to such viral antigens induces an immune response which may be propagated by myelin or neuronal axons after the viral infection is cleared [8, 9].

The most common T-cell receptor (TCR) consists of two disulfide-linked polypeptide chains the alpha- and the beta-chain, and they are associated with the CD3 (cluster of differentiation 3) T-cell differentiation antigen, responsible for signal transfer or transduction from the TCR, once antigen binding and recognition occurs, to structures inside the cell. During T cell development, a very large number of alpha- and beta-chain TCR are generated resulting in a highly polymorphic antigen receptors able to bind to antigenic peptide:major histocompatibility complexes (MHC) [10]. Human alpha/beta TCR chains have 32 and 24 known V alpha and V beta families, respectively. The alpha-chain consists of rearranged variable (V), joining (J) and constant region (C), gene segments, whereas the beta- chain contains also a diversity (D) segment, in addition to V, J, and C gene segments that are joined by recombination during T cell development [11]. Additionally, palindromic (P) and non-palindromic (N) nucleotides are inserted between the V, D, and J gene segments on the β chain and the V and J gene segments on the α chain [11] which contribute to the complementarity determining region 3 [12].

Homing of T cells into the CSF and CNS is due to vascular permeability mediated by integrins, such as lymphocyte function associated antigen-1 (LFA-1), that bind intercellular adhesion molecules on T cells, antigen presenting cells (APCs), and endothelium [11]. Once in the CNS, T cells that recognize antigen, proliferate, clonally expand and differentiate to effector cells, releasing primarily pro-inflammatory cytokines, and mediating demyelination and resulting in damage to oligodendrocytes and axons. The mechanisms involved have not been fully elucidated. A number of interleukins play a critical role in T-cell differentiation. Among others, IL-6 stimulates differentiation into Th17 cells and IL-12 stimulates differentiation into Th1 cells. Human Th17 differentiation requires the pro-inflammatory cytokine IL-1β, as well as other effector cytokines such as IL-17, IL-22, and interferon-gamma (IFN-γ). It is believed that putative APCs, such as microglia, dendritic cells, and B cells, present to T-cell clones that have responded previously to viral antigens, cross-reactive determinants of host antigens, such as myelin oligodendrocyte glycoprotein (MOG), MBP, proteolipid protein (PLP), cyclic nucleotide phosphodiesterase, and axon proteins such as contactin-2 [13-15]. Th1 cells secrete cytokines such as IL-2, IFN-γ, and tumor necrosis factor (TNF), which also induce proliferation of immune cells, inflammation, and destruction of myelin and any intracellular pathogens (Figure 1) [4, 16, 17]. Th17 works synergistically with TNF-α to inhibit re-myelination of damaged oligodendrocytes and promote apoptosis in vitro [18, 19]. Caspases within apoptotic cells can cleave proteins and be used by APCs to activate CD4+ T helper cells or CD8+ cytotoxic T cells via MHC class I expression, which suggests a mechanism for epitope spreading or antigen cross-reactivity [18]. Recruitment of cytotoxic CD8+ T cells by APCs results in expansion and production of more pro-inflammatory cytokines, such as IFN- γ and IL-17. Other cells involved

in demyelination may include myelin-reactive antibodies that activate antibody-dependent-cytotoxicity in macrophages and stimulate other innate immune mechanisms, such as complement proteins to increase opsonization and the membrane attack complex; these mechanisms ultimately lead to the destruction of myelin (Figure 1) ([17, 20].

FIGURE 1. PATHOGENESIS OF IMMUNE-MEDIATED INFLAMMATORY DEMYELINATION [17]



Foreign antigens or self-peptides from damaged CNS tissue are processed and bound to MHC molecules and APC. MHC I molecules present peptides in general to CD8+ T cells and MHC II to CD4+ T cells. Naïve T cell activation requires several signals: T cell receptor binding to peptide (antigen): MHC complexes, CD4 or CD8 molecules binding to monomorphic parts of the

MHC molecules, and cytokine stimulation to induce proliferation and differentiation of the effector T cell [11]. Co-stimulatory molecules from APCs include B7 glycoproteins that bind to CD28 receptors on T cells. Effector and memory T cells produce CD45RO proteins on their cell surface, which may be used to distinguish memory T cells stimulated by a previous infection, such as a viral infection, early in the development of the disease [11]. An additional antigen on T cells are CTLA-4 that binds to the B7 molecules during inhibition and regulation of T cell proliferation [11]. Impaired activity of regulatory T cells, as well as, reduced signaling by co-inhibitory molecules (e.g., CTLA-4) and immunosuppressive cytokines (e.g., IL-10) may also contribute to autoimmunity in MS [21].

MS is associated with certain MHC class II and class I haplotypes and in particular DRB1*15 [22-24]. These gene associations show prevalence in northern European populations, revealing geographic distribution and ethnic risk associations for MS (1 in 1000), 8.3-fold higher risk for MS in Caucasians with a homozygous allelic expression for the HLA-DRB1 gene [25, 26].

Damage to myelin appears to be mediated by autoreactive T cells that develop after peripheral antigen activation from viral and subsequently host antigen stimulation and then infiltrate the CNS. Earlier studies have identified CD4+ and CD8+ T cells in acute, chronic, and active demyelinating MS lesions. Human studies have shown that white matter lesions in acute MS patients have a high occurrence of CD4+ T cells, Th1 and Th17, and may play an important role in the early pathogenesis of MS [14, 27-30]. The T-cell repertoire investigated in brain and spinal cord regions also reveal a majority of oligoclonal CD8+ T cells with common peptide specificities [31, 32]. The TCR repertoire in peripheral blood of normal donors varies but does not clearly show higher or lower expression of a particular TCR Vβ chain. However, flow

cytometric comparison of CD4+ and CD8+ cells between blood and CSF compartments within MS patients showed a higher expression of particular Vβ regions TCR chains in CD8+ cells in the CSF [33]; in one patient with MS a CD8+ TCR clone accounted for 35% of the CD8+ cells detected in brain parenchyma [31]. Since then, several studies have detected similar results by using CDR3 spectratyping and single cell PCR to identify and compare clonally expanded T cells in parenchyma and perivascular brain tissue of MS patients, predominately CD8+T cells in parenchyma and increasing numbers of CD4+ T cells in perivascular areas [34]. In another case CD8+ TCR sequences were clonally expanded from perivascular (26%) or intra-parenchymal (71%) locations; fewer CD4+ T cell clones were represented in parenchyma tissue. Five of the CD8+ TCR clones were also detected in the CSF or blood of the same patient five years after the initial brain biopsy [35]. In a similar but separate study, CDR spectratyping and single cell PCR analysis were used to identify the TCR β-chain repertoire in distinct brain lesions (inactive demyelinating lesions, slowly expanding chronic lesions, and active lesions) and normal appearing white matter (NAWM) of four MS patients [27]. In each patient identical TCR clones were present in two or more brain regions. Moreover, distinct brain lesions contained similar TCR clones with silent nucleotide exchanges present in the hypervariable N-D-N region that code for identical amino acids sequences (e.g., different Vβ5.1-Dβ1-Jβ2.7 T cell clones), suggesting recruitment by a common antigen. MS related HLA class I and HLA class II alleles were observed in 2 of the patients (HLA-A*0201, -B*5101, -DRB1*04, -DRB1*15 and –DQB1*0602), however, none of the TCR sequences identified were shared between patients [27]. In another study where post-mortem brain tissue was used, CNS lesions in a MS patient contained oligoclonal T cells. These oligoclonal T cells were commonly observed in different

brain regions of NAWM and spinal cord lesions detected by CDR3 length distribution and gene expression profiling; common oligoclonal T cells were 3% of the total CDR3 lengths determined in all CNS regions [14]. A similar study used PBMCs and brain tissue from a MS patient, and detected clonally expanded TCRs with $V\beta1^{+}J\beta2.3^{+}$ $CD8^{+}$ chains paired with distinct $V\alpha7.2^{+}$ chains ($V\beta1^{+}$ represented 38% of all $CD8^{+}$ T cells, including a $V\alpha7.2^{-}$ $J\alpha33$ mucosal associated invariant T cell related chain [36]. Altogether, these studies showed clonal expansion of TCRs with common CDR3 regions in multiple CNS areas, each unique to individual MS patients. Because of the very large size of the T-cell receptor repertoire the only possible explanation for clonal expansions is that they are the result of specific-antigen(s) driven proliferation and clonal expansions in vivo, in response to a yet unidentified antigen(s).

Viral induced autoimmunity may be the result of cross-reactive immune response between viral and self-antigen. Some viruses reportedly show significant homology to myelin proteins, including measles, Herpes Simplex Virus, human herpesvirus 6, Coronaviridae, parainfluenza virus, Epstein-Barr virus (EBV), Cytomegalovirus (CMV), and hepatitis A viral infection [7, 37]. Studies have shown homology between MBP and nucleoprotein of the hemagglutinin of influenza virus, core protein of adenovirus, EC-LF2 protein of EBV, and others [38]. Recent studies investigating the B-cell repertoire in the CSF of an MS patient identified an antibody with high affinity for an EBV nuclear antigen 1 epitope (EBVNA1) and demonstrated a cross reactivity with glial cellular adhesion protein [39]. This study further demonstrated that co-immunization of mice with the EBVNA1 epitope exacerbated autoimmune demyelination [39]. Clonally expanded TCR transcripts (expressed in CD8+ T cell populations) have also been

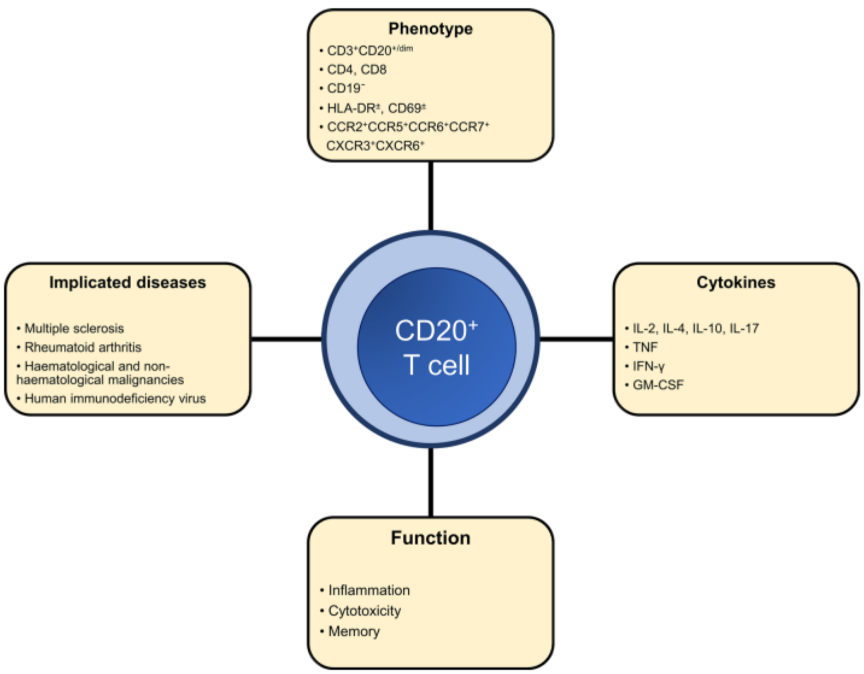
associated with EBV, and other viruses such as Influenza A, CMV, and varicella zoster virus specificities in CSF and blood for MS patients [40].

In a previous study, oligoclonal expansion of T cells was detected in the CSF of a child who developed pediatric MS following infection by hepatitis A virus; two of the T cell clones exhibited substantial CDR3 homology to myelin basic protein (MBP) [8]. Additionally, clonally expanded TCR transcripts from the CSF of this pediatric patient with MS-like demyelinating inflammatory disease recognized certain MOG peptides which shared homology with peptides of the Hepatitis A virus. This work was done by a former graduate student in our laboratory, X.Y. Zhang, Ph.D. (manuscript in preparation). These studies further support the role of viruses as a potential environmental trigger for MS and molecular mimicry as a possible mechanism for the development of the disease.

A population of T cells which is of considerable interest recently is the CD3+CD20+ T cells [41]. These cells constitute a small subset of T cells. Their presence has been documented in normal donors and in patients with autoimmune diseases, cancer, and viral infections. CD20 was considered to be a B cell differentiation antigen, however, it is expressed weakly, ranging between 0.1-6.8% of CD3+ T cells in the peripheral blood [41, 42]. The CD20 antigen may be obtained by the CD3+ T cell from the CD20+ B cells by trogocytosis [43]. CD3+CD20+ T cells may be a more activated and inflammatory phenotype over CD3+CD20- T cells [41]. CD3+CD20+ T cells are CD19-, the majority of them (over 75%) are CD8+ and the remaining either CD4+ or CD4-CD8-, and a portion of them express gamma/delta TCR [41]. Certain CD3+CD20+ T cells appear to express either CD45RO, CD45RA, HLA-DR and CD69 antigens, particularly in a number of autoimmune diseases (see Figure 2) [41].

Monoclonal antibodies (mabs) against the CD20 antigen have been used for the treatment of patients with MS [44, 45] and other autoimmune disorders and certain hematopoietic malignancies and have shown in general with high efficacy [46]. Although anti-CD20 mab treatment was expected to deplete CD20+ B cell, it has been effective in depleting CD3+CD20+ T cells [41, 47-49]. These CD3+CD20+ T cells may contain memory T cells which may be important in the immunopathogenesis of the disease.

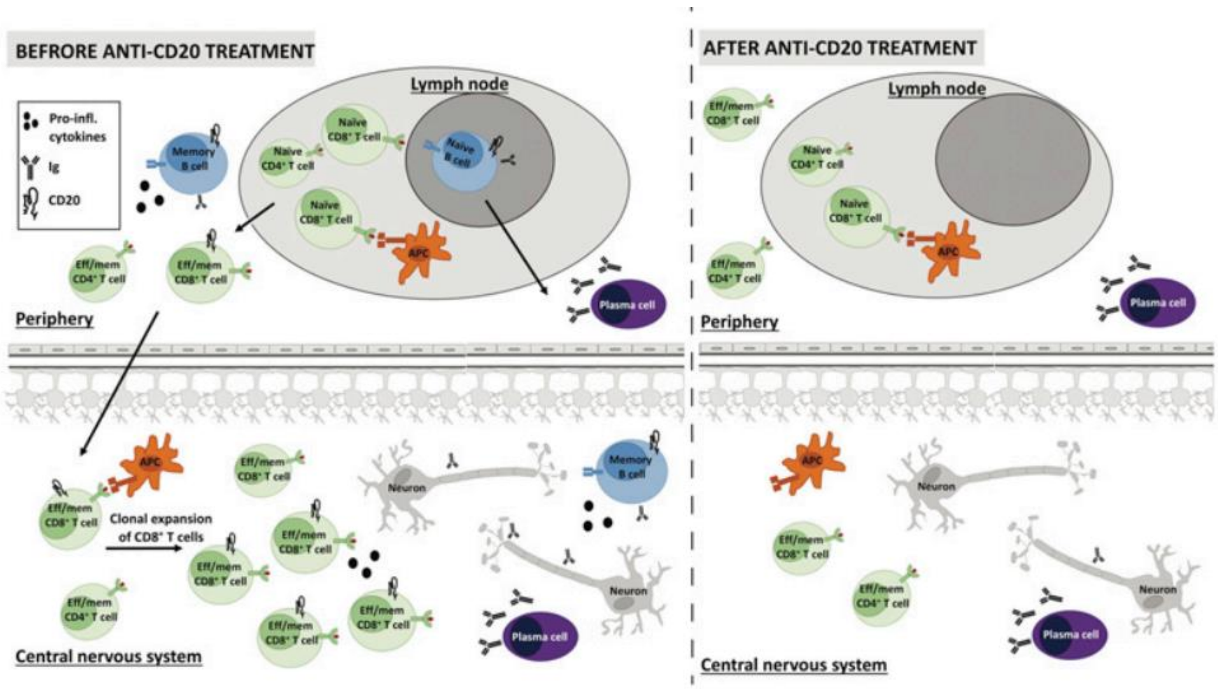
FIGURE 2. KEY FEATURES OF CD20+ T CELLS. [41]



It should be noted that although anti-CD20 mabs deplete B cells, plasma cells are CD20- and are retained and the same is correct for oligoclonal immunoglobulin bands in the CSF of these patients [50]. The mechanisms of involvement of B cells in the immunopathogenesis of the disease under these circumstances may not involve only production of autoantibodies in these patients, which may lead to the destruction of cells of the CNS through the complement

pathways. Additional mechanisms appear to be involved (see Figure 3). B cells may present myelin-derived peptides to T cells leading to their activation, proliferation and differentiation to effector cells contributing to the propagation of the inflammatory immune response [48]. Also, these B cells may produce proinflammatory cytokines, such as IL-6, promoting further the autoimmune response and contributing to the pathogenesis of the disease [48].

FIGURE 3. ABLATION OF CD20+ T AND B CELLS BY ANTI-CD20 THERAPY IN MS [48].



“Through presentation of CNS-derived antigens by APCs, naïve CD8+ T cells are primed in the lymph nodes. Along with plasma, CD4+ T, and CD20+ B cells, CD20+ effector memory CD8+ T cells transmigrate from the periphery through the inflammation disturbed blood–brain barrier into the CNS. There they are reactivated by CNS APCs and clonally expand feeding

inflammation. Anti-CD20 treatment by rituximab or ocrelizumab ablates both CD20-expressing CD8+ T and B cells but not Ig-producing plasma cells and CD20− T cells." Figure and legend from Waisman & Ebering [48].

LIMITATIONS OF EXISTING STUDIES.

MS is a disseminated inflammatory demyelinating autoimmune disease which involves T cells that destroy myelin components, oligodendrocytes, and ultimately damages axons. The current hypothesis on the origin of MS (supported by epidemiologic studies) suggest that virus(es) acquired possibly in childhood, induce, in genetically susceptible individuals T and B cell antiviral immune responses. These viral antigen (non-self) epitopes cross-react with self-myelin and/or other neuroantigen epitopes by molecular mimicry, resulting in propagation of these immune responses even after the virus is cleared and leading eventually in autoimmune disease. Although substantial evidence has accumulated supporting such a mechanism for the immunopathogenesis of the disease, convincing proof is still lacking, the process and the mechanisms involved are not well understood and more studies are needed to resolve these questions. Also, the repertoire of TCR in patients with long standing disease (often 30-40 years) may be a different repertoire of TCRs on T cells that triggered the disease. We have optimized a method which allows us to analyze TCR in peripheral blood, which when combined with using MRIs, will help diagnose the disease at an early stage and help resolve some of these issues.

CHAPTER 3

METHODOLOGY

PBMC AND RNA ISOLATION

Peripheral blood mononuclear cells from normal donors and MS patients were isolated from heparinized blood using a Ficoll Hypaque density cushion [51]. A portion of mononuclear cells isolated from PBMCs were used to isolate RNA using a guanidinium thiocyanate phenol chloroform single step extraction protocol for Trizol Reagent as recommended by the manufacturer (Ambion, Life Technologies, Carlsbad, CA) [52]. All research and use of biohazard materials was approved by the Institutional Biosafety Committee at Old Dominion University, Norfolk, VA (IBC # 1130842-5 Immune response in autoimmunity and cancer immunology).

SYNTHESIS OF cDNA AND NPA-PCR.

Total RNA isolated from PBMCs were used to synthesize complementary DNA (cDNA) using the Superscript Double-Stranded cDNA Synthesis Kit protocol as recommended by manufacturer instructions (Invitrogen, Life Technologies, Carlsbad, CA). Not I-oligo (dT) primer (Invitrogen), reverse transcriptase, 10mM deoxyribonucleotide triphosphate (dNTP) mix, 0.1 M dithiothreitol and buffer and were used for first strand synthesis according to manufacturer instructions (Invitrogen). All other procedures were followed according to the protocol for completion of second strand cDNA synthesis, including the use of T4 DNA polymerase needed for the blunt ending of cDNA [8]. Adaptor ligation followed by NPA-PCR was performed

according to protocols established in our laboratory; see Figure 4 [53, 54]. Primers used for NPA-PCR are listed in Tables 1 and 2.

FIGURE 4. NPA-PCR MODEL (PROVIDED BY DR. PLATSOUCAS AND DR. OLESZAK).

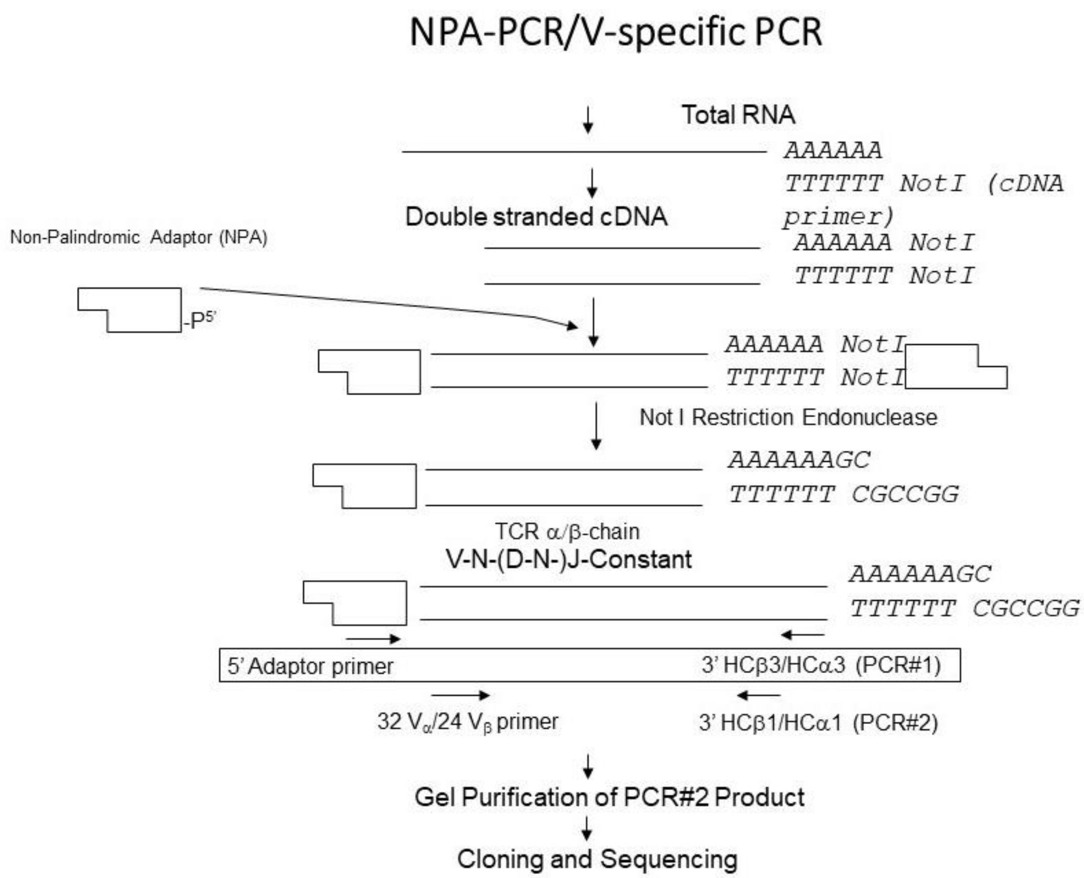


TABLE 1. PRIMERS FOR NPA-PCR AMPLIFICATION OF TCR V ALPHA FAMILIES.

5’ end Primer	Sequence 5’ – 3’
Vα1	GCAACATGCTGGCGGAGCACCCAC
Vα2	AGAAAGCAAGGACCAAGTGTT
Vα3	TCAACGTTGCTGAAGGGAATCCTC
Vα4	CATCTCCATGGACTCATATGA
Vα5	GATGTGGAGCAGAGTCTTTTC
Vα6	GGCCCTGAACATTCAGGA
Vα8	CTGAGGTGCAACTACTCA
Vα9	TACACAGCCACAGGATACCCTTCC
Vα10	GGAGGGAAAGAACTGCACTCTT
Vα12	CAGTGTTCCAGAGGGAGCCA
Vα13	CATTCGTTCAAATGTGG
Vα14	GTCACTTTCTAGCCTGCTGA
Vα16	ATCTCAGTGCTTGTGATAATA
Vα17	GGTGAACAGTCAACAGGGAGA
Vα19	CAGAAGGTAACTCAAGCGCAGACT
Vα20	CTTCACCCTGTATTCAGCTGGG
Vα21	TGCCTCGCTGGATAAATCATCAGG
Vα22	GAGCCAATTCCACGCTGCG
Vα23	GCTTATGAGAACACTGCGT
Vα24	GCAGCTTCCCTTCCAGCAAT
Vα25	TGCAAATTCCTCAGTACCAGCA
Vα26	TTGGTATCGACAGCTTCCCTCCCA
Vα27	ACCCAGCTGCTGGAGCAGAGCCCT
Vα29	GACTATACTAACAGCATGT
Vα30	AGGGGAAGATGCTGTCA
Vα34	AGAGGGAAAGAATCTCACCATAA
Vα35	ATCAGAGTCCTCAATCTATGTTTA
Vα36	CAAAGCCCTCTATCTCTGGTT

Table 1 Continued.

5' end Primer	Sequence 5' – 3'
Vα38	CAGTCTCAACCAGAGATGTC
Vα39	ACCCTCTGTTCCTGAGCATG
Vα40	CTGCAGCTTCTTCAGAGAGAGACAATGG
Vα41	AGAACCTGACTGCCCAGGAA
Constant 3'end primer	
HCα1	CTGGATTTAGAGTCTCTCAGCTGGTAC
HCα2	GATATACACATCAGAATCCTTAC
HCα3	GTTGCTCCAGGCCACAGCACTG

TABLE 2. PRIMERS FOR NPA-PCR AMPLIFICATION OF TCR V BETA FAMILIES.

5' end Primer	**Sequence 5' – 3'**
Vβ2	AAGTGATCTTGCGCTGTGTCCCCA
Vβ3	TTCCCTGGAGCTTGGTGACTCTGC
Vβ4	CCTGAATGCCCCAACAGCTCTCTC
Vβ5	ATACTTCAGTGAGACACAGAGA
Vβ6	CACTGCGGTGTACCCAGGATATGA
Vβ7	TCTCAGGTGTGATCCAAATTCGGG
Vβ9	CCGCACAACAGTTCCCTGACTTGC
Vβ10	TGTCACCAGACTGGGAACCACCAC
Vβ11	GATTCACAGTTGCCTAAGGA
Vβ12	CCATGATGCGGGGACTGGAGTTGC
Vβ13	GCAGGGTCCAGGTCAGGACCCCCA
Vβ14	GCCTGCAGAACTGGAGGATTCTGG
Vβ15	CCCAGTTTGGAAAGCCAGTGACCC
Vβ18	CTGCTGAATTTCCCAAAGAGGGCC
Vβ19	TCCTCTCACTGTGACATCGGCCCA
Vβ20	GGCCACATACGAGCAAGGCGTCGA
Vβ21	CCACGGAGTCAGGGGACACAGCAC
Vβ23	TCTCAATGCCCCAAGAACGCACCC
Vβ24	CAGGCACAGGCTAAATTCTCCCTG
Vβ25	TGCCAGGCCCTCACATACCTCTCA
Vβ27	GGGCTCGGCTTAAGGCAGACCTAC
Vβ28	GTCTCTAGAGAGAAGAAGGAGCGC
Vβ29	TTCCCATCAGCCGCCCAAACCTAA
Vβ30	TGCCCCAGAATCTCTCAGCCTCCA
Constant 3'end primer	
HCβ1	TTCTGATGGCTCAAACACAGCGACCTC
HCβ2	ACCAGCTCAGCTCCACGTGG
HCβ3	CAGGCAGTATCTGGAGTCATTG

CLONING AND SEQUENCING OF NPA-PCR PRODUCTS.

Five to ten microliters from each of the 32 V-alpha PCR products and 5-10 µl of each of the 24 V-beta products were run on 1% agarose gel [8]. The DNA bands that correspond to known molecular weights were excised and purified using a PureLink DNA extraction kit (Invitrogen, Life Technologies, Carlsbad, CA) as recommended by the manufacturer, then combined into one tube (one each for Vα and Vβ families). Two microliters of extracted DNA mixture, one each for the V-alpha and V-beta TCR families, were cloned into the TOPO-TA cloning vector (Invitrogen) and incubated at room temperature for 30 min. The vector is designed to accept PCR products made with Taq DNA polymerase which adds 3' overhanging deoxyadenosine nucleotides to the ends of the PCR product; topoisomerase I is bound to the vector and has a single 3’ overhanging deoxythymidine residue that allows the PCR insert to ligate with the vector effectively [55]. After vector ligation, the product was incubated with TOP10 One Shot Chemically Competent cells (Invitrogen) according to manufacturer’s instructions. Transformed cells were plated, incubated for 24 hours, and white colonies were selected and cultured, followed by plasmid isolation using a Wizard Plus Minipreps DNA Purification kit (Promega, Madison, WI) according to manufacturer’s instructions. Ten microliters of isolated plasmid DNA were submitted for commercial sequencing, approximately 200 ng/µl each (GenScript, Piscataway, NJ).

GENBANK SEQUENCE ANALYSIS.

TCR sequences were determined by PBMC isolation, RNA isolation, DNA extraction, transformation, NPA- PCR and plasmid isolation protocols. Amino acid sequences from the complementarity determining region (TCR alpha V-N-J region and TCR beta V-N-D-N-J regions) were entered into the Basic Local Alignment Search Tool (BLAST) database using a protein-query. Alpha- and beta-chain TCR transcripts were previously identified in our laboratory using frozen brain tissue and cerebrospinal fluid obtained from patients with different pathological forms of MS; these TCR transcripts were subsequently compared to CDR3 sequence homologies of nucleic acid and protein sequences reported in the GenBank/EMBL database. The nucleotide sequence of the N or N-D-N region of each alpha- or beta- chain TCR transcript was identified as the sequence between the last discernible V-alpha or V-beta nucleotide and the first discernible J-alpha or J-beta nucleotide. Results were also filtered to identify homologous proteins from human viruses, Homo sapiens (taxid:9606) and Viruses (taxid:10239). TCR transcripts identified from MS patients which recognized myelin peptides were also compared to homologous protein sequences of human viruses reported in the GenBank/EMBL database. There is no information on the maximum number of CDR3 amino acid differences that permit substantial CDR3 homology. Differences of two conservative and one nonconservative amino acids were chosen arbitrarily as the maximum number of differences allowed between CDR3 motifs from different T cell clones to define substantial CDR3 homology.

FLOW CYTOMETRY AND SINGLE CELL SORTING

Following PBMC isolation protocols, approximately 10^6 PBMCs from MS patients or normal donor controls are centrifuged at 300 g, 4^{o}C, for 5-10 min, then washed in a phosphate buffered saline (PBS) and 2% fetal bovine serum (FBS) mixture (repeated 3 times). After the final wash, the pelleted cells were resuspended in 100µl of the PBS/ 2% FBS solution and stained for signal enhancement and localization [36]. PBMCs were stained with FITC-conjugated anti-CD3, PE-conjugated anti-CD8, eFlour-450- conjugated anti-CD4, APC-conjugated anti-CD45RO, or anti-CD20 APC-eFluor 780 monoclonal antibodies (mab) (Invitrogen, Life Technologies, Carlsbad, CA). Propidium iodide (PI) was used to counterstain and exclude dead cells in gating selections. BD FACS flow cytometry instruments, such as the BD Influx Cell Sorter and BD FacsAria Fusion Cell Sorter, were used to identify preferred cell populations and sort single cells into 96-well plates prepared for reverse transcription cDNA synthesis and other studies (BD Biosciences, San Jose CA).

VARIABLE REGION REVERSE TRANSCRIPTION PCR (VRM RT-PCR)

Single CD3+CD8+, CD3+CD8+CD45RO+, CD3+CD4+CD45RO+, CD3+CD20+ T cells from human PBMC were sorted for various experiments and pre-amplified by reverse transcription (RT) PCR. The first RT-PCR reaction was prepared using the SuperScript III One-step RT-PCR System kit with Platinum Taq DNA polymerase (Invitrogen, Life Technologies, Carlsbad, CA), 2.5uM concentration of all TCR alpha-out and TCR beta-out variable primers, including the TCR alpha-OUT and TCR beta-OUT constant primers, and the addition of RNAse inhibitors. Ten

microliters of the RT-PCR mix were added to each well prior to single cell sorting. During the development of these techniques, single CD3+CD8+ cells were sorted and pre-amplified by reverse transcription (RT) PCR. Jurkat (RT3-T3.5) cells with transduced TCR lines were obtained from frozen cells stored in our laboratory and used as positive controls. The Jurkat (RT3-T3.5) cells transduced with known alpha and beta TCR chains were kindly provided by another Ph.D. student in our lab, Dr. Nikolaos Zacharakis.

During sorting, one cell was added to each well according to the flow cytometry and single cell sorting protocol previously described. The plate was briefly centrifuged to collect each cell into the PCR mixture. The first PCR amplification was performed with the following cycling conditions: 50 °C 15 min; 95 °C 2 min; 95 °C 15 sec, 60 °C 1 min, 72 °C 30 sec × 18 cycles; 4 °C. After the first amplification, the PCR plate was briefly centrifuged to collect all contents in the bottom of each well. Then, 4 µl of PCR product was added as a template to two individual 96-well PCR plates for a second nested RT-PCR amplification. The PCR master mix for the second PCR was prepared using the Hot Star Taq Plus DNA Polymerase kit (Qiagen, Germantown, MD), and all variable TCR alpha-IN primers and the TCR alpha Constant-IN primer for plate 1. Then, all variable TCR beta-IN primers and the TCR beta constant-IN primer were used in the master mix for plate 2. All primers used in the second PCR reaction were 0.6µM concentration and each well contained a total volume of 25 ul. The second PCR amplification was performed with the following cycling conditions: 95°C 5 min; 94°C 15 sec, 52°C 30 sec, 72°C 40 sec × 50 cycles; 72°C 5 min; 4°C. The primers used in the VRM RT-PCR protocol are listed in Tables 3 and 4. These methods were optimized and developed based on the multiplex reverse transcription PCR approach previously reported [56].

TABLE 3. VARIABLE REGION MULTIPLEX RT-PCR, TCR VA-IN AND VA-OUT PRIMERS.

TRAV1-1 OUT	GAG-GAG-ACA-GGT-CGT-TTT-TCT-TC
TRAV1-1 IN	TCC-TTA-GTC-GCT-CTG-ATA-GTT-ATG-G
TRAV1-2 OUT	GGA-GGA-GAA-AGG-TCG-TTT-TTC-TTC
TRAV1-2 IN	CCT-TAG-TCG-GTC-TAA-AGG-GTA-CA
TRAV2 OUT	TCA-GCA-GGG-ACG-ATA-CAA-CA
TRAV2 IN	GAC-CTA-TGA-ACG-GTT-CTC-TTC-ATC
TRAV3 OUT	GTT-AAA-GGC-AGC-TAT-GGC-TTT-GA
TRAV3 IN	GCT-GAA-TTT-AAC-AAG-AGC-CAA-ACC
TRAV4 OUT	GTT-ACA-AAC-GAA-GTG-GCC-TCC
TRAV4 IN	GTT-TAT-CCC-TGC-CGA-CAG-AAA
TRAV5 OUT	GGA-CAT-GAA-ACA-AGA-CCA-AAG-ACT-C
TRAV5 IN	GAT-AAA-CAT-CTG-TCT-CTG-CGC-A
TRAV6 OUT	GGA-AAG-AAA-GAC-TGA-AGG-TCA-CC
TRAV6 IN	TTG-ATA-CCA-CCC-TTA-AAC-AGA-GTT-TG
TRAV7 OUT	GGA-TAT-GAG-AAG-CAG-AAA-GGA-AGA-CTA
TRAV7 IN	GCT-ACA-TTA-CTG-AAG-AAT-GGA-AGC-A
TRAV8-1 OUT	GGT-TAA-AGG-CAT-CAA-GGG-CTT-T
TRAV8-1 IN	CTC-CTT-TAA-TCT-GAG-GAA-ACC-CTC
TRAV8-2.4 OUT	GCA-TCA-ACG-GTT-TTG-AGG-CT
TRAV8-2.4 IN	GAA-GAG-TGA-AAC-CTC-CTT-CCA-C
TRAV8-3 OUT	GGT-TCA-AGG-CAT-TAA-AGG-CTT-TGA
TRAV8-3 IN	GAG-GAG-TCA-ATC-TTC-CTT-CAA-TCT-G
TRAV8-6 OUT	GGT-TGA-AAG-CAT-CAA-CGG-TTT-TG
TRAV8-6 IN	GAG-TCA-AAC-TTC-CTT-CCA-CTT-GA
TRAV8-7 OUT	GGT-TAA-AGG-CAT-CAG-AGG-TTT-TGA-G
TRAV8-7 IN	GAG-CGA-AAC-CTC-CTT-CTA-CC
TRAV9-1.2 OUT	AGG-GAA-GSA-ACA-AAG-GTT-TTG-AAG
TRAV9-1.2 IN	TAC-CGT-AAA-GAA-ACC-ACT-TCT-TTC-C
TRAV10 OUT	GTC-GAA-CGG-AAG-ATA-TAC-AGC-AAC
TRAV10 IN	TGG-ATG-CAG-ACA-CAA-AGC-A
TRAV12-1.2.3 OUT	GAA-GAT-GGA-AGG-TTT-ACA-GCA-CAG
TRAV12-1 IN	TCA-ATA-GAG-CCA-GCC-AGT-ATA-TTT-C
TRAV12-2 IN	CTC-AAT-AAA-GCC-AGC-CAG-TAT-GT
TRAV12-3 IN	GTC-GAT-AAA-TCC-AGC-AAG-TAT-ATC-TCT-C
TRAV13-1 OUT	GAC-ATT-CGT-TCA-AAT-GTG-GGC-G
TRAV13-1 IN	GAC-CAA-CGA-ATT-GCT-GTT-ACA-TTG
TRAV13-2 OUT	GAC-ATT-CGT-TCA-AAT-ATG-GAC-AAA-AGG
TRAV13-2 IN	GGC-CAA-AGA-GTC-ACC-GTT-TTA
TRAV14/DV4 OUT	CAA-CAG-AAG-GTC-GCT-ACT-CAT-TG
TRAV14/DV4 IN	TCC-AGA-AGG-CAA-GAA-AAT-CCG
TRAV16 OUT	GAG-AGA-GCA-TCA-AAG-GCT-TCA-C
TRAV16IN	GAC-CTT-AAC-AAA-GGC-GAG-ACA
TRAV17 OUT	GAA-ACA-CAG-TGG-AAG-ATT-AAG-AGG-TC
TRAV17 IN	TGA-CAC-TTC-CAA-GAA-AAG-CAG-TT

TABLE 3. CONTINUED

PRIMER	SEQUENCE
TRAV18 OUT	CAG-GAG-ACG-GAC-AGC-AG
TRAV18 IN	CCA-GTC-CTA-TCA-AGA-GTG-ACA-G
TRAV19 OUT	GTG-GTC-GGT-ATT-CTT-GGA-ACT-TC
TRAV19 IN	CCA-CCA-GTT-CCT-TCA-ACT-TCA
TRAV20 OUT	GGA-GAA-AGA-AAG-GCT-AAA-AGC-CA
TRAV20 IN	GAA-GGA-AAG-CTT-TCT-GCA-CAT-C
TRAV21 OUT	GAG-AGA-GCA-AAC-AAG-TGG-AAG-ACT-TA
TRAV21 IN	CTC-GCT-GGA-TAA-ATC-ATC-AGG-AC
TRAV22 OUT	CTC-AGG-GAC-AAA-ACA-GAA-TGG-AAG
TRAV22 IN	CGA-CTG-TCG-CTA-CGG-AAC
TRAV23/DV6 OUT	CAG-ATG-TGA-GTG-AAA-AGA-AAG-AAG-GAA-G
TRAV23/DV6 IN	CAA-TCT-CCT-TCA-ATA-AAA-GTG-CCA-AG
TRAV24 OUT	GGG-GAT-GAA-AAG-AAG-AAA-GGA-CG
TRAV24 IN	GCC-ACT-CTT-AAT-ACC-AAG-GAG-G
TRAV25 OUT	GTG-GAG-AAG-TGA-AGA-AGC-AGA-AAA-G
TRAV25 IN	CAG-TTT-GGA-GAA-GCA-AAA-AAG-AAC-A
TRAV26-1 OUT	CCA-ATG-AAA-TGG-CCT-CTC-TGA-TC
TRAV26-1 IN	CAG-AAG-ACA-GAA-AGT-CCA-GCA
TRAV26-2 OUT	ACA-AGC-AAT-GTG-AAC-AAC-AGA-ATG-G
TRAV26-2 IN	GAA-GAC-AGA-AAG-TCC-AGT-ACC-TTG
TRAV27 OUT	AGT-GAA-GAA-GCT-GAA-GAG-ACT-AAC-C
TRAV27 IN	TGG-TGA-TGC-AAG-AAA-GGA-CAG
TRAV29/DV5 OUT	GAA-GAT-GGA-AGA-TTC-ACT-GTC-TTC-TTA-AAC
TRAV29/DV5 IN	GCC-AAG-CAC-CTC-TCT-CTC
TRAV30 OUT	GTG-GAG-AAC-AGA-AGG-GTC-ATG-A
TRAV30 IN	GCA-GCA-AAG-CTC-CCT-GTA
TRAV34 OUT	GTG-GGG-AAG-AGA-AAA-GTC-ATG-AAA-A
TRAV34 IN	CTG-CCA-AGT-TGG-ATG-AGA-AAA-AG
TRAV35 OUT	TGA-CCT-CAA-ATG-GAA-GAC-TGA-CTG
TRAV35 IN	GGT-ATA-ACC-AGA-AAG-GAC-AGT-TCC
TRAV36/DV7 OUT	AGT-GGA-ATT-GAA-AAG-AAG-TCA-GGA-AGA
TRAV36/DV7 IN	GAA-CTT-TCC-AGC-ATC-CTG-AAC-A
TRAV38-1.2 OUT	GAA-TGC-AAC-RGA-GAA-TCG-TTT-CTC
TRAV38-1.2 IN	AGA-AAG-CAG-CCA-AAT-CCT-TCA
TRAV39 OUT	TGG-AGC-AGT-GAA-GCA-GGA
TRAV39 IN	TGG-CCT-CAC-TTG-ATA-CCA-AAG
TRAV40 OUT	TGG-AAA-ACA-GCA-AAA-ACT-TCG-GA
TRAV40-IN	GAC-AAA-AAC-TCC-CCC-ATT-GTG-A
TRAV41 OUT	TGG-GAA-GAA-GAA-GCA-GGA-AGA
TRAV41 IN	GCC-ACA-ATA-AAC-ATA-CAG-GAA-AAG-C
TRAC M-OUT	CGA-CCA-GCT-TGA-CAT-CAC-AG
TRAC M-IN	GCT-CTT-GAA-GTC-CAT-AGA-CCT-CA

TABLE 4. VARIABLE REGION MULTIPLEX RT-PCR, TCR VB-IN AND VB-OUT PRIMERS.

PRIMER	SEQUENCE
TRBV2 OUT	TCG-ATG-ATC-AAT-TCT-CAG-TTG-AAA-GG
TRBV2 IN	ACT-CTG-AAG-ATC-CGG-TCC-A
TRBV3-1 OUT	AGT-TCC-AAA-TCG-CTT-CTC-ACC-TA
TRBV3-1 IN	TCT-CCA-GAC-AAA-GCT-CAC-TTA-AAT-C
TRBV4 OUT	GTG-TGC-CAA-GTC-GCT-TCT
TRBV4 IN	GAA-TGC-CCC-AAC-AGC-TCT-C
TRBV5-1 OUT	AGG-AAA-CTT-CCC-TGG-TCG-A
TRBV5-1 IN	CGC-TCT-GAG-ATG-AAT-GTG-AGC
TRBV5-3 OUT	CAG-AAG-GAA-ACT-TCC-CTA-ATC-GAT-TC
TRBV5-3 IN	TTG-CTC-TGA-GAT-GAA-TGT-GAG-TG
TRBV5-5.6.7 OUT	GAG-GAA-GAG-GAA-ACT-TCC-CTG-A
TRBV5-4.8 OUT	CAG-AGG-AAA-CTT-CCC-TCC-TAG-AT
TRBV5-4.5.6.7.8 IN	AGC-TCT-GAG-CTG-AAT-GTG-AAC
TRBV6-1 OUT	GGG-TAC-CAC-TGA-CAA-AGG-AGA
TRBV6-1.7 IN	CCA-ATG-GCT-ACA-ATG-TCT-CCA
TRBV6-2.3 OUT	GGG-TAC-AAC-TGC-CAA-AGG-AG
TRBV6-2.3 IN	CTG-ATG-GCT-ACA-ATG-TCT-CCA-G
TRBV6-4 OUT	AGG-TAC-CAC-TGG-CAA-AGG-A
TRBV6-4 IN	CCT-GAT-GGT-TAT-AGT-GTC-TCC-AGA
TRBV6-5 OUT	CTG-GTA-TCA-CTG-ACC-AAG-GAG-AA
TRBV6-5 IN	CCA-ATG-GCT-ACA-ATG-TCT-CCA
TRBV6-6 OUT	TGC-TGG-TAT-CAC-TGA-TAA-AGG-AGA-A
TRBV6-6 IN	CGA-ATG-GCT-ACA-ACG-TCT-CC
TRBV6-7 OUT	TGC-TCT-CAC-TGA-CAA-AGG-AGA
TRBV6-8 OUT	TGG-CTA-CAA-TGT-CTC-TAG-ATT-AAA-CAC-A
TRBV6-8 IN	CGA-TTT-CCC-ACT-CAG-GCT-G
TRBV6-9 OUT	TGC-TGG-TAT-CAC-TGA-CAA-AGG-A
TRBV6-9 IN	CCG-ATG-GCT-ACA-ATG-TAT-CCA-G
TRBV7-1 OUT	CCA-ATT-TAC-TTC-CAA-GGC-AAG-GAT
TRBV7-1 IN	TCT-CTG-CAC-AGA-GGT-CTG-A
TRBV7-2 OUT	TAC-TTC-CAA-GGC-AAC-AGT-GC
TRBV7-2 IN	TCT-CTG-CAG-AGA-GGA-CTG-G
TRBV7-3 OUT	TAC-TTC-CAA-GGC-ACG-GGT
TRBV7-3 IN	TCT-TTG-CAG-TCA-GGC-CTG
TRBV7-4 OUT	TGA-CTT-ACT-CCC-AGA-GTG-ATG-C
TRBV7-4 IN	TTC-TCT-GCA-GAG-AGG-CCT
TRBV7-6 OUT	TGA-CTT-ACT-TCA-ATT-ATG-AAG-CCC-AAC
TRBV7-6 IN	TCT-GCA-GAG-AGG-CCT-GA
TRBV7-7 OUT	CTG-ACT-TAC-TTC-AAT-TAT-GAA-GCT-CAA-CC
TRBV7-7 IN	CTC-TGC-AGA-GAG-GCC-TG

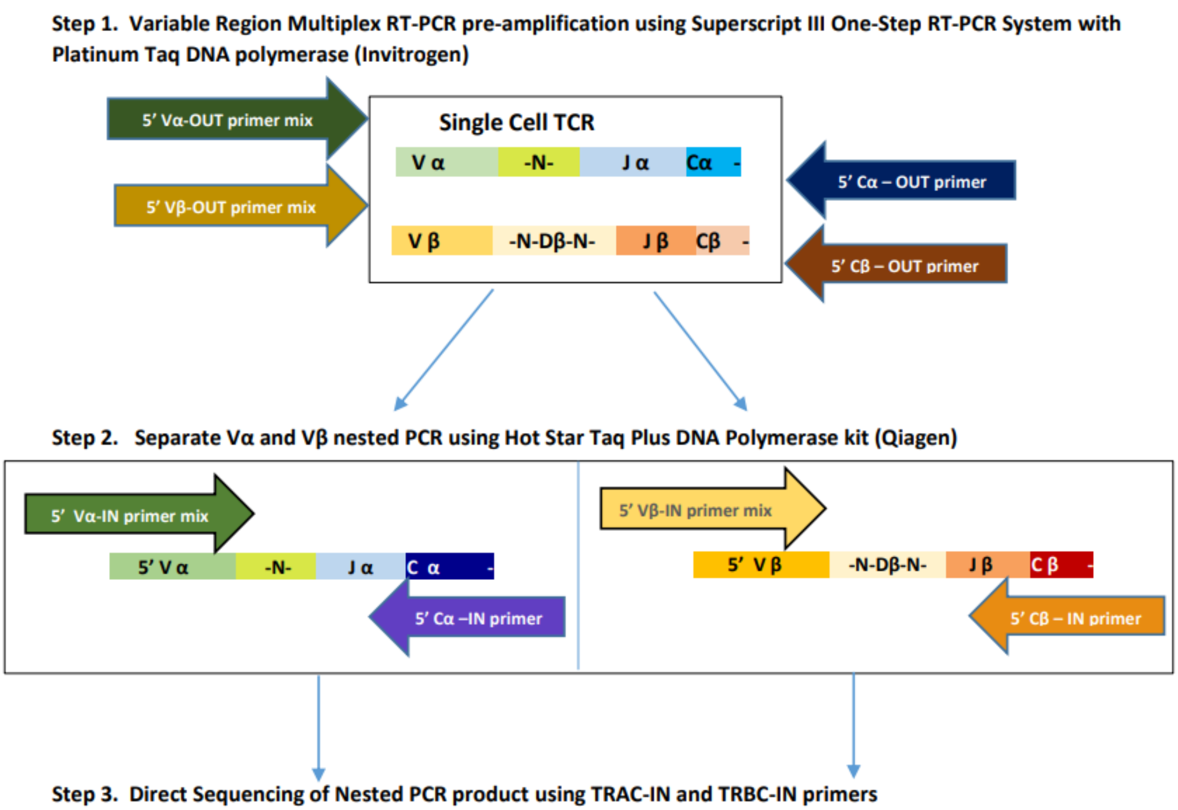
TABLE 4 CONTINUED.

PRIMER	SEQUENCE
TRBV7-8 OUT	CTG-ACT-TAT-TTC-CAG-AAT-GAA-GCT-CAA-C
TRBV7-8 IN	TCT-TTG-CAG-AAA-GGC-CTG-AG
TRBV7-9 OUT	GAC-TTA-CTT-CCA-GAA-TGA-AGC-TCA-AC
TRBV7-9 IN	TTC-TCT-GCA-GAG-AGG-CCT-TAA
TRBV9 OUT	AGC-AAA-AGG-AAA-CAT-TCT-TGA-ACG-A
TRBV9 IN	CGC-ACA-ACA-GTT-CCC-TGA
TRBV10-1.3 OUT	GAA-GTC-TCA-GAT-GGC-TAC-A
TRBV10-1.3 IN	GTG-TCT-CTA-GAT-CAA-ASA-CAG-AGG-A
TRBV10-2 OUT	GAA-GTC-CCC-GAT-GGC-TAT-G
TRBV10-2 IN	GTC-TCC-AGA-TCC-AAG-ACA-GAG-A
TRBV11 OUT	GAT-TCA-CAG-TTG-CCT-AAG-GAT-CG
TRBV11 IN	AGA-GAG-GCT-CAA-AGG-AGT-AGA-C
TRBV12-3.4 OUT	GAT-TCA-GGG-ATG-CCC-GAG
TRBV12-3.4 IN	GCT-AAG-ATG-CCT-AAT-GCA-TCA-TTC-TC
TRBV12-5 OUT	GAT-TCG-GGG-ATG-CCG-AAG
TRBV12-5 IN	CTC-AGC-AGA-GAT-GCC-TGA-TG
TRBV13 OUT	GCA-GAG-CGA-TAA-AGG-AAG-CAT-C
TRBV13 IN	TCA-GCT-CAA-CAG-TTC-AGT-GAC-TA
TRBV14 OUT	CGG-TAT-GCC-CAA-CAA-TCG-ATT
TRBV14 IN	GAA-AGG-ACT-GGA-GGG-ACG
TRBV15 OUT	CAA-TGA-AGC-AGA-CAC-CCC-TG
TRBV15 IN	CTT-CCA-ATC-CAG-GAG-GCC
TRBV 16 OUT	GAT-GAA-ACA-GGT-ATG-CCC-AAG-G
TRBV16 IN	TCA-TGC-CTC-CCA-AAT-TCA-CC
TRBV18 OUT	GAT-GAG-TCA-GGA-ATG-CCA-AAG-G
TRBV18 IN	CGA-TTT-TCT-GCT-GAA-TTT-CCC-AAA-G
TRBV19 OUT	CAG-AAA-GGA-GAT-ATA-GCT-GAA-GGG-TA
TRBV19 IN	TGA-AGG-GTA-CAG-CGT-CTC-T
TRBV20-1 OUT	CAA-GGC-CAC-ATA-CGA-GCA-A
TRBV20-1 IN	ACA-AGT-TTC-TCA-TCA-ACC-ATG-CA
TRBV24-1 OUT	GGA-GAG-ATC-TCT-GAT-GGA-TAC-AGT-G
TRBV24-1 IN	TCG-ACA-GGC-ACA-GGC-TAA
TRBV25-1 OUT	TTC-CAC-AGA-GAA-GGG-AGA-TCT-TTC
TRBV25-1 IN	TCT-GAG-TCA-ACA-GTC-TCC-AGA-A
TRBV27/28 OURT	GGT-ATC-GAC-AAG-ACC-CAG-G
TRBV27 IN	AGA-AGA-GGA-ATT-TCC-CCC-TGA
TRBV28 IN	GAG-AAG-AAG-GAG-CGC-TTC-TC
TRBV29 OUT	GCT-CTG-AGG-CCA-CAT-ATG-AG
TRBV29 IN	GCC-CAA-ACC-TAA-CAT-TCT-CAA-CTC
TRBV30 OUT	GAG-GTG-CCC-CAG-AAT-CTC-T
TRBV30 IN	CAG-GAC-CGG-CAG-TTC-ATC
CONSTANT BETA PRIMERS	
TRBC M-OUT	AGG-CAG-TAT-CTG-GAG-TCA-TTG-AG
TRBC M-IN	GCT-TCT-GAT-GGC-TCA-AAC-ACA-G

SEQUENCING AND ANALYSIS OF VRM RT-PCR PRODUCT

Ten microliters of VRM RT-PCR product were submitted for commercial sequencing, along with 10 µM of TCR alpha-In and TCR beta-In primers per reaction. Nucleotide sequences of human TCR transcripts encoding V, D, J, and C regions were compared to those in the International Immunogenetics Information System (IMGT) and analyzed using the IMGT/V-Quest software program [57, 58]. A flow chart of the VRM RT-PCR method is shown in Figure 5.

FIGURE 5. VRM RT-PCR IN SINGLE CELLS



STATISTICAL ANALYSIS

The binomial distribution was employed to determine the probability, p, that the number (x) of the multiple identical alpha-chain TCR transcripts identified among those sequenced (x/n; n is the total number of α-chain TCR transcripts sequenced), was statistically significant versus (i) a first alternative hypothesis that each α-chain TCR transcript is expressed only once and all α-chain TCR transcripts sequenced when compared to each other are unique (1/n), or (ii) a second alternative hypothesis that only a single α-chain TCR transcript is expressed twice and all the remaining α-chain TCR transcripts identified are expressed only once (2/n) [8, 54, 59, 60]. Likewise, a binomial distribution with the first or second alternative hypotheses were also used for the analysis of multiple identical β-chain TCR as previously reported [60].

CHAPTER 4

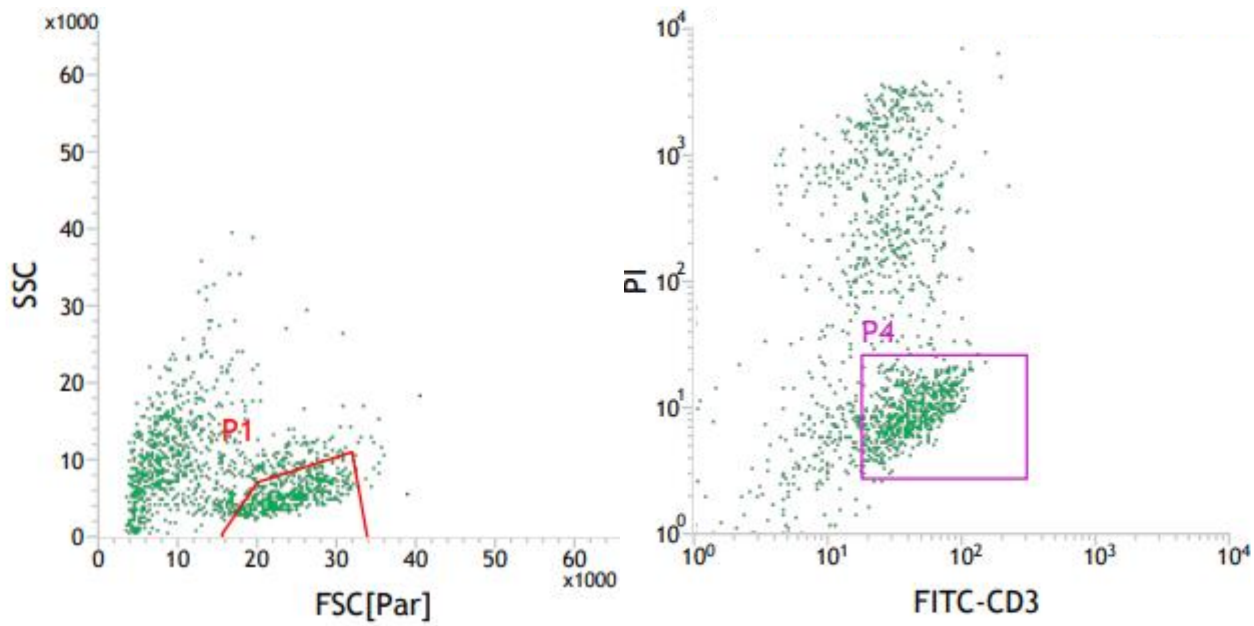
RESULTS

JURKAT CELLS WITH TRANSDUCED TCR WERE USED TO OPTIMIZE AND MODIFY THE VRM RT-PCR METHODS IN SINGLE CELLS.

In order to identify the antigens recognized by clonally expanded T cells in MS, a single-cell PCR and sequencing method was developed. To develop this method, we employed J.RT3-T3.5 mutant Jurkat T-cell lines that were transduced with known alpha-chain (Vα34 Jα47) and beta-chain (Vβ20.1 Jβ1.1) TCR; this monoclonal T cell population served as a positive control to further optimize the VRM RT-PCR method in single cells.

FIGURE 6. JURKAT (RT3-T3.5) CELLS TRANSDUCED WITH KNOWN TCR CHAINS VA34JA47 VB20.1JB1.1 WERE SINGLE CELL SORTED FOR VRM RT-PCR.

Approximately 10^6 transduced Jurkat (RT3-T3.5) cells were labeled with anti-CD3-FITC monoclonal antibody and single cell sorted using a BD Influx cell sorting instrument. The first histogram (left) shows a gate (P1) for the monoclonal lymphocyte population of mutant Jurkat cells, which was used to display the gate selection (P4) for viable CD3+ TCR using FITC-conjugated anti-CD3 antibody and propidium iodide (PI) exclusion of dead cells. Staining statistics show that 83.21% of the parent cell population were viable CD3+ cells; P2 and P3 events not shown.



Populations	Events	% Total	% Parent
All Events	1,299	100.00%	####
P1	405	31.18%	31.18%
P2	1	0.08%	0.25%
P4	337	25.94%	83.21%

Table 5. VRM RT-PCR METHODS IDENTIFIED KNOWN TCR IN MUTANT JURKAT CELLS

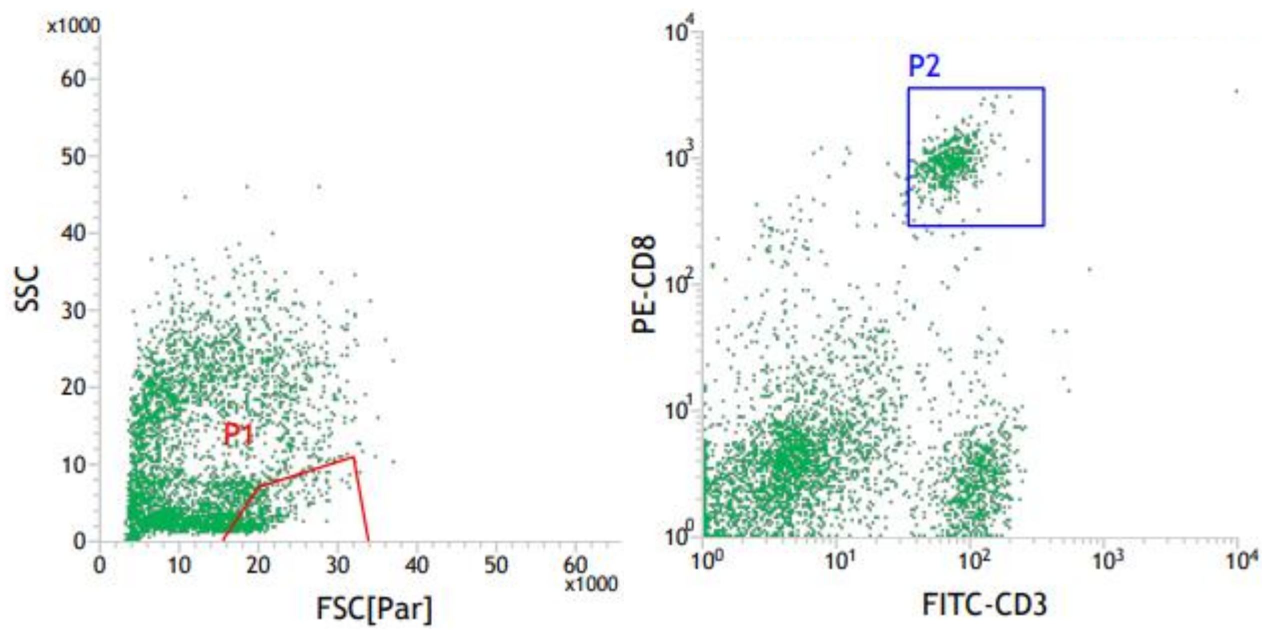
PCR Product	V segment	N/D segment	J segment	Transcript	Frequency
V alpha	**C G A D M** tgtggagcagaca		**E Y G N K L V F** tggaatatggaaacaaactggtcttt	Vα34.1 Jα47.1	(31/31) 100%
V Beta	**C S A R E** tgcagtgctagaga	**S M** gtcca	**N T E A F F** tgaacactgaagctttcttt	Vβ20.1 Dβ1.1 Jβ1.1	(31/31) 100%

V-ALPHA AND V-BETA CHAIN TCR TRANSCRIPT SEQUENCES IDENTIFIED IN SINGLE CELLS FROM HUMAN PBMC IN NORMAL DONORS USING VRM RT-PCR AMPLIFICATION AND SEQUENCING (SPECIFIC AIM#1)

To study at the single-cell level clonally expanded T cells and identify alpha- and beta-chain TCR transcript sequences, we have modified and optimized a variable region multiplex (VRM) single-cell PCR amplification method using PBMCs from normal donors. Single cells were isolated using the fluorescence activated cell sorter (FACS) and their alpha- and beta-chain TCR transcripts were amplified and sequenced. The data are presented below.

FIGURE 7. HUMAN PBMCS FROM NORMAL DONOR BM25 WERE SINGLE CELL SORTED FOR CD3+CD8+ T CELLS USING VRM RT-PCR.

The left histogram in Figure 8 shows the pre-sort staining of human PBMCs from a normal donor BM25 (an African American male 25 years old) using a BD Influx cell sorting instrument. Gate P1 displays the region of lymphocytes selected for gate P2 (right histogram), which displays a population of cells double positive for anti-CD3-FITC and anti-CD8-PE conjugated mabs. Pre-sort staining statistics show that CD3+CD8+ T cells represented 23.81% of the parent lymphocyte population.



Populations	Events	% Total	% Parent
All Events	3,867	100.00%	####
P1	504	13.03%	13.03%
P2	120	3.10%	23.81%

Table 6 shows the frequency of paired TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells after VRM RT-PCR; all unique transcripts.

TABLE 6. PAIRED CD3+ CD8+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM25

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 05	**C A** / tgtgcc	**P T T G G T S E G** / cccactacgggggaactagcgaggga	**K L P F** / aagctgcccattt	Vα24.1Jα52.1	(1/53) 1.88%
	C A S S L S / tgtgccagcagtttat	**G W D** / cagggtggg	**T E A F F** / acactgaagctttcttt	Vβ28.2Dβ1.1 Jβ1.1	
Well 013	**C A V** / tgtgctgt		**G G Y Q K V T F** / tggggggttaccagaaagttacctttt	Vα8.6Jα13.2	(1/53) 1.88%
	C A S R / tgtgccagcag	**G T G L D** / ggggacagggggcttgg	**Y G Y T F** / actatggctacaccttt	Vβ12.3Jβ1.2	
Well 024	**C A** / tgtgct	**L** / cta	**G Y N K L I F** / ggtggctacaataagctgattttt	Vα16.1Jα4.1	(1/53) 1.88%
	C A S / tgcgccagcagc	**Q W K D A** / gacagtggaaagacg	**G A N V L I F** / ctggggccaacgtcctgactttc	Vβ5.1Dβ1.1 Jβ2.6	
Well 062	**C A L R** / tgtgctctgag	**E P Y G** / ggaaccttatggt	**G A T N K L I F** / ggtgctacaaacaagctcatcttt	Vα19.1Jα32.2	(1/53) 1.88%
	C A S / tgtgccagcag	**G R G L R M** / cggcagggggctgcgaa	**N T E A F** / tgaacactgaagctttcttt	Vβ6.5Dβ1.1 Jβ1.1	
Well 065	**C A M R E** / tgtgcaatgagagag	**M D S S Y K L I F** / atggatagcagctataaattgatcttc		Vα14.4Jα12.1	(1/53) 1.88%
	C A S S / tgtgccagcagt	**D A Y** / gatgcct	**Y G Y T F** / actatggctacaccttt	Vβ2.2Jβ1.2	
Well 075	**C A A** / tgtgcagc	**I I K K G G C** / gataatcaagaagggcggatg	**E K L V F** / tgaaaagttggtcttt	Vα13.2Jα29.1	(1/53) 1.88%
	C A S S / tgtgccagcag	**R S Y S** / cagatcttattct	**N T E A F F** / aacactgaagctttcttt	Vβ28.1Dβ1.1 Jβ1.3	

Table 7 shows all sequencing data for normal donor BM25. Forty-seven wells each containing a single cell were sequenced. All of the alpha chain and beta chain sequences were

unique when compared to each other. Six wells corresponded to single cells that contained both alpha and beta chain TCR sequences. In addition, in a number of wells (41), only alpha or beta chain sequences were obtained presumably for technical reasons; all TCR transcripts identified were unique. These alpha chain T cell transcripts were also unique when compared to the alpha TCR transcripts in wells 05, 13, 24, 62, 65, 75. The beta chain T cell transcripts were also unique when compared to the beta TCR transcripts in wells 05, 13, 24, 62, 65, 75.

TABLE 7. ALL CD3+ CD8+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BM25 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 04	**C A V** tgcgctgtg	**V A** gttgcc	**Y Q K V T F** taccagaaagttacttt	Vα1.1Jα13.1
	Vβ chain unavailable			
Well 05	**C A** tgtgcc	**P T T G G T S E G** cccactacgggggggaactagcgaggga	**K L P F** aagctgcccattt	Vα24.1Jα52.1
	C A S S L S tgtgccagcagtttat	**G W D** cagggtggg	**T E A F F** acactgaagctttcttt	Vβ28.2Dβ1.1Jβ1.1
Well 06	**C A S** tgtgcagca	**D L S** gacttatc	**S G N T P L V F** ttcaggaaacacacctcttgtcttt	Vα13.1Jα29.1
	Vβ chain unavailable			
Well 09	**C V V** tgtgtggt	**T G S G S T D K L** tacagggtcgggtagcacagacaaactg	**I F** atcttt	Vα8.7Jα37.1
	Vβ chain unavailable			
Well 10	**C V V** tgtgtggt	**S A S G S T S K L T** ttccgcntcgggcagcacaagcaaactgac	**F** cttt	Vα12.1Jα37.1
	Vβ chain unavailable			
Well 12	**C A A M** tgtgcagcaa	**G T** tgggaa	**G A G S Y Q L T F** ctggggctgggagttaccaactcactttc	Vα13.1Jα28.1
	Vβ chain unavailable			
Well 13	**C A V** tgtgctgt		**G G Y Q K V T F** tgggggttaccagaaagttaccttt	Vα8.6Jα13.2
	C A S R tgtgccagcag	**G T G G L D** ggggacagggggcttgg	**Y G Y T F** actatggctacaccttt	Vβ12.3Jβ1.2
Well 14	**C A G E** tgtgcaggag	**P R** aaccgcg	**N N A R L M F** taacaatgccagactcatgttt	Vα27.1Jα13.1
	Vβ chain unavailable			
Well 15	**C A M R E A** tgtgcaatgagagagg	**L A R** ccctcgccagg	**G G T S Y G K L T F** ggtggtactagctatggaaagctgacattt	Vα14.4 Jα52.1
	Vβ chain unavailable			
Well 17	**C A G** tgtgcaggg	**Q** caa	**S G G S N Y K L T F** agtggaggtagcaactataaactgacattt	Vα25.1Jα53.1
	Vβ chain unavailable			

TABLE 7: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well	**C A M R D**	**G**	**S G G G A D G L T F**	Vα14.2Jα45.1
18	tgtgcaatgagaga	cgg	ttcaggaggaggtgctgacggactcacttt	
	Vβ chain unavailable			
Well	**C A A**	**L P**	**G Y S S A S K I I F**	Vα13.1Jα3.1
19	tgtgcagc	cctccc	ggggtacagcagtgcttccaagataatcttt	
	Vβ chain unavailable			
Well	**C A**	**L**	**G G Y N K L I F**	Vα16.1Jα4.1
24	tgtgct	cta	ggtggctacaataagctgattttt	
	C A S S	**R Q W K D A**	**G A N V L I F**	Vβ5.1Dβ1.1Jβ2.6
	tgcgccagcagc	cgacagtggaaagacg	tggggccaacgtcctgactttc	
Well	**Vα chain unavailable**			
26				
	C A S S F	**F S L**	**N T E A F F**	Vβ12.3Jβ1.1
	tgtgccagcagttt	tttttcac	tgaacactgaagctttcttt	
Well	**Vα chain unavailable**			
28				
	C S V	**E D P R A**	**N Y G Y T F**	Vβ29.1Dβ2.2Jβ1.2
	tgcagcg	ttgaggatccacgag	ctaactatggctacaccttc	
Well	**C V V S G**		**S G N T G K L I F**	Vα8.2Jα37.1
33	tgtgttgtgagtg	gg	tctggcaacacaggcaaactaatcttt	
	Vβ chain unavailable			
Well	**C A**	**S G**	**S G G G A D G L T F**	Vα22.1Jα45.1
34	tgtgc	ctcgggg	tcaggaggaggtgctgacggactcacttt	
	Vβ chain unavailable			
Well	**C V V**	**S P S**	**G S A R Q L T F**	Vα12.1Jα22.1
36	tgtgtggt	ttcccccctcc	ggttctgcaaggcaactgaccttt	
	Vβ chain unavailable			
Well	**C V**	**M**	**T S G T Y K Y I F**	Vα8.2Jα40.1
37	tgtgt	catg	acctcaggaacctacaaatacatcttt	
	Vβ chain unavailable			
Well	**C A M R**	**R**	**S G G S N Y K L T F**	Vα14.4Jα53.1
38	tgtgcaatgaga	aga	agtggaggtagcaactataaactgacattt	
	Vβ chain unavailable			

TABLE 7: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 39	**Vα chain unavailable**			
	C A S D	**V S G V**	**E Q F F**	Vβ6.1
	tgcagtgcccag	gtttcaggggtc	gagcagttcttc	Dβ1.1Jβ2.1
Well 40	**Vα chain unavailable**			
	C A S	**D V S G V E Q F**	**F**	Vβ6.1Dβ2.7Jβ1.1
	tgtgccagc	atgtttcaggggtcgagcagtt	cttc	
Well 41	**C V V**	**S P S G C**	**A R Q L T F**	
	tgtgtggt	ttccccctcaggttg	tgcaaggcaactgaccttt	Vα12.1.Jα22.1
	Vβ chain unavailable			
Well 42	**Vα chain unavailable**			
	C A S S S	**G Q F**	**T E A F F**	Vβ7.9Dβ1.1Jβ1.1
	tgtgccagcagct	ctggacagtt	cactgaagctttcttt	
Well 43	**Vα chain unavailable**			
	C A S S L	**G V T G**	**S P L H F**	Vβ7.3Dβ1.1Jβ1.6
	tgtgccagcagctt	ggggggttacggg	ttcacccctccacttt	
Well 45	**Vα chain unavailable**			
	C A S S	**P Q G T H**	**Q P Q H F**	Vβ6.6Dβ1.1Jβ1.5
	tgtgccagcag	cccccaaggaaccc	atcagccccagcatttt	
Well 49	**Vα chain unavailable**			
	C A S S D	**G G T D**	**T D T Q Y F**	Vβ6.4Dβ2.1Jβ2.3
	tgtgccagcagtgac	ggggcggggg	gcacagatacgcagtatttt	
Well 51	**Vα chain unavailable**			
	C	**A S S L A P G S**	**N Q P Q H F**	Vβ5.5Dβ1.1Jβ1.5
	tg	cgccagcagcttggccccgggctca	aatcagccccagcatttt	
Well 52	**Vα chain unavailable**			
	C A S S F	**L G Q G T**	**N T I Y F**	Vβ7.9Dβ1.1Jβ1.3
	tgtgccagcagctt	tttgggacagggaac	aaacaccatatatttt	
Well 55	**C A V**	**P A**	**Q G G S E K L V F**	Vα21.1.Jα57.1
	tgtgctgt	tccgg	ctcagggcggatctgaaaagctggtcttt	
	Vβ chain unavailable			

TABLE 7: Continued

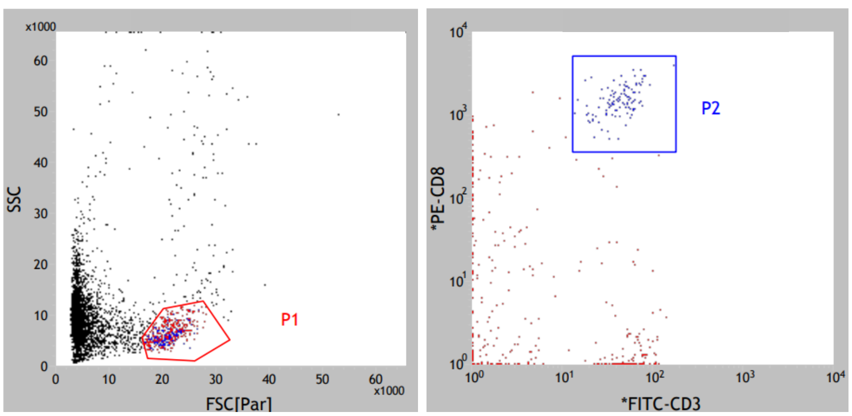
Single Cell	V segment	N / D segment	J segment	Transcript
Well 57	**C A** tgtgca	**P** c	**S G G S Y I P T F** catcaggaggaagctacatacctacattt	Vα5.1.Jα6.1
	Vβ chain unavailable			
Well 59	**C I L R D V G V L L S G G G A D G L T F** tgcatcctgagagacgtcggggtccttttatcaggaggaggtgctgacggactcacccttt			Vα26.2Jα45.1
	Vβ chain unavailable			
Well 60	**C A E N I** tgtgcagagaata	**K K** tcaaga	**G G S E K L V F** agggcggatctgaaaagctggtcttt	Vα13.2Jα57.1
	Vβ chain unavailable			
Well 62	**C A L R** tgtgctctgag	**E P Y G** ggaaccttatggt	**G A T N K L I F** ggtgctacaaacaagctcatcttt	Vα19.1Jα32.2
	C A S S tgtgccagcag	**G R G L R M** cggcagggggctgcgaa	**N T E A F F** tgaacactgaagctttcttt	Vβ6.5Dβ1.1Jβ1.1
Well 65	**C A M R E** tgtgcaatgagagag		**M D S S Y K L I F** atggatagcagctataaattgatcttc	Vα14.4Jα12.1
	C A S S tgtgccagcagt	**D A Y** gatgcct	**Y G Y T F** actatggctacaccttt	Vβ2.2Dβ1.1Jβ1.2
Well 66	**C A** tgtgc	**R** ccgg	**A G N M L T F** gcaggcaacatgctcaccttt	Vα1.2Jα39.1
	Vβ chain unavailable			
Well 67	**C A** tgtgc	**R** taga	**N T D K L I F** aacaccgacaagctcatcttt	Vα25.1Jα34.1
	Vβ chain unavailable			
Well 69	**C A S S L E** tgtgccagcagcttgg	**G Q H** aagggcaac	**T E A F F** acactgaagctttcttt	Vβ5.8Dβ1.1Jβ1.1
	Vβ chain unavailable			
Well 70	**Vα chain unavailable**			
	C S V tgcagcg	**E G L G R** ttgaaggcctaggacga	**N T E A F F** aacactgaagctttcttt	Vβ29.1Dβ1.1Jβ1.1
Well 71	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**P S D R** ccatcggacagg	**S Y E Q Y F** tcctacgagcagtacttc	Vβ9.2Dβ1.1Jβ2.7

TABLE 7: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 74	**C A S S**	**P D G G V S R**	**G Y T F**	Vβ9.1Dβ1.1Jβ1.2
	tgtgccagcagc	cctgacggggggtttcgcgt	ggctacaccttt	
	Vβ chain unavailable			
Well 75	**C A A**	**I I K K G G C**	**E K L V F**	Vα13.2Jα29.1
	tgtgcagc	gataatcaagaagggcggatg	tgaaaagttggtcttt	
	C A S S	**R S Y S**	**N T E A F F**	Vβ28.1Dβ1.1Jβ1.3
	tgtgccagcag	cagatcttattct	aacactgaagctttcttt	
Well 76	**Vα chain unavailable**			
	C A S S F	**G T A**	**N T G E L F F**	Vβ7.3Dβ1.1Jβ2.2
	tgtgccagcagctt	tgggaccg	cgaacaccggggagctgtttttt	
Well 77	**C I V R V A**	**D**	**Q A G T A L I F**	Vα26.1Jα15.1
	tgcatcgtcagagtcg	ccg	accaggcaggaactgctctgatcttt	
	Vβ chain unavailable			
Well 78	**C A**	**L F P Q G G C E K L**	**V F**	Vα8.6.1Jα57.1
	tgtgct	ctctttccccagggcggatgtgaaaagt	tggtcttt	
	Vβ chain unavailable			
Well 79	**C**	**W G L**	**T D S W G K L Q F**	Vα21.1.1Jα24.2
	tgt	tggggact	aactgacagctgggggaaattgcagttt	
	Vβ chain unavailable			
Well 80	**C**	**W G L N D R**	**W G K L Q F**	Vα21.2.1Jα24.2
	tgt	tggggactaaatgacaga	tgggggaaattgcagttt	
	Vβ chain unavailable			

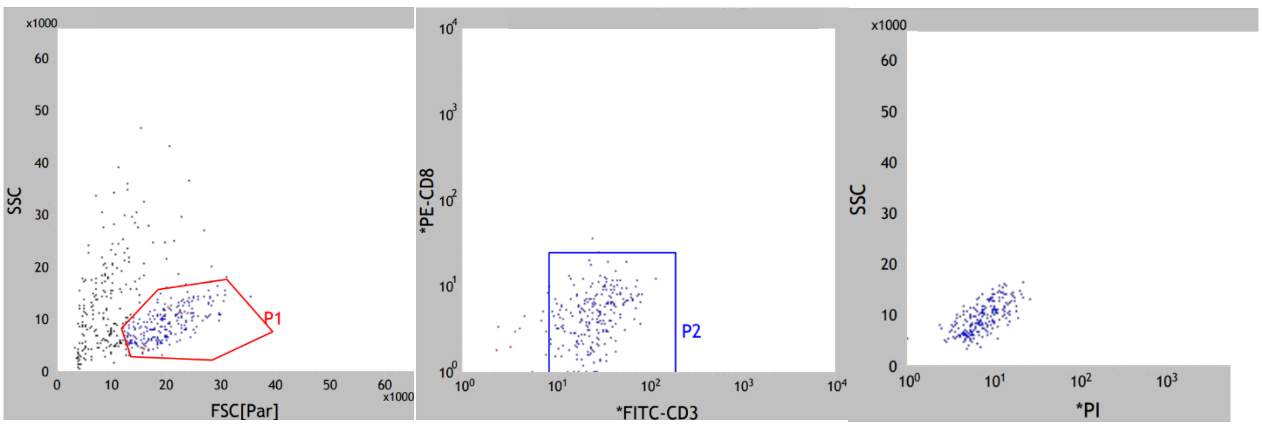
FIGURE 8. (A) HUMAN PBMCS FROM NORMAL DONOR BF31 WERE SINGLE CELL SORTED FOR VRM RT-PCR AND (B) COMPARED WITH MUTANT JURKAT CELLS TRANSDUCED WITH

In Figure 8(A), the histogram top left shows the pre-sort staining of human PBMCs from a normal donor BF31 (a Black Female 31 years old) using a BD Influx cell sorting instrument. Gate P1 displays the region of lymphocytes selected for gate P2 in the top right histogram, which displays a population of cells double positive for anti-CD3-FITC and anti-CD8-PE monoclonal antibodies. Pre-sort staining statistics show that CD3+CD8+ T cells represented 25.49% of the parent lymphocyte population in normal donor BF31.



Populations	Events	% Total	% Parent
All Events	3,813	100.00%	####
P1	459	12.04%	12.04%
P2	117	3.07%	25.49%

The next series for Figure 8(B) shows a gate (P1) for the monoclonal lymphocyte population of mutant Jurkat cells (bottom left), which was used to gate viable CD3+ TCR using anti-CD3+ FITC mab and propidium iodide (PI) exclusion of dead cells (shown as gate P2). Pre-sort staining statistics show that 93.64% of the parent cell population were viable CD3+ cells.



Populations	Events	% Total	% Parent
All Events	456	100.00%	####
P1	236	51.75%	51.75%
P2	221	48.46%	93.64%

Table 8 shows the frequency of paired TCR in PBMCs from normal donor BF31 determined from the total number of alpha- and beta- chain TCR sequences identified in single cells after VRM RT-PCR.

TABLE 8. PAIRED CD3+ CD8+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL FEMALE DONOR BF31

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 24	**C A** tgtgct	**L S E A C** ttgagtgaggcctgt	**N T G T A S K L T F** aataccggcactgccagtaaactcaccttt	Vα19.1 Jα44.1	(1/24) 4.16%
	C A S S tgtgccagcag	**L T G T** ccttaccgggact	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ6.5Dβ2.1 Jβ2.1	
Well 53	**A** gca	**V** gta	**S G Y S T L T F** tcaggatacagcaccctcaccttt	Vα13.2Jα11.1	(1/24) 4.16%
	C A S S V D tgtgccagcagcgtag	**G E** atggggag	**T Y Q F** acgcagtatttt	Vβ9.1Dβ2.2Jβ2.3	
Well 57	**C A V D R** tgtgccgtggaca	**L G G** ggctcggggg	**S G Y A L N F** ttccgggtatgcactcaacttc	Vα39.1Jα41.1	(1/24) 4.16%
	C A S S tgtgccagcag	**G S S G G A G** tgggtctagcgggggggcgggt	**D T Q Y F** gatacgcagtattt	Vβ9.1Dβ2.1 Jβ2.3	

Table 9 shows all sequencing data for normal donor BF31. Alpha and beta chain TCR transcripts from twenty-one wells each containing a single cell were sequenced. All of the alpha chain and beta chain sequences were unique when compared to each other. Three wells corresponded to single cells; both alpha and beta chain TCR sequences. In addition, in a number of wells (18), only alpha or beta chain sequences were obtained presumably for technical reasons; all TCR transcripts identified were unique. These alpha chain T cell transcripts were also unique when compared to the alpha chain TCR transcripts in wells 24, 53, 57. The beta chain T cell transcripts were also unique when compared to the beta chain TCR transcripts in wells 24, 53, 57.

TABLE 9. ALL CD3+ CD8+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BF31 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**Vα chain unavailable**			
	C A S S Y tgtgccagcagtta	**G D** tgggg	**E Q F F** atgagcagttcttc	Vβ6.5Dβ1.1Jβ2.1
Well 07	**Vα chain unavailable**			
	C A S S V tgtcccagcagcgt	**P G** ccttggg	**Q E T Q Y F** caagagacccagtacttc	Vβ9.1Dβ1.1Jβ2.5
Well 11	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**P R L Q V G P Y E Q Y** cctcgcctacaggtggggccctacgagcagtac	**F** ttc	Vβ7.6Dβ1.1Jβ2.6
Well 13	**Vα chain unavailable**			
	C S V D tgcagcgttga	**R Q** ccgac	**Q F F** agcagttcttc	Vβ29.1Dβ1.1Jβ2.1
Well 16	**Vα chain unavailable**			
	C S V tgcagcgt	**P G Q G G A** cccaggacagggggggag	**N Y G Y T F** ctaactatggctacaccttc	Vβ29.1Dβ1.1 Jβ1.2
Well 21	**Vα chain unavailable**			
	C A S S L tgtgccagcagctta	**G R G S N** ggcagggggagta	**N E Q F F** acaatgagcagttcttc	Vβ7.3Dβ1.1Jβ2.1
Well 24	**C A** tgtgct	**L S E A C** ttgagtgaggcctgt	**N T G T A S K L T F** aataccggcactgccagtaaactcacctttt	Vα19.1Jα44.1
	C A S S tgtgccagcag	**L T G T** ccttaccgggact	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ6.5Dβ2.1Jβ2.1
Well 25	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**Y S R G L P** tactcccggggactacct	**Q E T Q Y F** caagagacccagtacttc	Vβ6.6Dβ2.1Jβ2.5
Well 27	**Vα chain unavailable**			
	C A S S A tgcgccagcagtg	**G V** ctggggt	**N E Q F F** caatgagcagttcttc	Vβ10.1Dβ1.1Jβ2.1
Well 30	**C A V** tgtgctgtg	**R P L D** cggcccctag	**N A G N M L T F** ataatgcaggcaacatgctcacttt	Vα2.1Jα39.1
	Vβ chain unavailable			

TABLE 9: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 31	**C** tgt	**R V S F D** agagtgagcggagac	**S T L T F** agcaccctcaccttt	Vα8.6Jα11.1
	Vβ chain unavailable			
Well 34	**Vα chain unavailable**			
	C A S S V G tgtgccagcagcgtag	**T G V** ggacaggggt	**G N T I Y F** tggaaacaccatatattt	Vβ9.1Dβ1.1Jβ1.3
Well 38	**Vα chain unavailable**			
	C A S tgtgccagc	**G T S G S** gggactagcgggag	**E Q Y F** cgagcagtacttc	Vβ5.5Dβ2.2Jβ2.7
Well 41	**Vα chain unavailable**			
	C A S S D tgtgccagcagtga	**R** ccgg	**D T Q Y F** gatacgcagtatttt	Vβ6.1Dβ2.1Jβ2.3
Well 42	**Vα chain unavailable**			
	C A S S F tgtgccagcagctt	**K G Q G A I T** caaaggacagggggcgatcacg	**N T E A F F** aacactgaagctttcttt	Vβ11.2Dβ1.1 Jβ1.1
Well 44	**C A** tgtg	**V S P P G S A** ctgtgagccctccnggttctgca	**Q L T F** caactgaccttt	Vα8.2Jα22.1
	Vβ chain unavailable			
Well 46	**Vα chain unavailable**			
	C S G tgcagtg	**S D R G L G** ggtcggacagggggctaggg	**N E Q F F** aatgagcagttcttc	Vβ20.1Dβ1.1Jβ2.1
Well 53	**A** gca	**V** gta	**S G Y S T L T F** tcaggatacagcaccctcaccttt	Vα13.2Jα11.1
	C A S S V D tgtgccagcagcgtag	**G E** atggggag	**T Q Y F** acgcagtatttt	Vβ9.1Dβ2.2Jβ2.3
Well 56	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**H T G A A** catacaggtgccg	**T N E K L F F** caactaatgaaaaactgtttttt	Vβ7.6Dβ1.1Jβ1.4
Well 57	**C A V D R** tgtgccgtggaca	**L G G** ggctcggggg	**S G Y A L N F** ttccgggtatgcactcaacttc	Vα39.1Jα41.1
	C A S S tgtgccagcag	**G S S G G A G** tgggtctagcggggggcgggt	**D T Q Y F** gatacgcagtatttt	Vβ9.1Dβ2.1Jβ2.3
Well 61	**C A** tgtg	**V S D G P** ctgtgagtgatggcc	**G G G A D G L T F** caggaggaggtgctgacggactcaccttt	Vα8.2Jα45.1
	Vβ chain unavailable			

Table 10 shows 100% of the alpha- and beta- chain TCR transcripts amplified from single cells using VRM RT-PCR were positively identified by sequence analysis as the Vα34.1 Jα47.1 or Vβ20.1 Jβ1.1 TCR in the Jurkat (RT3-T3.5) T cell line transduced with Vα34.1 Jα47.1 alpha- and Vβ20.1 Jβ1.1 beta-chains; eleven of the wells identified paired TCR for both the alpha- and beta-chain, resulting in six wells with Vα34.1 Jα47.1 TCR and an unavailable beta chain. In contrast to the PBMC from normal donor BF31, 100% of the transcripts sequenced were identical to the alpha and beta TCR chains transduced in the Jurkat T cell line for Vα34.1 Jα47.1 or Vβ20.1 Jβ1.1 TCR.

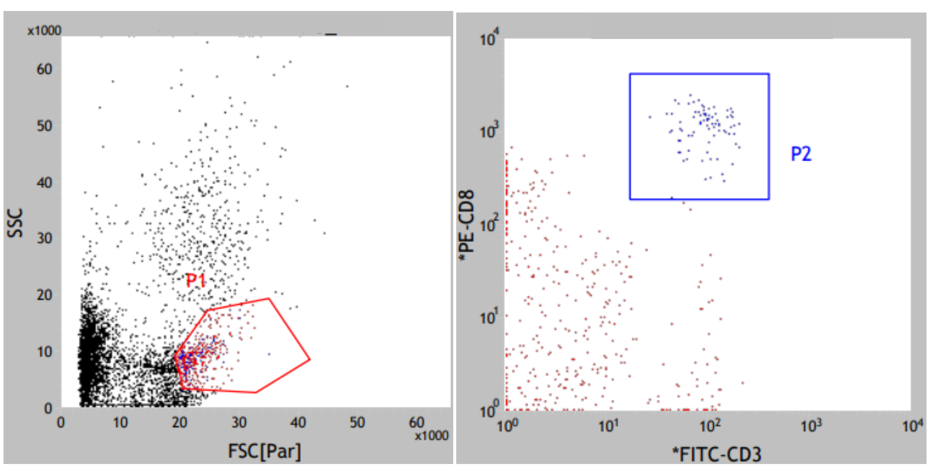
TABLE 10. MUTANT JURKAT CELLS SERVED AS POSITIVE CONTROLS IN SINGLE CELL VRM RT-PCR COMPARED TO SINGLE CELL VRM RT-PCR IN PBMC FROM NORMAL DONOR BF31

PCR Product	V segment	N/D segment	J segment	Transcript	Frequency
V alpha	**C G A D M** tgtggagcagaca		**E Y G N K L V F** tggaatatggaaacaaactggtcttt	Vα34.1 Jα47.1	(17/17) 100%
V Beta	**C S A R E** tgcagtgctagaga	**S M** gtcca	**N T E A F F** tgaacactgaagctttcttt	Vβ20.1 Dβ1.1 Jβ1.1	(11/11) 100%

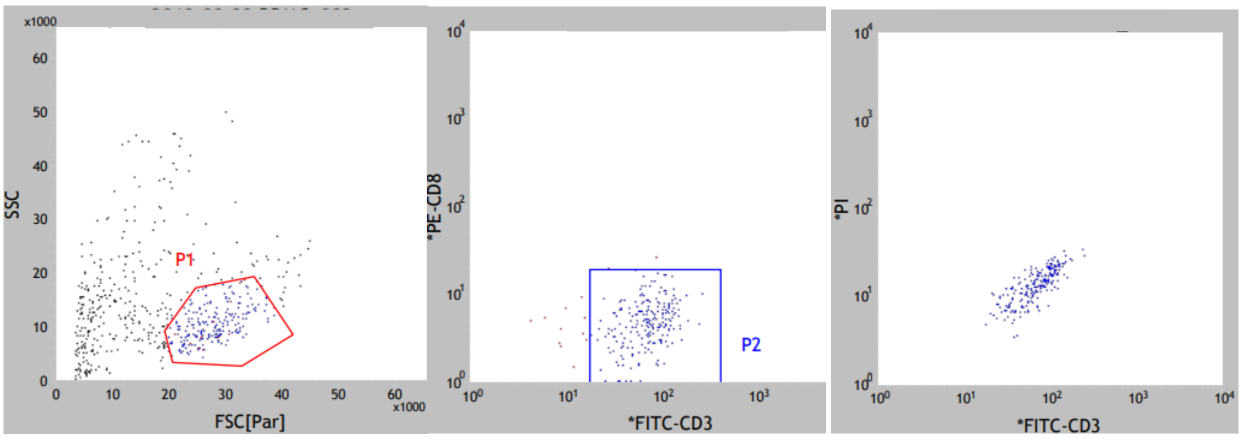
FIGURE 9. HUMAN PBMC FROM NORMAL DONOR BM41 WERE SINGLE CELL SORTED FOR VRM RT-PCR AND COMPARED TO MUTANT JURKAT CELLS TRANSDUCED WITH KNOWN TCR.

In Figure 9(A), the histogram top left shows the pre-sort staining of human PBMCs from a normal donor BM41 (a Black Male 41 years old) using a BD Influx Cell Sorter. Gate P1 displays the region of lymphocytes selected for gate P2 in the top right histogram, which displays a population of cells double positive for anti-CD3-FITC and anti-CD8-PE monoclonal antibodies. Pre-sort staining statistics show that CD3+CD8+ T cells represented 17.75% of the parent lymphocyte population in normal donor BM41.

Populations	Events	% Total	% Parent
All Events	4,778	100.00%	####
P1	462	9.67%	9.67%
P2	82	1.72%	17.75%



The next series, Figure 9(B), shows a gate (P1) for the monoclonal lymphocyte population of mutant Jurkat cells (bottom left), which was used to gate viable CD3+ TCR using anti-CD3+ FITC mab and propidium iodide (PI) exclusion of dead cells (shown as gate P2). Pre-sort staining statistics show that 94.35% of the parent cell population were viable CD3+ cells.



Populations	Events	% Total	% Parent
All Events	574	100.00%	####
P1	230	40.07%	40.07%
P2	217	37.80%	94.35%

Table 11 shows all sequencing data for normal donor BF31. Twenty-four wells each containing a single cell were sequenced. All of the alpha chain and beta chain sequences were unique when compared to each other. Two wells corresponded to single cells that contained both alpha and beta chain TCR sequences. In addition, in a number of wells (22), only alpha or beta chain sequences were obtained presumably for technical reasons; all TCR transcripts identified were unique. These alpha chain T cell transcripts were also unique when compared to the alpha TCR transcripts in wells 21 and 67. The beta chain T cell transcripts were also unique when compared to the beta TCR transcripts in wells 21 and 67.

TABLE 11. PAIRED CD3+ CD8+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM41

Single Cell	V segment	N / D segment	J segment	Transcript
Well 21	**C A V E D** tgtgctgtggagga	**D** cg	**T G F Q K L V F** acacaggctttcagaaacttgtattt	Vα2.1Jα8.1
	C A S tgtgccagc	**G A D T** ggagcggacacg	**Y N E Q F F** tacaatgagcagttcttc	Vβ6.1Dβ1.1 Jβ2.1
Well 067	**C A L S G** tgtgctctgagtg	**Y** gct	**T G T A S K L T F** ataccggcactgccagtaaactcaccttt	Vα19.1Jα44.1
	C A S S L D tgcgccagcagcttgg	**R G R Y N S P S** acaggggccgctataattcaccctcc	**F** ttt	Vβ5.1Dβ1.1 Jβ1.6
Well 04	**C A M R E** tgtgcaatgagaga	**S** aag	**T G G F K T I F** tactggaggcttcaaaactatcttt	Vα14.4Jα9.1
	Vβ chain unavailable			
Well 05	**C A L S** tgtgctctgagt	**R L G** cgtttggg	**A G K S T F** tgcaggcaaatcaacctttt	Vα19.1Jα27.1
	Vβ chain unavailable			
Well 07	**C A V** tgtgctgt	**R G N D** tggggtacggggg	**G N M R F** aatgacatgcgcttt	Vα36.2Jα43.1
	Vβ chain unavailable			
Well 16	**V P** gtgccg	**G L** gggctg	**G K L I F** ggcaaactaatcttt	Vα12.2Jα37.1
	Vβ chain unavailable			
Well 17	**Vα chain unavailable**			
	C A S S L A tgtgccagcagcttgg	**G A D** caggggccg	**T E A F F** acactgaagctttcttt	Vβ5.5Dβ1.1Jβ1.1
Well 19	**V** gtc	**S** tc	**G A Q K L V F** gggagcccagaagctggtattt	Vα12.2Jα54.1
	Vβ chain unavailable			
Well 21	**C A V E D** tgtgctgtggagga	**D** cg	**T G F Q K L V F** acacaggctttcagaaacttgtattt	Vα2.1Jα8.1
	C A S tgtgccagc	**G A D T** ggagcggacacg	**Y N E Q F F** tacaatgagcagttcttc	Vβ6.1Dβ1.1Jβ2.1

TABLE 11: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 22	**C A V** tgtgctgt	**G V R G** tggggtacggggg	**N D M R F** aatgacatgcgcttt	Vα36.3Jα43.1
	Vβ chain unavailable			
Well 25	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**P P R Y K T** cccccgcgctataaaac	**T Q Y F** gacccagtacttc	Vβ28.1Dβ2.1 Jβ2.5
Well 26	**A L** gctctg	**S D S** tctgacagc	**K L Q F** aaattgcagttt	Vα19.1Jα24.2
	Vβ chain unavailable			
Well 27	**Vα chain unavailable**			
	C tgt	**P H G** ccacacggc	**T D T Q Y F** acagatacgcagtatttt	Vβ7.6Dβ1.1 Jβ2.3
Well 41	**Vα chain unavailable**			
	C A S S V G tgtgccagcagcgtag	**G R S S** ggggcagaagctca	**E K L F F** gaaaaactgtttttt	Vβ9.2Dβ1.1Jβ1.4
Well 43	**C V V S V** tgtgttgtgagtg	**Y** ttt	**N N N D M R F** acaataacaatgacatgcgcttt	Vα8.2Jα43.1
	Vβ chain unavailable			
Well 44	**Vα chain unavailable**			
	R A S cgtgccagc	**S M V G G A G** tctatggtagggggcgccgg	**Y G Y T F** ctatggctacaccttc	Vβ7.3Dβ1.1Jβ1.2
Well 47	**C A V S** tgtgctgtgag	**R G D** tcgaggggac	**S S A S K I I F** agcagtgcttccaagataatcttt	Vα8.4Jα3.1
	Vβ chain unavailable			
Well 50	**C A V** tgtgccgtg	**G G** gggggg	**G S S N T G K L I F** ggctctagcaacacaggcaaactaatcttt	Vα12.2Jα37.2
	Vβ chain unavailable			
Well 53	**C A A** tgtgcag	**T T** ctaccacc	**S N D Y K L S F** tctaacgactacaagctcagcttt	Vα27.1Jα20.1
	Vβ chain unavailable			
Well 55	**Vα chain unavailable**			
	V P A gtgccagca	**L R** tctcga	**Q Y F** cagtacttc	Vβ28.1Dβ1.1Jβ2.7

TABLE 11: CONTINUED

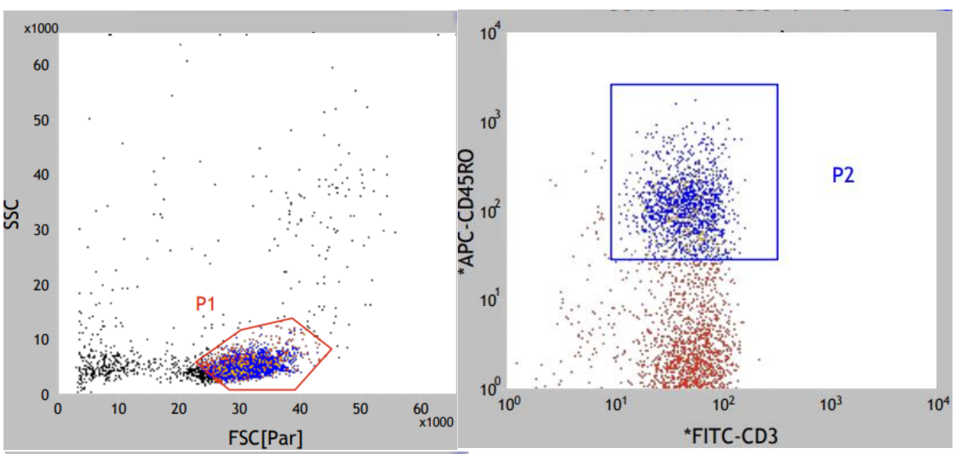
Single Cell	V segment	N / D segment	J segment	Transcript
Well 58	**Vα chain unavailable**			
	V gtc	**C R D L** tgccgggatctc	**N E Q F F** aatgagcagttcttc	Vβ28.1Dβ2.2Jβ2.1
Well 61	**C A L S D** tgtgctctgagtga	**S** ttc	**S G G Y N K L I F** ttctggtggctacaataagctgatttt	Vα19.1Jα4.1
	Vβ chain unavailable			
Well 66	**Vα chain unavailable**			
	C A S S L G tgcgccagcagcttgg	**S S D R S Y** ggtcgtcggacaggagctat	**G N T I Y F** ggaaacaccatatatttt	Vβ5.1Dβ1.1 Jβ1.3
Well 67	**C A L S G** tgtgctctgagtg	**Y** gct	**T G T A S K L T F** taccggcactgccagtaaactcaccttt	Vα19.1Jα44.1
	C A S S L D tgcgccagcagcttgg	**R G R** acaggggccg	**Y N S P L H F** ctataattcacccctccacttt	Vβ5.1Dβ1.1Jβ1.6
Well 69	**V L** gtgctg	**H L** caccctt	**F R K H T S F L** ttcaggaaacacacctcttttctt	Vα8.4Jα29.1
	Vβ chain unavailable			
Well 71	**C A L** tgtgcctt	**N G G** gaatgggg	**G G S N Y K L T F** gtggaggtagcaactataaactgacattt	Vα24.1Jα53.1
	Vβ chain unavailable			

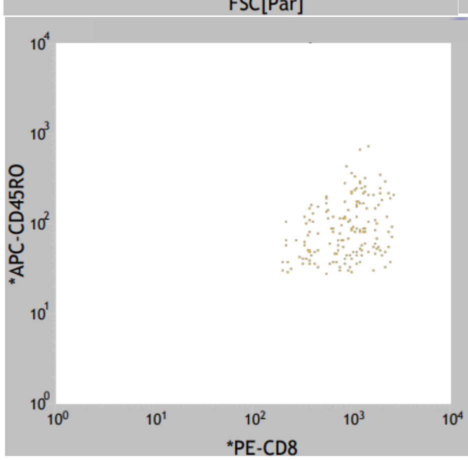
TCR V-ALPHA AND V-BETA CHAINS WERE IDENTIFIED IN CD3+CD8+CD45RO+ CD3+CD4+CD45RO+ AND CD3+CD20+ T CELLS FROM HUMAN PBMCS IN NORMAL DONORS USING SINGLE CELL VRM RT-PCR (SPECIFIC AIM #2A).

To determine whether T cells from the peripheral blood of patients with MS contain clonally expanded populations of alpha-beta TCR, VRM RT-PCR and sequencing was employed to identify alpha- and beta- chain TCR transcripts in human PBMC from normal donors in comparison to patients with relapsing-remitting forms of multiple sclerosis (RRMS). T cell populations studied include CD3+CD4+CD45RO+ T cells, CD3+CD8+CD45RO+ T cells, and CD3+CD20+ T cells to investigate memory T cells previously exposed to antigens. Results for normal donor controls are described below.

FIGURE 10. HUMAN PBMCS FROM NORMAL DONOR BM56 WERE SINGLE CELL SORTED FOR CD3+CD8+CD45RO+ T CELLS USING VRM RT-PCR.

Figure 10 shows the stain and sort of human PBMCs from normal donor BM56 (a Black Male 56 years old) stained with CD3-FITC, CD8-PE, and CD45RO-APC. Gate P1 (top left histogram), displays the region of lymphocytes selected as the parent population for CD3+CD45RO+ T cells shown in gate P2 (top right histogram). CD3+CD8+CD45RO+ T cells were selected in population 3 (bottom left right histogram) and individually sorted into a 96-well plate using a BD FACS Influx Cell Sorter; statistics show that CD3+CD8+CD45RO+ T cells represented 10.79% of the parent population.





Populations	Events	% Total	% Parent
All Events	3,841	100.00%	####
P1	3,156	82.17%	82.17%
P2	1,510	39.31%	47.85%
P3	163	4.24%	10.79%

Table 12 shows the frequency of paired TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells after VRM RT-PCR. One alpha- and beta- chain TCR pair was identified twice, Vα1.1Jα31.1 Vβ20.1Dβ1.1Jβ1.1 showing a frequency of 3.5% of the total alpha and beta chains identified in normal donor BM56.

TABLE 12. PAIRED CD3+CD8+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM56

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Wells 46, 77	**C A V R** tgcgctgtgag	**R** gagg	**N A R L M F** aatgccagactcatgttt	Vα1.1Jα31.1	2/57 3.5%
	C S A tgcagtgct	**D E T G G E S** gatgagacagggggcgagt	**E A F F** ctgaagctttcttt	Vβ20.1Dβ1.1 Jβ1.1	
Well 10	**C A M R E G** tgtgcaatgagagagg g	**R** ccg	**G G K L I F** gggaggaaagcttatcttc	Vα14.1Jα23.1	1/57 1.75%
	C A S S tgtgccagcagc	**H H S A G D S Y** caccactcagcgggggattccta	**S Y N E Q F F** ctcctacaatgagcagttcttc	Vβ9.1 Dβ2.1 Jβ2.1	
Well 22	**C A V R** tgtgccgtga	gg	**N A R L M F** aatgccagactcatgttt	Vα12.2 Jα31.1	1/57 1.75%
	C A S S Y tgtgccagcagct	**L G A E G L** atctcggggccgaggggctt	**Y T F** tacaccttc	Vβ7.9Dβ1.1 Jβ1.2	
Well 28	**C A** tgtgcc	**S** tc	**F N K F Y F** cttcaacaaattttacttt	Vα24.1Jα21.1	1/57 1.75%
	C A S S F tgtgccagcagctt	**W T S G S G** ttggactagcgggagtggg	**N E Q F F** aatgagcagttcttc	Vβ7.9Dβ2.2 Jβ2.1	
Well 31	**C A M R** tgtgcaatgag	**S** gag	**T D K L I F** caccgacaagctcatcttt	Vα14.2Jα34.1	1/57 1.75%
	C A S S L tgtgccagcagttta	**G T G D** gggacaggagat	**S Y E Q Y F** tcctacgagcagtacttc	Vβ28.1 Jβ2.7	
Well 42	**C A L S E A** tgtgctctgagtgagg c	**Q G** gcaggg	**N A G K S T F** caatgcaggcaaatcaacccttt	Vα19.1Jα27.1	1/57 1.75%
	C A S S tgtgccagcagc	**P E G G G P E** ccagagggcggggggccag	**E T Q Y F** aagagacccagtacttc	Vβ9.1Dβ2.1 Jβ2.5	

TABLE 12: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 43	**C A A S** tgtgcagcaa	**S E S L P V L** gtagtgagagccttccggttctt	**R Q L T F** aggcaactgaccttt	Vα13.1Jα22.1	1/57 1.75%
	C S A tgcagtgct	**S L S G R A R D** tcgcttagcgggagggcccggg	**N E Q F F** acaatgagcagttcttc	Vβ20.1Dβ2.1 Jβ2.2	
Well 58	**C A** tgtgct	**V R** gtacg	**Y S G G G A D G L T F** gtattcaggaggaggtgctgacggacacaccttt	Vα21.1Jα45.1	1/57 1.75%
	C A S S tgtgccagcagc	**P Q G G** cctcaggggggt	**N T G E L F F** aacaccggggagctgtttttt	Vβ9.2Dβ1.1 Jβ2.2	
Well 61	**C A** tgtgca	**T L G G S N Y** actcttggaggtagcaactat	**K L T F** aaactgacattt	Vα13.1Jα53.1	1/57 1.75%
	C A S S tgtgccagcag	**T L G G** caccctggggg	**N T E A F F** gaacactgaagctttcttt	Vβ6.5Dβ2.1 Jβ1.1	
Well 65	**C A L S E A** tgtgctctgagtgaggc	**Q G** gcaggg	**N A G K S T F** caatgcaggcaaatcaaccttt	Vα19.1Jα27.1	1/57 1.75%
	C A S S tgtgccagcagc	**P E G G G P E** ccagagggcgggggccag	**E T Q Y F** aagagacccagtacttc	Vβ9.1Dβ2.1 Jβ2.5	
Well 71	**C A E** tgtgcagag	**D Y** gact	**N A R L M F** acaatgccagactcatgttt	Vα5.1Jα31.1	1/57 1.75%
	C S A tgcagtgct	**R D R G L** cgagacaggggcctc	**G N T I Y F** ggaaacaccatatatttt	Vβ20.1Dβ1.1 Jβ1.3	
Well 75	**C A L S E G** tgtgctctgagtgagg	**F G** gcttcggg	**G N T P L V F** ggaaacacacctcttgtcttt	Vα19.1Jα29.1	1/57 1.75%
	C A S S V tgtgccagcagtg	**G I E** tgggtatcgaa	**G Y T F** ggctacaccttt	Vβ25.11 Dβ1.1 Jβ1.2	

Table 13 shows all sequencing data for normal donor BM56. Fifty-seven wells each containing a single cell were sequenced. Twelve wells corresponded to single cells that contained both alpha and beta chain TCR sequences. In addition, in a number of wells (44), only alpha or beta chain sequences were obtained presumably for technical reasons. Three alpha chain T cell transcripts were identical when compared to all other alpha TCR transcripts and three beta chain T cell transcripts were identical when compared to all other beta TCR transcripts.

TABLE 13. CD3+CD8+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BM56 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**R Q I E L** cgacaaatcgagct	**Q I R S I** acagatacgcagtatt	Vβ6.2Dβ1.1Jβ2.3
Well 04	**Vα chain unavailable**			
	C P S tgtcccagc	**Q T S E** cagactagcgaa	**N T G E L F F** aacaccggggagctgtttttt	Vβ6.4Dβ2.1Jβ2.2
Well 05	**Vα chain unavailable**			
	C A S S E tgtgccagcagtgaa	**T G T G G** accgggacagggggt	**T E A F F** actgaagctttcttt	Vβ6.1Dβ1.1Jβ1.1
Well 06	**Vα chain unavailable**			
	C S V tgcagtg	**R T G E G** tcaggaccggggaagga	**S P L H F** tcacccctccacttt	Vβ20.1Dβ2.1Jβ1.6
Well 07	**Vα chain unavailable**			
	C A S S E tgcgccagcagc	**D V P G** gatgtcccgggg	**N I Q Y F** aacattcagtacttc	Vβ5.1Dβ2.1Jβ1.6
Well 10	**C A M R E G R** tgtgcaatgagagaggg ccg		**G G K L I F** gggaggaaagcttatcttc	Vα14.1Jα23.1
	C A S S tgtgccagcagc	**H H S A G D S Y** caccactcagcgggggattccta	**S Y N E Q F F** ctcctacaatgagcagttcttc	Vβ9.1Dβ2.1 Jβ2.1
Well 13	**Vα chain unavailable**			
	C A S R tgtgccagcag	**Y R G E R** gtacaggggagaacgg	**Q E T Q Y** caagagacccagtac	Vβ2.1Dβ1.1 Jβ2.5
Well 15	**Vα chain unavailable**			
	C A S S F tgcgccagcagctt	**S V D** ctcagtcga	**S Y E Q Y F** ctcctacgagcagtacttc	Vβ5.1Dβ1.1 Jβ2.7
Well 18	**Vα chain unavailable**			
	C A S S D tgtgccagcagtga	**V R N P** tgtcaggaacc	**K N I Q Y F** ccaaaaacattcagtacttc	Vβ2.3Dβ1.1Jβ2.4
Well 20	**Vα chain unavailable**			
	C S A R A tgcagtgctagag	**G G S** cgggcgggagt	**Q E T Q Y F** caagagacccagtacttc	Vβ20.1Dβ2.2 Jβ2.5

TABLE 13: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 21	**Vα chain unavailable**			
	C A S S D S	**T G**	**S T D T Q Y F**	Vβ6.4Dβ1.1Jβ2.3
	tgtgccagcagtgact c	aacaggc	agcacagatacgcagtatttt	
Well 22	**C A V R**		**N A R L M F**	Vα12.2Jα31.1
	tgtgccgtga	gg	aatgccagactcatgttt	
	C A S S Y	**L G A E G L**	**Y T F**	Vβ7.9Dβ1.1 Jβ1.2
	tgtgccagcagct	atctcggggccgaggggctt	tacaccttc	
Well 25	**C A M R**	**S**	**T D K L I F**	Vα14.2Jα34.1
	tgtgcaatgag	gag	caccgacaagctcatcttt	
	Vβ chain unavailable			
Well 26	**Vα chain unavailable**			
	C A S S D	**G T E**	**N Q P Q H F**	Vβ6.1Dβ1.1 Jβ1.5
	tgtgccagcagtga	cgggacagaa	aatcagccccagcatttt	
Well 27	**Vα chain unavailable**			
	C A S S E	**T G T G G**	**T E A F F**	Vβ6.1Dβ1.1 Jβ1.1
	tgtgccagcagtgaa	accgggacagggggt	actgaagctttcttt	
Well 28	**C A**	**S**	**F N K F Y F**	Vα24.1Jα21.1
	tgtgcc	tc	cttcaacaaatttacttt	
	C A S S F	**W T S G S G**	**N E Q F F**	Vβ7.9Dβ2.2 Jβ2.1
	tgtgccagcagctt	ttggactagcgggagtggg	aatgagcagttcttc	
Well 30	**Vα chain unavailable**			
	C A S S S	**Q G V E R**	**N T G E L F F**	Vβ5.4Dβ2.2 Jβ1.1
	tgtgccagcagct	cccaaggggtcgagag	gaacaccggggagctgtttttt	
Well 31	**C A M R**	**S**	**T D K L I F**	Vα14.2Jα34.1
	tgtgcaatgag	gag	caccgacaagctcatcttt	
	C A S S L	**G T G D**	**S Y E Q Y F**	Vβ28.1Dβ1.1 Jβ2.7
	tgtgccagcagttta	gggacaggagat	tcctacgagcagtacttc	
Well 33	**Vα chain unavailable**			
	C A S S E	**E**	**S G A N V L T F**	Vβ6.4Dβ2.2 Jβ2.6
	tgtgccagcagtga	ggag	tctggggccaacgtcctgactttc	
Well 36	**Vα chain unavailable**			
	C A S S D	**G T S G S**	**N E Q F F**	Vβ6.4Dβ2.2 Jβ2.1
	tgtgccagcagtgac	gggactagcgggag	caatgagcagttcttc	
Well 39	**C V**	**P**	**G N N R L A F**	Vα10.1Jα7.1
	tgtgtg	ccc	gggaacaacagactcgctttt	
	Vβ chain unavailable			

TABLE 13: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 40	**Vα chain unavailable**			
	C S A	**R T D L A A T**	**Y N E Q F F**	Vβ20.1Dβ2.1
	tgcagtgc	caggaccgatctagcggcaaca	tacaatgagcagttcttc	Jβ2.1
Well 41	**Vα chain unavailable**			
	C S V E D	**L A**	**G Y T F**	Vβ29.1Dβ1.2
	tgcagcgttgaaga	tcttgcc	ggctacaccttc	Jβ2.1
Well 42	**C A L S E A**	**Q G**	**N A G K S T F**	Vα19.1Jα27.1
	tgtgctctgagtgaggc	gcaggg	caatgcaggcaaatcaaccttt	
	C A S S	**P E G G G P E**	**E T Q Y F**	Vβ9.1Dβ2.1
	tgtgccagcagc	ccagagggcgggggccag	aagagacccagtacttc	Jβ2.5
Well 43	**C A A S**	**S E S L P V L**	**R Q L T F**	Vα13.1Jα22.1
	tgtgcagcaa	gtagtgagagccttccggttctt	aggcaactgaccttt	
	C S A	**S L S G R A R D**	**N E Q F F**	Vβ20.1Dβ2.1
	tgcagtgct	tcgcttagcgggagggcccggg	acaatgagcagttcttc	Jβ2.2
Well 45	**C A L S E A**	**R G**	**G G F K T I F**	Vα19.1Jα9.1
	tgtgctctgagtgaggc	gcgggg	tggaggcttcaaaactatcttt	
	Vβ chain unavailable			
Well 46	**C A V R**	**R**	**N A R L M F**	Vα1.1Jα31.1
	tgcgctgtgag	gagg	aatgccagactcatgttt	
	C S A	**D E T G G E S**	**E A F F**	Vβ20.1Dβ1.1
	tgcagtgct	gatgagacaggggggcgagt	ctgaagctttcttt	Jβ1.1
Well 47	**Vα chain unavailable**			
	C A S S E	**T G T G G**	**T E A F F**	Vβ6.1Dβ1.1
	tgtgccagcagtgaa	accgggacagggggt	actgaagctttcttt	Jβ1.1
Well 48	**Vα chain unavailable**			
	C A S R	**S D E G L A G I G E K D**	**E Q F F**	Vβ5.1
	tgtgccagcag	atccgacgaggggctagcggggataggtgagaagg	atgagcagttcttc	Dβ2.1 Jβ2.1
Well 50	**Vα chain unavailable**			
	C A S S L S	**I R N**	**E Q F F**	Vβ27.1Dβ1.1
	tgtgccagcagtttatc	gatccgcaac	gagcagttcttc	Jβ2.1
Well 51	**Vα chain unavailable**			
	C S A R V	**A G R E A**	**D T Q Y F**	Vβ20.1Dβ2.2
	tgcagtgctagag	tcgccgggagggaag	cagatacgcagtatttt	Jβ2.3
Well 52	**Vα chain unavailable**			
	C A S S D	**G T E**	**N Q P Q H F**	Vβ6.1Dβ1.1
	tgtgccagcagtga	cgggacagaa	aatcagccccagcatttt	Jβ1.5

TABLE 13: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 53	**Vα chain unavailable**			
	C A S S	**R Q I E L**	**T D T Q Y F**	Vβ6.2Dβ1.1
	tgtgccagcagt	cgacaaatcgagctt	acagatacgcagtatttt	Jβ2.3
Well 54	**Vα chain unavailable**			
	C A S S Y	**R G D**	**T E A F F**	Vβ7.9Dβ1.1Jβ1.1
	tgtgccagcagct	acagggggg	acactgaagctttcttt	
Well 55	**Vα chain unavailable**			
	C A S S E	**L G Q A**	**Y N E Q F F**	Vβ6.1Dβ1.1Jβ2.1
	tgtgccagcagtgaa	ctgggacagg	cctacaatgagcagttcttc	
Well 56	**C A E T**	**P S**	**G T A L I F**	Vα5.1Jα15.1
	tgtgcagaga	ctccct	caggaactgctctgatcttt	
	Vβ chain unavailable			
Well 58	**C A**	**V R**	**Y S G G G A D G L T F**	Vα21.1Jα45.1
	tgtgct	gtacg	gtattcaggaggaggtgctgacggacacaccttt	
	C A S S	**P Q G G**	**N T G E L F F**	Vβ9.2Dβ1.1
	tgtgccagcagc	cctcaggggggt	aacaccggggagctgtttttt	Jβ2.2
Well 59	**Vα chain unavailable**			
	C A S S D	**G T E**	**N Q P Q H F**	Vβ6.1Dβ1.1Jβ1.5
	tgtgccagcagtga	cgggacagaa	aatcagccccagcatttt	
Well 61	**C A**	**T L G G S N Y**	**K L T F**	Vα13.1Jα53.1
	tgtgca	actcttggaggtagcaactat	aaactgacattt	
	C A S S	**T L G G**	**N T E A F F**	Vβ6.5Dβ2.1
	tgtgccagcag	caccctggggg	gaacactgaagctttcttt	Jβ1.1
Well 62	**Vα chain unavailable**			
	C A S S E	**G R**	**S G A N V L T F**	Vβ6.4Dβ1.1Jβ2.6
	tgtgccagcagtga	gggacg	ctctggggccaacgtcctgactttc	
Well 63	**Vα chain unavailable**			
	C A S S	**T G T G**	**N S P L H F**	Vβ6.1Dβ1.1
	tgtgccagcagt	accgggacaggg	aattcacccctccacttt	Jβ1.6
Well 65	**C A L S E A**	**Q G**	**N A G K S T F**	Vα19.1Jα27.1
	tgtgctctgagtgaggc	gcaggg	caatgcaggcaaatcaacctttt	
	C A S S	**P E G G G P E**	**E T Q Y F**	Vβ9.1Dβ2.1
	tgtgccagcagc	ccagagggcgggggccag	aagagacccagtacttc	Jβ2.5
Well 68	**Vα chain unavailable**			
	C S A	**W T G E**	**T E A F F**	Vβ20.1Dβ1.1
	tgcagtgct	tggacaggggag	actgaagctttcttt	Jβ1.1

TABLE 13: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 69	**Vα chain unavailable**			
	C A S S D tgtgccagcagtga	**G T E** cgggacagaa	**N Q P Q H F** aatcagccccagcatttt	Vβ6.1Dβ1.1 Jβ1.5
Well 71	**C A E** tgtgcagag	**D Y** gact	**N A R L M F** acaatgccagactcatgttt	Vα5.1Jα31.1
	C S A tgcagtgct	**R D R G L** cgagacaggggcctc	**G N T I Y F** ggaaacaccatatatttt	Vβ20.1Dβ1.1 Jβ1.3
Well 72	**Vα chain unavailable**			
	C A S R tgtgccagcag	**Y R G E R** gtacaggggagaacgg	**Q E T Q Y** caagagacccagtac	Vβ2.1 Jβ2.5
Well 74	**C A V** tgcgctgt	**R E K D Y N** cagagaaaaagactacaac	**L S F** ctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			
Well 75	**C A L S E G** tgtgctctgagtgagg	**F G** gcttcggg	**G N T P L V F** ggaaacacacctcttgtcttt	Vα19.1Jα29.1
	C A S S V tgtgccagcagtg	**G I E** tgggtatcgaa	**G Y T F** ggctacaccttt	Vβ25.1Dβ1.1 Jβ1.2
Well 76	**Vα chain unavailable**			
	C A S S Y tgtgccagcagtta	**Q G G F** atcagggagggtt	**Q E T Q Y F** caagagacccagtacttc	Vβ6.5Dβ2.2 Jβ2.5
Well 77	**C A V R** tgcgctgtgag	**R** gagg	**N A R L M F** aatgccagactcatgttt	Vα1.1Jα31.1
	C S A tgcagtgct	**D E T G G E S** gatgagacaggggggcgagt	**E A F F** ctgaagctttcttt	Vβ20.1Dβ1.1 Jβ1.1
Well 78	**C A E S** tgtgcagaga	**I** gtata	**G F K T I F** ggcttcaaaactatcttt	Vα5.1Jα9.1
	Vβ chain unavailable			
Well 79	**Vα chain unavailable**			
	C A S S D tgtgccagcagtg a	**S S** ttccag	**G A N V L T F** tctggggccaacgtcctgactttc	Vβ6.1Dβ1.1 Jβ2.6
Well 81	**Vα chain unavailable**			
	C A S R tgtgccagcag	**P E G G G P E** accagagggcgggggccagaa	**E T Q Y** gagacccagtac	Vβ9.1Dβ1.1 Jβ2.5

TABLE 13: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 82	**Vα chain unavailable**			
	C A S S E tgtgccagcagtga	**L G L A D D** gctcggactagcggatg	**N E Q F F** acaatgagcagttcttc	Vβ6.1Dβ2.1 Jβ2.1
Well 83	**Vα chain unavailable**			
	C A S S tgtgccagtagt	**P G P D P** ccaggcccggaccc	**N S P L H F** taattcacccctccacttt	Vβ19.1Dβ1.1 Jβ1.6
Well 87	**C A M R** tgtgcaatgag	**S** gag	**T D K L I F** caccgacaagctcatcttt	Vα14.2Jα34.1
	Vβ chain unavailable			

Table 14 shows clonally expanded TCR alpha- chain transcripts identified in single cells after VRM RT-PCR from normal donor BM56. The frequency is determined from the total number of alpha-chains identified.

TABLE 14. IDENTICAL ALPHA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN NORMAL DONOR BM56

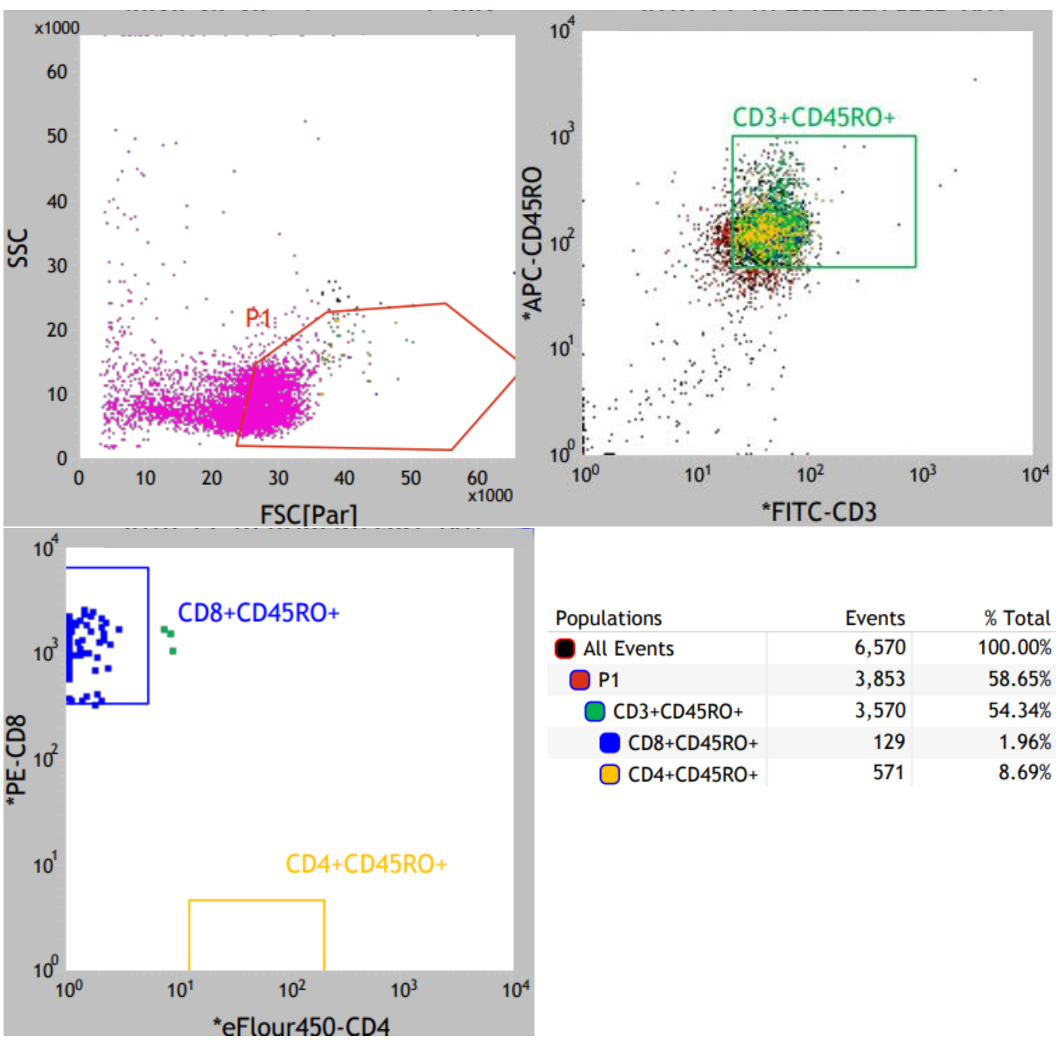
αTCR	V segment	N segment	J segment	Transcript	Frequency α TCR
Wells 25, 31, 87	**C A M R** tgtgcaatgag	**S** gag	**T D K L I F** caccgacaagctcatcttt	Vα14.2Jα34.1	3/21 14.2%
Wells 46, 77	**C A V R** tgcgctgtgag	**R** gagg	**N A R L M F** aatgccagactcatgttt	Vα1.1Jα31.1	2/21 9.5%
Wells 42, 65	**C A L S E A** tgtgctctgagtgaggc	**Q G** gcaggg	**N A G K S T F** caatgcaggcaaatcaacctttt	Vα19.1Jα27.1	2/21 9.5%

Table 15 shows clonally expanded TCR beta- chain transcripts identified in single cells after VRM RT-PCR from normal donor BM56. The frequency was determined from the total number of beta-chains identified.

TABLE 15. IDENTICAL BETA TCR CHAINS IN CD3+CD8+CD45RO+ SINGLE CELL TCR FROM PBMCS IN NORMAL DONOR BM56

βTCR	V segment	N / D segment	J segment	Transcript	Frequency β TCR
Wells 46, 77	**C S A** tgcagtgct	**D E T G G E S** gatgagacagggggcgagt	**E A F F** ctgaagctttcttt	Vβ20.1Dβ1.1 Jβ1.1	2/54 3.7%
Wells 42,65	**C A S S** tgtgccagcagc	**P E G G G P E** ccagagggcgggggccag	**E T Q Y F** aagagacccagtacttc	Vβ9.1Dβ2.1 Jβ2.5	2/54 3.77%
Wells 26,52, 59,69	**C A S S D** tgtgccagcagtga	**G T E** cgggacagaa	**N Q P Q H F** aatcagccccagcatttt	Vβ6.1Dβ1.1 Jβ1.5	4/54 7.4%

FIGURE 11. HUMAN PBMCS FROM NORMAL DONOR BM45 WERE SINGLE CELL SORTED FOR CD3+CD8+CD45RO+ T CELLS USING VRM RT-PCR. Figure 11 shows the stain and sort of human PBMCs from normal donor BM45 (a Black Male, 45 years old) stained with CD3-FITC, CD8-PE, CD4-eFluor450, and CD45RO-APC. Gate P1 (top left histogram), displays the region of lymphocytes selected as the parent population for CD3+CD45RO+ T cells labeled in the second gate (top right histogram). CD3+CD8+CD45RO+ T cells were selected for single cell sort (bottom left right histogram) using a BD FACS Influx Cell Sorter. Statistics show that CD3+CD8+CD45RO+ T cells represented 3.61% of the parent population; in comparison CD3+CD4+CD45RO+ T cells were 15.99% of the parent population (non-selected).



Populations	Events	% Total	% Parent
All Events	6,570	100.00%	####
P1	3,853	58.65%	58.65%
CD3+CD45RO+	3,570	54.34%	92.66%
CD8+CD45RO+	129	1.96%	3.61%
CD4+CD45RO+	571	8.69%	15.99%

Table 16 shows the frequency of paired TCR in normal donor BM45, determined from the total number of alpha- and beta- chain TCR sequences identified in single cells after VRM RT-PCR. One alpha- and beta- chain TCR pair exhibited clonal expansion $V\alpha13.1J\alpha28.1$ $V\beta6.1.1D\beta2.1J\beta2.7$ identified 12/112 with a frequency of 10.7% and another was identified as twice, $V\alpha25.1J\alpha11.1$ $V\beta7.2D\beta1.1J\beta1.2$ (2/112), showing a frequency of 1.79% out of the total alpha and beta chains identified. In general, healthy normal donor controls display unique and polyclonal T cells; wherewithal more than 80% of the normal donor TCR transcripts identified were unique in our reports. The clonal expansion observed in this normal donor BM45 may be due to an unknown illness (not reported during screening) or unknown antigen re-exposure.

TABLE 16. PAIRED CD3+CD8+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM45

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Wells 23,27, 34,68, 119,131 132,134 135,154 168,171	**C** tgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	$V\alpha13.1J\alpha28.1$	12/112
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtactt c	$V\beta6.1D\beta2.1$ $J\beta2.7$	10.7%
Wells 129, 184	**C A G** tgtgcagg	**E** cga	**N S G Y S T L T F** gaattcaggatacagcaccctcaccttt	$V\alpha25.1J\alpha11.1$	2/112 1.79%
	C V tgtg	**S N L P A T G A D** tcagcaacttgccagcaacaggggcag	**Y G Y T F** actatggctacaccttc	$V\beta7.2D\beta1.1$ $J\beta1.2$	
Well 19	**I** atc	**K M G A G S P H N** aaaatgggggcaggctccccccataac	**L I F** ctcatcttt	$V\alpha12.2J\alpha34.1$	1/112 0.9%
	V P A A gtgccagcagct	**Q G G K** agggggcaagg	**E Q F F** gagcagttcttc	$V\beta7.7D\beta1.1$ $J\beta2.1$	

TABLE 16: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Well 22	**F** t	**W Q** tctggcag	**I Y S T F I F** atttatagcacattcatcttt	Vα19.1Jα14.1	1/112 0.9%
	C tgt	**V S S L G E G** tcagcagtctgggggaagg	**E Q F F** tgagcagttcttc	Vβ10.3Dβ1.1 Jβ2.1	
Well 24	**C A V R D** tgtgctgtgagagac	**G Y R** gggtatcga	**Y N F N K F Y F** tacaacttcaacaaattttacttt	Vα3.1Jα21.1	1/112 0.9%
	C tgt	**Y R G** tatcggggg	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7	
Well 42	**C V V** tgtgtgg t	**Y W H Q A E A G Y** tatactggcatcaggcggaagctggatat	**P T F** cctacattt	Vα10.1Jα6.1	1/112 0.9%
	C S A R tgcagtgctaga	**P S S G G E R F** ccttctagcgggggagaaagatt	**E Q F F** tgagcagttcttc	Vβ20.1Dβ2.1 Jβ2.1	
Well 51	**C L** tgcctc	**V G E N** gtgggtgagaac	**W R L Q N Y L** tggaggcttcaaaactatctt	Vα4.1Jα9.1	1/112 0.9%
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7	
Well 52	**S V Q Q** tctgtgcagcaa	**V** gta	**N T N A G K S T F** aacaccaatgcaggcaaatcaaccttt	Vα13.1Jα27.1	1/112 0.9%
	C A S S Q tgtgccagcagccaa	**H P E A** cacccagaggct	**Y N E Q F F** tacaatgagcagttcttc	Vβ4.2Dβ2.2 Jβ2.1	
Well 55	**I** a	**K M I A E A G S L** tcaaaatgatcgcggaggcaggaagcctc	**K T G F** aaaactatcttt	Vα12.2Jα9.1	1/112 0.9%
	C A S S tgtgccagcagc	**V R G L** gtacgggggctg	**T G E L F F** accggggagctgttcttc	Vβ9.1Dβ1.1 Jβ2.2	
Well 62	**C A V R** tgtgctgtgaga	**D G** gacggg	**Q A G T A L I F** caggcaggaactgctctgatcttt	Vα3.1Jα15.1	1/112 0.9%
	C A S S E tgtgccagcagtga	**G H** gggaca	**S G A N V L T F** ctctggggccaacgtcctgactttc	Vβ6.1Dβ1.1 Jβ2.6	
Well 64	**C A V S** tgtgctgtgag		**N Q G G K L I F** taaccagggaggaaagcttatcttc	Vα3.1Jα23.1	1/112 0.9%
	C A S S E tgtgccagcagtgag	**T S G G P** actagcggggggc	**D T Q Y F** cagatacgcagtatttt	Vβ10.3Dβ1.1 Jβ2.3	
Well 67	**C A A S** tgtgcagcaa	**N** gtaac	**N D Y K L S F** aacgactacaagctcagcttt	Vα13.1Jα20.1	1/112 0.9%
	S agc	**S G** tctggg	**T F** accttc	Vβ7.2Dβ1.1 Jβ1.2	
Well 76	**C A M R E** tgtgcaatgagaga	**G T G H L R G** agggactggccacttaagaggc	**I W** atttgg	Vα14.1Jα38.1	1/112 0.9%
	C A S S L E tgcgccagcagcttgg	**N R V** agaataggt	**G N T I Y F** tggaaacaccatatatttt	Vβ5.1Dβ1.1 Jβ1.3	
Well 104	**A** gca		**G F K T I F** ggcttcaaaactatcttt	Vα13.1Jα9.1	1/112 0.9%
	C A S S tgtgccagcagc	**P P G G E E N A** ccccctgggggggaagagaacg	**D T Q Y F** cagatacgcagtatttt	Vβ7.3Dβ2.1 Jβ2.3	

TABLE 16: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Well 108	**C A G** tgtgcagg	**E** cga	**N S G Y S T L T F** gaattcaggatacagcaccctcacctttt	Vα25.1Jα11.1	1/112 0.9%
	C tgt	**T N K L P T T G A D** accaacaagctgccaacaacaggggcag	**Y G Y T F** actatggctacaccttc	Vβ7.2Dβ1.1 Jβ1.2	
Well 110	**C A** tgtgcc	**V D** gtgg	**T G G F K T I F** atactggaggcttcaaaactatcttt	Vα39.1Jα9.1	1/112 0.9%
	C A S S L G tgtgccagcagcttag	**G V** gaggggta	**T E A F F** actgaagctttcttt	Vβ7.2Dβ1.1 Jβ1.1	
Well 149	**C A V R** tgtgctgtgaga		**D S N Y Q L I W** gatagcaactatcagttaatctgg	Vα1.2Jα33.1	1/112 0.9%
	C A S S D tgtgccagcagtgac	**R D** aggg	**T G E L F F** acaccggggagctgtttttt	Vβ6.4Dβ1.1 Jβ2.2	
Well 163	**C L** tgcctc	**V G E T** gtgggtgaga	**G G F K T I F** ctggaggcttcaaaactatcttt	Vα4.1Jα9.1	1/112 0.9%
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1J β2.7	
Well 183	**C A V R** tgtgctgtgaga		**D S N Y Q L I W** gatagcaactatcagttaatctgg	Vα1.2Jα33.1	1/112 0.9%
	C A S S D tgtgccagcagtgac	**T L A G N** accctagcgggaa	**N E Q F F** acaatgagcagttcttc	Vβ6.4Dβ2.2 Jβ2.1	

Table 17 shows all sequencing data for normal donor BM45. Eighty-Three wells each containing a single cell were sequenced. Thirty-one wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 16). In addition, in a number of wells (52), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 17). Three alpha chain T cell transcripts were identical when compared to all other alpha TCR transcripts (see Table 18). Three beta chain T cell transcripts were identical when compared to all other beta TCR transcripts (see Table 19).

TABLE 17. ALL CD3+CD8+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BM45 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 04	**Vα chain unavailable**			
	S A W S V P A G G D R t ctgcctggagtgtcccagcgggggggggatcg		**E T Q Y F** agagacccagtacttc	Vβ30.1Dβ2.1 Jβ2.5
Well 05	**Vα chain unavailable**			
	C A S S L tgtgccagcagctta	**T** acc	**T G E L F F** accggggagctgtttttt	Vβ7.7JDβ1.1 Jβ2.2
Well 06	**Vα chain unavailable**			
	C A S S F tgcgccagcagctt	**S G G** cagcggggt	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ5.1Dβ2.1 Jβ2.1
Well 07	**Vα chain unavailable**			
	C A S S L G tgcgccagcagcttgg	gg	**E T Q Y** gagacccagtac	Vβ5.1Dβ1.1 Jβ2.5
Well 08	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 12	**Vα chain unavailable**			
	C A S S F tgcgccagcagctt	**M R A D** catgcgggccga	**Y E Q Y F** ctacgagcagtacttc	Vβ5.1Dβ2.1 Jβ2.7
Well 15	**Vα chain unavailable**			
	C A S tgtgccagc	**N R G** aatcggggt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.3Dβ2.1 Jβ2.7
Well 18	**Vα chain unavailable**			
	C S A S tgcagtgctag	**S T A H** ctctacagctc	**Q P Q H F** atcagccccagcatttt	Vβ20.1Dβ1.1 Jβ1.5
Well 19	**I** atc	**K M G A G S P H N** aaaatgggggcaggctccccccataac	**L I F** ctcatcttt	Vα12.2Jα34.1
	V P A A gtgccagcagct	**Q G G K** agggggcaagg	**E Q F F** gagcagttcttc	Vβ7.7Dβ1.1 Jβ2.1

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 20	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1Jβ2.7
Well 21	**S V** tctgtg		**I Y S T F I F** atttatagcacattcatcttt	Vα19.1Jα14.1
	Vβ chain unavailable			
Well 22	**F** t	**W Q** tctggcag	**I Y S T F I F** atttatagcacattcatcttt	Vα19.1Jα14.1
	C tgt	**V S S L G E G** tcagcagtctgggggaagg	**E Q F F** tgagcagttcttc	Vβ10.3Dβ1.1Jβ2.1
Well 23	**F C** ttctgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	Vα13.1Jα28.1
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1Jβ2.7
Well 24	**C A V R D** tgtgctgtgagagac	**G Y R** gggtatcga	**Y N F N K F Y F** tacaacttcaacaaattttacttt	Vα3.1Jα21.1
	C tgt	**Y R G** tatcggggg	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1Jβ2.7
Well 27	**C** tgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	Vα13.1Jα28.1
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1Jβ2.7
Well 28	**Vα chain unavailable**			
	C S A S tgcagtgctag	**S T A H Q** ctctacagctcatcag	**P Q H F** ccccagcatttt	Vβ20.1Dβ1.1Jβ1.5
Well 34	**F C** ttctgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	Vα13.1Jα28.1
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1Jβ2.7
Well 36	**C** tgt		**N T N A G K S T F** aacaccaatgcaggcaaatcaacctttt	Vα13.1Jα27.1
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y** tcctacgagcagtac	Vβ6.1Dβ2.1Jβ2.7
Well 37	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**D** tgac	**Y E Q Y F** tacgagcagtacttc	Vβ20.1Dβ2.1Jβ2.7

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 38	**Vα chain unavailable**			
	C A T S	**I T F**	**G E L F F**	Vβ24.1Dβ1.1
	tgtgccaccag	cattacatt	cggggagctgtttttt	Jβ2.2
Well 39	**Vα chain unavailable**			
	C S A R G	**S S G**	**T D T Q Y F**	Vβ20.1Dβ2.1
	tgcagtgctagag	gatctagcgg	cacagatacgcagtatttt	Jβ2.3
Well 42	**C V V**	**Y W H Q A E A G Y**	**P T F**	Vα10.1Jα6.1
	tgtgtgg	tatactggcatcaggcggaagctggatat	cctacattt	
	C S A R	**P S S G G E R F**	**E Q F F**	Vβ20.1Dβ2.1
	tgcagtgctaga	ccttctagcgggggagaaagatt	tgagcagttcttc	Jβ2.1
Well 43	**Vα chain unavailable**			
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1Jβ2.7
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	
Well 44	**C A A S**	**E H E**	**G Y Q K V T F**	Vα13.1Jα13.1
	tgtgcagcaagt	gaacatga	gggttaccagaaagttacctttt	
	Vβ chain unavailable			
Well 45	**Vα chain unavailable**			
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1Jβ2.7
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	
Well 47	**Vα chain unavailable**			
	C A S S V	**R G L V**	**T G E L F F**	Vβ9.1Dβ2.1Jβ2.2
	tgtgccagcagcgta	cggggactcgtg	accggggagctgtttttt	
Well 51	**C L**	**V G E N**	**W R L Q N Y L**	Vα4.1Jα9.1
	tgcctc	gtgggtgagaac	tggaggcttcaaaactatctt	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1Jβ2.7
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	
Well 52	**S V Q Q**	**V**	**N T N A G K S T F**	Vα13.1Jα27.1
	tctgtgcagcaa	gta	aacaccaatgcaggcaaatcaacctttt	
	C A S S Q	**H P E A**	**Y N E Q F F**	Vβ4.2Dβ2.2Jβ2.1
	tgtgccagcagccaa	cacccagaggct	tacaatgagcagttcttc	
Well 54	**Vα chain unavailable**			
	C A S S	**P G S**	**T F**	Vβ5.4Dβ1.1Jβ1.2
	tgtgccagcagc	cccggatca	accttc	
Well 55	**I**	**K M I A E A G S L**	**K T G F**	Vα12.2Jα9.1
	a	tcaaaatgatcgcggaggcaggaagcctc	aaaactatcttt	
	C A S S	**V R G L**	**T G E L F F**	Vβ9.1 Jβ2.2
	tgtgccagcagc	gtacgggggctg	accggggagctgttcttc	

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 56	**Vα chain unavailable**			
	C S A S	**S T A H**	**Q P Q H F**	Vβ20.1Dβ1.1
	tgcagtgctag	ctctacagctc	atcagccccagcatttt	Jβ1.5
Well 62	**C A V R**	**D G**	**Q A G T A L I F**	Vα3.1Jα15.1
	tgtgctgtgaga	gacggg	caggcaggaactgctctgatcttt	
	C A S S E	**G H**	**S G A N V L T F**	Vβ6.1Dβ1.1
	tgtgccagcagtga	gggaca	ctctggggccaacgtcctgactttc	Jβ2.6
Well 64	**C A V S**		**N Q G G K L I F**	Vα3.1Jα23.1
	tgtgctgtgag		taaccagggaggaaagcttatcttc	
	C A S S E	**T S G G P**	**D T Q Y F**	Vβ10.3Dβ1.1
	tgtgccagcagtgag	actagcgggggggc	cagatacgcagtatttt	Jβ2.3
Well 67	**C A A S**	**N**	**N D Y K L S F**	Vα13.1Jα20.1
	tgtgcagcaa	gtaac	aacgactacaagctcagcttt	
	S	**S G**	**T F**	Vβ7.2Dβ1.1 Jβ1.2
	agc	tctggg	accttc	
Well 68	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 74	**Vα chain unavailable**			
	C S A S	**S T A H**	**Q P Q H F**	Vβ20.1Dβ1.1
	tgcagtgctag	ctctacagctc	atcagcccagcatttt	Jβ1.5
Well 75	**Vα chain unavailable**			
	C S A S	**S T A H**	**Q P Q H F**	Vβ20.1Dβ1.1
	tgcagtgctag	ctctacagctc	atcagcccagcatttt	Jβ1.5
Well 76	**C A M R E**	**G T G H L R G**	**I W**	Vα14.1Jα38.1
	tgtgcaatgagaga	agggactggccacttaagaggc	atttgg	
	C A S S L E	**N R V**	**G N T I Y F**	Vβ5.1Dβ1.1
	tgcgccagcagcttgg	agaataggt	tggaaacaccatatattt	Jβ1.3
Well 77	**Vα chain unavailable**			
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 78	**Vα chain unavailable**			
	V	**P A A G P G**	**T D T Q Y F**	Vβ7.71Dβ1.1
	g	tgccagcagccggaccaggg	acagatacgcagtatttt	Jβ2.3

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 79	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 82	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 84	**Vα chain unavailable**			
	C A S S F tgtgccagcagtttt	**M A G G L** tatggcagggggcc	**N T E A F F** tgaacactgaagctttcttt	Vβ28.1Dβ1.1 Jβ1.1
Well 103	**Vα chain unavailable**			
	C A S S L tgtgccagcagctta	**T R G** actcgtgg	**T G E L F F** caccggggagctgtttttt	Vβ7.9Dβ2.1 Jβ2.2
Well 104	**A** gca		**G F K T I F** ggcttcaaaactatcttt	Vα13.1Jα9.1
	C A S S tgtgccagcagc	**P P G G E E N A** cccctggggggaagagaacg	**D T Q Y F** cagatacgcagtatttt	Vβ7.3Dβ2.1 Jβ2.3
Well 106	**C A V G A** tgtgctgtgggtgc	**V V** ggtagt	**A A G N K L T F** agctgcaggcaacaagctaacttttt	Vα8.3Jα17.1
	Vβ chain unavailable			
Well 108	**C A G** tgtgcagg	**E** cga	**N S G Y S T L T F** gaattcaggatacagcaccctcaccttt	Vα25.1Jα11.1
	C tgt	**T N K L P T T G A D** accaacaagctgccaacaacaggggcag	**Y G Y T F** actatggctacaccttc	Vβ7.2Dβ1.1 Jβ1.2
Well 110	**C A** tgtgcc	**V D** gtgg	**T G G F K T I F** atactggaggcttcaaaactatcttt	Vα39.1Jα9.1
	C A S S L G tgtgccagcagcttag	**G V** gaggggta	**T E A F F** actgaagctttcttt	Vβ7.2Dβ1.1Jβ1.1
Well 115	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G L** tttatcgcggggtta	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 116	**C A G** tgtgcagg	**E** cga	**N S G Y S T L T F** gaattcaggatacagcaccctcaccttt	Vα25.1Jα11.1
	Vβ chain unavailable			
Well 117	**C I** tgcatc	**L R D S P** ctgagagacagcc	**G Y A L N F** ccgggtatgcactcaacttc	Vα26.1Jα41.1
	Vβ chain unavailable			
Well 119	**C** tgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	Vα13.1Jα28.1
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 121	**C A V**	**G A**	**N D Y K L S F**	Vα8.3Jα20.1
	tgtgctgtg	ggtgc	taacgactacaagctcagcttt	
	Vβ chain unavailable			
Well 122	**W**	**T**	**S Y G K L I F**	Vα19.1Jα52.1
	tgg	act	agctatggaaagctgacattt	
	Vβ chain unavailable			
Well 125	**Vα chain unavailable**			
	C A S S	**P H R G I A**	**S G N T I Y F**	Vβ7.6Dβ1.1
	tgtgccagcag c	ccccacaggggaatcgct	tctggaaacaccatatattt	Jβ1.3
Well 127	**Vα chain unavailable**			
	C A S S E A	**R D T E**	**N T E A F F**	Vβ6.1Dβ1.1
	tgtgccagcagtgaagc	gagggacaccgaa	aacactgaagctttcttt	Jβ1.1
Well 129	**C A G**	**E**	**N S G Y S T L T F**	Vα25.1Jα11.1
	tgtgcagg	cga	gaattcaggatacagcaccctcaccttt	
	C V	**S N L P A T G A D**	**Y G Y T F**	Vβ7.2Dβ1.1
	tgtg	tcagcaacttgccagcaacaggggcag	actatggctacaccttc	Jβ1.2
Well 131	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 132	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 133	**Vα chain unavailable**			
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 134	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 135	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 137	**Vα chain unavailable**			
	C A S S Y S tgtgccagcagttactc	**S G G S** tagcgggggt	**D T Q Y F** cagatacgcagtatttt	Vβ6.2Dβ1.1 Jβ2.3
Well 139	**C A V** tgtgctgtg	**G A** ggtgc	**N D Y K L S F** taacgactacaagctcagcttt	Vα8.3Jα20.1
	Vβ chain unavailable			
Well 140	**V** gtg	**C L P R G E Q Q C F Q D** tgtctcccccgaggggaacagcagtgcttccaagat	**I I F** ataatcttt	Vα12.1Jα3.1
	Vβ chain unavailable			
Well 141	**Vα chain unavailable**			
	C A S S G tgtgccagcagtg	**T A N** gaacagcga	**N E Q F F** acaatgagcagttcttc	Vβ6.4Dβ1.1Jβ2.1
Well 147	**Vα chain unavailable**			
	C A S tgtgccagc	**T S T G G Q A** acctccacagggggcaagca	**E Q F F** gagcagttcttc	Vβ7.9 Jβ2.1
Well 149	**C A V R** tgtgctgtgaga		**D S N Y Q L I W** gatagcaactatcagttaatctgg	Vα1.2Jα33.1
	C A S S D tgtgccagcagtgac	**R D** aggg	**T G E L F F** acaccggggagctgtttttt	Vβ6.4Dβ1.1 Jβ2.2
Well 152	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 153	**C A E R** tgtgcagaga	**T F H** ggactttccac	**D D K I I F** gatgacaagatcatcttt	Vα13.2Jα30.1
	Vβ chain unavailable			
Well 154	**C** tgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	Vα13.1Jα28.1
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 157	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7
Well 160	**C V V** tgtgtggt g	**P W** ccctgg	**A S G G S Y I P T F** gcatcaggaggaagctacatacctacattt	Vα10.1Jα6.1
	Vβ chain unavailable			
Well 161	**C A V I** tgtgctgtga	**P** ttcc	**Q G A Q K L V F** tcagggagcccagaagctggtattt	Vα21.1Jα54.1
	Vβ chain unavailable			

TABLE 17: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 163	**C L**	**V G E T**	**G G F K T I F**	Vα4.1Jα9.1
	tgcctc	gtgggtgaga	ctggaggcttcaaaactatcttt	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 166	**C**	**P V V G S G R Y Q**	**Y I F**	Vα21.1Jα40.1
	tgt	cctgtggttggctcaggacgctacc	aatacatcttt	
	Vβ chain unavailable			
Well 168	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 171	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	C A S S	**F I A G F**	**S Y E Q Y F**	Vβ6.1Dβ2.1
	tgtgccagcagt	tttatcgcggggttt	tcctacgagcagtacttc	Jβ2.7
Well 174	**Vα chain unavailable**			
	C A S S E S	**G S T S**	**Y F**	Vβ25.1Dβ2.2
	tgtgccagcagtgaat	cgggatccacctc	gtacttc	Jβ2.7
Well 178	**C**	**S R**	**A G S Y Q L T F**	Vα13.1Jα28.1
	tgt	tcta	gggctgggagttaccaactcactttc	
	Vβ chain unavailable			
Well 181	**Vα chain unavailable**			
	C A S S	**P P G G E E N A**	**D T Q Y F**	Vβ7.3.1Dβ2.1
	tgtgccagcagc	ccccctggggggaagagaacg	cagatacgcagtatttt	Jβ2.3
Well 183	**C A V R**		**D S N Y Q L I W**	Vα1.2Jα33.1
	tgtgctgtgaga		gatagcaactatcagttaatctgg	
	C A S S D	**T L A G N**	**N E Q F F**	Vβ6.4Dβ2.2
	tgtgccagcagtgac	accctagcgggaa	acaatgagcagttcttc	Jβ2.1
Well 184	**C A G**	**E**	**N S G Y S T L T F**	Vα25.1Jα11.1
	tgtgcagg	cga	gaattcaggatacagcaccctcaccttt	
	C	**T N K L P T T G A D**	**Y G Y T F**	Vβ7.2Dβ1.1
	tgt	accaacaagctgccaacaacaggggcag	actatggctacaccttc	Jβ1.2

TABLE 18. IDENTICAL ALPHA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN NORMAL DONOR BM45

αTCR	V segment	N / D segment	J segment	Transcript	Frequency
Wells 23,27 34,68 119,131 132,134 135,154 168,171 178	**C** tgt	**S R** tcta	**A G S Y Q L T F** gggctgggagttaccaactcactttc	Vα13.1Jα28.1	(13/46) 28.26%
108, 116, 129, 184	**C A G** tgtgcagg	**E** cga	**N S G Y S T L T F** gaattcaggatacagcaccctcacctt	Vα25.1Jα11.1	(4/46) 8.7%
149, 183	**C A V R** tgtgctgtgaga		**D S N Y Q L I W** gatagcaactatcagttaatctgg	Vα1.2Jα33.1	(2/46) 4.35%

Table 18 shows clonally expanded TCR alpha- chain transcripts identified in single cells after VRM RT-PCR from normal donor BM45. The frequency is determined from the total number of alpha-chains identified.

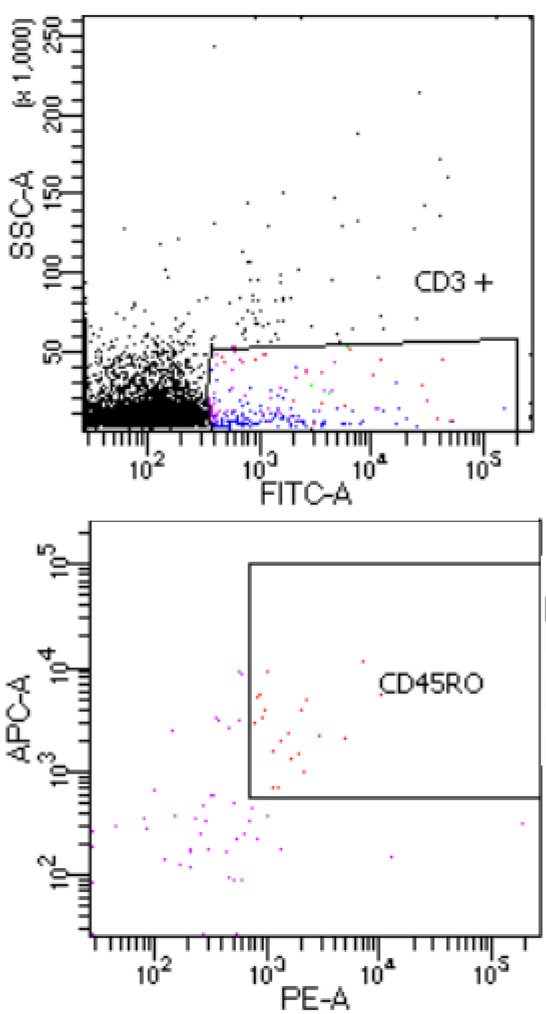
TABLE 19. IDENTICAL BETA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN NORMAL DONOR BM45

βTCR	V segment	N / D segment	J segment	Transcript	Frequency
Wells 08, 20 23, 24 27, 34 36, 43 45, 51 68, 77 79, 82 115, 119 131, 132 133, 134 135, 152 154, 157 163, 168 171	**C A S S** tgtgccagcagt	**F I A G F** tttatcgcggggttt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.1Dβ2.1 Jβ2.7	(27/69) 39.13%
18,28,56 74,75	**C S A S** tgcagtgctag	**S T A H** ctctacagctc	**Q P Q H F** atcagccccagcatttt	Vβ20.1Dβ1.1 Jβ1.5	(5/69) 7.25%
108, 184	**C** tgt	**T N K L P T T G A D** accaacaagctgccaacaacaggggcag	**Y G Y T F** actatggctacaccttc	Vβ7.2Dβ1.1 Jβ1.2	(2/69) 2.9%

Table 19 shows clonally expanded TCR beta- chain transcripts identified in single cells after VRM RT-PCR from normal donor BM45. The frequency is determined from the total number of beta-chains identified.

FIGURE 12. HUMAN PBMCS FROM NORMAL DONOR BM51 WERE SINGLE CELL SORTED FOR CD3+CD8+CD45RO+ T CELLS USING VRM RT-PCR.

Figure 12 shows the stain and sort of human PBMCs from normal donor BM51 (a Black Male 51 years old) stained with CD3-FITC, CD8-PE, and CD45RO-APC. CD3+ lymphocytes were gated (top left histogram) and selected as the parent population (top right histogram) for sorting by the BD FACSAria Fusion Cell Sorter instrument. CD3+CD8+CD45RO+ T cells were selected for single cell sort (bottom left right histogram) into 96-well plates. Statistics show that CD3+CD8+CD45RO+ T cells represented 30.3% of the parent CD3+ T cell population.



Population	#Events	%Parent	%Total
All Events	7,863	####	100.0
CD3 +	219	2.8	2.8
P2	212	96.8	2.7
P1	208	98.1	2.6
CD3 Sort Pop	66	31.7	0.8
CD45RO	20	30.3	0.3

Table 20 shows the frequency of paired alpha- and beta- chain TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells from normal donor BM51 after VRM RT-PCR. One alpha- and beta- chain TCR pair was identified twice, Vα38.1Jα43.1 Vβ6.1Dβ2.2Jβ2.5 showing a frequency of 4.5% of the total alpha and beta chains identified.

TABLE 20. PAIRED CD3+CD8+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM51

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Wells 10, 36	**C A F M K H**	**R D**	**D M R F**	Vα38.1Jα43.1	(2/44)
	tgtgctttcatgaagca	tagag	atgacatgcgcttt		4.5%
	C A S S E G	**W**	**E T Q Y F**	Vβ6.1Dβ2.2 Jβ2.5	
	tgtgccagcagtgaag	ggtgg	gagacccagtacttc		
Well 03	**C V V S**	**D Y**	**N N D M R F**	Vα8.4Jα43.1	(1/44) 2.3%
	tgtgttgtga	gtgact	ataacaatgacatgcgcttt		
	C A S R	**S E G T N A N**	**S**	Vβ14.2Dβ1.1 Jβ2.6	
	tgtgccagcag	atctgaggggactaatgctaac	tct		
Well 04	**A**	**E V R G N**	**K L S F**	Vα21.1Jα20.1	(1/44) 2.3%
	gct	gaagtgagaggcaac	aagctcagcttt		
	C A S S L	**F S G Q K E**	**N T E A F F**	Vβ27.1Dβ1.1 Jβ1.1	
	tgtgccagcagttta	ttttcgggacagaaagaa	aacactgaagctttcttt		
Well 05	**C**	**F P G E A G G G C**	**K L T F**	Vα8.2Jα10.1	(1/44) 2.3%
	tgt	tttccgggtgaggcgggggaggctgc	aaactcaccttt		
	C A S S	**P V G**	**N E Q F F**	Vβ7.8Dβ1.1 Jβ2.1	
	tgtgccagcagc	ccggtgggg	aatgagcagttcttc		
Well 06	**C A V R**	**Y**	**D Y K L S F**	Vα21.1Jα10.1	(1/44)
	tgtgctgtgagg	t	acgactacaagctcagcttt		2.3%
	C A S N	**Q G G L**	**A F F**	Vβ5.5Dβ1.1 Jβ1.1	
	tgtgccagca	accaggggggtt	agctttcttt		
Well 17	**W**	**G G N A**	**G G F K T I F**	Vα1.2Jα9.1	(1/44)
	tg	gggggggaatgct	ggaggcttcaaaactatcttt		2.3%
	C A S S		**S G N T**	Vβ6.1 Dβ1.1 Jβ1.3	
	tgtgccagcag	t	tctggaaacacc		

TABLE 20: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 25	**C A** tgtgc **C A S S L T** tgtgccagcagcttaac	**T A G** tacggcaggg **G I A** ggggatcgcg	**D S N Y Q L I W** ggatagcaactatcagttaatctgg **N T G E L F F** aacaccggggagctgtttttt	Vα2.1Jα33.1 Vβ7.3Dβ1.1 Jβ2.2	(1/44) 2.3%
Well 32	**C** tgt **C A S S L** tgtgccagcagctta	**P V S D Q S** cctgtgagtgatcagagc **T G I A** acggggatcg	**F Q K L V F** tttcagaaacttgtattt **N T G E L F F** cgaacaccggggagctgtttttt	Vα9.2Jα8.1 Vβ7.2Dβ2.1 Jβ2.2	(1/44) 2.3%
Well 39	**C A** tgtgc **C A S S** tgtgccagcag	**P G Q A** cccgggtcaagca **L F S G K K S Y S** tttattttcgggaaagaagagctatagt	**G G G N K L T F** ggaggaggaaacaaactcacctttt **A F F** gctttcttt	Vα8.3Jα10.1 Vβ10.3Dβ2.2 Jβ1.1	(1/44) 2.3%
Well 45	**C I V R** tgcatcgtcag **C A S S** tgcgccagcagc	**V V** ggtagtg **D L T G N P G** gacttaaccgggaacccgggg	**N A G N M L T F** aatgcaggcaacatgctcaccttt **E T Q Y F** gagacccagtacttc	Vα26.1Jα39.1 Vβ5.1Dβ2.1 Jβ2.5	(1/44) 2.3%
Well 47	**C A V** tgtgctgtg **I** a	**Q K** caaaag **S A V L E I W S Y** catctgcagtgctagagatctggtcgtac	**N N D M R F** aacaatgacatgcgcttt **Y N E Q F F** tacaatgagcagttcttc	Vα21.1Jα43.1 Vβ20.1Dβ2.1 Jβ2.1	(1/44) 2.3%
Well 49	**C A F M K H** tgtgctttcatgaagc a **C A S S E** tgtgccagcagtgaa	**R D** tagag	**D M R F** atgacatgcgcttt **W G Q R P D F** tggggccaacgtcctgacttt	Vα38.1Jα43.1 Vβ6.1Dβ1.1 Jβ2.6	(1/44) 2.3%
Well 52	**C A V** tgtgctgt **C A S S L S** ctgtgccagcagtttagc	**D** cg	**T G G F K T I F** atactggaggcttcaaaactatcttt **K N I Q Y** aaaaacattcagtac	Vα22.1Jα9.1 Vβ12.3Dβ1.1 Jβ2.4	(1/44) 2.3%
Well 54	**C A** tgtgct **C A S S L** tgtgccagcagctta	 **T G I A** acggggatcg	**N T G N Q F Y F** aacaccggtaaccagttctatttt **N T G E L F F** cgaacaccggggagctgtttttt	Vα9.2Jα49.1 Vβ7.2Dβ2.1 Jβ2.2	(1/44) 2.3%
Well 66	**C A M R E G** tgtgcaatgagagaggg **C A S S Q E** tgtgccagcagccaaga	**G** cggc **S G L** aagcggacta	**S A L** tcagctttg **S Y E Q** tcctacgagcag	Vα14.4Jα20.1 Vβ4.2Dβ1.1 Jβ2.7	(1/44) 2.3%
Well 69	**C A** tgtgc **C A S S L F** tgtgccagcagtttat	**P G Q A** cccgggtcaagca **S G Q K** tttcgggacagaaa	**G G G N K L T F** ggaggaggaaacaaactcacctttt **N T E A F F** aacactgaagctttcttt	Vα8.3Jα10.1 Vβ27.1Dβ1.1 Jβ1.1	(1/44) 2.3%

Table 21 shows all sequencing data for normal donor BM51. Forty-four wells each containing a single cell were sequenced. Seventeen wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 20). In addition, in a number of wells (27), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 21). Three alpha chain T cell transcripts were identical when compared to all other alpha TCR transcripts (see Table 22). Three beta chain T cell transcripts were identical when compared to all other beta TCR transcripts (see Table 23). One paired alpha and beta chain doublet appeared twice, Vα38.1Jα43.1 Vβ6.1Dβ2.2Jβ2.5, in wells 10 and 36.

TABLE 21. CD3+CD8+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BM51 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**C A** tgtg	**P G Q A** ccccgggtcaagca	**G G G N K L T F** ggaggaggaaacaaactcacttt	Vα8.2Jα10.1
	Vβ chain unavailable			
Well 02	**C** tgt	**S P G Q A** tccccgggtcaagca	**G G G N K L T F** ggaggaggaaacaaactcacttt	Vα8.4Jα10.1
	Vβ chain unavailable			
Well 03	**C V V S** tgtgttgtga	**D Y** gtgact	**N N D M R F** ataacaatgacatgcgcttt	Vα8.4Jα43.1
	C A S R tgtgccagcag	**S E G T N A N** atctgaggggactaatgctaac	**S** tct	Vβ14.2Dβ1.1 Jβ2.6
Well 04	**A** gct	**E V R G N** gaagtgagaggcaac	**K L S F** aagctcagcttt	Vα21.1Jα20.1
	C A S S L tgtgccagcagttta	**F S G Q K E** ttttcgggacagaaagaa	**N T E A F F** aacactgaagctttcttt	Vβ27.1Dβ1.1 Jβ1.1
Well 05	**C** tgt	**F P G E A G G G C** tttccgggtgaggcgggggaggctgc	**K L T F** aaactcaccttt	Vα8.2Jα10.1
	C A S S tgtgccagcagc	**P V G** ccggtgggg	**N E Q F F** aatgagcagttcttc	Vβ7.8Dβ1.1 Jβ2.1
Well 06	**C A V R** tgtgctgtgagg	**Y** t	**D Y K L S F** acgactacaagctcagcttt	Vα21.1Jα10.1
	C A S N tgtgccagca	**Q G G L** accagggggggtt	**A F F** agctttcttt	Vβ5.5Dβ1.1 Jβ1.1
Well 07	**G** g	**A V W G Y** gtgctgtgtggggctac	**K L T F** aaactcaccttt	Vα21.2Jα10.1
	Vβ chain unavailable			
Well 10	**C A F M K H** tgtgctttcatgaagca	**R D** tagag	**D M R F** atgacatgcgcttt	Vα38.1Jα43.1
	C A S S E G tgtgccagcagtgaag	**W** ggtgg	**E T Q Y F** gagacccagtacttc	Vβ6.1Dβ2.2 Jβ2.5
Well 15	**Vα chain unavailable**			
	C A S S tgtgccagcagc		**T E A F** actgaagctttc	Vβ7.2Dβ1.1 Jβ1.1
Well 16	**C A V** tgtgctgtg	**G A V R** ggtgcggtcagg	**S N Y Q L I W** agcaactatcagttaatctgg	Vα8.4Jα33.1
	Vβ chain unavailable			

TABLE 21: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 17	**W**	**G G N A**	**G G F K T I F**	Vα1.2Jα9.1
	tg	ggggggaatgct	ggaggcttcaaaactatcttt	
	C A S S		**S G N T**	Vβ6.1Dβ1.1 Jβ1.3
	tgtgccagcag	t	tctggaaacacc	
Well 18	**C A V R D**	**S**	**N Y Q L I W**	Vα1.2Jα33.1
	tgtgctgtgagaga	ttcg	aactatcagttaatctgg	
	Vβ chain unavailable			
Well 24	**C A**	**V**	**T G K L I F**	Vα12.2Jα37.1
	tgtgct	gtc	acaaggcaaactaatcttt	
	Vβ chain unavailable			
Well 25	**C A**	**T A G**	**D S N Y Q L I W**	Vα2.1Jα33.1
	tgtgc	tacggcaggg	ggatagcaactatcagttaatctgg	
	C A S S L T	**G I A**	**N T G E L F F**	Vβ7.3Dβ1.1 Jβ2.2
	tgtgccagcagcttaac	ggggatcgcg	aacaccggggagctgttttttt	
Well 26	**Vα chain unavailable**			
	C A S S L F	**S G Q K**	**N T E A F F**	Vβ27.1Dβ1.1 Jβ1.1
	tgtgccagcagtttat	tttcgggacagaaa	aacactgaagctttcttt	
Well 27	**C C**	**G A Q**	**N N D M R F**	Vα1.2Jα43.1
	tgctgt	ggggctcaa	aacaatgacatgcgcttt	
	Vβ chain unavailable			
Well 30	**C A**	**P G Q A**	**G G G N K L T F**	Vα8.2Jα10.1
	tgtgc	cccgggtcaagca	ggaggaggaaacaaactcaccttt	
	Vβ chain unavailable			
Well 31	**Vα chain unavailable**			
	C A S S A	**G G G G**	**N Q P Q H F**	Vβ9.1Dβ2.1 Jβ1.5
	tgtgccagcagcg	ccgggggaggaggc	aatcagccccagcatttt	
Well 32	**C**	**P V S D Q S**	**F Q K L V F**	Vα9.2Jα8.1
	tgt	cctgtgagtgatcagagc	tttcagaaacttgtattt	
	C A S S L	**T G I A**	**N T G E L F F**	Vβ7.2Dβ2.1 Jβ2.2
	tgtgccagcagctta	acggggatcg	cgaacaccggggagctgttttttt	
Well 34	**V**	**V R G N**	**K L S F**	Vα21.1Jα20.1
	g	ttgtgaggggca	acaagctcagcttt	
	Vβ chain unavailable			
Well 35	**Vα chain unavailable**			
	C A S S L F	**S G Q K**	**N T E A F F**	Vβ27.1Dβ1.1Jβ 1.1
	tgtgccagcagtttat	tttcgggacagaaa	aacactgaagctttcttt	

TABLE 21: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 36	**C A F M K H**	**R D**	**D M R F**	Vα38.1Jα43.1
	tgtgctttcatgaagca	tagag	atgacatgcgcttt	
	C A S S E G	**W**	**E T Q Y F**	Vβ6.1Dβ2.2
	tgtgccagcagtgaag	ggtgg	gagacccagtacttc	Jβ2.5
Well 37	**C A**	**P G Q A**	**G G G N K L T F**	Vα8.3Jα10.1
	tgtgc	cccgggtcaagca	ggaggaggaaacaaactcaccttt	
	Vβ chain unavailable			
Well 39	**C A**	**P G Q A**	**G G G N K L T F**	Vα8.3Jα10.1
	tgtgc	cccgggtcaagca	ggaggaggaaacaaactcaccttt	
	C A S S	**L F S G K K S Y S**	**A F F**	Vβ10.3Dβ2.2Jβ1.1
	tgtgccagcag	tttattttcgggaaagaagagctatagt	gctttcttt	
Well 40	**C A V**	**Q K**	**N N D M R F**	Vα21.1Jα43.1
	tgtgctgtg	caaaag	aacaatgacatgcgcttt	
	Vβ chain unavailable			
Well 41	**C L V G D I**	**G**	**S N S G Y A**	Vα4.1Jα41.1
	tgcctcgtgggtgaca	tagga	tcaaattccgggtatgca	
	Vβ chain unavailable			
Well 43	**C A F M K H**	**R D**	**D M R F**	Vα38.1Jα43.1
	tgtgctttcatgaagca	tagag	atgacatgcgcttt	
	Vβ chain unavailable			
Well 44	**C A A S**	**E A**	**G G G A D G L T F**	Vα13.1Jα45.1
	tgtgcagcaagt	Gaggcg	ggaggaggtgctgacggactcaccttt	
	Vβ chain unavailable			
Well 45	**C I V R**	**V V**	**N A G N M L T F**	Vα26.1Jα39.1
	tgcatcgtcag	ggtagtg	aatgcaggcaacatgctcaccttt	
	C A S S	**D L T G N P G**	**E T Q Y F**	Vβ5.1Dβ2.1
	tgcgccagcagc	gacttaaccgggaacccgggg	gagacccagtacttc	Jβ2.5
Well 46	**Vα chain unavailable**			
	C A S S	**F R A G A G G**	**E Q F F**	Vβ3.1Dβ2.2
	tgtgccagcagc	tttcgagcgggagccggggg	tgagcagttcttc	Jβ2.1
Well 47	**C A V**	**Q K**	**N N D M R F**	Vα21.1Jα43.1
	tgtgctgtg	caaaag	aacaatgacatgcgcttt	
	I	**S A V L E I W S Y**	**Y N E Q F F**	Vβ20.1Dβ2.1
	a	catctgcagtgctagagatctggtcgtac	tacaatgagcagttcttc	Jβ2.1
Well 48	**C A V R D**	**L E H L C R Q I K**	**T F**	Vα1.2Jα27.1
	tgtgctgtgagaga	tctgaacacctatgcaggcaaatcaag	accttt	
	Vβ chain unavailable			
Well 49	**C A F M K H**	**R D**	**D M R F**	Vα38.1Jα43.1
	tgtgctttcatgaagca	tagag	atgacatgcgcttt	
	C A S S E		**W G Q R P D F**	Vβ6.1Dβ1.1
	tgtgccagcagtgaa		tggggccaacgtcctgacttt	Jβ2.6

TABLE 21: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 51	**C A** tgtgc	**V G A V R** tgtgggtgcggtcagg	**S N Y Q L I W** agcaactatcagttaatctgg	Vα8.1Jα33.1
	Vβ chain unavailable			
Well 52	**C A V** tgtgctgt	**D** cg	**T G G F K T I F** atactggaggcttcaaaactatcttt	Vα22.1Jα9.1
	C A S S L S ctgtgccagcagtttagc		**K N I Q Y** aaaaacattcagtac	Vβ12.3Dβ1.1 Jβ2.4
Well 54	**C A** tgtgct		**N T G N Q F Y F** aacaccggtaaccagttctatttt	Vα9.2J49.1
	C A S S L tgtgccagcagctta	**T G I A** acggggatcg	**N T G E L F F** cgaacaccggggagctgtttttt	Vβ7.2Dβ2.1 Jβ2.2
Well 58	**C A** tgtgct	**P G G G** cctggggggg	**I G F G N V L H C** gataggctttgggaatgtgctgcattgc	Vα22.1Jα35.1
	Vβ chain unavailable			
Well 61	**Vα chain unavailable**			
	C A S S F tgtgccagcagttt	**L R G** cctcagggg	**E Q Y F** cgagcagtacttc	Vβ27.1Dβ1.1 Jβ2.7
Well 62	**Vα chain unavailable**			
	C A S S V tgtgccagcagcgt	**G Q G** gggacaggga	**N Q P Q H F** aatcagccccagcatttt	Vβ9.1Dβ1.1 Jβ1.5
Well 66	**C A M R E G** tgtgcaatgagagaggg	**G** cggc	**S A L** tcagctttg	Vα14.4Jα20.1
	C A S S Q E tgtgccagcagccaaga	**S G L** aagcggacta	**S Y E Q** tcctacgagcag	Vβ4.2Dβ1.1 Jβ2.7
Well 69	**C A** tgtgc	**P G Q A** cccgggtcaagca	**G G G N K L T F** ggaggaggaaacaaactcacttt	Vα8.3Jα10.1
	C A S S L F tgtgccagcagtttat	**S G Q K** tttcgggacagaaa	**N T E A F F** aacactgaagctttcttt	Vβ27.1Dβ1.1 Jβ1.1
Well 70	**C I L N** tgcatcctga		**F G N E K L T F** actttggaaatgagaaattaaccttt	Vα26.2Jα48.1
	Vβ chain unavailable			
Well 71	**C A** tgtg	**P G Q A** ccccgggtcaagca	**G G G N K L T F** ggaggaggaaacaaactcacttt	Vα8.3Jα10.1
	Vβ chain unavailable			
Well 74	**C A** tgtg	**P G Q A** ccccgggtcaagca	**G G G N K L T F** ggaggaggaaacaaactcacttt	Vα8.3Jα10.1
	Vβ chain unavailable			

Table 22 shows clonally expanded TCR alpha- chain transcripts identified in single cells after VRM RT-PCR from normal donor BM51. The frequency was determined from the total number of beta-chains identified.

TABLE 22.IDENTICAL ALPHA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN NORMAL DONOR BM51

αTCR	V segment	N segment	J segment	Transcript	Frequency α TCR
Wells 01,30, 37,39, 69,71, 74	**C A** tgtg	**P G Q A** ccccgggtcaagca	**G G G N K L T F** ggaggaggaaacaaactcaccttt	Vα8.3Jα10.1	7/37, 18.91%
Wells 10,36 43,49	**C A F M K H** tgtgctttcatgaagca	**R D** tagag	D M R F atgacatgcgcttt	Vα38.1Jα43.1	4/37, 10.81%
Wells 40,47	**C A V** tgtgctgtg	**Q K** caaaag	**N N D M R F** aacaatgacatgcgcttt	Vα21.1Jα43.1	2/37, 5.4%

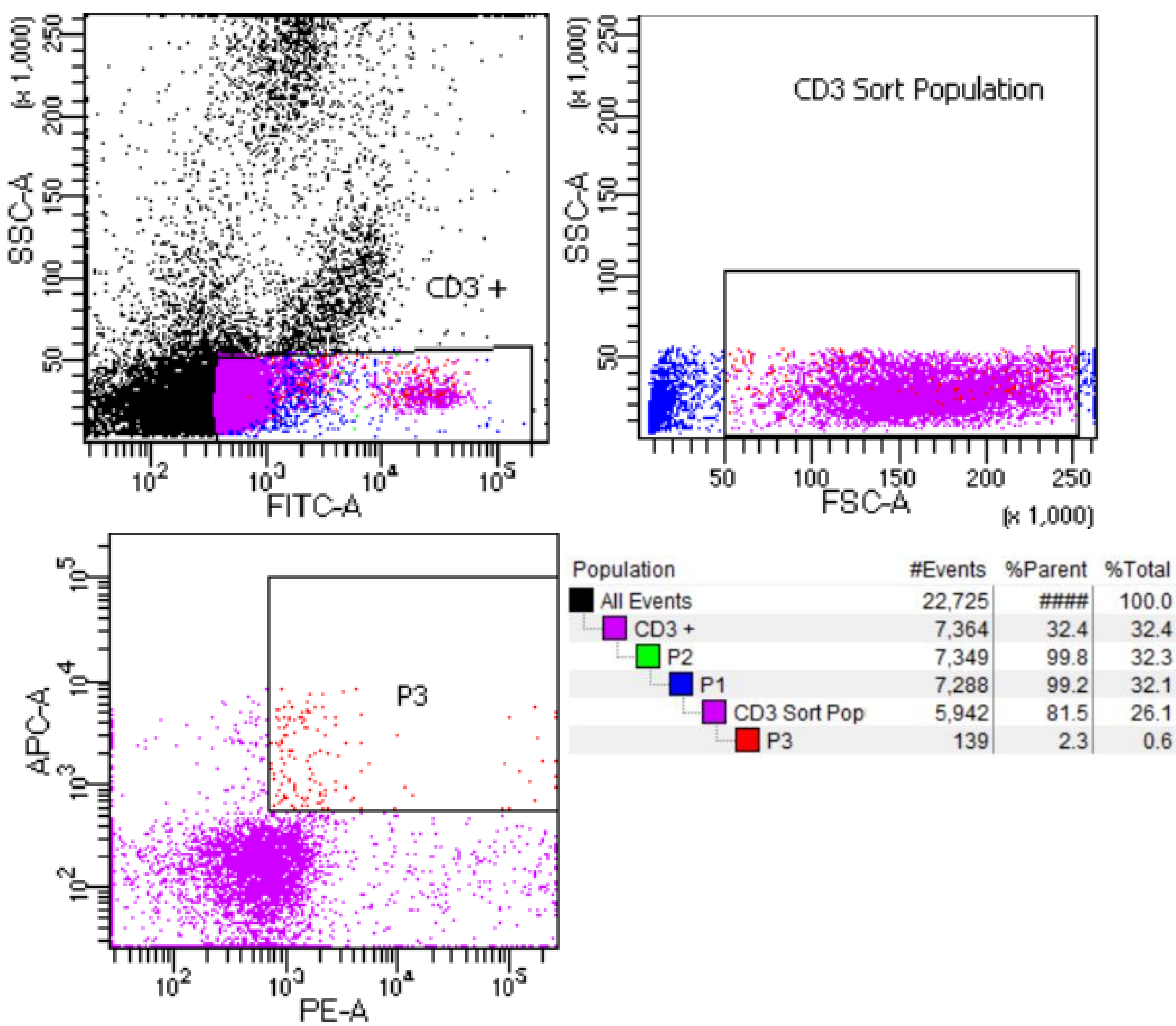
Table 23 shows clonally expanded TCR beta- chain transcripts identified in single cells after VRM RT-PCR from normal donor BM51. The frequency is determined from the total number of beta-chains identified.

TABLE 23. IDENTICAL BETA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN NORMAL DONOR BM51

βTCR	V segment	N / D segment	J segment	Transcript	Frequency β TCR
Wells 04,26 35,69	**C A S S L** tgtgccagcagttta	**F S G Q K E** ttttcgggacagaaagaa	**N T E A F F** aacactgaagctttcttt	Vβ27.1Dβ1.1 Jβ1.1	4/24 6.67%
Wells 10,36	**C A S S E G** tgtgccagcagtgaag	**W** ggtgg	**E T Q Y F** gagacccagtacttc	Vβ6.1Dβ2.2 Jβ2.5	2/24, 8.33%
Wells 32,54	**C A S S L** tgtgccagcagctta	**T G I A** acggggatcg	**N T G E L F F** aacaccggggagctgtttttt	Vβ7.2Dβ2.1 Jβ2.2	2/24 8.33%

FIGURE 13. HUMAN PBMCS FROM NORMAL DONOR BF29 WERE SINGLE CELL SORTED FOR CD3+CD8+CD45RO+ T CELLS USING VRM RT-PCR.

Figure 13 shows the stain and sort of human PBMCs from normal donor BF29 (a Black Female 29 years old) stained with CD3-FITC, CD8-PE, and CD45RO-APC. CD3+ lymphocytes were gated (top left histogram) and selected as the parent population (top right histogram) for sorting by the BD FACSAria Fusion Cell Sorter instrument. CD3+CD8+CD45RO+ T cells were selected for single cell sort (bottom left right histogram) into 96-well plates. Statistics show that CD3+CD8+CD45RO+ T cells represented 2.3% of the parent CD3+ T cell population.



Population	#Events	%Parent	%Total
All Events	22,725	####	100.0
CD3 +	7,364	32.4	32.4
P2	7,349	99.8	32.3
P1	7,288	99.2	32.1
CD3 Sort Pop	5,942	81.5	26.1
P3	139	2.3	0.6

Table 24 shows the frequency of uniquely paired alpha- and beta- chain TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells of normal donor BF29 after VRM RT-PCR.

TABLE 24. PAIRED CD3+CD8+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL FEMALE DONOR BF29

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 01	**C A A S**	**G C S**	**N Q F Y F**	Vα13.1Jα49.1	(1/54) 1.9%
	tgtgcagcaagt	ggttgca	gtaaccagttctatttt		
	C A S S D Y	**R Q M**	**Q F F**	Vβ6.4Dβ1.1	
	tgtgccagcagtgact	atcgacagat	gcagttcttc	Jβ2.1	
Well 03	**C A A**	**M**	**D S N Y Q L I W**	Vα1.2Jα33.1	(1/54) 1.9%
	tgtgctg	cca	tggatagcaactatcagttaatctgg		
	C S A R	**L A G G P**	**E T Q Y F**	Vβ20.1Dβ2.1	
	tgcagtgctaga	ctagcgggggggccc	gagacccagtacttc	Jβ2.5	
Well 09	**C A A S**	**R G**	**G N Q F Y F**	Vα13.2Jα49.1	(1/54) 1.9%
	tgtgcagcaagt	cgtgg	cggtaaccagttctatttt		
	C A S S D Y	**R Q M**	**Q F F**	Vβ6.4Dβ1.1	
	tgtgccagcagtgact	atcgaccagat	gcagttcttc	Jβ2.1	
Well 10	**C A D**		**G G A T N K L I F**	Vα13.2Jα32.2	(1/54) 1.9%
	tgtgcaga	c	ggtggtgctacaaacaagctcatcttt		
	C A S M	**F G V D**	**T G E L F F**	Vβ4.1Dβ2.2	
	tgcgccagca	tgtttggggtagac	accggggagctgtttttt	Jβ1.1	
Well 11	**C I L**		**G S S N T G K L I F**	Vα26.2Jα37.2	(1/54) 1.9%
	tgcatcctg		ggctctagcaacacaggcaaactaatcttt		
	C A S S Q	**Q W G T G D P**	**E T Q Y F**	Vβ4.1Dβ1.1	
	tgcgccagcagccaa	caatgggggacaggggatcc	agagacccagtacttc	Jβ2.5	
Well 12	**C A V R**	**G F**	**T G G G N K L T F**	Vα8.1Jα10.1	(1/54) 1.9%
	tgtgccgtga	gggggttt	acgggaggaggaaacaaactcaccttt		
	C A S S	**P G G Q G**	**E R R C**	Vβ13.1Dβ1.1	
	tgtgccagcagc	cccgggggacagggg	gagaggcgctgc	Jβ2.2	
Well 15	**C V V**	**R R G G A R**	**G L T F**	Vα12.2Jα45.1	(1/54) 1.9%
	tgtgtggtg	agacgaggaggagctaga	ggactcaccttt		
	C S A R E	**P R R P V L L**	**F**	Vβ20.1Dβ1.1	
	tgcagtgctagaga	gccaagacggccggttctgct	cttc	Jβ1.2	
Well 17	**C A A S**	**R Y**	**G N Q F Y F**	Vα13.2Jα49.1	(1/54) 1.9%
	tgtgcagcaagt	cgtta	cggtaaccagttctatttt		
	C A S S Y	**G I D T Q Y**	**A K N I Q Y F**	Vβ6.5Dβ1.1	
	tgtgccagcagttac	gggatagatacgcagtat	gccaaaaacattcagtacttc	Jβ2.4	
Well 18	**C A E**	**D R**	**G G Y Q K V T F**	Vα13.2Jα13.2	(1/54) 1.9%
	tgtgcagag	gatcgg	gggggttaccagaaagttaccttt		
	C A S S E	**T E D**	**F**	Vβ9.1Dβ1.1Jβ2.4	
	tgtgccagcagcg	agacagagg	acttc		
Well 24	**C A L R**	**H L S**	**G Y A L N F**	Vα19.1Jα14.1	(1/54) 1.9%
	tgtgctctgag	gcatctttca	gggtatgcactcaacttc		
	C A S S L	**K G L P R S Q L A S N T E A F**		Vβ12.3	
	tgtgccagcagttta	aaaggcttaccccgttcgcagcttgcatcaaacactgaagctttc		Dβ1.1Jβ1.2	

TABLE 24: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Well 25	**C A**	**T N G G A D E F**	**T F**	Vα13.1Jα45.1	(1/54)
	tgtgca	actaatggtggcgctgacgagt	tcaccttt		1.9%
	C A S R	**D S P G G**	**T N E K L F F**	Vβ6.1Dβ2.2	
	tgtgccagcag	ggattccccgggaggg	actaatgaaaaactgtttttt	Jβ1.4	
Well 27	**C A V**	**R A V**	**Y N Q G G K L I F**	Vα1.1Jα23.1	(1/54)
	tgcgctgt	acgagccg	tttataaccagggaggaaagcttatcttc		1.9%
	C A S S Y	**E**	**E T Q Y F**	Vβ7.2Dβ1.1	
	tgtgccagcagct	acg	aagagacccagtacttc	Jβ2.5	
Well 39	**C A V K**	**K V G P R**	**G S Q G N L I F**	Vα21.1	(1/54)
	tgtgctgtga	agaaagtcgggccgagg	ggaagccaaggaaatctcatcttt	Jα42.1	1.9%
	C A S S L E	**D W S R**	**A F F**	Vβ7.8Dβ1.1	
	tgtgccagcagcttag	aggattggtcccg	agctttcttt	Jβ1.1	
Well 41	**C A A N**	**G C**	**G N Q F Y F**	Vα13.1Jα49.1	(1/54)
	tgtgcagcaa	atggttg	cggtaaccagttctatttt		1.9%
	C A S S F	**S R G G L**	**Y N E Q F F**	Vβ11.2Dβ2.1	
	tgtgccagcagct	tagccgggggggcctc	tacaatgagcagttcttc	Jβ2.1	
	t				
Well 49	**C A V R D M**	**F G S Q K P**	**F**	Vα3.1Jα16.2	(1/54)
	tgtgctgtgagagaca	tgtttggaagccagaagcct	ttt		1.9%
	C A	**Y Q L P G P**	**N E K L F F**	Vβ15.1Dβ1.1	
	tgtgcc	taccagctcccaggaccg	aatgaaaaactgtttttt	Jβ1.4	
Well 50	**C A V D**	**D**	**Y G Q N F V F**	Vα22.1Jα26.1	(1/54)
	tgtgctgtgga	cg	actatggtcagaattttgtcttt		1.9%
	C A S S G	**E A G P P H**	**N E Q F F**	Vβ9.1Dβ2.2	
	tgtgccagcagcg	gggaggccggcccccccac	acaatgagcagttcttc	Jβ2.1	
Well 52	**C E**	**W W**	**T G K L I F**	Vα8.1Jα37.1	(1/54)
	tgtga	atggtgg	acaggcaaactaatcttt		1.9%
	V	**P A D Y**	**S N Q P Q H F**	Vβ27.1Dβ1.1	
	G	tgccagcagattat	agcaatcagccccagcatttt	Jβ1.5	
Well 54	**C A V N**	**L**	**G N Q F Y F**	Vα12.2Jα49.1	(1/54)
	tgtgccgtgaac	ct	ggtaaccagttctatttt		1.9%
	C A S S	**P G G A G V L**		Vβ6.6Dβ2.1Jβ1.2	
	tgtgccagcagt	cccgggggggcaggtgtac	tc		
Well 58	**C A V**	**G P P L D**	**N A G N M L T F**	Vα21.1Jα39.1	(1/54)
	tgtgctg	cggacccccccctcg	taatgcaggcaacatgctcaccttt		1.9%
	t				
	C A S S V	**S P V**	**T E A F F**	Vβ9.1Dβ1.1	
	tgtgccagcagcgta	tctcccgtt	actgaagctttcttt	Jβ1.1	
Well 70	**C**	**F Y K G R T S Y G**	**K L I F**	Vα26.1Jα52.1	(1/54)
	tgc	ttctacaagggacgtactagctatgga	aagctgatattt		1.9%
	C	**A D R R G S S G**	**G Y T F**	Vβ29.1Dβ2.1	
	tgc	gccgaccgtcgggggtcgagcggt	ggctacaccttc	Jβ1.2	

TABLE 24: CONTINUED

Single Cell	V segment N / D segment J segment	Transcript	Paired TCR Frequency
Well 71	**C A V R Y Q G A Q K L V F** tgtg ctgtgagata tcagggagcccagaagctggtattt **C A S S R L T D T Q Y F** tgtgccagcagc cgcct cacagatacgcagtatttt	Vα8.2Jα54.1 Vβ7.8Dβ1.1 Jβ2.3	(1/54) 1.9%
Well 73	**C L V G P L G N E K L T F** tgcctcgtgggt ccac ttggaaatgagaaattaacctttt **C A S S A F W G N V P W G Y T F** tgtgccagcag cgccttctggggcaacgtcccatgg ggctacaccttc	Vα4.1Jα48.1 Vβ27.1Dβ1.1 Jβ1.2	(1/54) 1.9%
Well 74	**C A V E P G G G G A D G L T F** tgtgctgt cgagccaggg ggaggaggtgctgacggactcacctttt **C A S Y E Q Y V G P N T G E L F** tgtgccag ttacgagcagtacgtcgggccg aacaccggggagctgttt	Vα21.1Jα45.1 Vβ2.1Dβ1.1 Jβ2.2	(1/54) 1.9%
Well 81	**S A L C D F G G G S Q G N L I F** t ctgctttgtgtgattttggg ggaggaagccaaggaaatctcatcttt **C A S S V Q T G V K N I Q Y F** tgtgccagcagcgta caaacagggg aaaaacattcagtacttt	Vα19.1 Jα42.1 Vβ9.1Dβ1.1 Jβ2.4	(1/54) 1.9%
Well 82	**C A A T P P G T Y K Y I F** tgtgcagcaa ctcctcca ggaacctacaaatacatcttt **C A S S F S G A S T D T Q Y F** tgtgccagcagctt ctctggggct agcacagatacgcagtatttt	Vα13.1Jα40.1 Vβ11.1Dβ1.1 Jβ2.3	(1/54) 1.9%
Well 83	**C I R G A G G N T P L V F** tgcatcc gggggccggt ggaaacacacctcttgtcttt **C A S S L R D S G T E A F F** tgtgccagcagctta agagactccgg cactgaagctttcttt	Vα26.2Jα29.1 Vβ7.9Dβ2.1 Jβ1.1	(1/54) 1.9%
Well 84	**C A V S N N A G N M L T F** tgtgctgt ttc taataatgcaggcaacatgctcaccttt **C S A R L R D K G Y E Q Y F** tgcagcg cacggctccgggacaagggg tacgagcagtacttc	Vα1.2Jα39.1 Vβ29.1Dβ1.1 Jβ2.7	(1/54) 1.9%

Table 25 shows all sequencing data for CD3+CD8+CD45RO+ in normal donor BF29. Fifty-four wells each containing a single cell were sequenced. Twenty-seven wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 24). In addition, in a number of wells (27), only alpha or beta chain sequences were obtained presumably for technical reasons. All alpha and beta TCR transcripts identified were unique.

TABLE 25. ALL CD3+CD8+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BF29 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**C A A S** tgtgcagcaagt	**G C S** ggttgca	**N Q F Y F** gtaaccagttctatttt	Vα13.1Jα49.1
	C A S S D Y tgtgccagcagtgact	**R Q M** atcgaccagat	**Q F F** gcagttcttc	Vβ6.4Dβ1.1 Jβ2.1
Well 03	**C A A** tgtgctg	**M** cca	**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2Jα33.1
	C S A R tgcagtgctaga	**L A G G P** ctagcggggggccc	**E T Q Y F** gagacccagtacttc	Vβ20.1Dβ2.1 Jβ2.5
Well 04	**Vα chain unavailable**			
	C A S S L tgtgccagcagcttg	**M R Q E** atgagacagga	**N T E A F F** gaacactgaagctttcttt	Vβ5.4Dβ1.1 Jβ1.1
Well 05	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**S R G P G** tccagggggcctggc	**N E Q F F** aatgagcagttcttc	Vβ7.2Dβ1.1 Jβ2.1
Well 06	**Vα chain unavailable**			
	C A S S V tgtgccagcagcgt	**A G Q G A M G L** tgccggacagggggcgatgggcctt	**Y T F** tacaccttc	Vβ9.1Dβ1.1 Jβ1.2
Well 09	**C A A S** tgtgcagcaagt	**R G** cgtgg	**G N Q F Y F** cggtaaccagttctatttt	Vα13.2Jα49.1
	C A S S D Y tgtgccagcagtgact	**R Q M** atcgaccagat	**Q F F** gcagttcttc	Vβ6.4Dβ1.1 Jβ2.1
Well 10	**C A D** tgtgcaga	c	**G G A T N K L I F** ggtggtgctacaaacaagctcatcttt	Vα13.2Jα32.2
	C A S M tgcgccagca	**F G V D** tgtttggggtagac	**T G E L F F** accggggagctgttttt	Vβ4.1Dβ2.2 Jβ1.1

TABLE 25: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 11	**C I L**	**G S S N T G K L I F**		Vα26.2Jα37.2
	tgcatcctg	ggctctagcaacacaggcaaactaatcttt		
	C A S S Q	**Q W G T G D P**	**E T Q Y F**	Vβ4.1Dβ1.1
	tgcgccagcagccaa	caatgggggacaggggatcc	agagacccagtacttc	Jβ2.5
Well 12	**C A V R**	**G F**	**T G G G N K L T F**	Vα8.1Jα10.1
	tgtgccgtga	gggggttt	acgggaggaggaaacaaactcaccttt	
	C A S S	**P G G Q G**	**E R R C**	Vβ13.1Dβ1.1
	tgtgccagcagc	cccgggggacagggg	gagaggcgctgc	Jβ2.2
Well 13	**C V V**	**P**	**G G A D G L T F**	Vα12.Jα45.1
	tgtgtggt	cccg	ggaggtgctgacggactcaccttt	
	Vβ chain unavailable			
Well 14	**C A G V**	**S**	**G N E K L T F**	Vα27.1Jα48.1
	tgtgcaggag	tctcc	ggaaatgagaaattaacctttt	
	Vβ chain unavailable			
Well 15	**C V V**	**R R G G A R**	**G L T F**	Vα12.2Jα45.1
	tgtgtggtg	agacgaggaggagctaga	ggactcaccttt	
	C S A R E	**P R R P V L L**	**F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	gccaagacggccggttctgct	cttc	Jβ1.2
Well 17	**C A A S**	**R Y**	**G N Q F Y F**	Vα13.2Jα49.1
	tgtgcagcaagt	cgtta	cggtaaccagttctattt	
	C A S S Y	**G I D T Q Y**	**A K N I Q Y F**	Vβ6.5Dβ1.1
	tgtgccagcagttac	gggatagatacgcagtat	gccaaaaacattcagtacttc	Jβ2.4
Well 18	**C A E**	**D R**	**G G Y Q K V T F**	Vα13.2Jα13.2
	tgtgcagag	gatcgg	gggggttaccagaaagttaccttt	
	C A S S E	**T E D**	**F**	Vβ9.1Dβ1.1
	tgtgccagcagcg	agacagagg	acttc	Jβ2.4
Well 19	**W**	**G**	**F V F**	Vα13.2Jα26.1
	tg	ggg	ttttgtcttt	
	Vβ chain unavailable			
Well 20	**Vα chain unavailable**			
	C S V E	**E G G G K**	**P Q H F**	Vβ29.1Dβ1.1
	tgcagcgttga	ggaagggggcggga	agccccagcatttt	Jβ1.5
Well 22	**Vα chain unavailable**			
	C A S S	**R P**	**Y N E Q F F**	Vβ6.1Dβ1.1
	tgtgccagcagt	aggccg	tacaatgagcagttcttc	Jβ2.1
Well 24	**C A L R**	**H L S**	**G Y A L N F**	Vα19.1Jα14.1
	tgtgctctgag	gcatctttca	gggtatgcactcaacttc	
	C A S S L	**K G L P R S Q L A S**	**N T E A F**	Vβ12.3
	tgtgccagcagttta	aaaggcttaccccgttcgcagcttgcatca	aacactgaagctttc	Dβ1.1 Jβ1.2

TABLE 25: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 25	**C A** tgtgca	**T N G G A D E F** actaatggtggcgctgacgagt	**T F** tcaccttt	Vα13.1Jα45.1
	C A S R tgtgccagcag	**D S P G G** ggattccccgggaggg	**T N E K L F F** actaatgaaaaactgtttttt	Vβ6.1Dβ2.2 Jβ1.4
Well 26	**C L V V** tgcctcgtgg	**I E** ttatagag	**G G S Y I P T F** ggaggaagctacatacctacattt	Vα4.1Jα6.1
	Vβ chain unavailable			
Well 27	**C A V** tgcgctgt	**R A V** acgagccg	**Y N Q G G K L I F** tttataaccagggaggaaagcttatcttc	Vα1.1Jα23.1
	C A S S Y tgtgccagcagct	**E** acg	**E T Q Y F** aagagacccagtacttc	Vβ7.2Dβ1.1 Jβ2.5
Well 28	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**Q Q G A** caacaggggg	**D T Q Y F** cagatacgcagtatttt	Vβ11.2Dβ1.1 Jβ2.3
Well 32	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**R G V D** caggggagtag	**E Q Y F** acgagcagtacttc	Vβ20.2Dβ1.1 Jβ2.7
Well 33	**C A A S** tgtgcagcaagt	**G C G N Q F I** ggttgcggtaaccagttcatc	**F** ttt	Vα13.1Jα49.1
	Vβ chain unavailable			
Well 34	**C A G** tgtgcagga	**P** ccg	**S G T Y K Y I F** tcaggaacctacaaatacatcttt	Vα27.1Jα40.1
	Vβ chain unavailable			
Well 38	**C A A** tgtgcagc		**S G T Y K Y I F** ctcaggaacctacaaatacatcttt	Vα13.1Jα40.1
	Vβ chain unavailable			
Well 39	**C A V K** tgtgctgtga	**K V G P R** agaaagtcgggccgagg	**G S Q G N L I F** ggaagccaaggaaatctcatcttt	Vα21.1Jα42 .1
	C A S S L E tgtgccagcagcttag	**D W S R** aggattggtcccg	**A F F** agctttcttt	Vβ7.8Dβ1.1 Jβ1.1
Well 41	**C A A N** tgtgcagcaa	**G C** atggttg	**G N Q F Y F** cggtaaccagttctatttt	Vα13.1Jα49.1
	C A S S F tgtgccagcagctt	**S R G G L** tagccgggggggcctc	**Y N E Q F F** tacaatgagcagttcttc	Vβ11.2Dβ2.1 Jβ2.1
Well 43	**C V V S D** tgtgttgtgagtga	**P A** tcccg	**G G Y Q K V T F** ctgggggttaccagaaagttaccttt	Vα8.2Jα13.2
	Vβ chain unavailable			

TABLE 25: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well	**C**	**V S G G G N Y I L**	**T F**	Vα1.2Jα6.1
44	tgc	gtgagtggaggaggaaactacatcctt	acattt	
	Vβ chain unavailable			
Well	**C A**	**V R Y**	**Q G A Q K L V F**	Vα8.2Jα54.1
46	tgtg	ctgtgagata	tcagggagcccagaagctggtattt	
	Vβ chain unavailable			
Well	**C A V R D M**	**F G S Q K P**	**F**	Vα3.1Jα16.2
49	tgtgctgtgagagaca	tgtttggaagccagaagcct	ttt	
	C A	**Y Q L P G P**	**N E K L F F**	Vβ15.1Dβ1.1
	tgtgcc	taccagctcccaggaccg	aatgaaaaactgtttttt	Jβ1.4
Well	**C A V D**	**D**	**Y G Q N F V F**	Vα22.1Jα26.1
50	tgtgctgtgga	cg	actatggtcagaattttgtcttt	
	C A S S G	**E A G P P H**	**N E Q F F**	Vβ9.1Dβ2.2
	tgtgccagcagcg	gggaggccggccccccac	acaatgagcagttcttc	Jβ2.1
Well	**C E**	**W W**	**T G K L I F**	Vα8.1Jα37.1
52	tgtga	atggtgg	acaggcaaactaatcttt	
	V	**P A D Y**	**S N Q P Q H F**	Vβ27.1Dβ1.1
	G	tgccagcagattat	agcaatcagccccagcatttt	Jβ1.5
Well	**P**	**S P E K K P D V L R K A P G S**	**T F**	Vα14.4
53	c	cgagccccgagaaaaaacccgatgttttgcggaaggcaccaggctcc	actttt	Jα17.1
	Vβ chain unavailable			
Well	**C A V N**	**L**	**G N Q F Y F**	Vα12.2Jα49.1
54	tgtgccgtgaac	ct	ggtaaccagttctatttt	
	C A S S	**P G G A G V L**		Vβ6.6Dβ2.1
	tgtgccagcagt	cccggggggcaggtgtac	tc	Jβ1.2
Well	**C A V**	**G P P L D**	**N A G N M L T F**	Vα21.1Jα39.1
58	tgtgctgt	cggacccccctcg	taatgcaggcaacatgctcaccttt	
	C A S S V	**S P V**	**T E A F F**	Vβ9.1Dβ1.1
	tgtgccagcagcgta	tctcccgtt	actgaagctttcttt	Jβ1.1
Well	**C A E R**	**R**	**S Q G N L I F**	Vα13.2Jα42.1
60	tgtgcagaga	gaa	gaagccaaggaaatctcatcttt	
	Vβ chain unavailable			
Well	**C A**	**L Q D**	**Y Q L I W**	Vα21.1Jα33.1
63	tgtgc	cctgcaag	actatcagttaatctgg	
	Vβ chain unavailable			
Well	**C A V Q D**	**H**	**T G G F K T I F**	Vα20.1Jα9.1
66	tgtgctgtgcagg	acc	atactggaggcttcaaaactatcttt	
	Vβ chain unavailable			
Well	**C A V R**	**I**	**N T N A G K S T F**	Vα1.1Jα27.1
67	tgcgctgtgag	att	taacaccaatgcaggcaaatcaaccttt	
	Vβ chain unavailable			

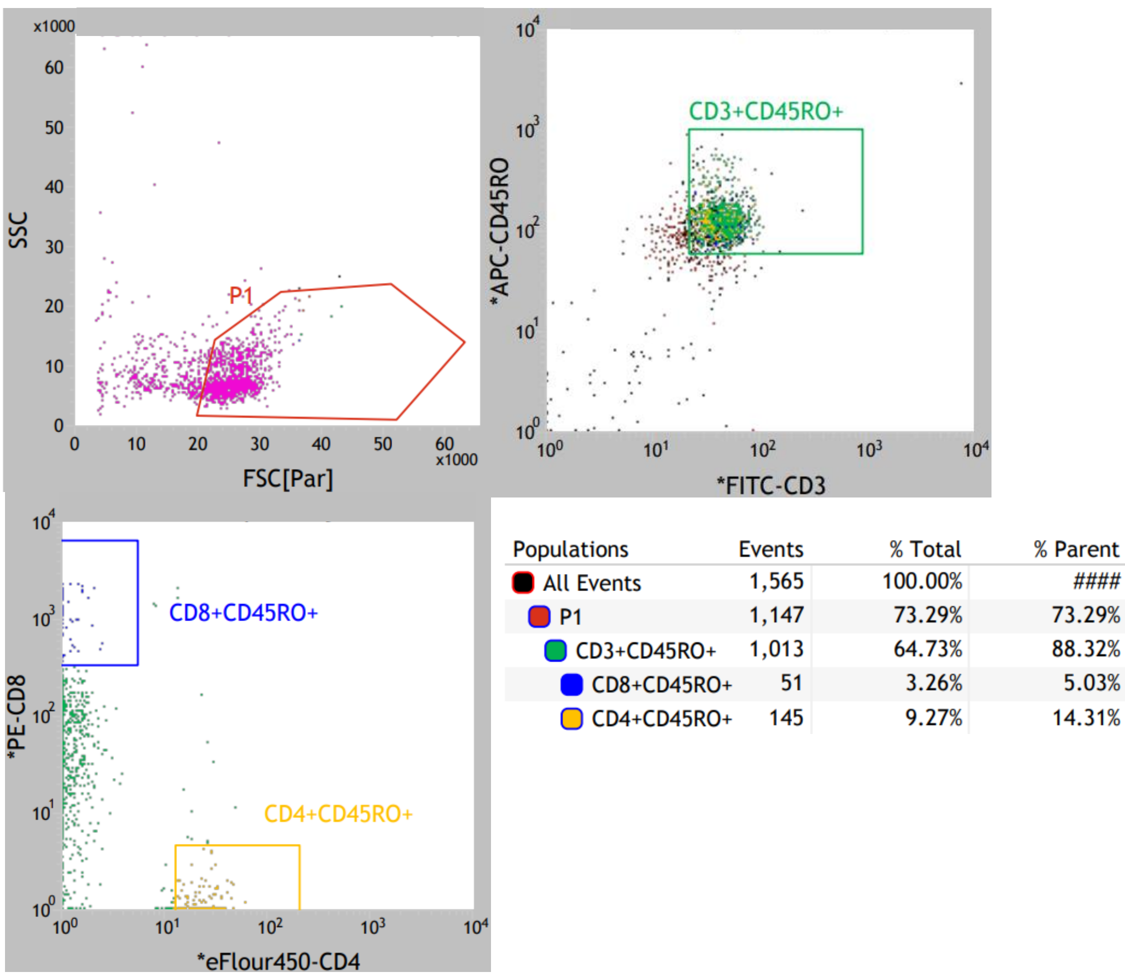
TABLE 25: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 68	**Vα chain unavailable**			
	C S A R D	**R L V**	**T G E L F F**	Vβ20.1Dβ2.1
	tgcagtgctagaga	tagactagta	accggggagctgtttttt	Jβ2.2
Well 70	**C**	**F Y K G R T S Y G**	**K L I F**	Vα26.1Jα52.1
	tgc	ttctacaagggacgtactagctatgga	aagctgatattt	
	C	**A D R R G S S G**	**G Y T F**	Vβ29.1Dβ2.1
	tgc	gccgaccgtcgggggtcgagcggt	ggctacaccttc	Jβ1.2
Well 71	**C A**	**V R Y**	**Q G A Q K L V F**	Vα8.2Jα54.1
	tgtg	ctgtgagata	tcagggagcccagaagctggtattt	
	C A S S	**R L**	**T D T Q Y F**	Vβ7.8Dβ1.1
	tgtgccagcagc	cgcct	cacagatacgcagtatttt	Jβ2.3
Well 72	**Vα chain unavailable**			
	C S V	**N T Y T**	**Y E Q Y F**	Vβ29.1Dβ1.1Jβ2.7
	tgcagcgt	aaacacgtata	cctacgagcagtacttc	
Well 73	**C L V G**	**P L**	**G N E K L T F**	Vα4.1Jα48.1
	tgcctcgtgggt	ccac	ttggaaatgagaaattaacctttt	
	C A S S	**A F W G N V P W**	**G Y T F**	Vβ27.1Dβ1.1
	tgtgccagcag	cgccttctggggcaacgtcccatgg	ggctacaccttc	Jβ1.2
Well 74	**C A V**	**E P G**	**G G G A D G L T F**	Vα21.1Jα45.1
	tgtgctgt	cgagccaggg	ggaggaggtgctgacggactcacctttt	
	C A S	**Y E Q Y V G P**	**N T G E L F**	Vβ2.1Dβ1.1
	tgtgccag	ttacgagcagtacgtcgggccg	aacaccggggagctgttt	Jβ2.2
Well 75	**A**	**S W V T L**	**K A A G N K L T F**	Vα4.1.1Jα17.1
	g	cctcgtgggtgactc	tcaaagctgcaggcaacaagctaactttt	
	Vβ chain unavailable			
Well 78	**Vα chain unavailable**			
	C S V	**Q L T G**	**S G A N V L T F**	Vβ29.1Dβ1.1
	tgcagcgtt	cagttgacagg	ctctggggccaacgtcctgactttc	Jβ2.6
Well 81	**S**	**A L C D F G**	**G G S Q G N L I F**	Vα19.1Jα42.1
	t	ctgctttgtgtgattttggg	ggaggaagccaaggaaatctcatcttt	
	C A S S V	**Q T G V**	**K N I Q Y F**	Vβ9.1Dβ1.1
	tgtgccagcagcgta	caaacagggg	aaaaacattcagtacttt	Jβ2.4
Well 82	**C A A T**	**P P**	**G T Y K Y I F**	Vα13.1Jα40.1
	tgtgcagcaa	ctcctcca	ggaacctacaaatacatcttt	
	C A S S F	**S G A**	**S T D T Q Y F**	Vβ11.1Dβ1.1
	tgtgccagcagctt	ctctggggct	agcacagatacgcagtatttt	Jβ2.3

TABLE 25: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 83	**C I R** tgcatcc	**G A G** gggggccggt	**G N T P L V F** ggaaacacacctcttgtcttt	Vα26.2Jα29.1
	C A S S L tgtgccagcagctta	**R D S G** agagactccgg	**T E A F F** cactgaagctttcttt	Vβ7.9Dβ2.1 Jβ1.1
Well 84	**C A V** tgtgctgt	**S** ttc	**N N A G N M L T F** taataatgcaggcaacatgctcacctttt	Vα1.2Jα39.1
	C S A tgcagcg	**R L R D K G** cacggctccgggacaagggg	**Y E Q Y F** tacgagcagtacttc	Vβ29.1Dβ1.1 Jβ2.7
Well 85	**Vα chain unavailable**			
	C S V tgcagtg	**R G S G G D** ttcgaggaagcgggggggac	**T G E L F** accggggagctgttt	Vβ20.1Dβ2.1 Jβ2.2

FIGURE 14. HUMAN PBMCS FROM NORMAL DONOR BM45 WERE SINGLE CELL SORTED FOR CD3+CD4+CD45RO+ T CELLS USING VRM RT-PCR. Figure 14 shows the stain and sort of human PBMCs from normal donor BM45 (Black Male, 45 years old) stained with CD3-FITC, CD8-PE, CD4-eFluor450, and CD45RO-APC. Gate P1 (top left histogram), displays the region of lymphocytes selected as the parent population for CD3+CD45RO+ T cells labeled in the second gate (top right histogram). CD3+CD4+CD45RO+ T cells were selected for single cell sort (bottom left right histogram) using a BD FACS Influx Cell Sorter. Statistics show that CD3+CD4+CD45RO+ T cells represented 14.31% of the parent population; in comparison CD3+CD8+CD45RO+ T cells were 5.03%.



Populations	Events	% Total	% Parent
All Events	1,565	100.00%	####
P1	1,147	73.29%	73.29%
CD3+CD45RO+	1,013	64.73%	88.32%
CD8+CD45RO+	51	3.26%	5.03%
CD4+CD45RO+	145	9.27%	14.31%

Table 26 shows the frequency of uniquely paired CD3+CD4+CD45RO+ alpha- and beta-chain TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells of normal donor BM45 after VRM RT-PCR.

TABLE 26. PAIRED CD3+CD4+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM45

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 01	**L**	**F C G R G G R R Q Q**	**K T I F**	Vα3.1Jα9.1	(1/42) 2.4%
	c	tcttctgcggcaggggggggaggaggcaacaa	aaaactatcttt		
	C S A S	**S T A H**	**Q P Q H F**	Vβ20.1Dβ1.1	
	tgcagtgctag	ctcaacagctc	atcagccccagcatttt	Jβ1.5	
Well 10	**C I L R**	**R S G G R N Y**	**K L T F**	Vα26.1Jα53.1	(1/42) 2.4%
	tgcatcctgag	gcgtagtggaggtagaaactat	aaactgacattt		
	C A S S L S	**G**	**D T Q Y F**	Vβ7.3Dβ2.1	
	tgtgccagcagcttaa	gcggg	gatacgcagtatttt	Jβ2.3	
Well 31	**C A A S**	**S N**	**Y K L S F**	Vα13.1Jα20.1	(1/42) 2.4%
	tgtgcagcaa	gtagca	actacaagctcagcttt		
	C A S S	**P R D D L L A**	**G E L F F**	Vβ7.3Dβ1.1	
	tgtgccagcagc	cccgggacgacctcctcgcc	ggggagctgtttttt	Jβ2.2	
Well 34	**E**	**S S W G G G Q I**	**A F**	Vα10.1Jα7.1	(1/42) 2.4%
	g	agtccagctggggggggaggacaaatt	gctttt		
	C A S R	**G T G G I S W**	**S N Q P Q H F**	Vβ6.2	
	tgtgccagcag	ggggacagggggggatcagttgg	agcaatcagccccagcattt	Dβ1.1	
			t	Jβ1.5	
Well 39	**C A G**	**A R**	**A A G N K L T F**	Vα27.1Jα17.1	(1/42) 2.4%
	tgtgcagg	gcgag	agctgcaggcaacaagctaacttttt		
	C A S S Y	**A G G R G**	**E Q Y F**	Vβ6.5Dβ2.1	
	tgtgccagcagttac	gccggggggcgagg	cgagcagtacttc	Jβ2.7	
Well 50	**C I V R A**		**S G N T P L V F**	Vα26.1Jα29.1	(1/42) 2.4%
	tgcatcgtcagag	c	ttcaggaaacacacctcttgtcttt		
	C S A R	**A T G V G L**	**A K N I Q Y F**	Vβ20.1	
	tgcagtgctag	ggcgacaggggtcggacta	gccaaaaacattcagtacttc	Dβ1.1	
				Jβ2.4	
Well 52	**C A E R**	**D Y**	**Q G G K L I F**	Vα13.2Jα23.1	(1/42) 2.4%
	tgtgcagaga	gggattat	cagggaggaaagcttatcttc		
	C A T S R G	**G G K E**	**E Q Y F**	Vβ15.2Dβ2.1	
	tgtgccaccagcagag	gcggggggaaagaa	gagcagtacttc	Jβ2.7	
Well 59	**C**	**L C G**	**N F G N E K L T F**	Vα19.1Jα48.1	(1/42) 2.4%
	tgt	ctctgcggc	aactttggaaatgagaaattaaccttt		
	H L S	**L R Q R G W G**	**E Q F F**	Vβ20.1Dβ2.1	
	cacttatct	ttgcgccagcgggggtgggga	gagcagttcttc	Jβ2.1	
Well 64	**C I V R V**	**A P P P**	**G N Q F**	Vα26.1Jα49.1	(1/42) 2.4%
	tgcatcgtcagag	tcgcccccccc	ccggtaaccagttc		
	C A S R	**S E E T G G W R**	**E K L F F**	Vβ6.1	
	tgtgccagcag	gtcagaagagacaggggggatggagg	gaaaaactgtttttt	Dβ1.1Jβ1.4	

Table 27 shows all sequencing data for CD3+CD4+CD45RO+ in normal donor BM45. Forty-two wells each containing a single cell were sequenced. Nine wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 26). In addition, in a number of wells (24), only alpha or beta chain sequences were obtained presumably for technical reasons. All alpha and beta TCR transcripts identified were unique.

TABLE 27. ALL CD3+CD4+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BM45 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**L**	**F C G R G G R R Q Q**	**K T I F**	Vα3.1Jα9.1
	c	tcttctgcggcaggggggggaggaggcaacaa	aaaactatcttt	
	C S A S	**S T A H**	**Q P Q H F**	Vβ20.1Dβ1.1
	tgcagtgctag	ctcaacagctc	atcagccccagcatttt	Jβ1.5
Well 10	**C I L R**	**R S G G R N Y**	**K L T F**	Vα26.1Jα53.1
	tgcatcctgag	gcgtagtggaggtagaaactat	aaactgacattt	
	C A S S L S	**G**	**D T Q Y F**	Vβ7.3Dβ2.1
	tgtgccagcagcttaa	gcggg	gatacgcagtatttt	Jβ2.3
Well 14	**C A G A**	**R T**	**G G G A D G L T F**	Vα27.1Jα45.1
	tgtgcaggag	cgagga	caggaggaggtgctgacggactcaccttt	
	Vβ chain unavailable			
Well 16	**F**	**S V G P G T**	**S Y E K L I F**	Vα8.2Jα52.1
	t	tttctgtgggtccgggtact	agctatgaaaagctgatattt	
	Vβ chain unavailable			
Well 18	**C A**	**A L K T T I L**	**Y F**	Vα13.2Jα21.1
	tgtgc	cgccctaaaaacaacaatttta	tacttt	
	Vβ chain unavailable			
Well 25	**Vα chain unavailable**			
	C S V	**K R**	**N T E A F F**	Vβ29.1Dβ2.2
	tgcagcg	taaagagg	aacactgaagctttcttt	Jβ1.1
Well 26	**Vα chain unavailable**			
	C A S S	**F S M G H**	**N E Q F F**	Vβ7.9Dβ1.1
	tgtgccagcag	ttttagcatggggc	acaatgagcagttcttc	Jβ2.1
Well 27	**C A V S**	**P A**	**G G Y Q K V T F**	Vα3.1Jα13.2
	tgtgctgtgag	tccag	ctgggggttaccagaaagttaccttt	
	Vβ chain unavailable			

TABLE 27: CONTINUED

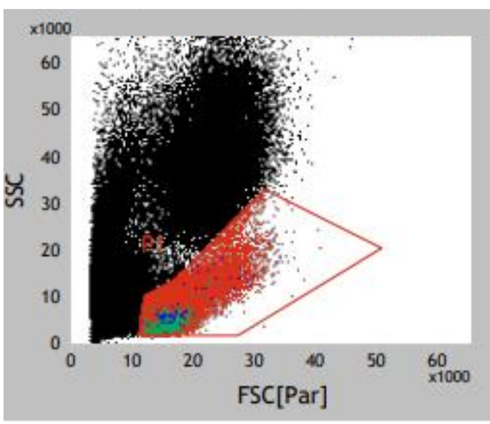
Single Cell	V segment	N / D segment	J segment	Transcript
Well 31	**C A A S**	**S N**	**Y K L S F**	Vα13.1Jα20.1
	tgtgcagcaa	gtagca	actacaagctcagcttt	
	C A S S	**P R D D L L A**	**G E L F F**	Vβ7.3Dβ1.1J
	tgtgccagcagc	ccccgggacgacctcctcgcc	gggagctgtttttt	β2.2
Well 34	**E**	**S S W G G G Q I**	**A F**	Vα10.1Jα7.1
	g	agtccagctggggggaggacaaatt	gctttt	
	C A S R	**G T G G I S W**	**S N Q P Q H F**	Vβ6.2Dβ1.1
	tgtgccagcag	ggggacagggggatcagttgg	agcaatcagccccagcatttt	Jβ1.5
Well 35	**Vα chain unavailable**			
	C S A R D	**G G T G**	**S Y E Q Y F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	tgggggacaggg	tcctacgagcagtacttc	Jβ2.7
Well 37	**Vα chain unavailable**			
	C A S S L A	**D R**	**Y N E Q F F**	Vβ7.2Dβ1.1
	tgtgccagcagcttagc	ggacaga	tacaatgagcagttcttc	Jβ2.1
Well 39	**C A G**	**A R**	**A A G N K L T F**	Vα27.1Jα17.1
	tgtgcagg	gcgag	agctgcaggcaacaagctaacttt	
	C A S S Y	**A G G R G**	**E Q Y F**	Vβ6.5Dβ2.1
	tgtgccagcagttac	gccgggggcgagg	cgagcagtacttc	Jβ2.7
Well 40	**C A**	**V G Q**	**G T S Y G K L T F**	Vα8.2Jα52.1
	tgtg	ctgtgggtcag	ggtactagctatggaaagctgacattt	
	Vβ chain unavailable			
Well 41	**Vα chain unavailable**			
	C	**T I N T A S D P P**	**E Q Y F**	Vβ6.8Dβ1.1
	tgt	accatcaatacagcctccgatccgcct	gagcagtacttc	Jβ2.7
Well 43	**Vα chain unavailable**			
	C A S S	**G P P F L A G S R**	**N E Q F F**	Vβ7.9Dβ2.1
	tgtgccagcag	tggccccccctttcctagcggggagcagg	aatgagcagttcttc	Jβ2.1
Well 46	**C A**	**V G Q G P**	**S Y G K L T F**	Vα8.2Jα52.1
	tgtg	ctgtgggtcagggtc	ctagctatggaaagctgacattt	
	Vβ chain unavailable			
Well 47	**R**		**N T G G F K T I F**	Vα35.1Jα9.1
	acgt		aatactggaggcttcaaaactatcttt	
	Vβ chain unavailable			
Well 48	**C A**	**V G Q**	**G T S Y G K L T F**	Vα8.2Jα52.1
	tgtg	ctgtgggtcag	ggtactagctatggaaagctgacattt	
	Vβ chain unavailable			
Well 50	**C I V R A**		**S G N T P L V F**	Vα26.1Jα29.1
	tgcatcgtcagag	c	ttcaggaaacacacctcttgtcttt	
	C S A R	**A T G V G L**	**A K N I Q Y F**	Vβ20.1Dβ1.1
	tgcagtgctag	ggcgacaggggtcggacta	gccaaaaacattcagtacttc	Jβ2.4
Well 51	**C A G**	**E P**	**G G Y Q K V T F**	Vα25.1Jα13.1
	tgtgcaggg	gaac	ctggggggttaccagaaagttacttt	
	Vβ chain unavailable			

TABLE 27: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 52	**C A E R**	**D Y**	**Q G G K L I F**	Vα13.2Jα23.1
	tgtgcagaga	gggattat	cagggaggaaagcttatcttc	
	C A T S R G	**G G K E**	**E Q Y F**	Vβ15.2Dβ2.1 Jβ2.7
	tgtgccaccagcagag	gcggggggaaagaa	gagcagtacttc	
Well 53	**C G T E R**	**G**	**G T S Y G K L T F**	Vα30.1Jα52.1
	tgcggcacagaga	ggggt	ggtactagctatggaaagctgatattt	
	Vβ chain unavailable			
Well 54	**Vα chain unavailable**			
	C A S	**G L L Q G**	**T D T Q Y F**	Vβ5.4Dβ2.1 Jβ2.3
	tgcgccagc	ggcctcctccagg	gcacagatacgcagtatttt	
Well 59	**C**	**L C G**	**N F G N E K L T F**	Vα19.1Jα48.1
	tgt	ctctgcggc	aactttggaaatgagaaattaacctttt	
	H L S	**L R Q R G W G**	**E Q F F**	Vβ20.1Dβ2.1 Jβ2.1
	cacttatct	ttgcgccagcgggggtgggga	gagcagttcttc	
Well 61	**Vα chain unavailable**			
	C A I S D	**P T I**	**T D T Q Y F**	Vβ10.3Dβ1.1 Jβ2.3
	tgtgccatcagtga	tccaacgat	cacagatacgcagtatttt	
Well 64	**C I V R V**	**A P P P**	**G N Q F**	Vα26.1Jα49.1
	tgcatcgtcagag	tcgccccccccc	ccggtaaccagttc	
	C A S R	**S E E T G G W R**	**E K L F F**	Vβ6.1Dβ1.1 Jβ1.4
	tgtgccagcag	gtcagaagagacaggggggatggagg	gaaaaactgtttttt	
Well 68	**C A V**	**L**	**S G G Y N K L I F**	Vα8.2Jα4.1
	tgtgctgt	tc	tttctggtggctacaataagctgatttttt	
	Vβ chain unavailable			
Well 72	**C A V G**	**P T M D**	**N A G N M L T F**	Vα8.3Jα39.1
	tgtgctgtgg	gcccgacgatgg	ataatgcaggcaacatgctcacctttt	
	Vβ chain unavailable			
Well 77	**Vα chain unavailable**			
	C A S S	**P L R L D R A I G**	**Q Y F**	Vβ7.3Dβ1.1 Jβ2.7
	tgtgccagcagc	cccttgcgcctggatagggccatcgg	gcagtacttc	
Well 81	**Vα chain unavailable**			
	C A S R	**D A K E**	**N S P L H F**	Vβ7.8Dβ1.1 Jβ1.6
	tgtgccagcag	ggacgcgaaggag	aattcacccctccacttt	
Well 83	**Vα chain unavailable**			
	C A S S S	**G T T R S**	**G E L F F**	Vβ7.9Dβ1.1 Jβ2.2
	tgtgccagcagct	ccgggacaacacggt	ccggggagctgtttttt	
Well 84	**Vα chain unavailable**			
	C S A S	**E D T P S G S**	**T F**	Vβ20.1Dβ2.1 Jβ1.2
	tgcagtgctag	cgaggatacgccaagcggcag	caccttc	

FIGURE 15. HUMAN PBMCS FROM NORMAL DONOR WM41 WERE SINGLE CELL SORTED FOR CD3+CD20+ T CELLS USING VRM RT-PCR.

Figure 15 shows the stain and sort of human PBMCs from normal donor WM41 (White Male 41 years old) stained with CD3-FITC, CD8-PE, and CD20-eFluor780. Lymphocytes were selected as the parent population P1 (gated in the top left histogram) for sorting by the BD FACS Influx Cell Sorter. Pre-sort statistics show that CD3+CD8+ T cells represented 2.73% of the parent population, whereas CD3+CD20+ T cells represented 0.35% of the Lymphocyte population selected for sorting (index sort statistics).

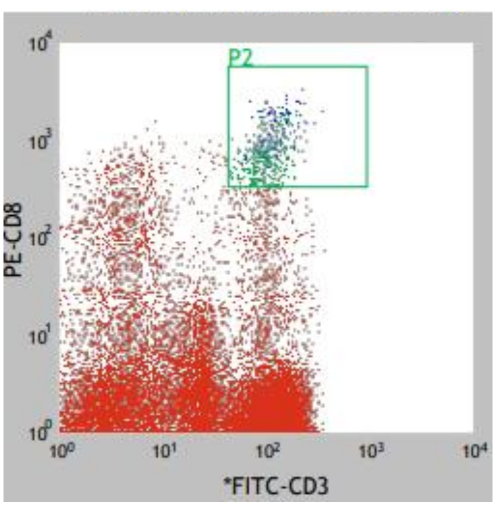


PRESORT STATISTICS

Populations	Events	% Total	% Parent
All Events	100,000	100.00%	####
P1	17,233	17.23%	17.23%
P2	470	0.47%	2.73%

INDEX SORT STATISTICS

Populations	Events	% Total	% Parent
All Events	408,191	100.00%	####
P1	43,393	10.63%	10.63%
P2	0	0.00%	0.00%
P3	0	0.00%	####
P4	152	0.04%	0.35%



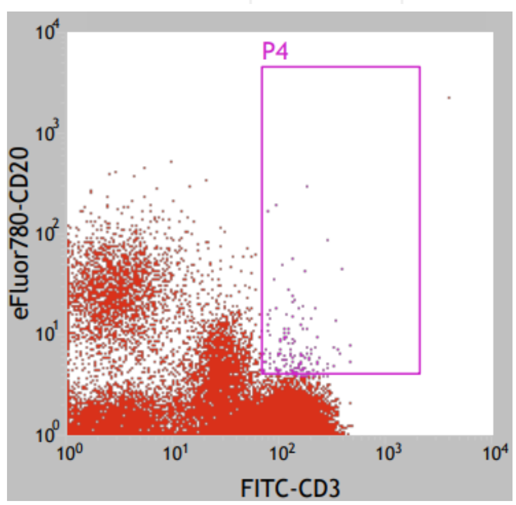


Table 28 shows the frequency of uniquely paired CD3+CD20+ alpha- and beta- chain TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells of normal donor WM41 (a White Male 41 years old) after VRM RT-PCR.

TABLE 28. PAIRED CD3+CD20+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR WM41

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 05	**C A A T**		**G G S N Y K L T F**	Vα13.1	1/44
	tgtgcagcaa	cg	ggaggtagcaactataaactgacattt	Jα53.1	2.3%
	C A S S	**P G C G L T**	**Y N E Q F F**	Vβ6.5Dβ1.1	
	tgtgccagcagt	ccaggttgtgggctcaca	tacaatgagcagttcttc	Jβ2.1	
Well 31	**C A**	**V T H**	**N Y G Q N F V F**	Vα8.2	1/44
	tgtg	ctgtgaccc	ataactatggtcagaattttgtcttt	Jα26.1	2.3%
	C A S R	**A T G L G D**	**N E Q F F**	Vβ3.1Dβ2.1	
	tgtgccagcag	ggctacgggactagggg	acaatgagcagttcttc	Jβ2.1	
Well 51	**C A E S**	**N E**	**S G G G A D G L T F**	Vα5.1Jα45.1	1/44
	tgtgcagaga	gtaatgag	tcaggaggaggtgctgacggactcaccttt		2.3%
	C A S S Q D	**H W I V**	**S Y N E Q**	Vβ14.1Dβ1.1	
	tgtgccagcagccaaga	cactggatagtgc	tcctacaatgagcag	Jβ2.1	
Well 52	**C A V V**	**G**	**A S G G S Y I P T F**	Vα2.1Jα6.1	1/44
	tgtgctgtgg	tgggg	gcatcaggaggaagctacatacctacattt		2.3%
	C A S S I	**A G R K G V E T**	**S N Q P Q H F**	Vβ19.1	
	tgtgccagtagtata	gcagggaggaaaggcgtggagaca	agcaatcagccccagcatttt	Dβ1.1 Jβ1.5	
Well 53	**C A M R G**	**P F**	**S S N T G K L I F**	Vα14.2	1/44
	tgtgcaatgagag	ggccttt	ctctagcaacacaggcaaactaatcttt	Jα37.2	2.3%
	C S A S	**G D L G I G R**	**Y N E Q F F**	Vβ20.1Dβ1.1Jβ2.1	
	tgcagtgctag	cggggacctaggtataggccgt	tacaatgagcagttcttc		
Well 74	**C A V**	**R**	**S G G Y N K L I F**	Vα1.2Jα4.1	1/44
	tgtgctgt	ccg	ttctggtggctacaataagctgatttt		2.3%
	C S A	**S P G G**	**T D T Q Y F**	Vβ20.1Dβ1.1Jβ2.3	
	tgcagtgct	tctccgggcg	gcacagatacgcagtatttt		
Well 76	**C A**	**V S G R**	**S N Y K L T F**	Vα8.2Jα53.1	1/44
	tgtg	ctgtgagtggtc	gtagcaactataaactgacattt		2.3%
	C A S S L E	**S G S**	**Y E Q Y F**	Vβ5.1Dβ2.2	
	tgcgccagcagcttgg	agagcgggag	ctacgagcagtacttc	Jβ2.7	
Well 78	**C D**	**R P G T L G L G V**	**Q L T F**	Vα1.2Jα28.1	1/44
	tgtg	accgcccggggactctggggctgggagtt	caactcactttc		2.3%
	C S G	**R P T D**	**Y N E Q F F**	Vβ29.1Dβ1.1	
	tgcagcg	gcaggcccacaga	ctacaatgagcagttcttc	Jβ2.1	

Table 29 shows all sequencing data for CD3+CD20+ TCR transcripts in normal donor WM41. Forty-four wells each containing a single cell were sequenced. Eight wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 28). In addition, in a number of wells (24), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 29). All alpha and beta TCR transcripts identified were unique.

TABLE 29. ALL CD3+CD20+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR WM41 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 02	**Y**	**A G G T T Y**	**N Q F Y F**	Vα13.2Jα49.1
	t	atgcaggtggtacaaccta	taaccagttctatttt	
	Vβ chain unavailable			
Well 03	**C A E**	**D R T S**	**N Q F Y F**	Vα13.2Jα49.1
	Tgtgcagag	gatagaacctca	aaccagttctatttt	
	Vβ chain unavailable			
Well 05	**C A A T**		**G G S N Y K L T F**	Vα13.1Jα53.1
	Tgtgcagcaa	cg	ggaggtagcaactataaactgacattt	
	C A S S	**P G C G L T**	**Y N E Q F F**	Vβ6.5Dβ1.1
	Tgtgccagcagt	ccaggttgtgggctcaca	tacaatgagcagttcttc	Jβ2.1
Well 06	**Vα chain unavailable**			
	C A S S L	**L A A**	**S T D T Q Y F**	Vβ5.1Dβ2.1
	Tgcgccagcagctt	actagcggct	agcacagatacgcagtatttt	Jβ2.3
Well 08	**Vα chain unavailable**			
	C A S	**G L G A R C D E E**	**F F**	Vβ5.5Dβ1.1
	tgtgccagc	ggcttgggcgctcggtgcgatgaggag	ttcttt	Jβ1.1
Well 11	**G**	**A P P R R E**	**L T F**	Vα21.1Jα5.1
	g	gtgctccccccaggagagag	cttactttt	
	Vβ chain unavailable			
Well 19	**C A E**	**D R D**	**N T N A G K S T F**	Vα5.1Jα27.1
	tgtgcaga	gaccgagac	aacaccaatgcaggcaaatcaacctttt	
	C S A R	**S G G Q G R T F**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctaga	tccgggggacaggggaggacctt	caccggggagctgtttttt	Jβ2.2

TABLE 29: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 24	**Vα chain unavailable**			
	C A S S L	**Y D P**	**N T E A F F**	Vβ5.6Dβ1.1J
	tgtgccagcagcttg	tacgatcc	gaacactgaagctttcttt	β1.1
Well 27	**Vα chain unavailable**			
	C A S S Q G	**P G L A G N**	**T D T Q Y F**	Vβ14.1Dβ2.1
	tgtgccagcagccaag	gaccgggactagcggggaa	cacagatacgcagtatttt	Jβ2.3
Well 29	**C A V**	**P**	**S G G S Y I P T F**	Vα2.1Jα6.1
	tgtgctgtg	c	catcaggaggaagctacatacctacattt	
	Vβ chain unavailable			
Well 30	**Vα chain unavailable**			
	C A S	**C L V P T L**	**N E K L F F**	Vβ11.1Dβ2.1
	tgtgccagc	tgcttagtacctaccct	taatgaaaaactgtttttt	Jβ1.4
Well 31	**C A**	**V T H**	**N Y G Q N F V F**	Vα8.2Jα26.1
	tgtg	ctgtgaccc	ataactatggtcagaattttgtcttt	
	C A S R	**A T G L G D**	**N E Q F F**	Vβ3.1Dβ2.1
	tgtgccagcag	ggctacgggactagggg	acaatgagcagttcttc	Jβ2.1
Well 33	**C A E N S**	**P S**	**N Q F Y F**	Vα13.2Jα49.1
	tgtgcagagaata	gcccctca	aaccagttctatttt	
	Vβ chain unavailable			
Well 37	**Vα chain unavailable**			
	C A S S V	**R G L D A**	**E A F F**	Vβ9.1Dβ2.2
	Tgtgccagcagcgt	tagagggctagacg	ctgaagctttcttt	Jβ1.1
Well 39	**C A M R E A**	**L V I**	**G G S Q G N L I F**	Vα14.2
	tgtgcaatgagagagg	ccctcgtgata	ggaggaagccaaggaaatctcatcttt	Jα42.1
	Vβ chain unavailable			
Well 43	**C A V**		**Q T G A N N L F F**	Vα21.1
	tgtgctgt		acaaactggggcaaacaacctcttcttt	Jα36.1
	Vβ chain unavailable			
Well 48	**Vα chain unavailable**			
	C A S S L	**Y D P**	**N T E A F F**	Vβ5.5Dβ1.1
	tgtgccagcagcttg	tacgatccc	aacactgaagctttcttt	Jβ1.1
Well 50	**Vα chain unavailable**			
	C S A S	**A G Y**	**N E K L F F**	Vβ20.1Dβ2.2
	tgcagtgctag	tgcgggata	taatgaaaaactgtttttt	Jβ1.4

TABLE 29: CONTINUED

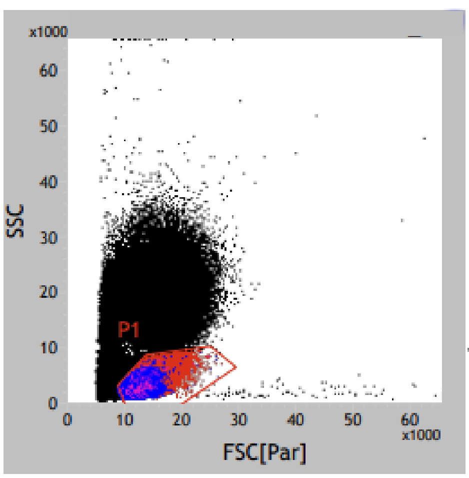
Single Cell	V segment	N / D segment	J segment	Transcript
Well 51	**C A E S** tgtgcagaga	**N E** gtaatgag	**S G G G A D G L T F** tcaggaggaggtgctgacggactcaccttt	Vα5.1Jα45.1
	C A S S Q D tgtgccagcagccaaga	**H W I V** cactggatagtgc	**S Y N E Q** tcctacaatgagcag	Vβ14.1Dβ1.1 Jβ2.1
Well 52	**C A V V** tgtgctgtgg	**G** tgggg	**A S G G S Y I P T F** gcatcaggaggaagctacatacctacattt	Vα2.1Jα6.1
	C A S S I tgtgccagtagtata	**A G R K G V E T** gcagggaggaaaggcgtggagaca	**S N Q P Q H F** agcaatcagccccagcattt	Vβ19.1 Dβ1.1 Jβ1.5
Well 53	**C A M R G** Tgtgcaatgagag	**P F** ggccttt	**S S N T G K L I F** ctctagcaacacaggcaaactaatcttt	Vα14.2Jα37.2
	C S A S Tgcagtgctag	**G D L G I G R** cggggacctaggtataggccgt	**Y N E Q F F** tacaatgagcagttcttc	Vβ20.1 Dβ1.1 Jβ2.1
Well 54	**C A Y R S A** tgtgcttataggagcg	**I S Q C R G** cgatttcacaatgcaggg	**K S T F** gcaaatcaacccttt	Vα38.2 Jα27.1
	Vβ chain unavailable			
Well 57	**C A E N S** Tgtgcagagaata	**P S** gcccctca	**N Q F Y F** aaccagttctatttt	Vα13.2 Jα49.1
	W tg	**P A A L I Q** gccagcagctttaatacag	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ5.1Dβ1.1 Jβ2.1
Well 58	**C** tgt	**L G T T H G** ctgggcaccacccacggg	**Q G G S E K L V F** cagggcggatctgaaaagctggtcttt	Vα35.1 Jα57.1
	Vβ chain unavailable			
Well 61	**C V G** tgtgtgg	**S V** ggagcgta	**G G Y N K L I F** ggtggctacaataagctgattttt	Vα10.1Jα4.1
	Vβ chain unavailable			
Well 65	**C A E N S** Tgtgcagagaata	**P S** gcccctca	**N Q F Y F** aaccagttctatttt	Vα13.2Jα49.1
	Vβ chain unavailable			
Well 67	**Vα chain unavailable**			
	C A S S Tgtgccagcagc	**T N T G S** accaatacagggtcc	**G A N V L T F** ggggccaacgtcctgactttc	Vβ7.9Dβ1.1 Jβ2.6
Well 72	**C A E N** Tgtgcagagaat	**P P L G F S D G** cctccgctagggttttcagatggc	**K L L F** aagctgctcttt	Vα13.2 Jα16.1
	Vβ chain unavailable			
Well 73	**C** tgt	**L L G** cttctgggc	**T S Y D K V I F** acctcctacgacaaggtgatattt	Vα6.1Jα50.1
	Vβ chain unavailable			

TABLE 29: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 74	**C A V** tgtgctgt	**R** ccg	**S G G Y N K L I F** ttctggtggctacaataagctgatttt	Vα1.2Jα4.1
	C S A Tgcagtgct	**S P G G** tctccgggcg	**T D T Q Y F** gcacagatacgcagtatttt	Vβ20.1Dβ1.1 Jβ2.3
Well 75	**C A** tgtgca	**P P** ccccct	**E Y G N K L V F** gaatatggaaacaaactggtcttt	Vα27.1Jα47.1
	Vβ chain unavailable			
Well 76	**C A** Tgtg	**V S G R** ctgtgagtggtc	**S N Y K L T F** gtagcaactataaactgacattt	Vα8.2Jα53.1
	C A S S L E tgcgccagcagcttgg	**S G S** agagcgggag	**Y E Q Y F** ctacgagcagtacttc	Vβ5.1Dβ2.2 Jβ2.7
Well 78	**C D** tgtg	**R P G T L G L G V** accgcccggggactctggggctgggagtt	**Q L T F** caactcactttc	Vα1.2Jα28.1
	C S G tgcagcg	**R P T D** gcaggcccacaga	**Y N E Q F F** ctacaatgagcagttcttc	Vβ29.1Dβ1.1 Jβ2.1
Well 80	**C A E N** Tgtgcagagaat	**P P L G F S D G** cctccgctagggttttcagatggc	**Q K L L F** cagaagctgctcttt	Vα13.1 Jα16.1
	Vβ chain unavailable			

FIGURE 16. HUMAN PBMCS FROM NORMAL DONOR BM61 WERE SINGLE CELL SORTED FOR CD3+CD20+ T CELLS USING VRM RT-PCR.

Figure 16 shows the stain and sort of human PBMCs from normal donor BM61 (a Black Male 61 years old) stained with CD3-FITC and CD20-eFluor780. Lymphocytes were selected as the parent population P1 (gated in the top left histogram) for sorting by the BD FACS Influx Cell Sorter. CD3+ T cells (population P4) were further selected as the parent population for CD8+CD20+ T cells (population P5). Sorting statistics show that CD3+CD8+CD20+ T cells represented 1.51% of the parent CD3+ population.



Populations	Events	% Total	% Parent
All Events	113,833	100.00%	####
P1	24,429	21.46%	21.46%
P2	2,512	2.21%	10.28%
P4	9,113	8.01%	37.30%
P5	138	0.12%	1.51%

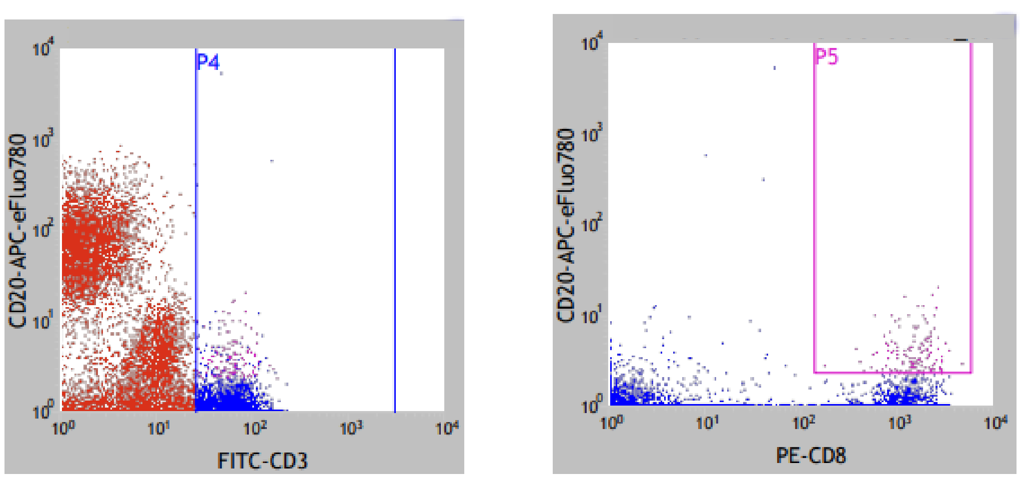


Table 30 shows the identify and frequency of alpha-beta TCR transcripts determined from the total number of alpha- and beta- chain TCR sequences identified in single cells after Variable region multiplex single cell polymerase chain reaction from PBMC in normal donor BM61 (a Black Male 61 years old); all paired CD3+CD20+ TCR transcripts identified in BM61 were unique.

TABLE 30. PAIRED CD3+CD8+CD20+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS USING THE VRM SINGLE CELL RT-PCR METHOD IN NORMAL MALE DONOR BM61

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete αβchain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 10	**C A V** tgtgctgtg	**G D F R R R** ggagacttcaggaggagg	**A D G L T F** gctgacggactcaccttt	Vα1.3Jα45.1	(1/52) 1.9%
	C A S S L A tgtgccagcagcttgg	**S S G G L** cttctagcgggggttg	**S Y E Q Y F** tcctacgagcagtacttc	Vβ5.6Dβ2.1Jβ2.7	
Well 14	**C A** tgtgcc	**T A K** accgcca	**E T S G S R L T F** aagaaaccagtggctctaggttgaccttt	Vα39.1Jα58.1	(1/52) 1.9%
	C A S tgcgccagc	**I L E L D G K V G** atcttggagcttgatggaaaggtgggg	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ5.1Dβ1.1 Jβ2.1	
Well 27	**C L L G V** Tgtcttctgggag	**S** taagt	**G T Y K Y I F** ggaacctacaaatacatcttt	Vα40.1Jα40.1	(1/52) 1.9%
	C A S R Tgtgccagcag	**G E R G H** gggggagagggggcat	**T D T Q Y F** acagatacgcagtatttt	Vβ5.8Dβ1.1Jβ2.3	
Well 39	**C A Y R S A** tgtgcttataggagcg	**G** ctgg	**F G N E K L T F** ctttggaaatgagaaattaacttt	Vα38.2Jα48.1	(1/52) 1.9%
	C A S S Q tgcgccagcagccaa	**E A D** gaggcggat	**S G N T I Y F** tctggaaacaccatatatttt	Vβ4.2Dβ1.1Jβ1.3	
Well 45	**C V V S** Tgtgttgtgagt	**P P R** cccccccgt	**G Y N K L I F** ggctacaataagctgattttt	Vα8.2Jα4.1	(1/52) 1.9%
	C A S S E tgtgccagcagtga	**V G P D K** ggtagggccggaca	**P Q H F** agccccagcatttt	Vβ25.1Dβ1.1 Jβ1.5	
Well 50	**C A V R** tgtgctgtgag	**P L S** accgctttct	**G R R K Q T T F** gggaggaggaaacaaactaccttt	Vα3.1Jα10.1	(1/52) 1.9%
	C A S S Q E tgtgccagcagccaaga	**T G L Q** aacaggacta	**Q P Q H F** cagccccagcatttt	Vβ3.1Dβ2.1Jβ1.5	

TABLE 30: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Well 52	**C A** Tgtgct	**T R G** accagggg	**D M R F** tgacatgcgcttt	Vα19.1Jα43.1	(1/52) 1.9%
	C A S S L tgtgccagcagttta	**T R R** actcgtcgg	**Q E T Q Y F** caagagacccagtacttc	Vβ12.3Dβ1.1 Jβ2.5	
Well 53	**C A** Tgtgc	**P G** tcctggg	**Q A G T A L I F** caggcaggaactgctctgatcttt	Vα24.1Jα15.1	(1/52) 1.9%
	C E tgtg	**H L V Q G R N E E H** agcacctcgtccaggggcggaacgaggagc	**T F** acaccttc	Vβ7.6Dβ1.1Jβ1.2	
Well 63	**C A A R** tgtgcagcaag	**L L N A G Y** actccttaatgctggct	**N R K L I W** acaaccgtaagctgatttgg	Vα13.1Jα38.1	1/52 1.9%
	C A Tgtgc	**S R Y S G** gagcagatactctggc	**Y G Y T F** tatggctacaccttc	Vβ6.4Dβ1.1Jβ1.2	
Well 74	**C I** tgcatc	**R G** agggga	**S N Y Q L I W** agcaactatcagttaatctgg	Vα26.2Jα33.1	1/52 1.9%
	C A S S tgtgccagcagc	**P L S S R R D R A** ccccttagttcgcgccgggacagggca	**Y E Q Y F** tacgagcagtacttc	Vβ5.5Dβ1.1 Jβ2.7	

Table 31 shows all sequencing data for CD3+CD8+CD20+ TCR transcripts in normal donor BM61. Fifty-two wells each containing a single cell were sequenced. Ten wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 30). In addition, in a number of wells (32), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 31). All alpha and beta TCR transcripts identified were unique.

TABLE 31. ALL CD3+CD20+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN NORMAL DONOR BM61 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**C A V** tgtgctgtg	**G T** gggacg	**N N A R L M F** aacaatgccagactcatgttt	Vα1.2Jα31.1
	Vβ chain unavailable			
Well 02	**C A V** tgtgctgt	**V** cgtc	**S N D Y K L S F** tctaacgactacaagctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			
Well 03	**C A V R E** tgtgctgtgagaga		**Y S S A S K I I F** gtacagcagtgcttccaagataatcttt	Vα3.1Jα3.1
	Vβ chain unavailable			
Well 07	**C A** tgtg	**V T P P G** ctgtgacccccccggga	**G G S Q G N L I F** ggaggaagccaaggaaatctcatcttt	Vα8.2Jα8.4
	Vβ chain unavailable			
Well 10	**C A V** tgtgctgtg	**G D F R R R** ggagacttcaggaggagg	**A D G L T F** gctgacggactcaccttt	Vα1.3Jα45.1
	C A S S L A tgtgccagcagcttgg	**S S G G L** cttctagcgggggttg	**S Y E Q Y F** tcctacgagcagtacttc	Vβ5.6Dβ2.1 Jβ2.7
Well 14	**C A** tgtgcc	**T A K** accgcca	**E T S G S R L T F** aagaaaccagtggctctaggttgaccttt	Vα39.1Jα58.1
	C A S tgcgccagc	**I L E L D G K V G** atcttggagcttgatggaaaggtgggg	**S Y N E Q F F** tcctacaatgagcagttctt c	Vβ5.1Dβ1.1 Jβ2.1
Well 18	**C G** tgtg	**K M** ggaaga	**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2Jα33.1
	Vβ chain unavailable			
Well 24	**C A G G** tgtgcaggag	**S** ggag	**A G G T S Y G K L T F** tgctggtggtactagctatggaaagctgacattt	Vα27.3Jα52.1
	Vβ chain unavailable			
Well 26	**C L L G V** tgtcttctgggag	**S** taagt	**G T Y K Y I F** ggaacctacaaatacatcttt	Vα40.1Jα40.1
	Vβ chain unavailable			

TABLE 31: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 27	**C L L G V** tgtcttctgggag	**S** taagt	**G T Y K Y I F** ggaacctacaaatacatcttt	Vα40.1Jα40.1
	C A S R tgtgccagcag	**G E R G H** gggggagagggggcat	**T D T Q Y F** acagatacgcagtatttt	Vβ5.8Dβ1.1Jβ2.3
Well 28	**C A V R A** tgtgctgtgagag	**D** cgg	**S G G Y Q K V T F** attctggggttaccagaaagttacctt	Vα3.1Jα13.2
	Vβ chain unavailable			
Well 29	**C A V R** tgtgccgtga	**G** gggg	**A R L M F** tgccagactcatgttt	Vα8.1Jα31.1
	Vβ chain unavailable			
Well 30	**C I** tgcatcc	**P F** ccttt	**S G G G A D G L T F** tcaggaggaggtgctgacggactcccttt	Vα26.2Jα45.1
	Vβ chain unavailable			
Well 33	**C A A** tgtgcag	**R R** cccgacgg	**N T G N Q F Y F** aacaccggtaaccagttctatttt	Vα27.1Jα49.1
	Vβ chain unavailable			
Well 34	**C I V R V A** tgcatcgtcagagtcg	**L** cacta	**S N F G N E K L T F** tctaactttggaaatgagaaattaaccttt	Vα26.1Jα49.1
	Vβ chain unavailable			
Well 35	**C A V G A** tgtgctgtgggtgc		**G G G G G A D G L T F** aggaggaggaggaggtgctgacggactcaccttt	Vα8.3Jα45.1
	Vβ chain unavailable			
Well 37	**C A E** Tgtgcagag	**P** cct	**T S G T Y K Y I F** acctcaggaacctacaaatacatcttt	Vα13.2Jα40.1
	Vβ chain unavailable			
Well 38	**C A V R** tgtgccgtga	**W G** ggtgggg	**A G N M L T F** tgcaggcaacatgctcaccttt	Vα8.1Jα39.1
	Vβ chain unavailable			
Well 39	**C A Y R S A** tgtgcttataggagcg	**G** ctgg	**F G N E K L T F** ctttggaaatgagaaattaaccttt	Vα38.2Jα48.1
	C A S S Q tgcgccagcagccaa	**E A D** gaggcggat	**S G N T I Y F** tctggaaacaccatatatttt	Vβ4.2Dβ1.1 Jβ1.3
Well 40	**C A V** tgtgctgt	c	**Q T G A N N L F F** caaactggggcaaacaacctcttcttt	Vα1.2Jα36.1
	Vβ chain unavailable			

TABLE 31: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 41	**C A A**	**R R**	**T G N Q F Y F**	Vα27.1Jα49.1
	Tgtgcag	cccgacgg	accggtaaccagttctatttt	
	Vβ chain unavailable			
Well 42	**C A L S E**	**K F**	**G F G N V L H C**	Vα19.1Jα35.1
	tgtgctctgagtgag	aaattc	ggctttgggaatgtgctgcattgc	
	Vβ chain unavailable			
Well 45	**C V V S**	**P P R**	**G Y N K L I F**	Vα8.2Jα4.1
	tgtgttgtgagt	cccccccgt	ggctacaataagctgattttt	
	C A S S E	**V G P D K**	**P Q H F**	Vβ25.1Dβ1.1 Jβ1.5
	tgtgccagcagtga	ggtagggccggaca	agccccagcatttt	
Well 50	**C A V R**	**P L S**	**G R R K Q T T F**	Vα3.1Jα10.1
	Tgtgctgtgag	accgctttct	gggaggaggaaacaaactaccttt	
	C A S S Q E	**T G L Q**	**Q P Q H F**	Vβ3.1Dβ2.1Jβ1.5
	tgtgccagcagccaaga	aacaggacta	cagccccagcatttt	
Well 52	**C A**	**T R G**	**D M R F**	Vα19.1Jα43.1
	Tgtgct	accagggg	tgacatgcgcttt	
	C A S S L	**T R R**	**Q E T Q Y F**	Vβ12.3Dβ1.1 Jβ2.5
	tgtgccagcagttta	actcgtcgg	caagagacccagtacttc	
Well 53	**C A**	**P G**	**Q A G T A L I F**	Vα24.1Jα15.1
	tgtgc	tcctggg	caggcaggaactgctctgatcttt	
	C E	**H L V Q G R N E E H**	**T F**	Vβ7.6Dβ1.1 Jβ1.2
	tgtg	agcacctcgtccaggggcggaacgaggagc	acaccttc	
Well 55	**C A G**	**G P**	**G G F K T I F**	Vα8.3Jα9.1
	tgtgctg	ggggaccc	ggaggcttcaaaactatcttt	
	Vβ chain unavailable			
Well 60	**Vα chain unavailable**			
	C A S S L T	**E G P L**	**N E Q F F**	Vβ7.3Dβ2.2 Jβ2.1
	tgtgccagcagcttaac	ggagggtccctta	aatgagcagttcttc	
Well 62	**C A**	**L R**	**M D S S Y K L I F**	Vα24.1Jα12.1
	tgtgc	tctcc	gatggatagcagctataaattgatcttc	
	Vβ chain unavailable			
Well 63	**C A A R**	**L L N A G Y**	**N R K L I W**	Vα13.1Jα38.1
	tgtgcagcaag	actccttaatgctggct	acaaccgtaagctgatttgg	
	C A	**S R Y S G**	**Y G Y T F**	Vβ6.4Dβ1.1 Jβ1.2
	tgtgc	gagcagatactctggc	tatggctacaccttc	

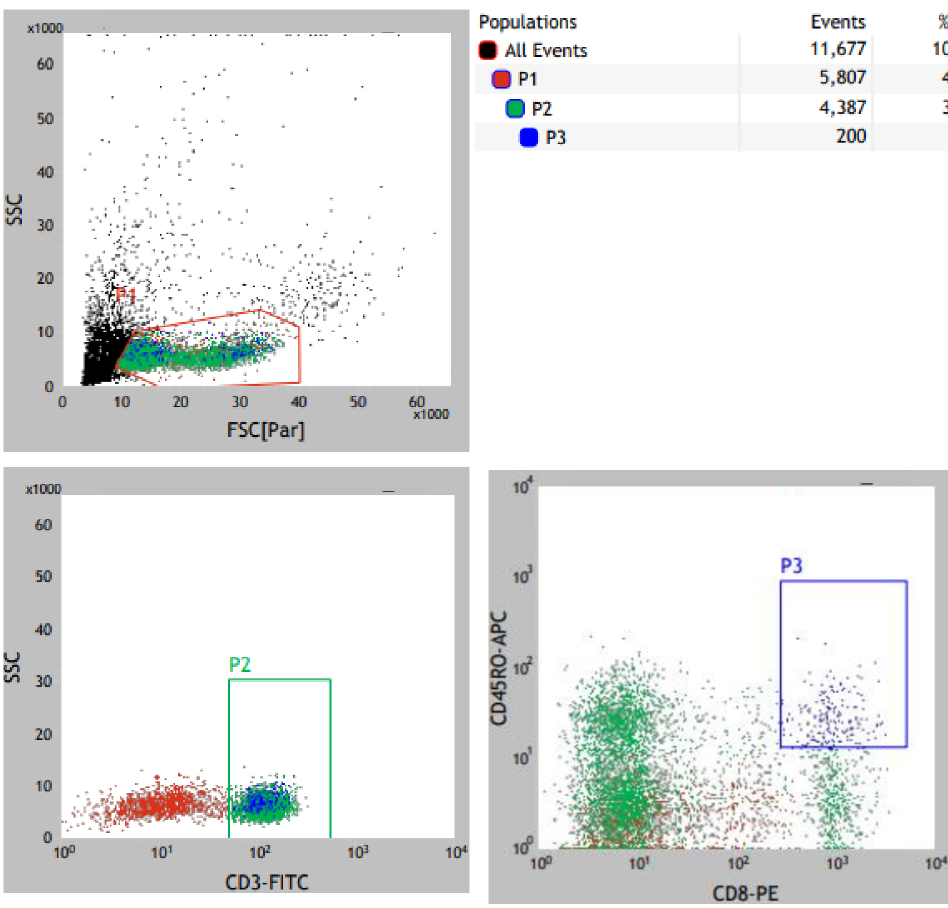
TABLE 31: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well	**C I P**	**F**	**S G G G A D G L T F**	Vα26.2Jα45.1
66	Tgcatcc	cctt	ttcaggaggaggtgctgacggactcaccttt	
	Vβ chain unavailable			
Well	**C A V**	**G T**	**N N A R L M F**	Vα1.2Jα31.1
71	Tgtgctgtg	gggacg	aacaatgccagactcatgttt	
	Vβ chain unavailable			
Well	**C I P**	**F**	**S G G G A D G L T F**	Vα26.2Jα45.1
72	tgcatcc	cctt	ttcaggaggaggtgctgacggactcaccttt	
	Vβ chain unavailable			
Well	**C A V R E**	**S**	**N R D D K I I F**	Vα1.2Jα30.1
73	tgtgctgtgagaga	atc	gaacagagatgacaagatcatcttt	
	Vβ chain unavailable			
Well	**C I**	**R G**	**S N Y Q L I W**	Vα26.2Jα33.1
74	tgcatc	agggga	agcaactatcagttaatctgg	
	C A S S	**P L S S R R D R A**	**Y E Q Y F**	Vβ5.5Dβ1.1
	tgtgccagcagc	cccttagttcgcgccgggacagggca	tacgagcagtacttc	Jβ2.7
Well	**C I**	**R G**	**S N Y Q L I W**	Vα26.2Jα33.1
75	tgcatc	agggga	agcaactatcagttaatctgg	
	Vβ chain unavailable			
Well	**C A V K**		**N T G N Q F Y F**	Vα41.1Jα49.1
76	Tgtgctgtca	a	gaacaccggtaaccagttctatttt	
	Vβ chain unavailable			
Well	**C A V R**	**V**	**D Y K L S F**	Vα8.1Jα20.1
77	Tgtgccgtga	gggt	cgactacaagctcagcttt	
	Vβ chain unavailable			
Well	**C A**	**V I S R**	**L T G G G N K L T F**	Vα8.2Jα10.1
80	tgtg	gtgatttctagg	ctcacgggaggaggaaacaaactcaccttt	
	Vβ chain unavailable			
Well	**C A**	**G L P G**	**G T S Y G K L T F**	Vα16.1Jα52.1
81	tgtgct	gggctaccagg	ggtactagctatggaaagctgacattt	
	Vβ chain unavailable			
Well	**C A L S E A**	**G G**	**T D K L I F**	Vα19.1Jα34.1
84	tgtgctctgagtgaggc	gggcgg	caccgacaagctcatcttt	
	Vβ chain unavailable			
Well	**C A**	**V S L**	**S Y N T D K L I F**	Vα8.2Jα34.1
86	Tgtg	ctgtgagtcta	tcttataacaccgacaagctcatcttt	
	Vβ chain unavailable			

TCR V-ALPHA AND V-BETA CHAINS WERE IDENTIFIED IN CD3+CD8+CD45RO+ AND CD3+CD20+ T CELLS FROM HUMAN PBMCS IN PATIENTS WITH RELAPSING-REMITTING MS USING SINGLE CELL VRM RT-PCR AND SEQUENCING (SPECIFIC AIM #2B).

T cell populations from the peripheral blood, primarily CD3+CD8+CD45RO+ and CD3+CD20+ T cells, were studied in patients with relapsing forms of MS and compared to similar studies from CD3+CD8+CD45RO+ and CD3+CD20+ T cells populations in normal donor PBMC. Clonally expanded memory T cells were identified in both alpha- and beta- chain TCR from patients with RRMS. Results are described below.

FIGURE 17. HUMAN PBMCS FROM AN MS PATIENT RRMS3409 WERE SINGLE CELL SORTED FOR CD3+CD8+CD45RO+ T CELLS USING VRM RT-PCR. Figure 17 shows a sample of human PBMCs from a patient with relapsing remitting multiple sclerosis, RRMS3409, stained with CD3-FITC, CD8-PE, and CD45RO-APC. Gate P1 (top left histogram), displays the parent population (P1) of lymphocytes which were used to gate CD3+ T cells labeled as CD3-FITC (P2 shown in the bottom left histogram). CD3+CD8+CD45RO+ T cells were selected for single cell sort (bottom right histogram) using a BD FACS Influx cell sorting instrument. Statistics show that CD3+CD8+CD45RO + T cells represented 4.56% of the parent population.



Populations	Events	% Total	% Parent
All Events	11,677	100.00%	####
P1	5,807	49.73%	49.73%
P2	4,387	37.57%	75.55%
P3	200	1.71%	4.56%

Table 32 shows clonally expanded CD3+ CD8+ CD45RO+ TCR alpha- chain transcripts identified in single cells after VRM RT-PCR from an MS patient RRMS3409. One of the clonally expanded alpha-chain TCR transcripts identified, Vα1.2Jα20.1, appeared at a high frequency, over 20% of occurrences, as determined by the total number of alpha-chains identified; this was statistically significant with a p value <0.0001. Another clonally expanded alpha chain TCR transcript, Vα1.2Jα33.1 also appeared at a high frequency, more than 11.4%, of the TCR alpha chains identified and was significant with a p value of 0.0142.

TABLE 32. IDENTICAL ALPHA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN MS PATIENT RRMS3409

αTCR	V segment	N segment	J segment	Transcript	Frequency α TCR	P value
Wells 38,39, 46,54, 55,56, 64	**C A V M** tgtgctgtga	**D G** tggatggg	**D Y K L S F** gactacaagctcagcttt	Vα1.2 Jα20.1	7/35 20%	<0.0001
Wells 69,70, 78,87	**C A V R D** tgtgctgtgagaga	**S** tag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2 Jα20.1	4/35 11.4%	0.0142
Wells 25,51 74	**C A V R D** tgtgctgtgagaga		**S N Y Q L I W** tagcaactatcagttaatctgg	Vα1.2 Jα33.1	3/35 8.6%	0.0604
Wells 18, 26,47	**C A V M** tgtgctgtga		**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2 Jα33.1	3/35 8.6%	0.0604
Wells 50,59 60	**C A** tgtgct		**K A A G N K L T F** aaagctgcaggcaacaagctaactttt	Vα1.2 Jα17.1	3/35 8.6%	0.0604
Wells 61,63	**C A V R** tgtgctgtgag	**D G** ggatggg	**D Y K L S F** gactacaagctcagcttt	Vα1.2J α20.1	2/35 5.7%	0.186
Wells 65,66	**C A V S D** tgtgctgtgagtga	**G** cgg	**G G G A D G L T F** aggaggaggtgctgacggactcaccttt	Vα8.2 Jα45.1	2/35 5.7%	0.186

Table 33 shows clonally expanded CD3+ CD8+ CD45RO+ TCR beta- chain transcripts identified in single cells after VRM RT-PCR from an MS patient RRMS3409. Two clonally expanded beta-chain TCR transcripts were identified, Vβ20.1Dβ1.1 Jβ2.2 and Vβ20.1Dβ2.2Jβ2.5, both of which appeared at a high frequency, over 16.7% of occurrences, as determined by the total number of beta-chains identified; each was statistically significant with a p value of 0.0025.

TABLE 33. IDENTICAL BETA TCR CHAINS IN CD3+CD8+CD45RO+ SINGLE CELL TCR FROM PBMCS IN MS PATIENT RRMS3409

βTCR	V segment	N / D segment	J segment	Transcript	Frequency	P value
Wells 67,66 74,75 77	**C S A R D** tgcagtgctagaga	**V G Q G** cgtggggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1 Dβ1.1 Jβ2.2	5/30 16.7%	0.0025
Wells 08,46 54, 55, 63	**C S A R** tgcagtgctaga	**L A G G** ctagcgggaggc	**Q E T Q Y F** caagagacccagtacttc	Vβ20.1 Dβ2.2 Jβ2.5	5/30 16.7%	0.0025

Table 34 shows the frequency of paired CD3+CD8+CD45RO+ TCR transcripts in a patient with RRMS, RRMS3409, determined from the total number of alpha- and beta- chain TCR sequences identified in single cells after VRM RT-PCR. One alpha- and beta- chain TCR pair exhibited clonal expansion Vα1.2Jα20.1 Vβ20.1Dβ2.2 Jβ2.5 identified 3/65 transcripts with a frequency of 4.6% determined from the total alpha and beta chains identified.

TABLE 34. PAIRED CD3+CD8+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS IN AN MS PATIENT RRMS3409 USING THE VRM SINGLE CELL RT-PCR METHOD

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 46, 54, 55	**C A V M** tgtgctgtga	**D G** tggatggg	**D Y K L S F** gactacaagctcagcttt	Vα1.2Jα20.1	3/65 4.6%
	C S A R tgcagtgctaga	**L A G G** ctagcgggaggc	**Q E T Q Y F** caagagacccagtacttc	Vβ20.1Dβ2.2 Jβ2.5	p=0.061
Well 08	**C A V** tgtgctgt	**L S S** cctatccag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2Jα20.1	1/65 1.5%
	C S A R tgcagtgctaga	**L A G G Q E A** ctagcgggaggccaagagg	**Q Y F** cccagtacttc	Vβ20.1Dβ2.2 Jβ2.5	
Well 12	**C A V** tgtgctgt	**L S** cctatcc	**N D Y K L S F** aacgactacaagctcagcttt	Vα1.2Jα20.1	1/65 1.5%
	C A S S E A tgtgccagcagtgaagc	**R G** aggggg	**L M K N L F F** ctaatgaaaaacctgtttttt	Vβ6.1Dβ1.1 Jβ1.1	
Well 30	**C A V R** tgtgctgtgaga		**E L K F** gaactcaaattc	Vα1.2Jα41.1	1/65 1.5%
	C A S S tgtgccagcag	**P L R E T** tccactacgggaaa	**Y E Q Y F** cctacgagcagtacttc	Vβ7.9Dβ2.2 Jβ2.7	
Well 38	**C A V M** tgtgctgtga	**D G** tggatggg	**D Y K L S F** gactacaagctcagcttt	Vα1.2Jα20.1	1/65 1.5%
	C A W N tgtgcctgga	**N W G** actggggg	**S Y E Q Y F** tcctacgagcagtacttc	Vβ30.1Dβ1.1 Jβ2.7	
Well 39	**C A V M** tgtgctgtga	**D G** tggatggg	**D Y K L S F** gactacaagctcagcttt	Vα1.2Jα20.1	1/65 1.5%
	C A S S L A tgcgccagcagcttgg	**R Q G N** ctcggcagggca	**Q E T Q Y F** accaagagacccagtacttc	Vβ5.1Dβ1.1 Jβ2.5	
Well 42	**C A V R G** tgtgctgtgagag	**H** ggtca	**Y N T D K L I F** ttataacaccgacaagctcatcttt	Vα3.1Jα34.1	1/65 1.5%
	C A S S L A tgtgccagcagcttagc	**E G P I** ggagggtcccat	**A K N I Q Y F** agccaaaaacattcagtacttc	Vβ7.8 Dβ2.2 Jβ2.4	
Well 45	**C A V S** tgtgctgtgag	**G** cggc	**G Y S T L T F** ggatacagcaccctcaccttt	Vα1.2Jα11.1	1/65 1.5%
	C A S S tgtgccagcagc	**Q D R S T** caagacaggagcacc	**G E L F F** ggggagctgtttttt	Vβ5.5Dβ1.1 Jβ2.2	
Well 47	**C A V M** tgtgctgtga		**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2Jα33.1	1/65 1.5%
	C S A R tgcagtgctaga		**A K N I Q Y F** gccaaaaacattcagtacttc	Vβ20.1 Jβ2.4	

TABLE 34: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	
Well	**C A V R**	**D G**	**D Y K L S F**	Vα1.2Jα20.1	1/65
61	tgtgctgtgag	gggatggg	gactacaagctcagcttt		1.5%
	C S A S	**E R**	**N T G E L F F**	Vβ20.1Dβ2.1	
	tgcagtgctag	cgagcg	gaacaccggggagctgtttttt	Jβ2.2	
Well	**C A V M**	**D R**	**D Y K L S F**	Vα1.2Jα20.1	1/65
62	tgtgctgtga	tggatagg	gactacaagctcagcttt		1.5%
	C A S S L E	**A S G S R**	**N E Q F F**	Vβ5.6Dβ2.1	
	tgtgccagcagcttgg	aggctagcgggagtagg	aatgagcagttcttc	Jβ2.2	
Well	**C A V R**	**D G**	**D Y K L S F**	Vα1.2Jα20.1	1/65
63	tgtgctgtgag	gggatggg	gactacaagctcagcttt		1.5%
	C S A R	**L A G G**	**Q E T Q Y F**	Vβ20.1Dβ2.2	
	tgcagtgctaga	ctagcgggaggc	caagagacccagtacttc	Jβ2.5	
Well	**C A V S D**	**G**	**G G G A D G L T F**	Vα8.2Jα45.1	1/65
65	tgtgctgtgagtga	cgg	aggaggaggtgctgacggactcaccttt		1.5%
	C S A	**R G W G R G R**	**G E L F F**	Vβ20.1Dβ1.1	
	tgcagtgc	aagaggatggggcaggggaaga	ggggagctgtttttt	Jβ2.2	
Well	**C A V S D**	**G**	**G G G A D G L T F**	Vα8.2Jα45.1	1/65
66	tgtgctgtgagtga	cgg	aggaggaggtgctgacggactcaccttt		1.5%
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1	
	tgcagtgctagaga	cgtggggcagggt	accggggagctgtttttt	Jβ2.2	
Well	**C A**	**L C A G G G G A D K**	**L N F**	Vα8.2Jα60.1	1/65
67	tgtgct	ttgtgtgccggaggaggaggagccgacaaa	ctcaacttt		1.5%
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1	
	tgcagtgctagaga	cgtggggcagggt	accggggagctgtttttt	Jβ2.2	
Well	**C A V R**	**D**	**R D D K I I F**	Vα1.2Jα30.1	1/65
79	tgtgctgtgag	Ggat	agagatgacaagatcatcttt		1.5%
	C A S S L A	**G A**	**S Y E Q Y F**	Vβ12.3Dβ2.2	
	tgtgccagcagtttagc	gggagc	ctcctacgagcagtacttc	Jα2.7	
Well	**C A Y N**	**G**	**G G S Q G N L I F**	Vα38.2Jα42.1	1/65
80	tgtgcttata	acgg	tggaggaagccaaggaaatctcatcttt		1.5%
	C A S S L A	**E A P E S S F**	**S G A N V L**	Vβ12.3	
	tgtgccagcagtttagc	ggaggctccagagagcagcttt	tctggggccaacgtcctg	Dβ2.2	
				Jα2.7	

Table 35 shows all sequencing data for CD3+CD8+CD45RO+ TCR transcripts in an MS patient, RRMS3409. Sixty-five wells each containing a single cell were sequenced. Nineteen wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 34). In addition, in a number of wells (25), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 35). One alpha- and beta- chain TCR pair exhibited clonal expansion Vα1.2Jα20.1 Vβ20.1Dβ2.2 Jβ2.5 and appeared three times (wells 46, 54, and 55).

TABLE 35. ALL CD3+CD8+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN PBMC OF MS PATIENT RRMS3409 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 04	**Vα chain unavailable**			
	C A S S Y tgtgccagcagttac	**Q P** caac	**G A N V L T F** ctggggccaacgtcctgactttc	Vβ6.2Dβ1.1 Jβ2.6
Well 08	**C A V** tgtgctgt	**L S S** cctatccag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2Jα20.1
	C S A R tgcagtgctaga	**L A G G** ctagcgggaggc	**Q E T Q Y F** caagagacccagtacttc	Vβ20.1Dβ2.2 Jβ2.5
Well 12	**C A V** tgtgctgt	**L S** cctatcc	**N D Y K L S F** aacgactacaagctcagcttt	Vα1.2Jα20.1
	C A S S E A tgtgccagcagtgaagc	**R G** aggggg	**L M K N L F F** ctaatgaaaaacctgtttttt	Vβ6.1Dβ1.1 Jβ1.1
Well 16	**C L V G D N** tgcctcgtgggtgaca	**E** acgag	**D T G R R A L T F** gacacgggcaggagagcacttacttt	Vα4.2Jα5.1
	Vβ chain unavailable			
Well 18	**C A V M** tgtgctgtga		**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2Jα33.1
	Vβ chain unavailable			
Well 26	**C A V M** tgtgctgtga		**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2Jα33.1
	Vβ chain unavailable			
Well 28	**Vα chain unavailable**			
	C A tgtgcc	**L E P G G T** ctcgaacctgggggcact	**L F F** ctgtttttt	Vβ7.9Dβ1.1 Jβ2.2
Well 30	**C A V R** tgtgctgtgaga		**E L K F** gaactcaaattc	Vα1.2Jα41.1
	C A S S tgtgccagcag	**P L R E T** tccactacgggaaa	**Y E Q Y F** cctacgagcagtacttc	Vβ7.9Dβ2.2 Jβ2.7
Well 31	**Vα chain unavailable**			
	C A S S tgcgccagcagc	**M A R Q G Q A K** atggcacggcaagggcaggccaaa	**E Q F F** gagcagttcttc	Vβ5.1Dβ1.1 Jβ2.1
Well 32	**Vα chain unavailable**			
	C A S S Y S tgtgccagcagttactc	**G** gga	**S Y E Q Y F** tcctacgagcagtacttc	Vβ6.5Dβ1.1 Jβ2.7

TABLE 35: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 36	**Vα chain unavailable**			
	C A K	**H P V G G P G**	**N E K L F F**	Vβ28.1Dβ2.1
	tgtgcca	agcacccggtgggggaccgggc	aatgaaaaactgtttttt	Jβ1.4
Well 38	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	C A W N	**N W G**	**S Y E Q Y F**	Vβ30.1Dβ1.1
	tgtgcctgga	actggggg	tcctacgagcagtacttc	Jβ2.7
Well 39	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	C A S S L A	**R Q G N**	**Q E T Q Y F**	Vβ5.1Dβ1.1
	tgcgccagcagcttgg	ctcggcagggca	accaagagacccagtacttc	Jβ2.5
Well 42	**C A V R G**	**H**	**Y N T D K L I F**	Vα3.1Jα34.1
	tgtgctgtgagag	ggtca	ttataacaccgacaagctcatcttt	
	C A S S L A	**E G P I**	**A K N I Q Y F**	Vβ7.8Dβ2.2
	tgtgccagcagcttagc	ggagggtcccat	agccaaaaacattcagtacttc	Jβ2.4
Well 45	**C A V S**	**G**	**G Y S T L T F**	Vα1.2Jα11.1
	tgtgctgtgag	cggc	ggatacagcaccctcaccttt	
	C A S S	**Q D R S T**	**G E L F F**	Vβ5.5Dβ1.1
	tgtgccagcagc	caagacaggagcacc	ggggagctgtttttt	Jβ2.2
Well 46	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	C S A R	**L A G G**	**Q E T Q Y F**	Vβ20.1Dβ2.2
	tgcagtgctaga	ctagcgggaggc	caagagacccagtacttc	Jβ2.5
Well 47	**C A V M**		**D S N Y Q L I W**	Vα1.2Jα33.1
	tgtgctgtga		tggatagcaactatcagttaatctgg	
	C S A R		**A K N I Q Y F**	Vβ20.1
	tgcagtgctaga		gccaaaaacattcagtacttc	Jβ2.4
Well 50	**C A**		**K A A G N K L T F**	Vα1.2Jα17.1
	tgtgct		aaagctgcaggcaacaagctaacttt	
	Vβ chain unavailable			
Well 53	**C A V R D**	**T**	**D Y K L S F**	Vα1.2Jα20.1
	tgtgctgtgagaga	tac	cgactacaagctcagcttt	
	Vβ chain unavailable			
Well 54	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	C S A R	**L A G G**	**Q E T Q Y F**	Vβ20.1Dβ2.2
	tgcagtgctaga	ctagcgggaggc	caagagacccagtacttc	Jβ2.5

TABLE 35: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
55	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	C S A R	**L A G G**	**Q E T Q Y F**	Vβ20.1Dβ2.2
	tgcagtgctaga	ctagcgggaggc	caagagacccagtacttc	Jβ2.5
Well	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
56	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	Vβ chain unavailable			
Well	**C A V R E**	**A D**	**K L T F**	Vα1.2Jα10.1
58	tgtgctagtagaga	agccgac	aaactcacctttt	
	Vβ chain unavailable			
Well	**C A**		**K A A G N K L T F**	Vα1.2Jα17.1
59	tgtgct		aaagctgcaggcaacaagctaacttttt	
	Vβ chain unavailable			
Well	**C A**		**K A A G N K L T F**	Vα1.2Jα17.1
60	tgtgct		aaagctgcaggcaacaagctaacttttt	
	Vβ chain unavailable			
Well	**C A V R**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
61	tgtgctgtgag	ggatggg	gactacaagctcagcttt	
	C S A S	**E R**	**N T G E L F F**	Vβ20.1Dβ2.1
	tgcagtgctag	cgagcg	gaacaccggggagctgtttttt	Jβ2.2
Well	**C A V M**	**D R**	**D Y K L S F**	Vα1.2Jα20.1
62	tgtgctgtga	tggatagg	gactacaagctcagcttt	
	C A S S L E	**A S G S R**	**N E Q F F**	Vβ5.6Dβ2.1
	tgtgccagcagcttgg	aggctagcgggagtagg	aatgagcagttcttc	Jβ2.2
Well	**C A V R**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
63	tgtgctgtgag	ggatggg	gactacaagctcagcttt	
	C S A R	**L A G G**	**Q E T Q Y F**	Vβ20.1Dβ2.2
	tgcagtgctaga	ctagcgggaggc	caagagacccagtacttc	Jβ2.5
Well	**C A V M**	**D G**	**D Y K L S F**	Vα1.2Jα20.1
64	tgtgctgtga	tggatggg	gactacaagctcagcttt	
	Vβ chain unavailable			
Well	**C A V S D**	**G**	**G G G A D G L T F**	Vα8.2Jα45.1
65	tgtgctgtgagtga	cgg	aggaggaggtgctgacggactcaccttt	
	C S A	**R G W G R G R**	**G E L F F**	Vβ20.1Dβ1.1
	tgcagtgc	aagaggatggggcaggggaaga	ggggagctgtttttt	Jβ2.2

TABLE 35: CONTINUED

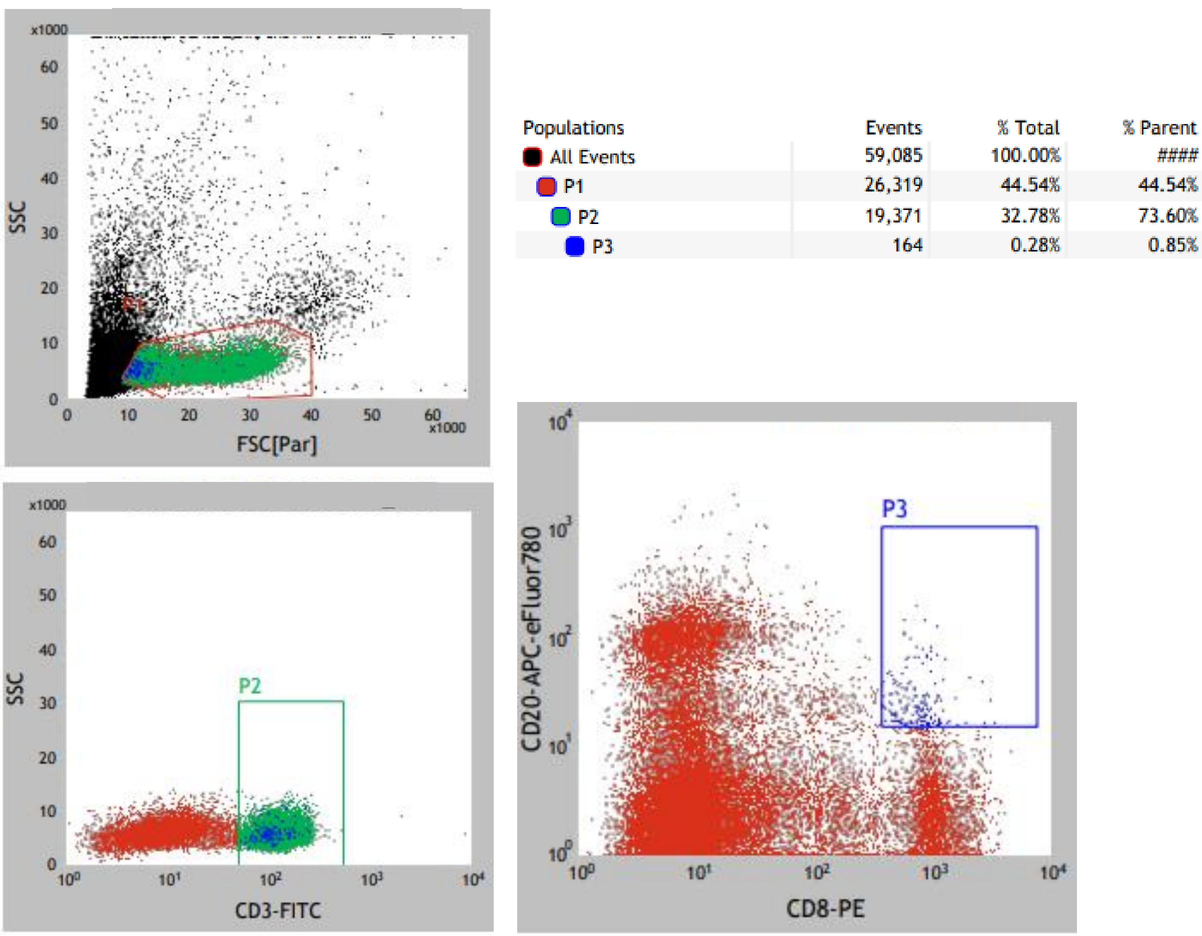
Single Cell	V segment	N / D segment	J segment	Transcript
Well 66	**C A V S D** tgtgctgtgagtga	**G** cgg	**G G G A D G L T F** aggaggaggtgctgacggactcaccttt	Vα8.2Jα45.1
	C S A R D tgcagtgctagaga	**V G Q G** cgtggggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 67	**C A** tgtgct	**L C A G G G G A D K** ttgtgtgccggaggaggaggagccgacaaa	**L N F** ctcaacttt	Vα8.2Jα60.1
	C S A R D tgcagtgctagaga	**V G Q G** cgtggggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 68	**C A V R** tgtgctgtgag	**E S V Y K F** ggaaagcgtctacaagttc	**Y F** tacttt	Vα1.2Jα21.1
	C S A R D tgcagtgctagaga	**V G Q G** cgtggggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 69	**C A V R D** tgtgctgtgagaga	**S** tag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			
Well 70	**C A V R D** tgtgctgtgagaga	**S** tag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			
Well 71	**C A V R** tgtgctgtgaga		**N D Y K L S F** taacgactacaagctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			
Well 74	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtggggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 75	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtggggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 77	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtggggcaggg	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 78	**C A V R D** tgtgctgtgagaga	**S** tag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			

TABLE 35: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 79	**C A V R** tgtgctgtgag	**D** ggat	**R D D K I I F** agagatgacaagatcatcttt	Vα1.2Jα30.1
	C A S S L A tgtgccagcagtttagc	**G A** gggagc	**S Y E Q Y F** ctcctacgagcagtacttc	Vβ12.3Dβ2.2 Jα2.7
Well 80	**C A Y N** tgtgcttata	**G** acgg	**G G S Q G N L I F** tggaggaagccaaggaaatctcatcttt	Vα38.2Jα42.1
	C A S S L A tgtgccagcagtttagc	**E A P E S S F** ggaggctccagagagcagcttt	**S G A N V L** tctggggccaacgtcctg	Vβ12.3 Dβ2.2 Jα2.7
Well 81	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**Q S** caatc	**S Y E Q Y F** ctcctacgagcagtacttc	Vβ7.2Dβ1.1 Jβ2.7
Well 87	**C A V R D** tgtgctgtgagaga	**S** tag	**D Y K L S F** cgactacaagctcagcttt	Vα1.2Jα20.1
	Vβ chain unavailable			
Well 89	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**P S** ccgtc	**S Y E Q Y F** ctcctacgagcagtacttc	Vβ7.2Dβ1.1 Jβ2.7

FIGURE 18. HUMAN PBMCS FROM AN MS PATIENT RRMS3409 WERE SINGLE CELL SORTED FOR CD3+CD20+ T CELLS USING VRM RT-PCR.

Figure 18 shows a sample of human PBMCs from a patient with relapsing remitting multiple sclerosis, RRMS3409, stained with CD3-FITC, CD8-PE, and CD20-efluor 780. Gate P1 (top left histogram), displays the parent population (P1) of lymphocytes which were used to gate CD3+ T cells labeled as CD3-FITC (P2 shown in the bottom left histogram). CD3+CD8+CD20+ T cells were selected for single cell sort (bottom right histogram) using a BD FACS Influx cell sorting instrument. Statistics show that CD8+CD20+ T cells represented 0.85% of the parent population.



Populations	Events	% Total	% Parent
All Events	59,085	100.00%	####
P1	26,319	44.54%	44.54%
P2	19,371	32.78%	73.60%
P3	164	0.28%	0.85%

TABLE 36. PAIRED CD3+CD8+CD20+ TCR TRANSCRIPTS IDENTIFIED FROM HUMAN PBMCS IN AN MS PATIENT RRMS3409 USING THE VRM SINGLE CELL RT-PCR METHOD

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 63	**C G** tgtg	gg	**T G G G N K L T F** acgggaggaggaaacaaactcacctttt	Vα1.2Jα10.1	1/25 4%
	C A S S tgtgccagcagt	**V G T G** gtcgggacaggg	**S T D T Q Y F** agcacagatacgcagtatttt	Vβ12.3Dβ1.1 Jβ2.3	

Table 37 shows clonally expanded CD3+ CD8+ C20+ TCR beta- chain transcripts identified in single cells after VRM RT-PCR from an MS patient RRMS3409. Two clonally expanded beta-chain TCR transcripts were identified, Vβ20.1Dβ1.1 Jβ2.2 and Vβ28.1Dβ2.1Jβ2.7, appearing at a high frequency of 58.3% and 16.7% respectively, as determined by the total number of beta-chains identified; each was statistically significant.

TABLE 37. IDENTICAL BETA TCR CHAINS IN CD3+CD8+CD20+ SINGLE CELL TCR FROM PBMCS IN AN MS PATIENT RRMS3409

βTCR	V segment	N / D segment	J segment	Transcript	Frequency	P value
Wells 12,20 25,26 29,30 31,35 37,38 39,44 47,49	**C S A R D** tgcagtgctagaga	**V G Q** cgtgggcagggt	**G T G E L F F** accggggagctgtttttt	Vβ20.1 Dβ1.1 Jβ2.2	14/24 58.3%	0.0001
Wells 70,78 79,84	**C A S S** tgtgccagcag	**Y S G L S G** ctactccggactctcggg c	**E Q Y F** gagcagtacttc	Vβ28.1 Dβ2.1 Jβ2.7	4/24 16.7%	0.0137
Wells 61,67	**C A S S** tgtgccagcag	**T P H** actccgcac	**S Y E Q Y F** tcctacgagcagtacttc	Vβ28.1 Dβ1.1 Jβ2.7	2/24 8.3%	0.1879
Wells 10,11	**C S V** tgcagcgt	**S T G L** atcgacaggact	**Q E T Q Y F** ccaagagacccagtacttc	Vβ29.1 Dβ1.1 Jβ2.5	2/24 8.3%	0.1879

TABLE 38. ALL CD3+CD20+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN PBMC OF MS PATIENT RRMS3409 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 01	**Vα chain unavailable**			
	C S V E		**Q E T Q Y F**	Vβ29.1
	tgcagcgttgaa		ccaagagacccagtacttc	Jβ2.5
Well 10	**Vα chain unavailable**			
	C S V	**S T G L**	**Q E T Q Y F**	Vβ29.1Dβ1.1
	tgcagcgt	atcgacaggact	ccaagagacccagtacttc	Jβ2.5
Well 11	**Vα chain unavailable**			
	C S V	**S T G L**	**Q E T Q Y F**	Vβ29.1Dβ1.1
	tgcagcgt	atcgacaggact	ccaagagacccagtacttc	Jβ2.5
Well 12	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2
Well 20	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2
Well 25	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2
Well 26	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2
Well 29	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2
Well 30	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2
Well 31	**Vα chain unavailable**			
	C S A R D	**V G Q G**	**T G E L F F**	Vβ20.1Dβ1.1
	tgcagtgctagaga	cgtgggcagggt	accggggagctgtttttt	Jβ2.2

TABLE 38: CONTINUED

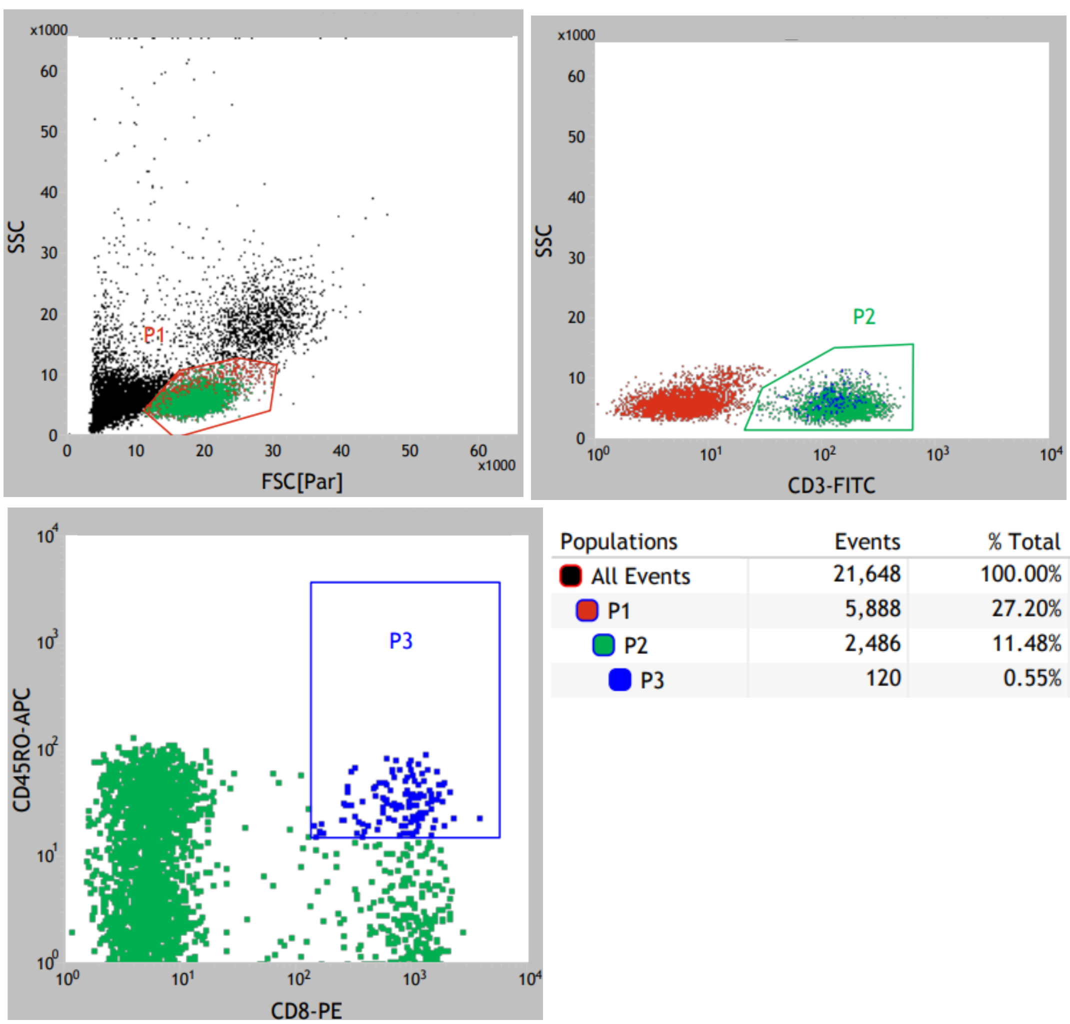
Single Cell	V segment	N / D segment	J segment	Transcript
Well 35	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 37	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 38	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 39	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 44	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 47	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 49	**Vα chain unavailable**			
	C S A R D tgcagtgctagaga	**V G Q G** cgtgggcagggt	**T G E L F F** accggggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 61	**Vα chain unavailable**			
	C A S S tgtgccagcagt	**T P H** actccgcac	**S Y E Q Y F** tcctacgagcagtacttc	Vβ28.1Dβ1.1 Jβ2.7
Well 63	**C G** tgtg	gg	**T G G G N K L T F** acgggaggaggaaacaaactcaccttt	Vα1.2Jα10.1
	C A S S tgtgccagcagt	**V G T G** gtcgggacaggg	**S T D T Q Y F** agcacagatacgcagtatttt	Vβ12.3Dβ1.1 Jβ2.3
Well 67	**Vα chain unavailable**			
	C A S S tgtgccagcag	**T P H** actccgcac	**S Y E Q Y F** tcctacgagcagtacttc	Vβ28.1Dβ1.1 Jβ2.7

TABLE 38: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 70	**Vα chain unavailable**			
	C A S S	**Y S G L S G**	**E Q Y F**	Vβ28.1Dβ2.1
	tgtgccagcag	ctactccggactctcgggc	gagcagtacttc	Jβ2.7
Well 78	**Vα chain unavailable**			
	C A S S	**Y S G L S G**	**E Q Y F**	Vβ28.1Dβ2.1
	tgtgccagcag	ctactccggactctcgggc	gagcagtacttc	Jβ2.7
Well 79	**Vα chain unavailable**			
	C A S S	**Y S G L S G**	**E Q Y F**	Vβ28.1Dβ2.1
	tgtgccagcag	ctactccggactctcgggc	gagcagtacttc	Jβ2.7
Well 84	**Vα chain unavailable**			
	C A S S	**Y S G L S G**	**E Q Y F**	Vβ28.1Dβ2.1
	tgtgccagcag	ctactccggactctcgggc	gagcagtacttc	Jβ2.7

FIGURE 19. HUMAN PBMCS FROM AN MS PATIENT RRMS3392 WERE SINGLE CELL SORTED FOR CD3+CD8+CD45RO+ T CELLS AND AMPLIFIED USING VRM RT-PCR.

Figure 19 shows a sample of human PBMCs from a patient with relapsing remitting multiple sclerosis, RRMS3392, stained with CD3-FITC, CD8-PE, and CD45RO-APC. Gate P1 (top left histogram), displays the parent population (P1) of lymphocytes which were used to gate CD3+ T cells labeled as CD3-FITC (P2 shown in the top right histogram). CD3+CD8+CD45RO+ T cells were selected for single cell sort (bottom left histogram) using a BD FACS Influx cytometer. Statistics show that CD3+CD8+CD45RO+ T cells represented 4.83% of the parent population.



Populations	Events	% Total	% Parent
All Events	21,648	100.00%	####
P1	5,888	27.20%	27.20%
P2	2,486	11.48%	42.22%
P3	120	0.55%	4.83%

Table 39 shows the frequency of paired TCR determined from the total number of alpha- and beta- chain TCR sequences identified in single cells from patient RRMS3392 after VRM RT-PCR; all unique transcripts.

TABLE 39. PAIRED CD3+CD8+CD45RO+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS IN AN MS PATIENT RRMS3392 USING THE VRM SINGLE CELL RT-PCR METHOD

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 04	**C A M R E G**	**S G**	**F G N E K L T F**	Vα14.1Jα48.1	1/55
	tgtgcaatgagagagggg	gagcgg	ctttggaaatgagaaattaacctttt		1.8%
	C A S S F	**N S G E A P Q R**	**F F**	Vβ5.4Dβ1.1	
	tgtgccagcagctt	caatagcggggaggcaccgcagagg	ttcttt	Jβ2.1	
Well 11	**C A V R**	**G D Y G A P A R**	**K L I F**	Vα3.1Jα32.1	1/55
	tgtgctgtgaga	ggcgattatggagccccggcaaga	aagctcatcttt		1.8%
	C A S S	**A P G G Y**	**Q E T Q Y F**	Vβ6.2Dβ2.2	
	tgtgccagcagt	gccccgggagggt	accaagagacccagtacttc	Jβ2.5	
Well 16	**C**	**Q N W G W E L P**	**L T F**	Vα3.1Jα32.1	1/55
	tgt	cagaactggggctgggagttacca	ctcactttc		1.8%
	C A S S L	**G P V**	**N E K L F F**	Vβ27.1Dβ1.1	
	tgtgccagcagttt	ggggccagt	taatgaaaaactgtttttt	Jβ1.4	
Well 17	**C**	**G Q K L L F**		Vα8.6Jα16.1	1/55
	tgc	ggccagaagctgctcttt			1.8%
	C A C	**P L V V**	**N T G E L F F**	Vβ30.2Dβ2.1	
	tgtgcctg	gtcccctagtcgcg	aacaccggggagctgtttttt	Jβ2.2	
Well 25	**C A V R D**		**S N Y Q L I W**	Vα1.2Jα33.1	1/55
	tgtgctgtgagaga		tagcaactatcagttaatctgg		1.8%
	C A S S Q D	**R G G**	**Q E T Q Y F**	Vβ4.2Dβ1.1	
	tgtgccagcagccaaga	tcgggggggc	caagagacccagtacttc	Jβ2.5	
Well 30	**C A V D**	**P L K**	**T D K L I F**	Vα2.1Jα34.1	1/55
	tgtgctgtgga	ccccttaaa	accgacaagctcatcttt		1.8%
	c A S S E	**E G A S**	**N E K L F F**	Vβ9.1Dβ1.1	
	tgtgccagcagcg	aggagggggcgt	ctaatgaaaaactgtttttt	Jβ1.4	
Well 42	**C A V**	**G Q I**	**S N F G N E K L T F**	Vα21.1Jα48.	1/55
	tgtgctgtg	ggccaaa	tatctaactttggaaatgagaaattaacctttt	1	1.8%
	C A S S I E		**A N V L T F**	Vβ19.1 Jβ2.6	
	tgtgccagtagtataga		gccaacgtcctgactttc		
Well 45	**C A L S E**	**P**	**T D S W G K L Q F**	Vα19.1Jα24.1	1/55
	tgtgctctgagtgag	ccc	actgacagctgggggaaattgcagttt		1.8%
	C A S S	**G E**	**T G E L F F**	Vβ6.2Dβ1.1	
	tgtgccagcagt	ggggag	accggggagctgtttttt	Jβ2.2	

TABLE 39: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 74	**C A V M** tgtgctgtga		**D S N Y Q L I W** tggatagcaactatcagttaatctgg	Vα1.2Jα33.1	1/55 1.8%
	C S A R tgcagtgctag	**V R D** ggttcggga	**Y N E Q F F** ctacaatgagcagttcttc	Vβ20.1Dβ2.2 Jβ2.1	
Well 77	**C A L S G** tgtgctctgagtg	**A** ggg	**G A N S K L T F** ctggagccaatagtaagctgacattt	Vα19.1Jα56.1	1/55 1.8%
	C S A R D tgcagtgctagaga	**L R D S** tttgcgggacagt	**S Y E Q Y F** tcctacgagcagtacttc	Vβ20.1 Dβ1.1 Jβ2.7	

Table 40 shows clonally expanded CD3+ CD8+ CD45RO+ TCR alpha- chain transcripts identified in single cells after VRM RT-PCR from an MS patient RRMS3392. The frequency is determined from the total number of alpha-chains identified.

Table 40. IDENTICAL ALPHA TCR CHAINS IN CD3+ CD8+ CD45RO+ SINGLE CELL TCR FROM PBMCS IN MS PATIENT RRMS3392

αTCR	V segment	N segment	J segment	Transcript	Frequency α TCR	Statistical Significance
Wells 17,35, 50,59	**C** tgc		**G Q K L L F** ggccagaagctgctcttt	Vα8.6 Jα16.1	4/31 12.9%	$p<0.0141$
Wells 25,51 74	**C A V R D** tgtgctgtgagaga		**S N Y Q L I W** tagcaactatcagttaatctgg	Vα1.2 Jα33.1	3/31 9.7%	$p<0.0602$

Table 41 shows one CD3+CD8+CD45RO+ beta-chain TCR that appeared twice in MS patient RRMS3392. The frequency is determined from the total number of beta-chains identified.

TABLE 41. IDENTICAL BETA TCR CHAINS IN CD3+CD8+CD45RO+ SINGLE CELL TCR FROM PBMCS IN MS PATIENT IN RRMS3392

βTCR	V segment	N / D segment	J segment	Transcript	Frequency β TCR
Wells 15,16	**C A S S L** tgtgccagcagttt	**G P V** ggggccagt	**N E K L F F** taatgaaaaactgtttttt	Vβ27.1Dβ1.1 Jβ1.4	2/24 8.33%

Table 42 shows all sequencing data for CD3+CD8+C45RO+ TCR transcripts in an MS patient, RRMS3392. Fifty-five wells each containing a single cell were sequenced. Nineteen wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 34). In addition, in a number of wells (45), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 42).

TABLE 42. ALL CD3+CD8+CD45RO+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN MS PATIENT RRMS3392 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 04	**C A M R E G** tgtgcaatgagagaggg	**S G** gagcgg	**F G N E K L T F** ctttggaaatgagaaattaaccttt	Vα14.1Jα48.1
	C A S S F tgtgccagcagctt	**N S G E A P Q R** caatagcggggaggcaccgcagagg	**F F** ttcttt	Vβ5.4Dβ1.1 Jβ2.1
Well 06	**Vα chain unavailable**			
	C A S S F tgtgccagcagctt	**Y T G** ctatacgggg	**N T G E L F F** aacaccggggagctgtttttt	Vβ5.4Dβ1.1 Jβ2.2
Well 07	**Vα chain unavailable**			
	C A S S R tgtgccagctcac	**P E V P M** gcccagaggtgccaatg	**E A F F** gaagctttcttt	Vβ18.1Dβ1.1 Jβ2.2
Well 11	**C A V R** tgtgctgtgaga	**G D Y G A P A R** ggcgattatggagccccggcaaga	**K L I F** aagctcatcttt	Vα3.1Jα32.1
	C A S S tgtgccagcagt	**A P G G Y** gccccgggagggt	**Q E T Q Y F** accaagagacccagtacttc	Vβ6.2Dβ2.2 Jβ2.5
Well 15	**Vα chain unavailable**			
	C A S S L tgtgccagcagttt	**G P V** ggggccagt	**N E K L F F** taatgaaaaactgtttttt	Vβ27.1Dβ1.1 Jβ1.4
Well 16	**C** tgt	**Q N W G W E L P** cagaactggggctgggagttacca	**L T F** ctcactttc	Vα3.1Jα32.1
	C A S S L tgtgccagcagttt	**G P V** ggggccagt	**N E K L F F** taatgaaaaactgtttttt	Vβ27.1Dβ1.1 Jβ1.4
Well 17	**C** tgc		**G Q K L L F** ggccagaagctgctcttt	Vα8.6Jα16.1
	C A C tgtgcctg	**P L V V** gtcccctagtcgcg	**N T G E L F F** aacaccggggagctgtttttt	Vβ30.2Dβ2.1 Jβ2.2
Well 19	**C A V M** tgtgctgtga	**D S S C** tggatagcagctg	**K L I F** taaattgatcttc	Vα1.2Jα12.1
	Vβ chain unavailable			
Well 21	**Vα chain unavailable**			
	C A T S D tgtgccaccagtgat	**Q S** cagtct	**N E Q F F** aatgagcagttcttc	Vβ24.1Dβ1.1 Jβ2.1
Well 24	**C A V S E** tgtgctgtgagtga	**M** ga	**I K A A G N K L T F** tgatcaaagctgcaggcaacaagctaactttt	Vα8.2Jα1 7.1
	Vβ chain unavailable			

TABLE 42: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 25	**C A V R D** tgtgctgtgagaga		**S N Y Q L I W** tagcaactatcagttaatctgg	Vα1.2Jα33.1
	C A S S Q D tgtgccagcagccaaga	**R G G** tcgggggggc	**Q E T Q Y F** caagagacccagtacttc	Vβ4.2Dβ1.1 Jβ2.5
Well 26	**Vα chain unavailable**			
	C A S S L tgtgccagcagctt	**R I D** gcgtatcg	**E Q Y F** acgagcagtacttc	Vβ7.9Dβ2.1 Jβ2.7
Well 27	**C A V E** tgtgctgtggag		**A G N N R K L I W** gctggcaacaaccgtaagctgatttgg	Vα2.1Jα38.1
	Vβ chain unavailable			
Well 28	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**I R D K G A W** atacgggacaagggggcttgg	**Y E Q Y F** tacgagcagtacttc	Vβ3.1Dβ1.1 Jβ2.7
Well 30	**C A V D** tgtgctgtgga	**P L K** cccccttaaa	**T D K L I F** accgacaagctcatcttt	Vα2.1Jα34.1
	c A S S E tgtgccagcagcg	**E G A S** aggagggggcgt	**N E K L F F** ctaatgaaaaactgtttttt	Vβ9.1Dβ1.1 Jβ1.4
Well 31	**Vα chain unavailable**			
	C A S S F tgtgccagcagctt	**E G P L R** cgagggcccgcttcgg	**N E Q F F** aatgagcagttcttc	Vβ7.6Dβ2.2 Jβ2.1
Well 32	**Vα chain unavailable**			
	C A S S P tgtgccagctcacc	**W G N** gtgggggaac	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ18.1Dβ1.1 Jβ2.1
Well 33	**C A L S G** tgtgctctgagtg	**A** gggc	**Y N Q G G K L I F** ttataaccagggaggaaagcttatcttc	Vα19.1Jα23.1
	Vβ chain unavailable			
Well 34	**C A M I** tgtgcaatga	ta	**D S W G K L Q F** gacagctgggggaaattgcagttt	Vα14.1Jα24.1
	Vβ chain unavailable			
Well 35	**C** tgc		**G Q K L L F** ggccagaagctgctcttt	Vα8.6Jα16.1
	Vβ chain unavailable			
Well 41	**Vα chain unavailable**			
	C A T S G tgtgccaccagtg	**Q S** gtcagtct	**N E Q F F** aatgagcagttcttc	Vβ24.1Dβ1.1 Jβ2.1

TABLE 42: CONTINUED

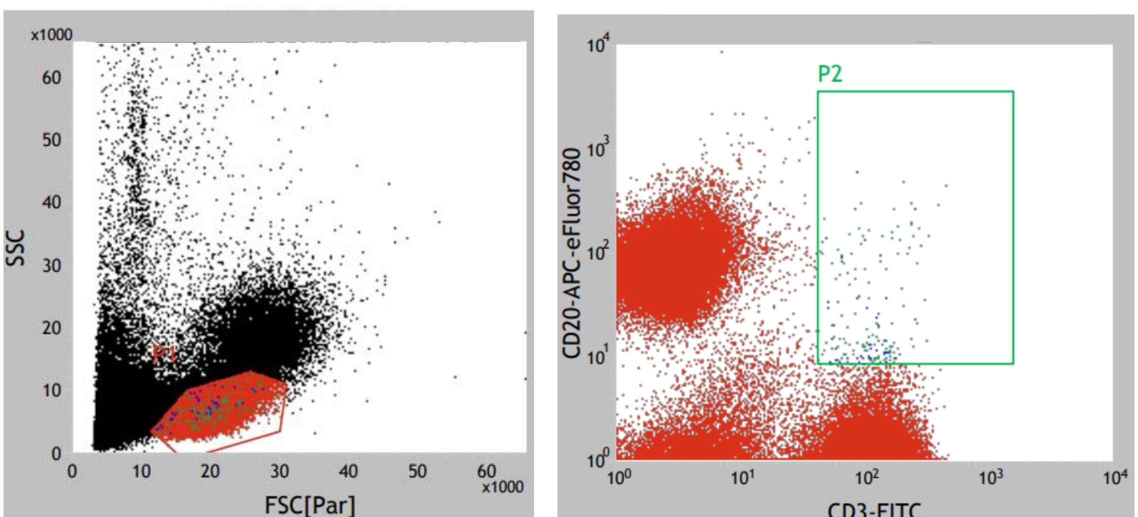
Single Cell	V segment	N / D segment	J segment	Transcript
Well 42	**C A V** tgtgctgtg	**G Q I** ggccaaa	**S N F G N E K L T F** tatctaactttggaaatgagaaattaaccttt	Vα21.1Jα48.1
	C A S S I E tgtgccagtagtataga		**A N V L T F** gccaacgtcctgactttc	Vβ19.1 Jβ2.6
Well 45	**C A L S E** tgtgctctgagtgag	**P** ccc	**T D S W G K L Q F** actgacagctggggaaattgcagttt	Vα19.1Jα24.1
	C A S S tgtgccagcagt	**G E** ggggag	**T G E L F F** accggggagctgtttttt	Vβ6.2Dβ1.1 Jβ2.2
Well 47	**C I V R V** tgcatcgtcagagtc	**T D** acgg	**G G A T N K L I F** atggtggtgctacaaacaagctcatcttt	Vα26.1Jα32.1
	Vβ chain unavailable			
Well 48	**Vα chain unavailable**			
	C A S S Q E tgcgccagcagccaaga	**A G G F** agcaggggatt	**T E A F F** cactgaagctttcttt	Vβ4.1Dβ1.1 Jβ1.1
Well 49	**C A** tgtgct	**R A A R E E E T N S** cgtgcagcacgggaggaggaaacaaactcc	**T F** acctttt	Vα8.2Jα10.1
	Vβ chain unavailable			
Well 50	**C** tgc		**G Q K L L F** ggccagaagctgctcttt	Vα8.6Jα16.1
	Vβ chain unavailable			
Well 51	**C A V R D** tgtgctgtgagaga		**S N Y Q L I W** tagcaactatcagttaatctgg	Vα1.2Jα33.1
	Vβ chain unavailable			
Well 52	**Vα chain unavailable**			
	C A S S Q tgcgccagcagccaa	**A R G Q G D** agccgggggcagggaga	**T E A F F** cactgaagctttcttt	Vβ4.2Dβ1.1 Jβ1.1
Well 53	**C G A D** tgtggagcagac	**L** ctt	**N F N K F Y F** cttcaacaaattttacttt	
	Vβ chain unavailable			
Well 54	**C A V R D** tgtgctgtgagaga	**G P L** atgggcccctt	**I Y N Q G G K L I F** atttataaccagggaggaaagcttatcttc	Vα1.2Jα23.1
	Vβ chain unavailable			
Well 55	**C I V R** tgcatcgtcag	**P** gccc	**N S G N T P L V F** aattcaggaaacacacctcttgtcttt	Vα26.1Jα29.1
	Vβ chain unavailable			
Well 56	**C A V R** tgtgctgtgag	**A** ag	**G A N S K L T F** ctggagccaatagtaagctgacattt	Vα21.1Jα56.1
	Vβ chain unavailable			

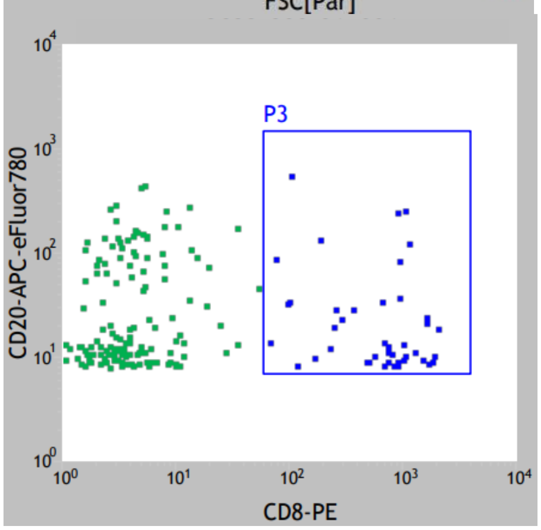
TABLE 42: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 58	**C A V R**	**G G**	**T S G S R L T F**	Vα21.1Jα58.1
	tgtgctgtgag	aggagg	acggagccaatagtaagctgacattt	
Well 59	**C**		**G Q K L L F**	Vα8.6Jα16.1
	tgc		ggccagaagctgctcttt	
	Vβ chain unavailable			
Well 60	**C A V T**	**Y**	**S G G Y N K L I F**	Vα8.6Jα4.1
	tgtgctgtga	ctta	ttctggtggctacaataagctgatttt	
	Vβ chain unavailable			
Well 64	**Vα chain unavailable**			
	C A S S Q D	**W V G G G G N**	**T D T Q Y F**	Vβ4.2Dβ2.1Jβ2.3
	tgtgccagcagccaaga	ttgggttggcgggggggaaa	cacagatacgcagtatttt	
Well 72	**C A L S E E**	**Y R**	**N K L V F**	Vα19.1Jα47.2
	tgtgctctgagtgagg	aatata	gaaacaagctggtcttt	
	Vβ chain unavailable			
Well 74	**C A V M**		**D S N Y Q L I W**	Vα1.2Jα33.1
	tgtgctgtga		tggatagcaactatcagttaatctgg	
	C S A R	**V R D**	**Y N E Q F F**	Vβ20.1Dβ2.2Jβ2.1
	tgcagtgctag	ggttcggga	ctacaatgagcagttcttc	
Well 77	**C A L S G**	**A**	**G A N S K L T F**	Vα19.1Jα56.1
	tgtgctctgagtg	ggg	ctggagccaatagtaagctgacattt	
	C S A R D	**L R D S**	**S Y E Q Y F**	Vβ20.1Dβ1.1Jβ2.7
	tgcagtgctagaga	tttgcgggacagt	tcctacgagcagtacttc	
Well 78	**C A V R D I**	**G**	**T G R R A L T F**	Vα3.1Jα5.1
	tgtgctgtgagagaca	taggg	acgggcaggagagcacttactttt	
	Vβ chain unavailable			
Well 81	**Vα chain unavailable**			
	C S A	**G G G K N E**	**Q Y F**	Vβ20.1Dβ2.1Jβ2.3
	tgcagtgct	gggggggggaaaaatgag	cagtacttt	
Well 82	**C A V**	**S**	**D S N Y Q L I W**	Vα1.2Jα33.1
	tgtgctgtg	tc	ggatagcaactatcagttaatctgg	
	Vβ chain unavailable			
Well 89	**C A V**	**T G G R N K L I**	**F**	Vα1.2Jα10.1
	tgtgctgt	Cacgggaggaagaaacaaactaat	cttt	
	Vβ chain unavailable			
Well 90	**C A E T**	**P P**	**T G R R A L T F**	Vα13.2Jα5.1
	tgtgcagaga	cccccccca	acgggcaggagagcacttactttt	
	Vβ chain unavailable			

FIGURE 20. HUMAN PBMCS FROM AN MS PATIENT RRMS3392 WERE SINGLE CELL SORTED FOR CD3+CD20+ T CELLS USING VRM RT-PCR.

Figure 20 shows a sample of human PBMCs from a patient with relapsing remitting multiple sclerosis, RRMS3392, stained with CD3-FITC, CD8-PE, and CD20-eFluor 780. Gate P1 (top left histogram), displays the parent population (P1) of lymphocytes which were used to select and sort CD3+CD20+ T cells (P2 shown in the top right histogram) using a BD FACS Influx Cell Sorter. Statistics show that CD3+CD20+ T cells represented 0.2% of the parent population and CD8+ T cells represented 24% of the cells single sorted.





Populations	Events	% Total	% Parent
All Events	166,202	100.00%	####
P1	86,616	52.11%	52.11%
P2	175	0.11%	0.20%
P3	42	0.03%	24.00%

Table 43 shows the frequency of paired CD3+CD20+ TCR transcripts determined from the total number of alpha- and beta- chain TCR sequences identified in single cells from patient RRMS3392 after VRM RT-PCR; all unique transcripts.

TABLE 43. PAIRED CD3+CD20+ TRANSCRIPTS WERE IDENTIFIED FROM HUMAN PBMCS IN AN MS PATIENT RRMS3392 USING THE VRM SINGLE CELL RT-PCR METHOD

Single Cell	V segment	N / D segment	J segment	Transcript	Paired TCR Frequency
Complete alpha- and beta- chain TCR transcripts amplified by VRM RT-PCR in single cells					
Well 03	**C G** tgtgg **C A S R** tgtgccagcag	**A A M A P G G G G R** cgcagccatggcccccggcggcgggggtaga **G D V N** gggggacgttaac	**G L T F** ggactcaccttt **S G N T I Y F** tctggaaacaccatatatttt	Vα34.1Jα45.1 Vβ6.1Dβ1.1 Jβ1.3	1/41 2.4%
Well 04	**C G** tgtgg **C S A R D** tgcagtgctagaga	**A A I A P G G G T R** cgcagcaatcgccccaggaggaggtactaga **P L V D** tccgctngtcg	**G L T F** ggactcaccttt **E Q Y V** acgagcagtacgtc	Vα34.1Jα45.1 Vβ20.1Dβ1.1 Jβ2.7	1/41 2.4%
Well 15	**C A** tgtg **C** tgt	**G** ctggg **P A G R P G** ccagcaggccgtccgggg	**M D S S Y K L I F** atggatagcagctataaattgatcttc **T D T Q Y F** acagatacgcagtatttt	Vα8.2Jα12.1 Vβ6.2Dβ2.1 Jβ2.3	1/41 2.4%
Well 22	**C A L S E A** tgtgctctgagtgaggc **C A S S Y** tgtgccagcagttac	a **P** cc	**N S G N T P L V F** aattcaggaaacacacctcttgtcttt **T D T Q Y F** cacagatacgcagtatttt	Vα19.1Jα29.1 Vβ6.2Dβ1.1 Jβ2.3	1/41 2.4%
Well 37	**C A** tgtgc **C S A** tgcagtgc t	**G G** cgggggg **Q I G A P D** Caaatcggggccccggat	**A Q K L V F** gcccagaagctggtattt **T E A F F** actgaagctttcttt	Vα16.1Jα55.1 Vβ20.1Dβ1.1 Jβ1.1	1/41 2.4%
Well 52	**C A V S A** tgtgctgtgagtg **C** tgc	**R** ctc **P** ccc	**N T G G F K T I** gaaatactggaggcttcaaaactatc **S Y N E Q F F** tcctacaatgagcagttcttc	Vα8.6Jα9.1 Vβ5.1 Jβ2.1	1/41 2.4%
Well 54	**C A** tgtgc **C A S R** tgcgccagcag	c **G S G G K K** gggtagcgggggaagaag	**G A Q K L V F** ggagcccagaagctggtattt **Y N E Q F F** tacaatgagcagttcttc	Vα16.1Jα55.1 Vβ5.1Dβ2.1 Jβ2.1	1/41 2.4%
Well 66	**C I A** tgcatcg **C S A R** tgcagtgctaga	**R M K** cccgaatgaag **L L Y** cttctgt	**G N E K L T F** ggaaatgagaaattaacctttt **Q E T Q Y F** accaagagacccagtacttc	Vα26.1Jα48.1 Vβ20.1Dβ1.1 Jβ2.5	1/41 2.4%

TABLE 43: CONTINUED

Single Cell	V segment / N / D segment / J segment	Transcript	Paired TCR Frequency
Well 72	**C I V R M N Y G G S Q G N L I F** tgcatcgtcaga a tgaattatggaggaagccaaggaaatctcatcttt **C S A T L T N E Q F F** tgcagtgcta ctcacc aatgagcagttcttc	Vα26.1Jα42.1 Vβ20.1Dβ1.1 Jβ2.1	1/41 2.4%
Well 75	**C I L G R I Q G A Q K L V F** tgcatcctg ggaag aattcagggagcccagaagctggtattt **C A S S Q V E N T E A F F** tgtgccagcagccaag tagaa aacactgaagctttcttt	Vα26.1Jα55.1 Vβ3.1Dβ1.1 Jβ1.1	1/41 2.4%
Well 80	**C A V S A R N T G G F K T I F** tgtgctgtgagtg ctc gaaatactggaggcttcaaaactatcttt **C A S S S S Y N E Q F F** tgtgccagcagct cc tcctacaatgagcagttcttc	Vα8.2Jα9.1 Vβ5.8 Jβ2.1	1/41 2.4%
Well 82	**C A L S S N T D K L I F** tgtgctctaagt agt aacaccgacaagctcatcttt **C A S S R V Q T N E Q F F** tgtgccagc tccagggtccagact aatgagcagttcttc	Vα16.1Jα34.1 Vβ6.1Dβ1.1 Jβ2.1	1/41 2.4%
Well 84	**C A T R Y S F N K F Y F** tgtgct acccgatacagc ttcaacaaattttacttt **C A S S Q G Q G G N E K L F F** tgtgccagcagccaag gacagggcggt aatgaaaagctgtttttt	Vα8.4Jα21.1 Vβ3.1Dβ1.1 Jβ1.4	1/41 2.4%

Table 44 shows CD3+CD20+ TCR alpha- chain transcripts identified twice in single cell VRM RT-PCR and sequencing from an MS patient RRMS3392. The frequency is determined from the total number of alpha-chains identified.

TABLE 44. IDENTICAL CD3+CD20+ALPHA TCR CHAINS IN CD3+ CD20+ SINGLE CELL TCR FROM PBMCS IN MS PATIENT RRMS3392

αTCR	V segment	N segment	J segment	Transcript	Frequency α TCR
Wells 02, 04	**C G** tgtgg	**A A I A P G G G T R** cgcagcaatcgccccaggaggaggtactaga	**G L T F** ggactcaccttt	Vα34.1 Jα45.1	2/18 11.1%
Wells 52, 80	**C A V S A** tgtgctgtgagtg	**R** ctc	**N T G G F K T I F** gaaatactggaggcttcaaaactatcttt	Vα8.2 Jα9.1	2/18 11.1%

Table 45 shows clonally expanded CD3+CD20+ TCR beta- chain transcripts identified in single cells after VRM RT-PCR from an MS patient RRMS3392. The frequency is determined from the total number of beta-chains identified.

TABLE 45. IDENTICAL CD3+CD20+ BETA TCR CHAINS IN CD3+CD8+CD45RO+ SINGLE CELL TCR FROM

βTCR	V segment	N / D segment	J segment	Transcript	Frequency β TCR
Wells 46,47	**C A S** tgtgccagc	**G S G G Q T** ggtagcggggggcaaa	**Y N E Q F F** cctacaatgagcagttcttc	Vβ5.4Dβ2.1 Jβ2.1	2/23 8.7%

Table 46 shows all sequencing data for CD3+CD8+CD20+ TCR transcripts in an MS patient, RRMS3392. Forty-one wells each containing a single cell were sequenced. Thirteen wells corresponded to single cells that contained both alpha and beta chain TCR sequences (see Table 43). In addition, in a number of wells (15), only alpha or beta chain sequences were obtained presumably for technical reasons (see Table 46).

TABLE 46. ALL CD3+CD20+ ALPHA- AND BETA- CHAIN TCR TRANSCRIPTS FROM SINGLE CELLS IN MS PATIENT RRMS3392 USING VRM RT-PCR

Single Cell	V segment	N / D segment	J segment	Transcript
Well 02	**C G**	**A A I A P G G G T R**	**G L T F**	Vα34.1Jα45.1
	tgtgg	cgcagcaatcgccccaggaggaggtactaga	ggactcaccttt	
	Vβ chain unavailable			
Well 03	**C G**	**A A M A P G G G T R**	**G L T F**	Vα34.1Jα45.1
	tgtgg	cgcagccatggcccccggcggcgggggtaga	ggactcaccttt	
	C A S R	**G D V N**	**S G N T I Y F**	Vβ6.1Dβ1.1
	tgtgccagcag	gggggacgttaac	tctggaaacaccatatatttt	Jβ1.3
Well 04	**C G**	**A A I A P G G G T R**	**G L T F**	Vα34.1Jα45.1
	tgtgg	cgcagcaatcgccccaggaggaggtactaga	ggactcaccttt	
	C S A R D	**P L V D**	**E Q Y V**	Vβ20.1Dβ1.1
	tgcagtgctagaga	tccgctngtcg	acgagcagtacgtc	Jβ2.7
Well 07	**G**	**G A A M D F S R**	**G R R A L T F**	Vα34.1Jα5.1
	g	ggggcgcagccatggacttctcccgc	ggcaggagagcacttacttt	
	Vβ chain unavailable			
Well 12	**C A V R**	**D D**	**Y G G A T N K L I F**	Vα2.1Jα32.2
	tgtgctgtgg	gagacgat	attatggtggtgctacaaacaagctcatcttt	
	Vβ chain unavailable			
Well 15	**C A**	**G**	**M D S S Y K L I F**	Vα8.2Jα12.1
	tgtg	ctggg	atggatagcagctataaattgatcttc	
	C	**P A G R P G**	**T D T Q Y F**	Vβ6.2Dβ2.1
	tgt	ccagcaggccgtccgggg	acagatacgcagtatttt	Jβ2.3
Well 20	**Vα chain unavailable**			
	C A S R	**G T G E**	**E T Q Y F**	Vβ2.3Dβ1.1
	tgtgccagcag	agggacagggg	aagagacccagtacttc	Jβ2.5
Well 22	**C A L S E A**		**N S G N T P L V F**	Vα19.1Jα29.1
	tgtgctctgagtgaggc	a	aattcaggaaacacacctcttgtcttt	
	C A S S Y	**P**	**T D T Q Y F**	Vβ6.2Dβ1.1
	tgtgccagcagttac	cc	cacagatacgcagtatttt	Jβ2.3
Well 24	**Vα chain unavailable**			
	C A N	**S S R G**	**K L F F**	Vβ7.2Dβ1.4
	tgtgcca	acagttcccggggt	aaactgttttt	Jβ2.1
Well 26	**Vα chain unavailable**			
	C S A R	**T S Y R Q E N N**	**Q Y F**	Vβ20.1Dβ1.1
	tgcagtgctag	gacatcctatcgacaggaaaataac	cagtacttc	Jβ2.5
Well 27	**Vα chain unavailable**			
	C A S S	**G Q G G**	**V L T F**	Vβ9.1Dβ1.1
	tgtgccagcagc	ggacagggaggg	gtcctgactttc	Jβ2.6

TABLE 46: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 29	**C L** tgcctc	**G A G** ggtgcnggc	**D K I I F** gacaagatcatcttt	Vα4.1Jα30.1
	Vβ chain unavailable			
Well 32	**Vα chain unavailable**			
	C S A tgcagtgct	**S G P R N T R** tccgggccaaggaatacca	**E Q L F** gggagctgtttttt	Vβ20.1Dβ1.1 Jβ2.2
Well 33	**Vα chain unavailable**			
	C A S N tgtgccagca	**G R G A T T W** atggccggggggctaccacttgg	**Y N E Q F F** tacaatgagcagttcttc	Vβ28.1Dβ1.1 Jβ2.1
Well 37	**C A** tgtgc	**G G** cgggggg	**A Q K L V F** gcccagaagctggtattt	Vα16.1Jα55.1
	C S A tgcagtgct	**Q I G A P D** caaatcggggccccggat	**T E A F F** actgaagctttcttt	Vβ20.1Dβ1.1 Jβ1.1
Well 46	**Vα chain unavailable**			
	C A S tgtgccagc	**G S G G Q T** ggtagcgggggcaaa	**Y N E Q F F** cctacaatgagcagttcttc	Vβ5.4Dβ2.1 Jβ2.1
Well 47	**Vα chain unavailable**			
	C A S tgtgccagc	**G S G G Q T** ggtagcgggggcaaa	**Y N E Q F** cctacaatgagcagttc	Vβ5.4Dβ2.1 Jβ2.1
Well 50	**Vα chain unavailable**			
	C A S S L tgtgccagcagctta	**R S T** cggtcaacc	**T N E K L F F** actaatgaaaaactgtttttt	Vβ7.2Dβ2.1 Jβ1.4
Well 52	**C A V S A** tgtgctgtgagtg	**R** ctc	**N T G G F K T I** gaaatactggaggcttcaaaactatc	Vα8.2Jα9.1
	C tgc	**P** ccc	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ5.1 Jβ2.1
Well 54	**C A** tgtgc	c	**G A Q K L V F** ggagcccagaagctggtattt	Vα16.1Jα55.1
	C A S R tgcgccagcag	**G S G G K K** gggtagcgggggaagaag	**Y N E Q F F** tacaatgagcagttcttc	Vβ5.1Dβ2.1 Jβ2.1
Well 63	**Vα chain unavailable**			
	C A S S tgtgccagcagc	**T R** acccgg	**Y N E Q F F** tacaatgagcagttcttc	Vβ5.1Dβ2.1 Jβ2.1
Well 66	**C I A** tgcatcg	**R M K** cccgaatgaag	**G N E K L T F** ggaaatgagaaattaacctttt	Vα26.1Jα48.1
	C S A R tgcagtgctaga	**L L Y** cttctgt	**Q E T Q Y F** accaagagacccagtacttc	Vβ20.1Dβ1.1 Jβ2.5

TABLE 46: CONTINUED

Single Cell	V segment	N / D segment	J segment	Transcript
Well 72	**C I V R** tgcatcgtcaga	**M** a	**N Y G G S Q G N L I F** tgaattatggaggaagccaaggaaatctcatcttt	Vα26.1Jα42.1
	C S A tgcagtgct	**L T** ctcacc	**N E Q F F** aatgagcagttcttc	Vβ20.1Dβ1.1 Jβ2.1
Well 75	**C I L** tgcatcctg	**G R** ggaag	**I Q G A Q K L V F** aattcagggagcccagaagctggtattt	Vα26.1Jα55.1
	C A S S Q V tgtgccagcagccaag	**E** tagaa	**N T E A F F** aacactgaagctttcttt	Vβ3.1Dβ1.1 Jβ1.1
Well 80	**C A V S A** tgtgctgtgagtg	**R** ctc	**N T G G F K T I F** gaaatactggaggcttcaaaactatcttt	Vα8.2Jα9.1
	C A S S S tgtgccagcagct	cc	**S Y N E Q F F** tcctacaatgagcagttcttc	Vβ5.8 Jβ2.1
Well 82	**C A L S** tgtgctctaagt	**S** agt	**N T D K L I F** aacaccgacaagctcatcttt	Vα16.1Jα34.1
	C A S tgtgccagc	**S R V Q T** tccagggtccagact	**N E Q F F** aatgagcagttcttc	Vβ6.1Dβ1.1 Jβ2.1
Well 84	**C A** tgtgct	**T R Y S** acccgatacagc	**F N K F Y F** ttcaacaaattttacttt	Vα8.4Jα21.1
	C A S S Q G tgtgccagcagccaag	**Q G G** gacagggcggt	**N E K L F F** aatgaaaagctgtttttt	Vβ3.1Dβ1.1 Jβ1.4
Well 87	**C A V S E** tgtgctgtgagtga	g	**T G A N S K L T F** actggagccaatagtaagctgacattt	Vα8.2Jα56.1
	Vβ chain unavailable			

COMPARISON OF AMINO ACID CDR3 SEQUENCES OF ALPHA AND BETA CHAIN TCR TRANSCRIPTS FROM AUTOPSY BRAIN PLAQUES AND CSF FROM PATIENTS WITH MS AND MS-LIKE DISEASE TO CDR3 TCR SEQUENCES PREVIOUSLY REPORTED IN THE GENBANK/EMBL DATABASE (SPECIFIC AIM #3).

The objective of these studies is to determine whether there are amino acid CDR3 TCR sequence homologies between 254 alpha- and beta-chain TCR transcripts in autopsy brain plaques and CSF from patients with MS and MS-like disease, compared to amino acid CDR3 TCR sequences previously reported in the GenBank/EMBL/SWISSProt databases by other investigators. The TCR transcripts identified from autopsy brain plaques and CSF in patients with MS and MS-like disease were previously identified in our laboratory by a former graduate student, X.Y. Zhang, Ph.D. (manuscript in preparation). Amino acid sequences from the CDR3 TCR alpha V-N-J region and TCR beta V-N-D-N-J regions were entered into the Basic Local Alignment Search Tool (BLAST) database using a protein-query and compared to other sequences reported from MS patients in the GenBank/EMBL database. The CDR3 regions of the alpha- and the beta-chain TCR are the regions of the TCR chains that bind to the specific antigen (antigenic peptides) plus MHC that each alpha/beta TCR heterodimer recognizes.

FIGURE 21. OVERVIEW OF METHODOLOGIES FOR T-CELL RECEPTOR REPERTOIRE ANALYSIS. [61]

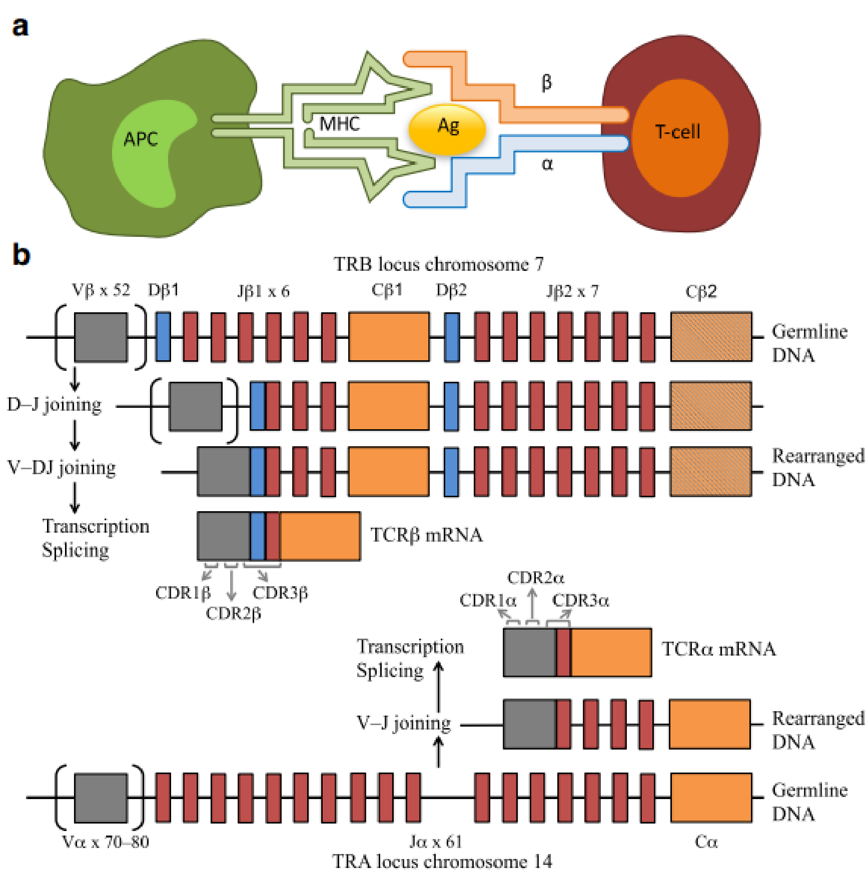


Fig. 1 Interaction between an antigen presenting cell (APC) and a T cell, and V(D)J recombination. **a** Interaction between the antigen–major histocompatibility complex (MHC) and the αβ T-cell receptor (TCR). **b** V(D)J recombination: During T cell development, the loci that encode T-cell receptor α and β-chains are rearranged. For both loci, variable (V) and joining (J) gene segments, and an additional diversity (D) gene segment for the β-chain, are recombined to form the final rearranged TCR DNA sequence. This process also involves the deletion and insertion of nucleotides at the V-D, D-J and V-J junctions (not shown). Following transcription, the sequence between the recombined V (D)J regions and the gene encoding the constant (C) region is removed by splicing. The complementarity-determining region (CDR) 3 is encoded by the V (D) J junction, whereas the CDR1 and CDR2 loops are encoded within the germline V gene

Alpha- and beta-chain TCR transcripts were previously identified in our laboratory using frozen brain autopsy tissue and cerebrospinal fluid obtained from six patients with different forms of MS. The objective of these studies is to identify in the GenBank/EMBL databases, TCR transcripts with known antigenic specificity, i.e., those that recognize antigen (antigenic peptides), which have highly homologous CDR3 regions to those TCR transcripts that we have identified in our laboratory in brain autopsy specimens or CSF from patients with MS or MS-like disease.

Identification of such substantial CDR3 homology will in turn permit to identify or to provide substantial information for the identification of the antigenic peptides recognized by the clonally expanded TCR that we found to be expressed in brain autopsy specimens or CSF from patients with MS or MS-like disease. This line of studies may permit the development of bioinformatics/ computational approaches for the identification of the antigenic peptides recognized by clonally expanded TCR identified in brain autopsy specimens, CSF or PBMCs from patients with MS or MS-like disease, without the need to carry out complicated, lengthy and expensive laboratory experiments.

Identification of substantial CDR3 homology between TCR transcripts reported in the GenBank/EMBL databases, compared to those TCR transcripts that we have identified in brain autopsy specimens or CSF from patients with MS or MS-like disease will in turn permit us to:

- Identify or provide substantial information for the antigenic peptides recognized by clonally expanded TCR expressed in tissue from patients with MS or MS-like disease.
- Reduce the costs and length of complicated laboratory experiments previously required.

The 254 alpha- or beta-chain TCR transcripts previously identified in our laboratory were compared for TCR CDR3 homology to alpha- or beta-chain TCR sequences previously reported in the GenBank/EMBL database. These bioinformatics data were organized into the next 14 tables. There is no information on the maximum number of CDR3 amino acid differences that constitute substantial CDR3 homology. Differences of two conservative and one nonconservative amino acids were chosen arbitrarily by our laboratory as the maximum number of differences allowed between CDR3 motifs from different T cell clones to define substantial CDR3 homology. This definition has been well accepted by the reviewers of a substantial number of research papers.

TABLE 47. EXAMPLE CDR3 SEQUENCE HOMOLOGY

AMS-HA Patient TCR alpha chain	Clone 9a CDR3 sequence	YLCVVFGAGGFK
CD4+ T cell isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	**Homologous CDR3**	YLCVVNGAGGFK

Group A. Alpha- and beta-chain TCR transcripts expressed in brain autopsies or CSF of patients with MS and identified in our laboratory, exhibited extensive CDR3 sequence homology to previously identified alpha- and beta-chain TCR transcripts expressed in several autoimmune diseases, including demyelinating diseases, Sjogren's Syndrome, other autoimmune diseases, cancer, and viral infections previously reported in the GenBank/EMBL databases.

Over 286 reports of CDR3 sequence homology between TCR transcripts of patients with MS or MS-like disease and TCR transcripts in patients with Sjogren's syndrome were identified. These bioinformatics data were organized into the next 14 tables.

Group B. Alpha- and beta-chain TCR transcripts sharing substantial CDR3 sequence homology to alpha- and beta-chain TCR transcripts previously reported the GenBank/EMBL database, which were expressed: (a) in CD4+ or CD8+ T-cell clones generated by stimulating T cells from patients with MS or normal donors with myelin antigens (MBP, PLP); (b) in brain autopsies of patients with MS or MS-like disease.

- 63 TCR transcripts identified in our laboratory in patients with MS or MS-like disease shared TCR CDR3 homology with T cells stimulated with myelin proteins (PLP, MBP) reported in the GenBank/EMBL database. These bioinformatics data were organized into the next 14 tables.

- 77 TCR transcripts identified in our laboratory from patients with MS or MS-like disease shared TCR CDR3 sequence homology with 138 different TCR CDR3 regions reported in other MS patients previously reported in the GenBank/EMBL. These bioinformatics data were organized into the next 14 tables.

We identified extensive CDR3 region homologies between TCR expressed in brain autopsies or CSF of patients with MS or MS-like disease and those TCR expressed in T cells from MS patients or normal donors stimulated with myelin antigens, as well as those from patients with autoimmune diseases, Sjogren's Syndrome, cancer, and viral infections reported in the GenBank/EMBL databases.

TABLE 48. LIST OF PATIENTS/TISSUE OBTAINED FROM AUTOPSY BRAIN PLAQUES AND CSF OF SIX PATIENTS WITH MS OR MS-LIKE DISEASE.

Alpha- and beta- chain TCR from autopsy brain materials of four patients with MS (CAL-1, 4063, HUN, ROW) and cerebrospinal fluids (CSF) from two patients with MS-like disease (AMS-HA, LR) were analyzed for CDR3 sequence homologies to other nucleic acids and amino acids reported in the GenBank/EMBL databases. The list of patient tissue is below.

Patients	**Tissue**
CAL-I	**Autopsy brain plaques**
4063	**Autopsy brain plaques**
HUN (tissue I)	**Autopsy brain plaques**
HUN (tissue II)	**Autopsy brain plaques**
ROW	**Autopsy brain plaques**
LR	**CSF**
AMS-HA	**CSF**

TABLE 49. CLONES SHARING HOMOLOGY WITH ALPHA-CHAIN TCR SEQUENCES FROM CEREBROSPINAL FLUID OF PATIENT AMS-HA AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	2a	FCAYTGTAS Clonal Expansion	TGTAS	Bone marrow in a patient with Aplastic Anemia	MG791025.1	[62]
			YTGTAS	TCR clone BC5 cl78 which recognized endogenous CD1a presenting lipid ligands	KP676375.1	[63]
			TGTAS	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's	KX076543.1	[64]
			TGTAS	CD4+ T cell isolated from Subject9 peripheral blood in a study of Sjogren's Syndrome	KX075269.1	[64]
			TGTAS	CD4+ T cell isolated from Subject7 peripheral blood in a study of Sjogren's Syndrome	KX074515.1	[64]
			TGTAS	CD4+ T cell isolated from Subject2 peripheral blood in a study of Sjogren's Syndrome	KX074490.1	[64]
			TGTAS	CD8+ T lymphocytes specific for Epstein-Barr Virus BRLF-1, clone F_29	AB749838.1	[65]
	3a	FCAYRPTSG T Clonal Expansion	RPTSG	Homo sapiens tectonic family member 1 (TCTN1) for sequence genome of chromosome 12; overview of congenital hepatic fibrosis	NG_030381.1	[66]
	4a	FCAASLGG GTS Clonal Expansion	FCAMSFA GGTS	Homo sapiens mRNA for TCR alpha chain clone 621 obtained from intra-thyroidal CD8+ T cells in a patient with Hashimoto's thyroiditis	X92047.1	[67]
			FCAASASA GGT FCAASASA GGTS	CD4+ T cell isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	KX077141.1 KX077112.1	[64]

TABLE 49 CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	6a	CVVSAKDNYG Clonal Expansion	VVSAK	Reference chromosome 7 for homo sapiens forkhead box P2 (FOXP2)	NG_007491.3	[68]
	7a	FCAVRDQDSSAS	CAVRDQ FCAVREKD	CD8+ T cell isolates submitted by the Center for AIDS research	AB977439 AB976739	[69]
			CAVRDQ	Homo sapiens mRNA for TCR alpha chain region (TCRAV7S4AJ1729) obtained from peripheral blood and specific for viral epitopes of EBV	Z49903.1	[70]
			FCAVSEGSSAS	CD4+ TCR found in the peripheral blood of patient6 with Sjogren's syndrome	KX075181.1	[64]
	8a	YLCVVSGAGGFK	YLCVVSTGGFK	Homo sapiens isolate AA cell32 3C8 T cell receptor clone isolated from the bone marrow of a patient with severe aplastic anemia	MG791077.1	[62]
	9a	YLCVVFGAGGFK	YLCVVNGAGGFK	CD4+ T cell isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55862.1	[64]
			YLCAVNGAGGFK	CD4+ T cell isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55662.1	[64]
	10a	FCALRSGNTG	ALRSGNTG	Human Rhinovirus C, VP2 picornavirus capsid protein	BAQ55342.1	[71]

TABLE 50. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM CEREBROSPINAL FLUID OF PATIENT AMS-HA AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	1	YFCASSLEVYSGNT Clonal Expansion	YLCASSLEVYS	CD4+ T cell isolated from Subject4 peripheral blood in a study of Sjogren's Syndrome	ANO54479.1	[64]
			YFCASSLQVY YLCASSL-VYSGD YFCASS---YSGGT	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10340.1 AIE10676.1 AIE10763.1	[72]
			YFCASSLEPY YFCASSLEPY	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO27047.1 ABO27058.1	[73]
			YFCASSLQV	CD8+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAV32397.1	[74]
			CASSPEVYGGN	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB2126479.1	[75]
			YLCASSLVVFSGNT	CD4+ T cell isolated from Subject8 peripheral blood in a study of Sjogren's Syndrome	ANO55438.1	[64]
			YFCASSLDRYTG	CD4+ T cell isolated from Subject3 peripheral blood in a study of Sjogren's Syndrome	ANO54840.1	[64]
			YFCASSLD-YAG	CD4+ T cell obtained from the synovial fluid of patient CS-1 with rheumatoid arthritis	AAC72564.1	[76]
			YFCASSL-IYPG	Crystal structure of TCR PF8 in complex with Influenza A virus, flu MP (958-66) epitope presented by HLA-A2	5E6I_B	[77]
			CARALDVYSGN	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOP95732.1	[78]
			YFCASSVAVYSTDT	TCR beta chain isolated from a HLA-B27 positive patient with reactive arthritis	AAF81880.1	[79]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	1	YFCASSLEVYSGNT Clonal Expansion	YFCASSVGVYSTDT YFCASSLGRYSTDT YFCASSVELFSTDT	TCR beta chain isolated from a HLA-B27 positive patient with reactive arthritis	AAF81832.1 AAF81835.1 AAF81865.1	[79]
			YFCASSLEAFFGYT	CD4+ T cell isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56530.1	[64]
			YFCAASL---SGNT	CD8+ T cell isolate submitted by the Center for AIDS research	BAS03358.1	[69]
			YFCASS----SGNT	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72604.1	[76]
			YFCASSVE--GGNT	T cell infiltrates obtained from aortic valve lesions in a patient with calcific aortic stenosis	ABO27031.1	[73]
			YFCASS----SGNT	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57210.1	[74]
			YFCASSL---SGTT	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81597.1	[80]
			YFCASS---YVGNT	TCR CDR2 residues by phage in a study of phage directed evolution of cognate peptide-MHC affinity	2F53_E	[81]
			YFCATSLRTGEVY	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03984.1	[82]
			YFCASS---YSKGGNT	CD8+ T cell isolate from a multiple sclerosis brain lesion	CAC03816.1	[31]
			YFCASS---YSKGGNT	CD8+ T cell isolate from a multiple sclerosis brain lesion	CAC03816.1	[31]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	1	YFCASSLEVYSGNT Clonal Expansion	YFCASSVGIYSTDT	CD8+ TCR beta chain from synovium in an HLA B27+ patient with Reactive Arthritis	CAB95663.1	[83]
			YFCASSVATYSTDT	TCR in reactive arthritis patient study of HLA B-27- associated autoantigens	CAD12802.1	[84]
			CASSFGRGDGYTF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78532.1	[85]
	2	CASSYRGDGYTF Clonal Expansion	CASSLRGADGYTF	CD8+ T cell isolate submitted by the Center for AIDS research	BAS03818.1	[69]
			CASSYRAYGYTF	CD4+ T cell isolated from Subject2 peripheral blood in a study of Sjogren's Syndrome	ANO54239.1	[64]
			CASSFRADGY	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOO49195.1	[78]
			CASSLRGAGDGYTF CASSFTGGGYTF	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AAF29307.1 AAF29374.1	[86]
			CASSTFRGEGYTF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57094.1	[87]
			CASSFDRGGGYTF	CD4+ T cell isolated from Subject8 peripheral blood in a study of Sjogren's Syndrome	ANO55552.1	[64]
			CASSFNRGHGYTF	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76020.1	[88]
			CASSFNRGHGYTF	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76020.1	[88]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	2	CASSYRGDGYTF Clonal Expansion	CASSFRDGGY TF	CD4+ T cell isolated from Subject4 peripheral blood in a study of Sjogren's Syndrome	ANO54486.1	[64]
			CASSYR---YTF	Memory B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCB08218.1	[89]
			CASS-RGQGRDGYTF	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72599.1	[76]
			CASSYR-DRGLYGYTF	CD4+ T cell isolated from Subject9 peripheral blood in a study of Sjogren's Syndrome	ANO55069.1	[64]
			CASSFGSRGGPD GYTF	CD8+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAV31734.1	[74]
			CASSYSQGQGD YGYTF	TCR isolated from rectal adenocarcinoma of 1-11rank tissue in a 42 yr.-old female patient	ADC34082.1	[90]
			CASSYQQGARG-GYTF	CD4+ T cell isolated from Subject9 peripheral blood in a study of Sjogren's Syndrome	ANO54873.1	[64]
			CASSYRDRGQN GYTF	CD4+ T cell isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55931.1	[64]
			CASSFWGQDW DGYTF	CD8+ T lymphocytes specific for Epstein-Barr Virus BRLF-1, clone Q_88_beta	BAN84615.1	[65]
			CASSSLGQPQH	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78559.1	[85]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	3	CASSSVGQPQH	CASSSLNQPQH	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81645.1	[80]
			CASSSLNQPQH	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81645.1	[80]
			CASSSGDQPQH	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient4 with chronic beryllium disease	AAD55207.1	[91]
			CASRSGGQPQH	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57217.1	[87]
			CASSSPNQPQH	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76031.1	[88]
			CASSPKGQPQH	CD4+ T cell isolated from Subject2 peripheral blood in a study of Sjogren’s Syndrome	ANO54163.1	[64]
			CASSSVPGPRQPQH	CD8+ T lymphocyte obtained from lymph nodes of patient A3 in a study of T cell subpopulations in non-Hodgkin’s lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34124.1	[92]
			CASSSTGGGQPQH	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72643.1	[76]
			CASSSTGINQPQH	CD4+ T cell isolated from Subject6 salivary glands of a patient with Sjogren’s Syndrome	ANO56441.1	[64]
			CASSTQTGQPQH	Viral superantigen-9 stimulation of human T cells	AAC51952.1	[93]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	3	CASSSVGQPQH	CASSQVPGVGQ PQH	CD8+ T cell isolate submitted by the Center for AIDS research	BAS04078.1	[69]
			CASSPGKVWVG QPQH	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03906.1	[31]
			LCASSSPSAKG--- AYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAB34779.1	[76]
	4	LCASSSPNTKRD RLAYEQY	LCASSRPN--RE- L-YEQY	CD8+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAW31103.1	[74]
			LCASS-PG----- LAYEQY	Neoplastic T cells in angioimmunoblastic T-cell lymphoma, lymph node central nodule	CAH56737.1	[94]
			CASSYSPG----- LAYEQY	CD8+ T cell isolate submitted by the Center for AIDS research	BAS03932.1	[69]
			LCASS-------- LAYEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81509.1	[80]
			LCASSSPG------ GYEQY	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren’s Syndrome	ANO56263.1	[64]
			LCASSNPD------ VYEQY	CD4+ T cell isolated from Subject6 salivary glands of a patient with Sjogren’s Syndrome	ANO56393.1	[64]
			CASSSANYGY	Cytomegalovirus CMV-pp65 specific TCR from peripheral blood	ACY74608.1	[95]
	6	CASSSANYGY	CASSSANYGY CASSSANYGY	TCR isolates in chronic idiopathic thrombocytopenic purpura	ABX83957.1 ABX83961.1	[96]
			CASSSANYGY CASSSANYGY	TCR isolates in chronic idiopathic thrombocytopenic purpura	ABX83957.1 ABX83961.1	[96]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	6	CASSSANYGY	CASSTSVNYGY CASSWTAANYGY	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03869.1 CAC03880.1	[31]
			CASSSRDNYGY	CD4+ T cell isolated from Subject7 peripheral blood in a study of Sjogren's Syndrome	ANO54387.1	[64]
			CASSQTNYGY	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK15498.1	[97]
			CASSQENYGY	CD4+ T cell isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56616.1	[64]
			CASSFVASANYGY	CD4+ T cell isolated from Subject8 peripheral blood in a study of Sjogren's Syndrome	ANO55485.1	[64]
			CASSQGTANYGY	Clonal cytotoxic T cells in myeloma	CAC06609.1	[98]
			CASSLVGANYGY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78935.1	[85]
			CASSFSTCSANYGY CASSFSTCSANYGY	CD8+ T cell isolate submitted by the Center for AIDS research	BAS03883.1 BAS03755.1	[69]
			CASSFSTCSANYGY	CD4+ T cell isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56074.1	[64]
			CASSPTDYGY	Peripheral blood and bronchoalveolar lavage of patient4 following beryllium sulfate induced lung disease	AAD55204.1	[91]
			CASSQDRGAANYGY	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10701.1	[72]
			YLCAWSISGTENIQY	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10789.1	[72]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	7	YLCAWGRSGTA NIQY	YLCAWSVGGTA KNIQY YLCAWSGGGTA N YLCAW--SDRAKNIQY	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AAF29181.1 AAF29186.1 AAF29215.1	[86]
			YLCASSRSGGADT QY	Herpes simplex virus-specific CD4+ T lymphocyte derived from herpetic skin lesions	AAV28664.1	[99]
			YLCASSSSGTAN EQF	CD8+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34166.1	[92]
			YLCASSRSGTSG GASADTQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78536.1	[85]
			YLCASRPGG YLCASRPGG YLCASRSGTSGR TKNIQ	CD8+ T cell isolate submitted by the Center for AIDS research	BAS04277.1 BAS04083.1 BAS03863.1	[69]
	1b	YLCASRPGGRIQ ETQ Clonal Expansion	YLCAS-SGDRVQET YLCASSPQGRI	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AAF29274.1 AAF29248.1	[86]
			YLCASSRTSGRV EET	CD4+ T cell isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56804.1	[64]
			YLCASRPSGQLD E	HCV-TCR-138 clone from patient with Hepatitis C Virus Infection	ADQ19398.1	[100]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	1b	YLCASRPGGRIQ ETQ Clonal Expansion	YLCASRVAGRI	CD4+ T cell isolated from Subject3 peripheral blood in a study of Sjogren's Syndrome	ANO54880.1	[64]
			YLCASRPG YLCASRPG YLCASRPG	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10344.1 AIE10346.1 AIE10547.1	[72]
			YLCASRPDG	HPV16-E7 peptide directed CD8+ T cells from patients with cervical cancer cross-reactive to coronavirus NS2 protein	AAK97637.1	[101]
			YLCASRPSG	CD8+ T lymphocytes specific for Epstein-Barr Virus BRLF-1, clone U_19_beta	BAN84625.1	[65]
			YLCASSPGGAIG E	Herpes simplex virus-specific CD4+ T lymphocyte derived from herpetic skin lesions	AAV28665.1	[99]
			YLCAS-- SGREQET	CD4+ T cell isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56593.1	[64]
			YFCASRPQGR- EET	TCR beta chain from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR37264.1	[102]
			YFCASSPPDRVQ ET	CD8+ T lymphocyte obtained from lymph nodes of patient A2 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34211.1	[92]
			CASSYGHNSPLH	CD8+ T cell isolate submitted by the Center for AIDS research	AB977927.1	[69]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	2b	CASSYGYLSPLH Clonal Expansion	CASSLGGYNSPLH	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AF189492.1	[86]
			CASSFGDAPLH	Peripheral blood and bronchoalveolar lavage of patient2 following beryllium sulfate induced lung disease	AF079047.1	[91]
			CASSPPGRGSYEQ	Peripheral blood and bronchoalveolar lavage of patient5 with chronic beryllium disease	AF079005.1	[91]
	3b	FCASNPSGRSSYEQ	CASSRSGRAAYEQ CASSPGAGTSYEQ	CD8+ T cell isolates submitted by the Center for AIDS research	AB977640.1 AB977506.1	[69]
			FCASSPRGGAYEQ	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	KM004212.1	[72]
			CASRPQGTPSYEQ	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AF189455.1	[86]
			FCASSPSGGPSDEQ	CD8+ T lymphocyte obtained from lymph nodes of patient A2 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	AJ301393.1	[92]
			FCASSPLXGASYEQ	Clonal cytotoxic T cells in myeloma	AJ276199.1	[98]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	3b	FCASNPSGRSSYEQ	FCASSLSGTTSYE	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	KU749142.1	[80]
			FCASSSGLA	T cell variant isolated from cutaneous skin manifestations in a patient with Hodgkin's lymphoma	AJ406164.1	[103]
	4b	FCASSTGLALVKEFFGP	FCASSYGTS	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	KM004742.1	[72]
			FCASSPGLA CASSPGLADYNEQFFGP FCASSPGLARLNEQFFGP	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	MG193046.1 MG192709.1 MG193043.1	[85]
			FCASSVGLA CASSWTSGGYEQYFG CASSFGTSSYNEQFFGP	CD8+ T cell isolates submitted by the Center for AIDS research	AB977643.1 AB977642.1 AB977559.1	[69]
			FCASSYSGGREFFGP FCASSVGLAGGPG	CD8+ T cell isolates submitted by the Center for AIDS research	AB977633.1 AB977680.1	
			FCASSPGLA FCASGRTRSGEQFFGP	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	EF415410.1 EF415468.1	[73]
			FCASSRTSGVYNEQFFGP	Activated and effector memory T cells clonally expanded in bicuspid valve in a case calcific aortic stenosis	JF731131.1	[88]
			FCASSPGLA	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AF043859.1	[76]
			FCASSPGLA	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	U55163.1	[82]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4b	FCASSTGLALVK EFFGP	CASSPGLA CASSAGLA	Clonotypes from muscle-infiltrating lymphocytes from a patient (case3) with human T lymphotropic virus type 1 polymyositis	AB076794.1 AB076792.1 AB076788.1 AB076791.1	[104]
			FCASSIGL	Clonal cytotoxic T cells in myeloma	AJ276200.1	[98]
			FCASSTGTSGNN EQFFGP	CD8+ T lymphocytes specific for Epstein-Barr Virus BRLF-1, clone E_168_beta	AB749829.1	[65]
			FCASSPGLAGYE QFFGP	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	KU749198.1	[80]
			FCASSPGLAGYE QFFGP	CD8+ T cell isolated from PBMCs in a healthy subject stimulated with myelin binding protein	HM236623.1	[87]
			CASSRGLAYGEQ FFGP	CD4+ T cell isolated from Subject8 peripheral blood in a study of Sjogren's Syndrome	KX075589.1	[64]
			FCASSQGLAGVE QFFGP CASSETSNSEQFFG P	CD4+ T cell isolated from Subject6 peripheral blood in a study of Sjogren's Syndrome	KX075183.1 KX075179.1	[64]
			FCASSGQDYNE QFFGP	Herpes simplex virus-specific CD4+ T lymphocyte derived from herpetic skin lesions	AY751314.1	[99]
			FCASSFGTSGDN EQFFG	CD8+ T cell isolate from a multiple sclerosis brain lesion	AJ405782.1	[31]
			FCASSPGLAYYE QYFG	CD8+ T melanocyte-specific cells in one vitiligo patient	AY190099.1	[105]
			FCASSSTSAGEQ YFG	T cell receptor clone isolated from the bone marrow of a patient with severe aplastic anemia	MG791400.1	[62]
			FCAISGGLAEWH EQFFGP CASREWTSGGN EQFFGP	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	KM004545.1 KM004558.1	[72]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4b	FCASSTGLALVK EFFGP	FCASSADQGSE QFFGP	CD8+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	AJ301393.1	[92]
			FCASSYATSGYN EQLFGP	CD8+ T cell clone from a HLA-B27 positive patient with Reactive Arthritis	AJ296369.1	[83]
			FCASSPRLAGSY EQYFG	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	KM004675.1	[72]
			YFCASSLAGFGQP QH	Patient with antiphospholipid syndrome	DQ294632.1	[106]
	5b	YFCATASTGLGQ PQN	YFCASSSTGGGQ PQH YFCASSSTGGGE PQH	CD4+ TCRs obtained from the synovial fluid of a patient with rheumatoid arthritis	AF043843.1 AF043844.1	[76]
			YFCASSLQGSSQP QH	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	KM004647.1	[72]
			YLCASRPG	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10344.1 AIE10346.1	[72]
	3-1b	YLCASRPGGRIQ ETQ	YLCASRPDG	HPV16-E7 peptide directed CD8+ T cells from patients with cervical cancer cross-reactive to coronavirus NS2 protein	AAK97637.1	[101]
			YLCASRPSG	CD8+ T-lymphocytes from blood of patients with cancer	BAN84625.1	[65]
			YLCASRVAGRI YLCASSRTSGRV EETQ	CD4 T cells from peripheral blood of Subject3 with Sjogren's syndrome	ANO54880.1 ANO56804.1	[64]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	3-1b	YLCASRPGGRIQ ETQ	YLCASSPQGRI YLCAS-SGDRVQETQ	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AAF29248.1 AAF29274.1	[86]
			YFCASRPGQG-DQETQ	Myelin basic protein-specific T cell clone in an HLA-DR2 multiple sclerosis patient	AAN08405.1	[107]
			YLCASRPSGQLD E	HCV-TCR-138 clone from patient with Hepatitis C Virus Infection	ADQ19398.1	[100]
			YFCASSPPDRVQ ETQ	CD8+ T lymphocyte isolated from patient A2 with non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34211.1	[92]
			CASSSNRVGYTF	CD4+ T cell isolated from Subject3 peripheral blood in a study of Sjogren's Syndrome	KX075135.1	[64]
	8-1b	CASSSTVGYTF	CASSYGHNSPLH	CD8+ T cell isolate submitted by the Center for AIDS research	AB977927.1	[69]
	13-1b	CASSYGYLSPLN	CASSLGGYNSPL H	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AF189492.1	[86]
			CASSFGDAPLH	Peripheral blood and bronchoalveolar lavage of patient2 following beryllium sulfate induced lung disease	AF079047.1	[91]
			CASSPPGRGSYE Q	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient5 with chronic beryllium disease	AF079005.1	[91]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	13-2b	FCASNPSGRSSYEQ	CASSRSGRAAYEQ	CD8+ T cell isolates submitted by the Center for AIDS research	AB977640.1 AB977506.1	[69]
			FCAS--SGRLSYEQ	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*27052; B*5701	AAK07588.1	[108]
			CASRPQGTPSYEQ	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AF189455.1	[86]
			FCASSPSGGPSDEQ	CD8+ T lymphocyte isolated from patient A2 with non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	AJ301393.1	[92]
			CASTLSGSATYEQ FCASSLSGTTSYE	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	KX685087.1 KU749142	[80]
			FCASTPGGRSSY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78787.1	[85]
			CASSPPGRGSYEQ	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient5 with chronic beryllium disease	AF079005.1	[86]
	13-3b	FCASSPSGRSSYEQ	CASSRSGRAAYEQ CASSPGAGTSYEQ FCASSPGG	CD8+ T cell isolates submitted by the Center for AIDS research	AB977640.1 AB977506.1 AB977523.1	[69]
			FCASSPRGGAYEQ CASSSAGGAFSHEQ FCASSPSGG	Tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	KM004212.1 KM004243.1 KM004679.1	[72]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	13-3b	FCASSPSGRSSYEQ	FCASSPSGGPSDEQ FCASSLAGTSYEQ	CD4+ and CD8+ T cells taken from peripheral blood during the early phase of pediatric human immunodeficiency virus infection	AJ301393.1 AJ301479.1	[86]
			FCASSPLXGASYEQ	Clonal cytotoxic T cells in myeloma	AJ276199.1	[98]
			FCASSPQLAVSYEQ FCASSFGGSSYEQ	CD4+ T cell isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	KX075412 KX076739.1	[64]
			CASSTGGRNSYEQ	CD4+ T cell isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	KX077157.1	[64]
			CASSDGGLYSYEQ	Bone marrow of a patient with severe aplastic anemia	MG791404.1	[62]
			CASTLSGSATYEQ FCASSLSGTTSYE	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	KX685087.1 KU749142.1	[80]
			FCASSTGGSGNFSYEQ	TCR specific to HCV in patients with persistent hepatitis C virus infection	HM568289.1	[100]
			FCASSVLAGGPYEQ	CD4+ T cell isolate from a multiple sclerosis brain lesion	AJ405796.1	[31]
			FCASSPTGGG	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AF043845.1	[76]
			VYFCAIRSMNTEA	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	KU749208.1	[80]

TABLE 50: CONTINUED

Patient AMS-HA	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	13-4b	VYFCAAGG MNTEA	YFCASGTGMNT EA	Infiltrating T cell isolate obtained from localized brain tissue in a patient with chronic encephalitis of Rasmussen	HSU55093	[82]
			VYFCASISGMNT EA	T cell receptor clone isolated from the bone marrow of a patient with severe aplastic anemia	MG791156.1	[62]
			VYFCAIRGPMNTE A	CD4+ T cell isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	KX076289.1	[64]
			VYFCASSLMENTE A	CD4+ T cell isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	KX075884.1	[64]
			YFCASTAGRLNTE A	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	KX076474.1	[64]
			GMNTEA	CD4+ T cell isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	KX076628.1	[64]
			VYFCASSFAGMN TEA	CD4+ T cell isolated from Subject4 peripheral blood in a study of Sjogren's Syndrome	KX074747.1	[64]
			VYFCASGVMNTEA YFCASISWGDG NNEA	CD8+ T cell isolates submitted by the Center for AIDS research	AB977465.1	[69]
			VYFCASSYGGENT EA	TCR clone3-05 reported in a study of cerebrospinal fluid from patients with schizophrenia or affective disorder	AY611540.1	[109]
			VGQMNTEA	CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	MG192714.1	[85]
			GMNTEA	CD8+ T lymphocytes specific for Epstein-Barr Virus BRLF-1, clone F_29	AB749877.1	[65]
			YFCAAGE	CD8+ tumor infiltrating lymphocyte clone, melanoma antigen-specific TCR	S69569	[110]

TABLE 51. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM CEREBROSPINAL FLUID OF PATIENT LR AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 1(b)	ICSARSGGETE QFFQ Clonal Expansion	ICSARRG-DTEQFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57242.1	[87]
			ICSASSGGKNEQFF ICSARVGGNTEAFF ICSAR-GGET-QYF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78572.1 AVK78533.1 AVK78474.1	[85]
			ICSATSGGYNEQFF	CD8+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAW31104.1	[74]
			CSASSGGTNEQFF CSARAGGGRNTEAFF	TCR V beta chain expressed in CD8+ ulcerative colitis	AAB36335.1 AAB36341.1	[111]
			ICSARGSGPDTEAFF ICSARSPTSGRTNEQFF ICSARGGGGALGSYNEQFF	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10804.1 AIE10806.1 AIE10525.1	[72]
			ICSAREGAGNTEAFF ICSATGGGET-QYF ICSARDRSSGTNEQFF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78844.1 AVK78672.1 AVK78557.1	[85]
			ICSAVSGGSTYEQYF ICSASSGGFPITEAFF	CD4+ TCR found in the peripheral blood of patient6 with Sjogren's syndrome	ANO54973.1 ANO55017.1	[64]
			ICSARGDGD-EQFF	CD4+ T cell isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55614.1	[64]
			ICSASTGGSTEAFF ICSARTGARSTEAFF	CD4+ TCR found in the peripheral blood of patient5 with Sjogren's syndrome	ANO54627.1 ANO54737.1	[64]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 1(b)	ICSARSGGETE QFFQ Clonal Expansion	ICSASEGAETEAF F	CD4+ TCR found in the peripheral blood of patient10 with Sjogren's syndrome	ANO55265.1	[64]
			ICSAREDGNTEA FF ICSASSGAGGGN EQFF	CD4+ T cell isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56199.1 ANO56116.1	[64]
			ICSAREGRGTEQ YF	Small nuclear ribonucleoprotein (snRNP) reactive T cell clone isolated from a patient with connective tissue disease	AAB47711.1	[112]
			ICSARQG— NEQFF	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03771.1	[31]
			ICSARAGGASYEQ YF	CD8+ TCR beta chain from multiple sclerosis brain lesions	CAC03812.1	[31]
			ICSARTSGDFGEQ FF	TCR in mucosal associated invariant T cells	CAC03812.1	[113]
			ICSARTSGDFGEQ FF	MR1-mediated recognition of the mucosal associated invariant TCR	4DZB_B	[114]
			ICSAPALGGDTEA FF ICSARGSGDAYEQ YF	CD4+ TCR found in the peripheral blood of patient8 with Sjogren's syndrome	ANO55469.1 ANO55534.1	[64]
			ICSARAGTSGRE YNEQFF	CD4+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAV32376.1	[74]
			ICSARDLTSGAN NEQFF	Cross-reactivity of myelin specific TCR and low affinity microbial peptides	2WBJ_D	[115]
			ICSARDLTSGAN NEQFF	TCR from a patient with multiple sclerosis with unconventional self peptide-major histocompatibility complex binding	1YMM_E	[116]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 2(b)	CASSYMQLETP Clonal Expansion	CASTYMQLD	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB1773132.1	[75]
	LR 4(b)	CASSLEDHDNSPL Clonal Expansion	CASSLDGRNNSPL	Viral superantigen-9 stimulation of human T cells	AAC51979.1	[93]
			CASSLEGRNYNSPL	CD8+ T cell isolates submitted by the Center for AIDS research	BAS03857.1	[69]
	LR 5(b)	LCAWSRPKLAGEYNEQ Clonal Expansion	CASSR--LAGVYNEQ	HIV-specific CD8+ T cell beta chain	QCR99151.1	[117]
			LCASSRSGLAAGYNEQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78649.1	[85]
			LCASS---LAGGYNEQ	Clonotypes from muscle-infiltrating lymphocytes from a patient (case3) with human T lymphotropic virus type 1 polymyositis	BAC01035.1	[118]
	LR 6(b)	ICSARVSQGAPNTEA Clonal Expansion	ICSAREGFPGAPNTEA	CD4+ TCR beta chain from multiple sclerosis brain lesions	CAC03931.1	[31]
			ICSARDPQGA-DTEA	CD4+ TCR found in the peripheral blood of patient1 with Sjogren's syndrome	ANO54142.1	[64]
			ICSARVG-G--NTEA	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78533.1	[85]
			ICSARGS--GPDTEA	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10804.1	[72]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 7(b)	ICSARQSYEQY	SARESYEQY	CD4+ T cell isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56095.1	[64]
			ICSANRRSYEQY ICSAGQVSYEQY ICSASGQGYEQY ICSARDAARSYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78916.1 AVK78515.1 AVK78376.1 AVK78454.1	[85]
			ICSARPGPSSYEQY	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO26883.1	[73]
			ICSARTGTASYEQY	TCR beta chain from the left anterior descending coronary artery of a patient with chronic cardiac allograft rejection	AAG15819.1	[119]
			ICSARGPTQFYEQY	CD4+ TCR found in the peripheral blood of patient10 with Sjogren's syndrome	ANO55348.1	[64]
			ICSARAGGASYEQY	CD4+ TCR beta chain from multiple sclerosis brain lesions	CAC03812.1	[31]
			ICSARGSGDAYEQY ICSARSWRGYEQY	CD4+ TCR found in the peripheral blood of patient8 with Sjogren's syndrome	ANO55534.1 ANO55487.1	[64]
			ICSARDEALQAYEQY	CD8+ T cell isolates submitted by the Center for AIDS research	BAS04017.1	[69]
			ICSARDSITGTYEQY ICSARDSSGGTYEQY ICSARGPEQGAYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78825.1 AVK78729.1 AVK78502.1	[85]
			ICSASQAGGSSYEQY	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10809.1	[72]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 7(b)	ICSARQSYEQY	ICSARERDSLYEQY	CD8+ TCR beta chain from multiple sclerosis brain lesions	CAC03966.1	[31]
			ICSARKGRGAYEQY	Herpes simplex virus specific CD4+ T lymphocyte obtained from cervical secretion	AAV28687.1	[99]
			ICSARPSGRGRSYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78879.1	[85]
			ICSAREIRTGTYEQY	CD4+ TCR found in the peripheral blood of patient8 with Sjogren's syndrome	ANO55416.1	[64]
	LR 8(b)	CSARGGGDSYEQ Clonal Expansion	ARGGGDSY ARGGGDSY ARGGGDSY	Unswitched memory B cell in lymph node germinal centers linked to poor affinity maturation	MOK12827.1 MOK35879.1 MOK40131.1	[78]
			CSA-GGGDSYEQ	CD8+ T cell isolates submitted by the Center for AIDS research	BAS03672.1	[69]
			STRGGGDSY	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOQ03230.1	[78]
			CSARGSGDAYEQ	CD4+ TCR found in the peripheral blood of patient8 with Sjogren's syndrome	ANO55534.1	[64]
			CSARAGGASYEQ	CD4+ TCR beta chain from multiple sclerosis brain lesions	CAC03812.1	[31]
			CSAGGAGESYEQ	CD8+ TCR beta chain from synovium in an HLA B27+ patient with Reactive Arthritis	CAB95669.1	[83]
	LR 9(b)	CATSDEQEGYGYT	CATSREREGIYGYT	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78410.1	[85]
			CATSRDQ-GYGYT	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03907.1	[31]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 10(b)	FCASSQDIQETQYFG Clonal Expansion	FCASSQDIQETQYFG FCASSQDRWGTGTQDTQYFG	CD8+ T cell in a patient with ataxia telangiectasia	CAD26902.1 CAD26876.1	[120]
			CASSQ-IRETQYFG	Tumor-specific, MHC class II-restricted T cell receptor G4	4E41_E	[121]
			FCASSQDPGPQETQYFG	Clonotypes from muscle-infiltrating lymphocytes from a patient (case1) with human T lymphotropic virus type 1 polymyositis	BAC01005.1	[118]
			FCASSQPDRAQETQYFG	CD4+ TCR found in the peripheral blood of patient3 with Sjogren's syndrome	ANO54812.1	[64]
			FCASSQGRFQETQYFG FCASSQDRPGKETQYFG	CD4+ T cell isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55734.1 ANO55689.1	[64]
			FCASSEPDYQETQYFG FCASTQGTQETQYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78386.1 AVK78527.1	[85]
			FCASSVDRFQETQYFG FCASSVDRFQETQYFG	CD8+ TCR beta chain from synovium in an HLA B27+ patient with Reactive Arthritis	CAB95665.1 CAB95688.1	[83]
			FCASSGQVQETQYFG	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72653.1	[76]
			FCASSREAQETQYFG	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56242.1	[64]
			FCASSPGLQETQYFG	CD4+ T cell isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56106.1	[64]
			CASSQDVQGQTQYFG FCASS-ETQETQYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78385.1 AVK78479.1	[85]

TABLE 51 CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 10(b)	FCASSQDIQETQYFG Clonal Expansion	FCASSQD-RDTQYFG	TCR structural basis for a major histocompatibility complex Ib-restricted T cell response to cytomegalovirus	2ESV_E	[122]
			FCASSLGTQETQYFG FCASSQDPGREETQYFG	TCR beta chain from the lymph node of a patient with Hodgkin's lymphoma	CAC48308.1 CAC48309.1	[103]
			FCASSRQYQETQYFG	CD4+ T cell in a patient with ataxia telangiectasia	CAD26872.1	[120]
			FCASSDGAQETQYFG FCASSLTQGITDTQYFG	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10593.1 AIE10671.1	[72]
			FCASSP--QETQYFG	TCR clone of myelin basic protein-reactive T cells in MS patients	AAA98124.1	[123]
			FCASSQA--ETQYFG	CD4+ TCR found in the peripheral blood of patient1 with Sjogren's syndrome	ANO54017.1	[64]
			FCASSRG-QETQYFG	TCR VB17 gene sequence associated with diffuse large B-cell lymphoma	ACF49254.1	[124]
			CASSQDTGPETQYFG FCASSHLDRLQETQYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78676.1 AVK78834.1	[85]
			CASSQDSTDTQYFG	Oligoclonal Expansions among Specific V Expressing T Cells in Human Chagas Disease	ABR67605.1	[125]
			CASS--LQETQYFG	Anti-DNA autoantibody-inducing T cells in a human lupus patient	AAA80077.1	[126]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 10(b)	FCASSQDIQETQYFG Clonal Expansion	FCASSQAGSRQ ETQYFG	CD8+ T lymphocyte obtained from lymph nodes of patient A3 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34111.1	[92]
			FCASSQDPWPR ETQYFG FCASSQDPWPR ETQYFG	CD8+ T cell isolate submitted by the Center for AIDS research	BAS04117.1 BAS04115.1	[69]
			FCASSPPDRVQE TQYFG	CD8+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34211.1	[92]
			FCASSSGQA-QETQYFG FCASSQDTSTDT QYFG	CD8+ T cell isolate submitted by the Center for AIDS research	BAS04128.1 BAS04304.1	[69]
			FCASSLQGRTQE TQYFG	CD4+ T cell isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56680.1	[64]
			CASSPSQGLQET QYFG FCASSQGRTGS QETQYFG	CD8+ T cell isolate submitted by the Center for AIDS research	BAS04001.1 BAS04022.1	[69]
			FCASSHGAEETQY FG	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO27030.1	[73]
			FCASSQGLAGLQE TQYFG	CD4+ T lymphocyte isolated from a patient with DiGeorge/ velocardiofacial syndrome	CAD45173.1	[127]
			FCASSEGGQGI-ETQYFG	CD4+ T cell isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55760.1	[64]

TABLE 51. CONTINUED

Patient LR	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	LR 10(b)	FCASSQDIQETQYFG Clonal Expansion	FCASSPLGQG-QETQYFG	CD4+ TCR found in the peripheral blood of patient8 with Sjogren's syndrome	ANO55464.1	[64]
			CASSQDVAGGKETQYFG CASSQEGQGRQETQYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78546.1 AVK78382.1	[85]
			FCASSQGASGGRQETQYFG FCATSEGGTGIQETQYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78517.1 AVK78468.1	[85]
			FCASSQEVAGDGETQYFG	CD8+ T cell isolate submitted by the Center for AIDS research	BAS04144.1	[69]
			CASSQELGGAGQETQYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78645.1	[85]
			FCASSYGTSGRVIQETQYFG	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10757.1	[116]
			FCASSQDVTSGGLGDTQYFG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADP89868.1	[87]
	LR 11(b)	LCAWSRPKLAGEYNEQ	CASSR--LAGVYNEQ	HIV-specific CD8+ T cell beta chain	QCR99151.1	[117]
			LCASSRSGLAAGYNEQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78649.1	[85]
			LCASS---LAGGYNEQ	Clonotypes from muscle-infiltrating lymphocytes from a patient (case2) with human T lymphotropic virus type 1 polymyositis	BAC01035.1	[104]

TABLE 52. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT CAL-1 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	6-1(b)	ASSLGTGTRETQY Clonal Expansion	ASSLGSGTLQ ETQY	myelin basic protein specific T-cell receptor	AAB25615.1	[128]
			ASSLGGGTR RTQY	Oligoclonal Expansions among Specific V Expressing T Cells in Human Chagas Disease	ABR67606.1	[125]
			ASSL-TG-RETQY	CD4+ T cell isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56881.1	[64]
			ASSLGTS--ETQY	T cell receptor beta chain from patient with the left descending coronary artery of a patient with chronic cardiac allograft rejection	AAG15824.1	[119]
			ASSLGVGT-DTQY	Peripheral blood of Subject9 clone 1081-9 in a patient with Sjogren's syndrome	ANO55083.1	[64]
			ASSLGT--QETQY	TCR beta chain from the lymph node of a patient with Hodgkin's lymphoma	CAC48308.1	[103]
			ASSLLRLSGIG GRETQY	Clonotypes from muscle-infiltrating lymphocytes from a patient (case3) with human T lymphotropic virus type 1 polymyositis	BAC01037.1	[104]
			ASSAGTGDQ ETQY	Activated and effector memory T cells clonally expanded in bicuspid valve in a case calcific aortic stenosis	AEK76026.1	[88]
			ASSLGT-VQETQY	CD8+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAV32421.1	[74]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	6-2(b)	CASSLSGLGENIQY Clonal Expansion	CASSLE-RGENIQY	CD4+ T cell isolated from Subject5 salivary glands of a patient with Sjogren’s Syndrome	ANO56113.1	[64]
			CASSLQGLGSNEQF	TCR beta chain in a study of infiltrating T cells in the salivary gland in the sicca syndrome of HIV-1 infection	AAB27499.1	[129]
	6-3(b)	VYLCVRTRRREASTDTQ	RTRRREAST	Human papillomavirus type 49	NP_041835.1	[130]
			VYLCASSRRGAATSTDTQ	Human Hepatitis C Virus specific TCR clone-36	ADQ19297.1	[100]
	4-1(b)	IYLCSIRDGRFTDTQ Clonal Expansion	IYLCSVGREGR-PDTQ	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57180.1	[87]
	4-3(b)	YLCSGSGSLHANEQF	YLCATSAGQGSLSPNEQF	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren’s Syndrome	ANO56314.1	[64]
			YLCASSGGL-AGVNEQF	CD8+ TCR beta chain from multiple sclerosis lesion brain tissue	CAC03777.1	[31]
			YLCASSSSGT--ANEQF	CD8+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin’s lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34166.1	[92]
			YLCSAQVGTGG--ANEQF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78952.1	[85]
			YICSAPRGLHTNEQF	CD4+ T cell isolated from Subject4 peripheral blood in a study of Sjogren’s Syndrome	ANO54442.1	[64]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	4-4(b)	YLCSAGTGVGH EQFF	YLCSAGLRGVGY NEQFF	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAR06233.1	[131]
			YLCSAGLTG-GREQYF	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10797.1	[116]
			YLCSVGTGV--EQYF	CD4+ T cell isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56822.1	[64]
			YLCSAVGTG-GSTSEQFF YLCSAQVGTGGA NEQFF YLCSASVGVRGT EAFF YICSASSGGKNE QFF	circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78930.1 AVK78952.1 AVK78911.1 AVK78572.1	[85]
			YLCASRPGPGVG NEQFF	CD4+ beta TCR isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10547.1	[116]
			YICSASSGAGGG NEQFF	CD4+ T cell isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56116.1	[64]
			YLCAWSRG---GHEQFF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29165.1	[86]
			YLCASSSGSGSG YEQYF	CD4+ T cell isolated from Subject5 peripheral blood in a study of Sjogren's Syndrome	ANO54683.1	[64]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	4-4(b)	YLCSAGTGVG HEQFF	YLCASSGSGGSR EQFF YFCASSFTGAGN EQFF	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72667.1 AAC72587.1	[76]
			YLCASSSGSGSG YEQYF YFCASSETGAGN EQFF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57007.1 ADQ57170.1	[87]
			YLCASSSTGGGD EQYF	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15750.1	[119]
			YLCASTTTAGGN EQFF	CD4+ T cell isolated from Subject3 peripheral blood in a study of Sjogren's Syndrome	ANO54930.1	[64]
			YLCASSLGTGNE QFF	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56243.1	[64]
			YLCASSSGTSGN NEQFF	TCR beta chain from a cross reactive T cell clone in a study of cell mimicry and epitope specificity in rheumatic heart disease	AAW33957.1	[132]
			YLCSSGGTSGGN TYNEQFF	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83284.1	[133]
			YLCASSTGLGSSY NEQFF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32377.1	[74]
			YLCASSTLTTGK GNEQFF	CD4+ T cell isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56018.1	[64]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	4-4(b)	YLCSAGTGVG HEQFF	YLCASSFIAGLGN EQFF	CD8+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34198.1	[92]
			YLCASTLGLATD TQYF	CD4+ T cell isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56050.1	[64]
	4-5(b)	YLCSAILGLTQ YF	YLCASSLGLTDT QYF	TCR clone from CSF in schizophrenia patients	AAT72842.1	[109]
			YLCSA-- GLTGGREQYF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10797.1	[72]
			YLCASSLGLAGR PDTQYF	Interleukin- 2 receptor-positive T cells, V beta, from synovial cells in rheumatoid arthritis	AAB20507.1	[134]
			YLCASSLGLGGG ETQYF	CD8+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34167.1	[92]
			YLCASSLGLAGGE ETQYF	Human Hepatitis C Virus specific TCR-clone 159	ADQ19419.1	[100]
			YLCSVLAGGTYE QY	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO27040	[73]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4-6(b)	YLCSVRAGYEQY	YLCASLR-GYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10333.1	[72]
			YLCASSVRSSYEQY YLCASSVQGAYEQY	TCR beta chain isolated from synovial fluid of a patient with spondyloarthropathy	AAN78482.1 AAN78480.1	[135]
			YLCASSLRGGYEQY	CD4+ T cell isolated from Subject5 peripheral blood in a study of Sjogren's Syndrome	ANO55162.1	[64]
			YLCSVVTGKSR-GYEQY YLCSVVSGSSYEQY	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03972.1 AAB03973.1	[82]
			YLCASSIRSSYEQY YLCASSIRSSYEQY	T-cell antigen receptor recognizing HLA-A2 and influenza A matrix peptide	AAB20045.1 P0DSE2.1	[136]
			YICSARAGGASYEQY	CD4+ TCR beta chain from MS lesion brain tissue	CAC03812.1 CAC03767.1	[31]
			YLCASSIRSSYEQY YLCSVSGQATYEQY YLCASSMRGSYEQY YLCSVEGGSSYEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81515.1 AOO95292.1 AOO95310.1 AMT81483.1	[80]
			YLCASSIRSSYEQY	TCR beta chain in a molecular study for universal HLA-A*0201-restricted CD8+ T cell immunity against influenza viruses	5HHO_E	[137]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4-6(b)	YLCSVRAGYEQY	YLCSVELARNSYEQY	CD8+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAR06216.1	[131]
			YLCASSIRPSYEQY	CD4+ T cell isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO55995.1	[64]
			YLCSVLTSGRADGSYEQY	CD8+ TCR beta chain from MS lesion brain tissue	CAC03767.1	[31]
			YLCASSHQAGYEQY YLCASSSGYEQY YLCASSLLAGYEQY YLCASSLVTRAAYEQY	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29257.1 AAF29258.1 AAF29229.1 AAF29256.1	[86]
			YLCSVRRDRDYEQY	Herpes simplex virus specific CD4+ T lymphocyte obtained from cervical secretion	AAV28688.1	[99]
			YICSARSWRGYEQY	CD4+ T cell isolated from Subject8 peripheral blood in a study of Sjogren's Syndrome	ANO55487.1	[64]
			YICSARGTSGYEQY	CD4+ T cell isolated from Subject9 peripheral blood in a study of Sjogren's Syndrome	ANO55165.1	[64]
			YLCASARESYEQY	CD4+ T cell isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56095.1	[64]
			YLCASLR-GYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10333.1	[72]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4-6(b)	YLCSVRAGYEQY	YLCSVETGDSYEQY YLCSVETGDTYEQY YLCSVGTGESYEQY	HIV-specific CD8+ T cell beta chain	QCR99149.1 QCR99150.1 QCR99144.1	[117]
			YICSARQSYEQY	TCR clone from CSF in schizophrenia patients	AAT72846.1	[109]
			YICSARTGTASYEQY	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15819.1	[119]
	4-7(b)	LCSVGRDYEQY	SVGQDYEQY	CD8+ T lymphocyte obtained from lymph nodes of patient A3 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34113.1	[92]
			LCSVGLSYEQY	CD4+ T cell isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55727.1	[64]
			LCSVRRDRDYEQY	herpes simplex virus-specific CD4+ T lymphocyte derived from herpetic skin lesions	AAV28688.1	[99]
			LCSVGQTGNYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10824.1	[72]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4-8(b)	YLCSGRTGAPQ EQYF	CASRTGPPY EQYF	Breast tumor-specific beta TCR from peripheral blood of a breast cancer patient	AAB32195.1	[138]
			YICSARTGTA SYEQYF	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15819.1	[119]
			YLCSVRTGLA KNIQYF YLCASSSRTG ASETQYF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10827.1 AIE10734.1	[72]
			YLCSVATGG KDEQYF	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO27066.1	[73]
			YLCS--- GAGQGGEQ YF YICSAR- GMGLAPHE QYF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78418.1 AVK78396.1	[85]
			CSARTSGAQ ETQYF	Anti-DNA autoantibody-inducing T cells in a human lupus patient	AAA80062.1	[126]
			YLCASSTGTP SYEQYF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57036.1	[87]
			YICSARGAG AGDEQYF	CD4+ T cell isolated from Subject9 salivary glands of a patient with Sjogren’s Syndrome	ANO56519.1	[64]
			YFCASRKTGI PSEQYF	TCR beta chain from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR91955.1	[102]

TABLE 52. CONTINUED

Patient CAL-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4-8(b)	YLCSGRTGAP QEQYF	YLCSVSSGGT QETQYF	CD4+ T cell isolated from Subject7 peripheral blood in a study of Sjogren’s Syndrome	ANO54294.1	[64]
			YLCSVRMSFR GKPDEQYF	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAR06231.1	[131]
			YLCASSSGRS GAPNENEQF F	CD4+ T cell isolated from Subject5 peripheral blood in a study of Sjogren’s Syndrome	ANO54639.1	[64]

TABLE 53. CLONES SHARING HOMOLOGY WITH ALPHA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT 4063 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	4063 1(a)	YFCAAYNNND Clonal Expansion	YICAAYNNND YFCAAFYNND	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56235.1 ANO56319.1	[64]
			YFCAAYNTN	CD4+ T cell isolated from Subject6 peripheral blood in a study of Sjogren's Syndrome	ANO54981.1	[64]
			YFCALSGYNNND	Myelin basic protein (84-102) specific TCR alpha chain	AAB31425.1	[38]
			YFCAVSWYNNND	CD4+ T cell isolated from Subject7 peripheral blood in a study of Sjogren's Syndrome	ANO54379.1	[64]
	4063 3(a)	YLCAVMDSS Clonal Expansion	YLCAVRMDSS	TCR antigen complexes at an immunodominant epitope in HIV-1 infection	3VXR_D	[139]
			YFCAVMDSS	CD4+ T cell isolated from Subject4 peripheral blood in a study of Sjogren's Syndrome	ANO54471.1	[64]
			YLCAVQTMDSS	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11169.1	[72]
			YLCAVNPMDSS	CD4+ T cell isolated from Subject2 peripheral blood in a study of Sjogren's Syndrome	ANO54176.1	[64]

TABLE 53. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	4063 4(a)	YICVVANTGGF Clonal Expansion	YICVVAN YICVVSRNTGGF	CD4+ TCR beta, partial isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10398.1 AIE10396.1	[72]
			YFCAVADTGGF	CD4+ T cell isolated from Subject3 peripheral blood in a study of Sjogren's Syndrome	ANO54837.1	[64]
			YLCAMANTGGF	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11165.1	[72]
			YFCAVPNTGGF	CD4+ T cell isolated from Subject7 peripheral blood in a study of Sjogren's Syndrome	ANO54337.1	[64]
	4063 5(a)	FCATDLLYNQG	CATDLLY	Unswitched memory B cell in lymph node germinal centers linked to poor affinity maturation	MOK05167	[78]
			CATDLLY CATDLLYD	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB2052179.1 MBB2050679.1	[75]
			FCATDLLTNYNQG	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56280.1	[64]
			FCATD-FYNQG	CD4+ T cell isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56460.1	[64]
			FCATDAGYNQG	T cell alpha chain variable region in a study of insulin B-chain transpeptidation superagonists for CD4+ T cells in human Type 1 diabetes	6DFX_G	[140]

TABLE 53. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	4063 7(a)	YICAALNDMR	YICAAYNNNDMR	CD4+ T cell isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56235.1	[64]
	4063 9(a)	YLCAVPNYGG	YICAVPNYGG	TCR alpha chain form a patient with leukocyte leukemia	AAC60622.2	[141]
			YLCAVPPGNYG YLCAVQAWNYGG YLCAVSNY	CD4+ TCR alpha chain isolated from Subject3 peripheral blood in a study of Sjogren's Syndrome	ANO54906.1 ANO54760.1 ANO54756.1	[64]
			YLCAVPSYPGG	CD4+ TCR alpha chain isolated from Subject10 peripheral blood in a study of Sjogren's Syndrome	ANO55296.1	[64]
			YLCAAANYGG	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11101.1	[72]
			YLCAVPAYSG	CD4+ TCR alpha chain isolated from Subject6 peripheral blood in a study of Sjogren's Syndrome	ANO54957.1	[64]

TABLE 53. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	4063 9(a)	YLCAVPNYGG	YLCAVNNYG YLCAVPN YLCAVPN	CD4+ TCR alpha chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56167.1 ANO56166.1 ANO56102.1	[64]
			YFCAGPNYGG	CD4+ TCR alpha chain isolated from Subject5 peripheral blood in a study of Sjogren's Syndrome	ANO54724.1	[64]
	4063 10(a)	ICVVSRMIKAA	ICVISRQHMNTMIKA	CDK5 regulatory subunit associated protein 2	NP_060719.4	[142]
	4063 11(a)	YFCAVSQNNAG Clonal Expansion	YFCAVSPNNAG YFCALSTNNAG	CD4+ TCR alpha chain isolated from Subject1 peripheral blood in a study of Sjogren's Syndrome	ANO54131.1 ANO54035.1	[64]
			YFCAVSEN	CD4+ TCR alpha chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55948.1	[64]
			YFCAVSEN	CD4+ TCR alpha chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56707.1	[64]
			YFCAVKENNAG	CD4+ TCR alpha chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55732.1	[64]
			YFCAVGANNAG	CD4+ TCR alpha chain isolated from Subject2 peripheral blood in a study of Sjogren's Syndrome	ANO54193.1	[64]

TABLE 53. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	4063 11(a)	YFCAVSQNNAG Clonal Expansion	YFCAVITNNAG	CD4+ TCR alpha chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO55973.1	[64]
			YFCAVTEGNAG	CD4+ TCR alpha chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56268.1	[64]
			YFCAVSEANTG	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11192.1	[72]

TABLE 54. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT 4063 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcripts	4063 1(b)	LCASSPVGSSYNE Clonal Expansion	LCASSPGGSSY	CD4+ TCR beta chain isolated from Subject5 peripheral blood in a study of Sjogren's Syndrome	ANO54689.1	[64]
			LCASSPSASSYNE	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78767.1	[85]
			LCASSLAGSSYNE	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56180.1	[64]
			CASSPLGTSSYNE	Muscle infiltrating lymphocytes inclusion body myositis	AAB32015.1	[143]
			LCASSPTGNPSSYNE	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32384.1	[74]
			LCASSLRKVGSSYNE	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55564.1	[64]
			CASSPHSRGSSYNE	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15826.1	[119]
			LCASTPGLAGGSSYNE	CD4+ TCR beta chain isolated from Subject1 peripheral blood in a study of Sjogren's Syndrome	ANO54103.1	[64]
				CD4+ TCR beta chain isolated from Subject9 peripheral blood in a study of Sjogren's Syndrome	ANO55146.1	[64]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 2(b)	LCASREGVGT DTQ Clonal Expansion	LCASREWG-GTDTQ	TCR beta chain from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR37271.1	[102]
			LCASSLGVGTDTQ	CD4+ TCR beta chain isolated from Subject9 peripheral blood in a study of Sjogren's Syndrome	ANO55083.1	[64]
			LCASSQGRGVGTD TQ LCASSEGEVTDTQ	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10461.1 AIE10599.1	[72]
			LCASSLEGISTDTQ LCASSEGEVTDTQ	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89834.1	[87]
			LCASSETGGTDTQ LCASNETGGTDT Q	TCR beta chain isolated from a HLA-B27 positive patient with reactive arthritis	AAF81839.1 AAF81838.1	[79]
			CASREGGG-DTQ	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54215.1	[64]
			CASSSGVSTDTQ	TCR obtained from spinal cord of a patient with HTLV-I associated myelopathy/tropical spastic paraparesis	BAA06787.1	[144]
	4063 3(b)	YFCATAGTGE GNYGY Clonal Expansion	YFCATTGTG	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03975.1	[82]
			YFCATSGLAGTGE	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAP84264.1	[131]
			YFCATSERTG-ANYGY	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26895.1	[73]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 3(b)	YFCATAGTGE GNYGY Clonal Expansion	YFCASSLLGQGNY GY YFCASSSAGSGGY GY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31454.1 AAV32370.1	[74]
			YFCATSSLLDGNY GY	CD8+ TCR beta chain from MS brain lesion tissue	CAC03968.1	[31]
			YFCASS-YGAGNYGY YLCATSRARGTGG SNYGY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78619.1 AVK78586.1	[85]
			YFCASSPTG-GGYGY	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72641.1	[76]
			YFCATSDG---GDYGY	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO55006.1	[64]
			YFCASSLRGTGTA NYGY	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient5 with chronic beryllium disease	AAV52848.1	[91]
			YLCASENQAGT-EANYGY	CD4+ T cell obtained from the synovial fluid of patient CS-1 with rheumatoid arthritis	AAC72591.1	[76]
			YFCASSG--QGDYGY	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56805.1	[64]
			YFCAISESAAG---GNYGY	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54343.1	[64]
	4063 4(b)	ASSEAPVGNT EA Clonal Expansion	ASSQDPVGNTEA	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56140.1	[64]
	4063 5(b)	FCASSVRQTN TGE Clonal Expansion	FCASSVAETNTGE	Human Hepatitis C Virus specific TCR clone-107	ADQ19367.1	[100]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 5(b)	FCASSVRQTN TGE Clonal Expansion	FCASSV-ATLNTGE	Human Hepatitis C Virus specific TCR clone-106	ADQ19366.1	[100]
			FCASSVR-TSVGE	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10753.1	[72]
			FCASSVDRDKNT GE	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK16720.1	[97]
			FCASSLRQVDT	TCR beta chain specific to pyruvate dehydrogenase in a patient with primary biliary cirrhosis	AAC03523.1	[145]
			FCASTAPATNTGE	Human Hepatitis C Virus specific TCR clone-109	ADQ19369.1	[100]
			FCASSLPDINTGE	Human Hepatitis C Virus specific TCR clone-98	ADQ19358.1	[100]
	4063 6(b)	CAWSVERGR RSNQP Clonal Expansion	CAWSADRG--SNQP	CD8+ T lymphocyte obtained from lymph nodes of patient A2 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34092.1	[92]
	4063 7(b)	LCASSADSYE QY Clonal Expansion	CASSA-SYEQY LCASSQDNRNSY EQY LCASSLTSGGASSY EQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78512.1 AVK78762.1 AVK78592.1	[85]
			LCASSPRDSYEQY LCASSPRDSYEQY	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55939.1 ANO55861.1	[64]
			LCASSPRDSYEQY	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54336.1	[64]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 7(b)	LCASSADSYEQY Clonal Expansion	CASSLMADSY EQY	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55471.1	[64]
			LCASSLDVSYE QY	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56817.1	[64]
			LCASSLGSYEQ Y	CD8+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34150.1	[92]
			LCASSS-SYEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81482.1	[80]
			CASSSNSYEQ Y	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32383.1	[74]
			LCASSARDNY SYEQY	CD8+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34200.1	[92]
			LCASSLVADTY EQY	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54617.1	[64]
			LCASSLLVDSY EQY	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83282.1	[133]
			LCASSAPGQS YEQY	TCR beta cells from lung tissue in a patient with emphysema	AV52846.1	[91]
			LCASSSIDSSYE QY	Interleukin- 2 receptor-positive T cells, V beta, from synovial cells in rheumatoid arthritis	AAB20495.1	[134]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 7(b)	LCASSADSYEQY Clonal Expansion	LCASSATGFSYEQY	TCR beta in rheumatoid synovium	AAC14928.1	[146]
			LCASS-DTVSYEQY	TCR Specific for HLA A02 presenting HIV Epitope SLYNTVATL	5NMD_B	[147]
			LCASSQEASYEQY LCASSTAGTYEQY	Myelin basic protein specific T-cell receptor	AAB25666.1 AAB25648.1	[128]
			LCASPGASYEQY	TCR beta in a study of infiltrating oligoclonal T cells in the brain of children with AIDS	AAM03355.1	[59]
			LCASSSGDYEQY	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient2 with chronic beryllium disease	AAD55191.1	[91]
			LCASARESYEQY	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56095.1	[64]
			LCASSLDPGLSYEQY LCASSTGGRNSYEQY LCASSTGGRNSYEQY	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56880.1 ANO56896.1 ANO56938.1	[64]
			LCASSLWAASSYEQY	CD8+ T lymphocyte in long-term persistent HIV-1 subjects with variable rates of disease progression	AAF76235.1	[148]
			LCASSLGAEAYEQY	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient5 with chronic beryllium disease	AAD55234.1	[91]
			LCASSQDEGGDSYEQY	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54501.1	[64]
			LCASSQDAALHSYEQY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31427.1	[74]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 7(b)	LCASSADSYEQY Clonal Expansion	LCASSLDGDRASYEQY	TCR beta chain in a patient with celiac disease	ABF14438.1	[149]
			LCASSRDSGGSSYEQY	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56435.1	[64]
			LCASSLAAGNSYEQY	CD4+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34173.1	[92]
			LCASSHGLAEPYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57199.1	[87]
			LCASSRRWDNSYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72563.1	[76]
	4063 8(b)	YICSVIFHEGPHSNQP	YICSVIFGDNPRPN	Neuraminidase gene variations of Influenza virus A (H1N1)09pdm	ASB32466.1	[150]
			YICSARFHPGQGGDSNQP	CD4+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34230.1	[92]
	4063 10(b)	YICSAPFGTSGNEQF	YICSAP-GTSGSNEQF YICSATAGTSYNEQF YICSAP-GTGGTEAF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78519.1 AVK78885.1 AVK78550.1	[85]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 10(b)	YICSAPFGTSGNEQF	YICSAP-RTSGTYNEQF YICSAR-GTSGYEQY	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55076.1 ANO55165.1	[64]
			YICSATTSTGGNEQF	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56109.1	[64]
			YICSARAGTSGREYNEQF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32376.1	[74]
			YICSA---TSGGYNEQF	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31104.1	[74]
	4063 12(b)	LCASSIPTGGSYNE	CASSLPTGGS	TCR V beta chain expressed in CD8+ ulcerative colitis	AAB36361.1	[111]
			LCASSQPTGGAYNE LCASSISASGGSYNE LCASSIDRMAGSSYNE	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10714.1 AIE10628.1 AIE10626.1	[72]
			LCASSIVTGYSYNE LCASSFRAGVSYNE	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32416.1 AAV32422.1	[74]
			CASSIGTGG-YNE	HIV-specific T-cell antigen receptor beta chain	AAB31470.1	[151]
			LCASSLETGGNYNE	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54251.1	[64]
			LCASSIVTGTTYNE LCASSI-SSGSYNE	Interleukin- 2 receptor-positive T cells, V beta, from synovial cells in rheumatoid arthritis	AAB20496.1 AAB20490.1	[134]
			LCASSLGTGTSYNE	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32382.1	[74]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 12(b)	LCASSIPTGGS YNE	LCAWS-- TGGSYNE	Small nuclear ribonucleoprotein (snRNP) reactive T cell clone isolated from a patient with connective tissue disease	AAB47710.1	[112]
			LCASSIGGGGS WNE	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55166.1	[64]
			CASSL- TSGSYNE	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15800.1	[119]
			CASSLTIGGSYN	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB2071526.1	[75]
			LCASSIRTSGPY	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56941.1	[64]
			LCASSQPTGLA AYNE	Clonotypes from muscle-infiltrating lymphocytes from a patient (case2) with human T lymphotropic virus type 1 polymyositis	BAC01017.1	[104]
			LCASSLGLAGG SYNE	TCR beta chain from the lymph node of a patient with Hodgkin's lymphoma	CAC48315.1	[92]
			LCASSQERTGA SYNE	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56717.1	[64]
			LCASSLPS-- SYNE	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15762.1	[119]
			CAST- PTGGTYND	Unswitched memory B cell in lymph node germinal centers linked to poor affinity maturation	MOL89449.1	[78]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 12(b)	LCASSIPTGGSYNE	LCASSVESSGGYNE	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56051.1	[64]
	4063 16(b)	CASSDGNTEA	CASSSDSNTEA	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57173.1	[87]
			CASSQANTEA	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78770.1	[85]
			CASSPTDGDTEA	CD4+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34131.1	[92]
	4063 17(b)	FCASSVGINTEA	FCASSVGI	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56114.1	[64]
			FCASSVGI	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57028.1	[87]
			FCASSPGLNTEA	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78628.1	[85]
			FCASRVGQNTEA	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO54954.1	[64]
			FCASSVE-NTEA	TCR beta chain from the lymph node of a patient with classical Hodgkin's lymphoma	CAC48321.1	[103]
			CASSLVGMNTEA FCASSVKIDSEA	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10672.1 AIE10751.1	[72]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 17(b)	FCASSVGINTEA	FCASSLGVNT	HIV-specific CD8+ T cell beta chain	QCR99128.1	[117]
			FCASSTGTGINTEA	TCR beta chain clonotypes in synovial tissues of rheumatoid arthritis	AAB36315.1	[152]
			FCASSLSIDTEA	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56753.1	[64]
			FCASGTGMNTEA	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03920.1	[82]
			FCASSTDMNTEA	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56039.1	[64]
			FCASSVLGGMENTEA	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54052.1	[64]
			FCASSVAPLMNTEA	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03829.1	[31]
			FCASSVSGTTNTEA	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54688.1	[64]
			FCASSAGRHLNTEA	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55817.1	[64]
	4063 18(b)	FCASSQGRGSNGYGYG	FCASSQGRSSN FCASSQGRSSN	TCR beta chains specific for similar myelin basic protein peptide/major histocompatibility complexes	PIR: S57878 PIR: S57879	[153]
			FCASSEGQGSN FCASSIGQGGNGYTFG FCASSQVWGQGAD-YGY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78824.1 AVK78579.1 AVK78827.1	[85]
			FCASSQGPGSGDFGY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57214.1	[87]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 18(b)	FCASSQGRGSNGYGYG	FCASSPGTGG-GYGY	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29312.1	[86]
			FCASSSA-GSGGYGY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32370.1	[74]
			FCASSE-RG-QGYGY	TCR variable beta 2 chain from melanoma patients following MAGE vaccination	ACA28842.1	[154]
			CASSQDRGAANYGY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10701.1	[72]
			CASSQNKGPN-YGY	Clonotypes from muscle-infiltrating lymphocytes from a patient (case1) with human T lymphotropic virus type 1 polymyositis	BAC00998.1	[104]
			CASSAGQGFSSNSYGY	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54347.1	[64]
			FCASSQDRQGAGGYTFG	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54018.1	[64]
			FCASSEGQGRGGYTFG	CD4+ TCR beta chain in multiple sclerosis brain lesion	CAC03844.1	[31]
	4063 19(b)	CASSLVGREDKLFF	CASSLLGQEEKLFF	TCR beta chain variable region in pediatric acquired severe aplastic anemia	ACN65177.1	[155]
			CASSLVLDRDEKLFF	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO56506.1	[64]
			CASSLVTGNGEKLFF	TCR beta chain variable region isolated from patients suffering from Rasmussen encephalitis	AMT81611.1	[80]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 19(b)	CASSLVGRED KLFF	CASSLAGVDEKLF F	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient2 with chronic beryllium disease	AAD55236.1	[91]
			CASSLV-KNEKLFF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56943.1	[64]
			CASSLQGTNEKLF F	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78481.1	[85]
			CASSL-- RRGEEKLFF	TCR in peripheral blood isolated from an HLA-DR2 multiple sclerosis patient 2	CAA69603.1	[156]
			CASSL- GTERNEKLFF	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54095.1	[64]
	4063 20(b)	CASSPDCYEQ Y	CASSPRDSYEQY CASSPRDSYEQY	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55939.1 ANO55861.1	[64]
			CASSPRDSYEQY	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54336.1	[64]
			CASSNPDVYEQY	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56393.1	[64]
			SSPNCYEHY SSPNCYEHY	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB2139433.1 MBB2001073.1	[75]
			CASSPRTDAYEQY	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54825.1	[64]
			CASSPPGSYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72672.1	[76]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 20(b)	CASSPDCYEQY	CASSSNSYEQY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32383.1	[74]
			CASSPDPGQLYEQY	Human Hepatitis C Virus specific TCR clone-154	ADQ19414.1	[100]
			CASSPDRLFNYEQY	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56092.1	[64]
			CASSPLSGGDYYEQY	TCR beta in a study of infiltrating oligoclonal T cells in the brain of children with AIDS	AAM03403.1	[59]
			CASSSDHYEQY	Viral superantigen-9 stimulation of human T cells	AAC51997.1	[93]
			CASSPEQTGSYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78881.1	[85]
			CARDCSSPNCYEVY CARSPYCGGDCYENY	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOK76678.1 MOR19189.1	[78]
	4063 21(b)	CASSPEGYEQY	CASSPRGYEQY CASSPAGPFYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10443.1 AIE10430.1	[72]
			CASS-EGYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31436.1	[74]
			CASSPAEFGYEQY	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03982.1	[31]
			CASSPGGSYEQY	Anti-DNA autoantibody-inducing T cells in a human lupus patient	AAA80036.1	[126]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 21(b)	CASSPEGYEQY	CASSPPGSYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72672.1	[76]
			CASSPGGPYEQY	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56383.1	[64]
			CASSSPGGYEQY	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56263.1	[64]
			CASSLEAGYEQY	TCR beta in a study of infiltrating oligoclonal T cells in the brain of children with AIDS	AAM03398.1	[59]
			CASSTERGYEQY	TCR beta chain specific to pyruvate dehydrogenase in a patient with primary biliary cirrhosis	AAC03522.1	[145]
			CASSPTXYEQY	CD8+ TCR beta chain from MS lesion brain tissue	CAC03899.1	[31]
			CASSLGTEGYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-1 with rheumatoid arthritis	AAC72684.1	[76]
			CASSPQEGGYEQY	Viral superantigen-9 stimulation of human T cells	AAC52009.1	[93]
			CASSPGTGGYEQY	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15783.1	[119]
			CASSPGGSSYEQY	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54689.1	[64]
			CASSPSTGGYEQY CASSPEQTGSYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78919.1 AVK78881.1	[85]
			CATSGPESYEQY	TCR beta chain in peripheral blood from a patient post-transfusion graft-versus-host disease	BAA09370.1	[157]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 21(b)	CASSPEGYEQY	CASSPAGQDLYEQY	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55913.1	[64]
			CASSAEGGKTYEQY	TCR beta chain isolated from a HLA-B27 positive patient with reactive arthritis	AAF81881.1	[79]
			CASSPQGYYNEQF	Liver infiltrating T lymphocyte from patients with primary biliary cirrhosis	AAB29047.1	[158]
	4063 22(b)	FCASSTEDYEQY	FCASSTERGYEQY	TCR beta chain specific to pyruvate dehydrogenase in a patient with primary biliary cirrhosis	AAC03522.1	[145]
			FCASSPTSDYEQY	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55611.1	[64]
			FCASS-EGYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31436.1	[74]
			FCASSQE-YEQY	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03953.1	[82]
			CASSSGDYEQY CASSQGDYEQY CASSLGDYEQY	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient2 with chronic beryllium disease	AAD55191.1 AAD55190.1 AAD55189.1	[91]
			FCASSLGTEGYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-1 with rheumatoid arthritis	AAC72684.1	[76]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 23(b)	CASSYRDTYEQY	CASSLRDVTYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31731.1	[74]
			CAS--RDTYEQY	Human Hepatitis C Virus specific TCR-clone 159	ADQ19373.1	[100]
			CASSFMDTYEQY	Viral superantigen-9 stimulation of human T cells	AAC51965.1	[93]
			CASSFRDSSYEQY	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56071.1	[64]
			CASSEYKATYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10366.1	[72]
	4063 24(b)	LCASSADHYEQY	CASSLADPYEQY	CD4+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34082.1	[92]
			LCASSLVADTYEQY	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54617.1	[64]
			CASSSDHYEQY	Viral superantigen-9 stimulation of human T cells	AAC51997.1	[93]
			LCASSSQPHYEQY	Activated and effector memory T cells clonally expanded in bicuspid valve in a case calcific aortic stenosis	AEK76014.1	[88]
			LCASSPRDSYEQY LCASSPRDSYEQY	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55861.1 ANO55939.1	[64]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 24(b)	LCASSADHYEQY	LCASSQDGDYEQY	Neoplastic T cells in angioimmunoblastic T-cell lymphoma, subscapular lymph node	CAH56758.1	[94]
			LCASSPRDSYEQY	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54336.1	[64]
			CASSLMADSYEQY	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55471.1	[64]
			LCASSNPDVYEQY	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56393.1	[64]
			LCASSSGDYEQY LCASSQGDYEQY LCASSLGDYEQY	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient2 with chronic beryllium disease	AAD55191.1 AAD55190.1 AAD55189.1	[91]
			LCASSARDNYSYEQY	CD4+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34200.1	[92]
			CASSSNSYEQY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32383.1	[74]
			LCASSLLVDSYEQY	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83282.1	[133]
			LCASSALAGPYEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81612.1	[80]
			LCASSHGLAEPYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57199.1	[87]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 24(b)	LCASSADHYEQY	LCASSQDNRNSYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78762.1	[85]
			LCASSPDPGQLYEQY	Human Hepatitis C Virus specific TCR-clone 154	ADQ19414.1	[100]
			LCASSQMGQGHYEQY	Small nuclear ribonucleoprotein (snRNP) reactive T cell clone isolated from a patient with connective tissue disease	AAB42074.1	[112]
			LCASSASTGGRYEQY LCASSQDRSFTGYEQY	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26888.1 ABO26977.1	[73]
	4063 25(b)	FCASRGTGFYNEQ Clonal Expansion	FCASRGTG	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55225.1	[64]
			CA-RGTGFYND	CD19lo Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOL38152.1	[78]
			FCASRTGTGGFY-EQ	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55851.1	[64]
			FCAKRGTGYY	Immunoglobulin variable chain in a study of infants with Respiratory Syncytial Virus	AXA12283.1	[159]
			FCASRAGTT-YNEQ	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54848.1	[64]
			FCASRGRGFPY-EQ FCASSKGTSAYNEQ	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31442.1 AAV31441.1	[74]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 25(b)	FCASRGTGFYNEQ Clonal Expansion	FCASKPGGFYNEQ	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56642.1	[64]
			FCASSWTGYYNEQ	TCR beta clone isolated from intestine synovium in an HLA-B27+ patient with enterogenic spondyloarthropathy	AAD30044.1	[160]
			FCASSPTGF-NEQ	CD8+ TCR beta clone isolated from whole tissue in a patient with active psoriatic arthritis, HLA B*0702	AAM92226.1	[161]
			FCASREPSG-GFYNEQ	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03960.1	[31]
			CASSTTGYYNEQ	Liver infiltrating T lymphocyte from patients with primary biliary cirrhosis	AAB29046.1	[158]
			CASSRSTSGGFYNEQ	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO54952.1	[64]
			FCASRLAGVG-YNEQ	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAP84258.1	[131]
			CARRGTGFYHD	Unswitched memory B cell in lymph node germinal centers linked to poor affinity maturation	MOK28792.1	[78]
			FCASSATGISYNEQ	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54014.1	[64]
			FCASRVGQNLYNEQ	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26935.1	[73]
			FCASRVGQNLYNEQ	T cell infiltrates obtained from peripheral blood in a patient with calcific aortic stenosis	ABO26943.1	[73]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 25(b)	FCASRGTGFYNEQ Clonal Expansion	FCASSGTGYFHEQ	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83281.1	[133]
			FCASSGTGTGIGSYNEQ	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56057.1	[64]
	4063 26(b)	YFCASWASGRSSYNE	YFCAS-NSGGSSYNE	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54921.1	[64]
			YFCASTPGGRSSYN YFCASSPPGRWSSYNE	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78787.1 AVK78594.1	[85]
			YFCASSHWTSGRS	TCR beta chain isolated from a HLA-B27 positive patient with reactive arthritis	AAF81892.1	[79]
			YFCASSVAGRGSYNE YFCAS—SARGSYNE YFCASSATGI-SYNE	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54086.1 ANO54020.1 ANO54014.1	[64]
			YFCASSQPGRVSYNE	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54437.1	[64]
			CATWSSGRSDY	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB1977996.1	[75]
			YFCASSQVLSGRGSSYNE	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55146.1	[64]
			YFCAS---SRGSYNE	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10721.1	[72]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Referen
β-chain TCR transcript	4063 13-1(b)	FCASSVRQTNTGE Clonal Expansion	FCASSVAETNTGE	Human Hepatitis C Virus specific TCR clone-106	ADQ19367.1	[100]
			FCASSV-ATLNTGE	Human Hepatitis C Virus specific TCR clone-107	ADQ19366.1	[100]
			FCASSVDRDKNTGE	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK16720.1	[97]
			FCASSVR-TSVGE	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10753.1	[72]
			FCASSLRQVDT	TCR beta chain specific to pyruvate dehydrogenase in a patient with primary biliary cirrhosis	AAC03523.1	[145]
			FCASTAPATNTGE	Human Hepatitis C Virus specific TCR clone-109	ADQ19369.1	[100]
			FCASSLPDINTGE	Human Hepatitis C Virus specific TCR clone-98	ADQ19358.1	[100]
	4063 13-2(b)	ASSEAPVGNTEA Clonal Expansion	ASSQDPVGNTEA	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56140.1	[64]
	4063 13-3(b)	FCASTQSGVLTGEL	FCASTQSG	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55160.1	[64]
			FCASSMTGVNTGEL	Perivascular T cell beta chain in multiple sclerosis brain lesions	CAC03905.1	[31]
			FCASSQGG--TGEL	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10709.1	[72]
			FCASSQVGMTTGEL	Melanocyte-specific CD8+ TCR	AAO40287.1	[105]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Referen
β-chain TCR transcript	4063 13-4(b)	FCASRTGQNT GE	FCASRVGQNT	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO54954.1	[64]
			FCASRVGQN FCASRVGQN	T cell infiltrates obtained from a patient with calcific aortic stenosis	ABO26935.1 ABO26943.1	[73]
			FCASRTGTSNT GE	Human Hepatitis C Virus specific TCR clone-121	ADQ19381.1	[100]
			FCASRTGTINT GE	Human Hepatitis C Virus specific TCR clone-127	ADQ19385.1	[100]
			FCASRTGISNT GE	Human Hepatitis C Virus specific TCR clone-124	ADQ19384.1	[100]
			FCASRTG-GTGE	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72625.1	[76]
			CASRRGHNTG E	T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34158.1	[92]
			CA-RSGQNTGE	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB2101606.1	[75]
			FCASRT--NTG	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient3 with chronic beryllium disease	AAD55163.1	[91]
			FCASRPGTG-NTGE	T lymphocyte obtained from lymph nodes of patient A7 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34234.1	[92]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 13-4(b)	FCASRTGQNTGE	FCASRSGDTNTGE	Human Hepatitis C Virus specific TCR clone-119	ADQ19379.1	[100]
			FCASRSGTSNTGE	Human Hepatitis C Virus specific TCR clone-117	ADQ19377.1	[100]
			FCASRSGTSNTGE	Human Hepatitis C Virus specific TCR clone-122	ADQ19382.1	[100]
			FCASSPGRNTGE FCASSYLQGDTEAF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78547.1 AVK78529.1	[85]
	4063 13-5(b)	FCASSYFGVTEAF	FCASSYQG-TEAF	TCR clone recognizing Human Telomerase Reverse Transcriptase	5MEN_E	[147]
			FCASSYLGPRTEAF	HIV-specific CD8+ T cell beta chain	QCR99123.1	[117]
			FCASSYGGLNTEAF	HLA restriction and T-cells recognizing DQ7	AAB31886.1	[162]
			FCASSY-SVGTEAF	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54918.1	[64]
			FCASSYLGTAEAF	TCR auto-antigen in a Type 1 Diabetes patient	QHU23673.1	[163]
			FCASSFGEVTEAF	Interleukin- 2 receptor-positive T cells, V beta, from synovial cells in rheumatoid arthritis	AAB20517.1	[134]
			FCASTRFGGTEAF	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03796.1	[31]
			FCASSYMGDRVNTEAF	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03985.1	[82]
			FCASSYRTGVKNTEAF	TCR obtained from spinal cord of a patient with HTLV-I associated myelopathy/tropical spastic paraparesis	BAA06783.1	[144]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 13-5(b)	FCASSYFGVTEAF	CASSFFLQGATEAF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ56995.1	[87]
			FCASSYYDRGMNTEAF	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54884.1	[64]
	4063 13-6(b)	FCASSKPPVGSTEAF	FCASSQDPVGNTEAF	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56140.1	[64]
			FCASSPLPTGSTEAF	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54375.1	[64]
			FCASSQVPGGNTEAF	Small nuclear ribonucleoprotein reactive T cell from connective tissue disease patient	AAC24868.1	[164]
			CASS-PTVGNTEAF FCASS--PSWGSTEAF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29265.1 AAF29330.1	[86]
			FCASS-PPDRVG-TEAF	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56304.1	[64]
			CASSTP--GSTEAF	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31444.1	[74]
			CASSPPPAG-TEAF	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient3 with chronic beryllium disease	AAV52856.1	[91]
			FCASR---IGSTEAF	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55840.1	[64]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 13-6(b)	FCASSKPPVG STEAF	FCASSEIVAGQAP -GSTEAF	Clonotypes from muscle-infiltrating lymphocytes from a patient (case3) with human T lymphotropic virus type 1 polymyositis	BAC01049.1	[104]
			FCASRKTPGPNTE AF	T cells in early rheumatoid arthritis	AAB96946.1	[165]
	4063 13-7(b)	FCASSRQASN EKL	FCASSRQA FCASSRQGAN	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54128.1 ANO54773.1	[64]
			FCASSRQSS FCASSRQSS	TCR beta chains in rheumatoid arthritis synovial tissue	AAD13940.1 AAB27280.1	[166]
			FCASSPRQGANE KL FCASSRRD-NEKL FCASSPQAVGQN EKL FCASSTQGPTNEK L	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78708.1 AVK78422.1 AVK78898.1 AVK78565.1	[85]
			CASSRQGRGEKL FCASSRDLGATNE KL	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10724.1 AIE10719.1	[72]
			FCASSPQTGENEK L	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55210.1	[64]
			FCASRPQGANEK L	TCR beta chain from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR37260.1	[102]
			FCASSLGVRLATN EKL	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren’s Syndrome	ANO56041.1	[64]
	4063 13-8(b)	FCASTLGPRN YGY	FCASSVGPVNYG Y	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO26912.1	[73]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 13-8(b)	FCASTLGPRNYGY	FCASSLGTENYGY	CD4+ T cell obtained from the synovial fluid of patient C1-2 with rheumatoid arthritis	AAC72578.1	[76]
			FCASSLGTFNYGY FCASSLARQGDRNYGY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10656.1 AIE10634.1	[72]
			FCASTLGQTLLNYGY	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK17938.1	[97]
	4063 13-10(b)	YFCASRGTSGRSTDT	YFCSSRGNTSARITD	Tumor infiltrating T cells recognizing HPV33 E7 peptides, HLA DR*0402	AAF67076.1	[167]
			YFCASRPGTSG	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31425.1	[74]
			YFCASRGTGG	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55225.1	[64]
			YFCASTGTSG	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54178.1	[64]
			YFCASSGTSG-STDT YFCASRMTSGSS	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81519.1 AMT81609.1	[80]
			CASSGTSGPSTDT	TCR in pediatric acquired severe aplastic anemia	ACN65196.1	[155]
			YFCASSPRGTSG YFCASSWDVSGRATDT	CD4+ T cell obtained from the synovial fluid of patient CS3 with rheumatoid arthritis	AAC72662.1 AAC72661.1	[76]
			YFCASSYGTSGR YFCASRRT-GMSTDT YFCASRQTSGQET YFCASSSTGTSGR YFCASRKGTQGARSGNT	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10757.1 AIE10350.1 AIE10349.1 AIE10483.1 AIE10576.1	[72]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 13-10(b)	YFCASRGTSG RSTDT	YFCASSFGTSG R	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO26998.1	[73]
			YFCASSSR-TSGRGTDT YFCASR--TG-STDT YFCASR-THGRNTE	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78398.1 AVK78370.1 AVK78711.1	[85]
			YFCAIS--VSGRSTDT	Human Hepatitis C Virus specific TCR clone-26	ADQ19287.1	[100]
			YFCASSPGTSG R--DT	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54650.1	[64]
			YFCASSIGTSG —TDT YFCASSATSG MNTDT YFCAS--SAGRYSTDT	TCR beta chain isolated from synovial fluid in a HLA-B27 positive patient with reactive arthritis	AAF81844.1 AAF81850.1 AAF81868.1	[79]
			YFCASSETSG-GTDT	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK15747.1	[97]
			YFCASSLSSGA STDT	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55406.1	[64]
			YFCASGGTSG K--DT	Brain-infiltrating CD8+ TCR clone in an MS patient	AAS21504.1	[35]
			YFCASRIAGT---STDT	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57189.1	[87]
			YFCASSPQAS RSTDT	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54282.1	[64]
			YFCASSST---STDT	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29351.1	[86]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 13-11(b)	FCASIQGQPS YEQ	FCASSFQGQGSYE Q FCASSVEGQSTYE Q	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78630.1 AVK78742.1	[85]
			FCASSVKGQESYE Q FCASSVKGQESYE Q	CD8+ TCR beta-chain in myeloma	CAC06593.1 CAC06594.1	[98]
			FCASSVAGTPSYE Q	TCR gene usage in HLA-DQ8 Associated Celiac Disease	5KSA_D	[168]
	4063 4-1(b)	YLCSGLYSVSG YTF Clonal Expansion	YLCASLTGVDGYT F	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO27025.1	[73]
	4063 4-3(b)	LCSVVGQGRNT EA	LCSAGGQGRGNT EA	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10796.1	[72]
	4063 4-4(b)	YLCSVAETRL MSTEAF	YLCSV-E--- MNTEAF	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55072.1	[64]
			YLCSVGQ--- MNTEAF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78542.1	[85]
	4063 4-5(b)	LCSVESRGGY TF	LCSVEGGGYGYTF LCSVERSSGSFSYGY TF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10819.1 AIE10822.1	[72]
			LCSVEGRGLNYGY TF LCSVETFWPERNG YTF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78616.1 AVK78608.1	[85]
			LCSVEYRYGYYGY TF	TCR clone of myelin basic protein-reactive T cells in MS patients	AAA98128.1	[123]
	4063 4-6(b)	YLCSVYWQGPGE F	YLCSVFVRESPGE LF	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAR06229.1	[131]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 4-6(b)	YLCSVYWQGPGELF	YLCASRYV--QGPGELF	Anti-melanoma specific cytotoxic tumor infiltrating lymphocyte	AAA83014.1	[169]
			YICSAFRQGSGELF	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO55854.1	[64]
	4063 4-7(b)	IYLCSLPSGTDTQ	YLCASSLTSGTDTQ	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31105.1	[74]
			YLCASSL-SGTDTQ	Activated and effector memory T cells clonally expanded in bicuspid valve in a case calcific aortic stenosis	AEK76057.1	[88]
			IYLCSALAPGIDTQ IYLCSVPVWRRSTDTQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78598.1 AVK78735.1	[85]
			YLCASIPHPTSGTDTQ	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO55011.1	[64]
[97]			IYLCSVRAGIGTDTQ	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK16722.1	[97]
	4063 4-8(b)	IYLCSIKDGRITDTQ	VYLCASSKEGRITDTQ	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10387.1	[72]
			IYLCSVRAG-IGTDTQ	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK16722.1	[97]
			IYLCSV--GSLTDTQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78940.1	[85]
	4063 4-9(b)	YLCSVKSRKASGETQY	YLCA--SRNDSKETQY	Activated and effector memory T cells clonally expanded in bicuspid valve in a case calcific aortic stenosis	AEK75982.1	[88]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 4-9(b)	YLCSVKSRKAS GETQY	YLCSVETQSR---GDTQY	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56670.1	[64]
			YLCSV----SSGGTQETQY	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54294.1	[64]
			YLCASSSRTGASE TQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10734.1	[72]
	4063 4-10(b)	YLCSVENDR GADEQYF	YLCSVELDRGRTE TQYF YLCSV--NWGGGFDEQYF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78627.1 AVK78683.1	[85]
			YLCSVETQSRG-DTQYF	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56670.1	[64]
			YLCSVRRDR--DYEQYF	Herpes simplex virus specific CD4+ T lymphocyte obtained from cervical secretion	AAV28688.1	[99]
			YLCSVELARNSYE QYF	CD8+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAR06216.1	[131]
			YLCSVATG-GKDEQYF	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO27066.1	[73]
			YLCSVDEE-GIADTQYF YLCSVEGEREGN EQFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57074.1 ADQ57287.1	[87]
			YLCSVEE--GAGGTDTQYF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10818.1	[72]
			YLCATSPSSGRG SDEQYF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56833.1	[64]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 4-10(b)	YLCSVENDRG ADEQYF	YLCSVET---GDSYEQYF YLCSVET---GDTYEQYF	HIV-specific CD8+ T cell beta chain	QCR99149.1 QCR99150.1	[117]
			YLCSV---RLRLAGGDEQYF	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAR06230.1	[131]
			YLCASGPGVE--RGAYEQYF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29249.1	[86]
			YICSANDDRPGG HEQYF	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03940.1	[82]
			YLCSVE----VDGTLYEQYF	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AO095291.1	[80]
			YLCSVE-DRGLTMWSSYNE QFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57275.1	[87]
	4063 4-11(b)	LCSVVAEAGR GYEQY	LCSVVTGKSRGYE QY	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03972.1	[82]
			CS--ANSGRGYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78635.1	[85]
			LCSV--EGGSSYEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81483.1	[80]
	4063 8-1(b)	VYFCASSLRG DRSVRGYTFG Clonal Expansion	VYFCASSLRGD VYFCASSLRGD VYFCASSLRDD	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72612.1 AAC72609.1 AAC72611.1	[76]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 8-1(b)	VYFCASSLRG DRSVRGYTFG Clonal Expansion	VYFCASSLRG VYFCASSLRG VYFCASSLRG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78745.1 AVK78850.1 AVK78809.1	[85]
			VYFCASSL-GDRS	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54531.1	[64]
			VYFCASSLR-DR	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56799.1	[64]
			VYFCASSLRGE VYFCASSL--D---TGYTFG	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO27037.1 ABO27011.1	[73]
			VYFCASS--GD-SVWRGYTFG VYFCASSRR-DR--HGYTFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78485.1 AVK78561.1	[85]
			VYFCASSL-GHR-VAGYTFG	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56251.1	[64]
			VYFCASSLARQGDRNY-GYTFG YFCASSTRTDN--RGYTFG	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10634.1 AIE10743.1	[72]
			VYFCASSDLPG-RSNYGYTFG	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55645.1	[64]
			VYFCASSYR-DRGLYGYTFG	CD4+ TCR beta chain isolated from Subject9 peripheral blood in a study of Sjogren's syndrome	ANO55069.1	[64]
			VYFCASSYR-DRGQNGYTFG	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55931.1	[64]
			YFCASSLRPQG-RS--GYT	Oligoclonal CD4+ TCR in rheumatoid joints	AAB34444.1	[170]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 8-1(b)	VYFCASSLRG DRSVRGYTFG Clonal Expansion	YFCASSLRGG---YGYTF VYLCASSLAGDR—REYGYTF YFCASSLRGAGD----GYTF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29299.1 AAF29271.1 AAF29307.1	[86]
			VYFCASSLTTERIP VYGYTFG	Autologous melanoma specific infiltrating T cell lymphocytes	AAA59126.1	[171]
			VYFCASSSLTGGK LVGGYTFG	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55546.1	[64]
			VYFCASSF--DRGLGGYTFG	CD4+ T cell obtained from the synovial fluid of patient CS-1 with rheumatoid arthritis	AAC72565.1	[76]
			VYFCASS-RGQTGLHGYTFG	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO55546.1	[64]
			YFCASSFGRGD----GYTFG VYFCASS--STRGVYGYTFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78532.1 AVK78549.1	[85]
			YFCASSLSKGQRA NYGYTFG	CD8+ TCR beta chain in brain multiple sclerosis lesion	CAC03952.1	[31]
			YLCASSLR-DRGLNYGYTFG	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15757.1	[119]
			VYFCASSL-GQ--IYGYTFG	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*0702; B*44031	AAK07572.1	[108]
			VYFCASSFPGT-GVGGYTFG VYFCASSLRAGGN----GYTFG	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03989.1 AAB03987.1	[82]
			YFCASSL---SSSQGYTFG YFCASSLRGGGY-----GYTFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78503.1 AVK78374.1	[85]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 8-1(b)	VYFCASSLRG DRSVRGYTFG Clonal Expansion	VYFCASSLR----- RDYGYTFG	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10421.1	[72]
			YFCASSEALRGLD- ---GYTFG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57021.1	[87]
			VYFCASSLLQGN-- --GYTFG	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55098.1	[64]
			VYFCASSTFRGE-- --GYTFG	CD4+ T cells stimulated with myelin basic protein in a healthy subject	ADQ57094.1	[87]
			VYFCASSFRDG--- --GYTFG	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54486.1	[64]
			VYFCASSFNRG--- -HGYTFG	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76020.1	[88]
			VYFCASS---- RTVDYGYTFG	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*27052; B*5701	AAK07586.1	[108]
			YFCASSWGLRG-- -PPGYTFG	CD8+ T-lymphocyte specific to lymphotropic virus type 1 Tax11-19 peptide complexes; HLA-A2	BAB18706.1	[118]
			VYFCASSLRG---- RGETEAFFG	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54305.1	[64]
			VYFCASS----- SIYGYTFG	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54881.1	[64]
			YFCASSLSSAGD-- --GYTF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29292.1	[86]

TABLE 54. CONTINUED

Patient 4063	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	4063 8-1(b)	VYFCASSLRG DRSVRGYTFG Clonal Expansion	VYFCASSLQ----- YGYTFG	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54084.1	[64]
			VYFCASSLKAGGN ----GYTFG	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03986.1	[82]
			YFCASSL---- SSRRFGGYTFG VYFCASSARG--- ARGYNEQFFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78737.1 AVK78953.1	[85]
			VYFCASS----- SVRTGGHGYTFG	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO55999.1	[64]
			YFCASSL---- SAWDLLRGYTFG	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57216.1	[87]
			VYFCASS---- RTPRTGSGYTFG	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56258.1	[64]
			VYFCASSYPSNR-- RPNYGYTFG	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54739.1	[64]
			VYFCASSYQQGA RG-----GYTFG	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54873.1	[64]
			YFCASSLRGTGTA NY-----GYTFG	TCR beta cells from lung tissue in a patient with emphysema	AAV52848.1	[91]
			VYFCASSFGSFPT GL----SV-GYTFG	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56516.1	[64]
			FCASSGRLSYEQ	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*27052; B*5701	AAK07588.1	[108]

TABLE 55. CLONES SHARING HOMOLOGY WITH ALPHA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT HUN - TISSUE 1 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-1 1(a)	CAVEGYGGS Clonal Expansion	CAVEDYGGS	HLA restriction and T- cells recognizing DQ7	AAB31880.1	[162]
	HUN-1 3(a)	SYFCASYSSA Clonal Expansion	YFCASYS	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10939.1	[72]
			YFCASSYSSA	CD4+ TCR alpha chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32398.1	[74]
			YFCSSYSS	Immunoglobulin from synovial joint tissue in a patient with rheumatoid arthritis	AAC36637.1	[172]
			YFCSSYSS	IgD-only B cell from peripheral blood	CAR62604.1	[173]
			SYFCASETYS SA	TCR VA7 gene sequence associated with diffuse large B-cell lymphoma	ACF49256.1	[124]
	HUN-1 5(a)	CATDALSGGYN Clonal Expansion	CATDAFSGG YN	TCR alpha in peripheral blood after bone marrow transplantation	AAA73593.1	[174]
			ATDAGLSGG YN	Jejunal intestinal intraepithelial lymphocyte T cell	AAB19828.2	[175]
			CATDPISGGY N	CD4+ TCR alpha chain isolated from Subject7 peripheral blood	ANO54392.1	[64]
			CARDELSGG YN	Unswitched memory B cell in lymph node germinal centers linked to poor affinity maturation	MOK11890.1	[78]
			CATDALSTG YN	GB virus C, Hepatitis C virus NS3 helicases nucleotide binding region	CAA67326.1	[176]
			CATDALSTG Y	Hepatitis C virus NS3 envelope protein	AAD31543.1	[177]
			CATDALSTG Y	Hepatitis C virus genotype envelope, NS2	AAD31765.1	[178]

TABLE 55. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-1 5(a)	CATDALSGGYN Clonal Expansion	CATDALSTGY CATDALSTGY CATDALSTGY CATDALSTGY	Human pegivirus isolate (HCV_ NS2) from plasma in study for HCV and HIV-RNA positive blood donations	AXR98542.1 AXR98538.1 AXR98539.1 AXR98544.1	[179]
			CATDALSTGY	GB virus C polyprotein isolated from plasma in a patient infected with HCV	QGN67998.1	[180]
	HUN-1 6(a)	LCALALGFQK	LCAMTLGFQK	CD4+ TCR alpha chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56139.1	[64]
	HUN-1 7(a)	YLCALTNSGN	YLCAVTNAGN	CD4+ TCR alpha chain isolated from Subject3 peripheral blood	ANO54800.1	[64]
			YLCALANSG	CD4+ TCR alpha chain isolated from Subject6 peripheral blood	ANO54956.1	[64]
			YLCAVTNSG	CD4+ TCR alpha chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55849.1	[64]
			YLCALENAGN	CD4+ TCR alpha chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55977.1	[64]
			YLCALENAGN YFCALTPNSGN	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11129.1 AIE10277.1	[72]
			YLCALPNSG	CD4+ TCR alpha chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55618.1	[64]
			YLCVPTNSGN	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAO74612.1	[181]
	HUN-1 9(a)	LCALDGPGNTG	LCALDASGNT	TCR alpha in peripheral blood after bone marrow transplantation	AAA68181.1	[174]

TABLE 55. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-1 11(a)	YFCAVLYSSA Clonal Expansion	YFCAVLY	CD4+ TCR alpha chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56699.1	[64]
			YFCAAMYSSA	Myelin basic protein-specific T cells in multiple sclerosis	AAB30923.1	[182]
	HUN-1 12(a)	VYFCAHAGGT Clonal Expansion	VYFCASAGGT	Herpes simplex virus-specific CD4+ T lymphocyte derived from herpetic skin lesions	AAV28678.1	[99]
			VYFCARAGG	CD4+ TCR alpha chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56692.1	[64]
			VYFCASAGG	CMV seropositive NKG2C+ peripheral blood cytotoxic T cell in a patient with celiac disease	ABF14429.1	[149]
			VYFCAHPG	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03909.1	[82]
			VYFCAENAGGT VYFCAENAGGT	CD4+ TCR alpha chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56854.1 ANO56840.1	[64]
			VYFCAENAGGT VYFCAENAGGT VYFCALSGGT	CD4+ TCR alpha chain isolated from Subject5 peripheral blood	ANO54714.1 ANO54705.1 ANO54754.1	[64]
			VYFCAENAGGT	CD4+ TCR alpha chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56473.1	[64]
			VYFCASSGGT	TCR in mucosal associated invariant T cells	4PJ7_F	[113]
			VYFCAETGGT	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11206.1	[72]

TABLE 55. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-1 12(a)	VYFCAHAGGT Clonal Expansion	VYFCASSGGT VYFCASSGGT	CD4+ TCR alpha chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55613.1 ANO55572.1	[64]
			VYFCALLSNA GGT	Small nuclear ribonucleoprotein -reactive TCR alpha chain from connective tissue disease patient	AAC62083.1	[112]
			VYFCALSRNA GGT	CD4+ TCR alpha chain isolated from Subject9 peripheral blood	ANO55107.1	[64]
	HUN-1 14(a)	MYFCARTSYG	MYFCARTDY G	Membrane Antigen Specific Human B cell immunoglobulin heavy chain variable region	QCP57642.1	[183]
			YFCARESYG	Pre-onset sample Immunoglobulin in a study of Pemphigus vulgaris autoimmune disease	QDO16624.1	[184]
			MYYCARTS	Anti-rabies virus immunoglobulin heavy chain variable region	AAY33211.1	[185]
			MYFCARAS	RSV antibody from memory B cells	APZ84770.1	[186]
			MYFCAYRSSY	CD4+ TCR alpha chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56711.1	[64]
			MYFCARVGY	B cell in atopic dermatitis patient	CAA81431.1	[187]
			YYCARTAYG	Immunoglobulin hypervariable region in infants infected with Respiratory Syncytial Virus	AXA12198.1	[159]
			MYFCASARDS YG MYFCAYRSAY G	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10564.1 AIE10438.1	[72]
			MYYCARTIAY G	Single CD19+CD27-IgD+ B lymphocyte from synovial fluid in children with juvenile idiopathic arthritis	ACT68828.1	[188]

TABLE 55. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-1 14(a)	MYFCARTSYG	MYYCARATYG	Peripheral blood memory B cell CD20+ IgD- IgG+ EBV+ in a patient with acute infectious mononucleosis	ABK81480.1	[189]
	HUN-1 15(a)	YICAVGNTDK Clonal Expansion	YFCAVGPYNT DK	CD4+ TCR alpha chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56357.1	[64]
			YICAAGDNYN TDK	CD4+ TCR alpha chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO55785.1	[64]
	HUN-1 16(a)	YICAVAGGEYGGS	YICAVE-- DYGGS	HLA restriction and TCR alpha cells recognizing DQ7	AAB31880.1	[162]
	HUN-1 17(a)	ICAVRLNTGN	CALRMNTGN	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient3 with chronic beryllium disease	AAD55161.1	[91]
	HUN-1 18(a)	YLCGANPPRGRL NFG	YLCASSPPRG QGNNSPLHF G	CD4+ T cell from MS lesion brain tissue	CAC03915.1	[31]
	HUN-1 19(a)	HAGIYLCGDPPEE KLT	HAGIYLCG	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10829.1	[72]
			HAGIYLCG	CD4+ TCR alpha chain isolated from Subject8 peripheral blood	ANO55401.1	[64]
	HUN-1 20(a)	YFCAGPYMEYGN Clonal Expansion	YFCAAPRYME YGN	CD4+ TCR alpha chain isolated from Subject10 peripheral blood	ANO55320.1	[64]
			YLCAVSFMEY GN YLCAVSFMEY GN	CD4+ TCR alpha chain isolated from Subject8 peripheral blood	ANO55516.1 ANO55515.1	[64]

TABLE 56. CLONES SHARING HOMOLOGY WITH ALPHA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT HUN - TISSUE 2 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-2 6(a)	FCATEGFGN Clonal Expansion	CATEGFG	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOR36011.1	[78]
			FCATEGNFGN	TCR VA7 gene sequence associated with diffuse large B-cell lymphoma	ACF49251.1	[124]
			FCATRGFGN FCATRGFGN	CD4+ TCR alpha chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56648.1 ANO56777.1	[64]
	HUN-2 7(a)	FCATVEYGN	FCATGLVEYGN	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11143.1	[72]
			CATMEYGN	CD4+ TCR alpha chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56465.1	[64]
			FCTTIEYG	Memory B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCA82242.1	[89]
			CAKVEYGN	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOP93353.1	[78]
	HUN-2 8(a)	YLCALGASAGRRA	YLCALGANAG	CD4+ TCR alpha chain isolated from Subject10 peripheral blood	ANO55287.1	[64]
	HUN-2 9(a)	YLCALSNAGN	YLCALENAGN	CD4+ TCR alpha chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO55977.1	[64]
			YLCALENAGN YFCALNNAGN	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11129.1 AIE11063.1	[72]

TABLE 56. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-2 9(a)	YLCALSNAGN	YLCAVTNAGN	CD4+ TCR alpha chain isolated from Subject3 peripheral blood	ANO54800.1	[64]
			YLCAMSARNAGN	Small nuclear ribonucleoprotein (snRNP) reactive T cell clone isolated from a patient with connective tissue disease	AAC62078.1	[112]
			YLCALELLNNAGN	CD4+ TCR alpha chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56400.1	[64]
	HUN-2 10(a)	LYLCGLGGSQG	YLCGAGGSQG	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10829.1	[72]
			LYLCAGGGSQG	T-cell antigen receptor recognizing HLA-A2 and influenza A matrix peptide	P0DSE1.1	[136]
	HUN-2 11(a)	LYLCGSRGSQG	YLCAERGSQG	CD4+ TCR alpha chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55676.1	[64]
	HUN-2 13(a)	VYFCASGEGYSS	VYYCASGEG	Anti-HIV-1 gp120 immunoglobulin 411g heavy chain	ANO54928	[190]
			VYYCASGPGYSS	Rotavirus-specific intestinal-homing antibody heavy chain variable region	AAW67390.1	[191]
	HUN-2 14(a)	VYFCASGGGYSS	CASGGGYSS CASGGGYSS	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOQ97663.1 MOO23535.1	[78]
			VYFCAAGGPGYSS VYFCAAGGPGYSS	CD4+ TCR alpha chain isolated from Subject9 peripheral blood	ANO55102.1 AGP01430.1	[64]
			VYYCASGPGYSS	Rotavirus-specific intestinal-homing antibody heavy chain variable region	AAW67390.1	[191]

TABLE 56. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-2 15(a)	FCAVEGGYN	CAVEGGYN	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOP82922.1	[78]
	HUN-2 17(a)	YFCAYLTGTA	YFCAYLSG	CD4+ TCR alpha chain isolated from Subject9 peripheral blood	ANO54570.1	[64]
			YFCAFLTG	CD4+ TCR alpha chain isolated from Subject1 peripheral blood	ANO54082.1	[64]
	HUN-2 18(a)	AIYFCAASFSGG	AVYFCAASFSG AIYFCAESISGG AVYFCASSFS	CD4+ TCR alpha chain isolated from Subject2 peripheral blood	ANO54160.1 ANO54272.1 ANO54170.1	[64]
			AVYFCAASF	TCR alpha clone specific to a dominant influenza virus epitope	5TEZ_I	[192]
			AVYFCAASF ATYFCAASIEGFSGG	CD4+ TCR alpha chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55657.1 ANO55696.1	[64]
			AVYFCAASFPSGG	CD4+ TCR alpha chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55845.1	[64]
			AVYFCAASFTGG	CD4+ TCR alpha chain isolated from Subject7 peripheral blood	ANO54411.1	[64]
			AVYFCAASFSDG	CD4+ TCR alpha chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56588.1	[64]
			AIYFCAESISGG	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84640.1	[65]
			ATYFCAASISGG	CD4+ TCR alpha chain isolated from Subject3 peripheral blood	ANO54859.1	[64]
			AVYFCAASASGG	TCR auto-antigen in a Type 1 Diabetes patient	QHU23672.1	[163]
			AVYFCAASVSGG AVYFCAASISG AVYFCAASVAFSG	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE11181.1 AIE11054.1 AIE11096.1	[72]

TABLE 56. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	HUN-2 18(a)	AIYFCAASFSGG	AVYFCAASRSGG	CD4+ TCR alpha chain isolated from Subject5 peripheral blood	ANO54669.1	[64]
			AVYFCASSFSG	CD4+ TCR alpha chain isolated from Subject10 peripheral blood	ANO55280.1	[64]
			AVYFCASSFSG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78460.1	[85]
			AVYFCAASSSG	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72703.1	[76]
			AVYFCAASSFSDG AVYFCAATFQGG AVYFCASSFAG	CD4+ TCR alpha chain isolated from Subject4 peripheral blood	ANO54470.1 ANO54554.1 ANO54528.1	[64]
			ALYFCASSFRGG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57179.1	[87]
			AVYFCAASEWYSGG	CD4+ TCR alpha chain isolated from Subject8 peripheral blood	ANO55509.1	[64]
	HUN-2 21(a)	FCAASKRYNTD	FCAASRSRYNTD	TCR VA7 gene sequence associated with diffuse large B-cell lymphoma	ACF49243.1	[124]
	HUN-2 22(a)	ICVVSLASGG	CVVRLASGG	TCR alpha chain, CD1d-restricted T cell activation by non-lipidic small molecules	AAS48652.1	[193]
	HUN-2 25(a)	LCAVELGQNF	LCAVGLGQNF	CD4+ TCR alpha chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56270.1	[64]
	HUN-2 26(a)	CAVEADFGNE	CAVESSFGNE	CD4+ TCR alpha chain isolated from Subject8 peripheral blood	ANO55447.1	[64]
			CATEVDFGNE	TCR alpha chain isolated in an acute myeloid leukemia-M2 patient with cGVHD	ABY60725.1	[194]

TABLE 57. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT HUN - TISSUE 1 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 1(b)	YICSAEQGNTEA Clonal Expansion	YICSAREDGNTEA	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56199.1	[64]
			YICSANPGNTEA YICSAREGAGNTEA	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78480.1 AVK78844.1	[85]
			YICSASRGNTEA YICSASRGNTEA	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10531.1 AIE10810.1	[72]
			YICSADRGVNTEA	TCR clone reactive to human renal cell carcinomas	ABO16435.1	[195]
			YLCSVEAGNTEA	CD8+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57198.1	[87]
			YICSASQGGAMNTEA	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03978.1	[31]
			YLCSVEYRQGNTEA	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57181.1	[87]
	HUN-1 2(b)	YICSALNQDGYTF	YLCSALGQDGYTF YICSARDLN-AGYTF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56894.1 ANO56925.1	[64]
			YLCASSLNQDGYTF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10416.1	[72]
			YICSAPGQGPLIDGYTF YICSA-NPPGQGDGYTF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78955.1 AVK78569.1	[85]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 3(b)	YICSAGGGTHFFGPG	YICSASGGTDTQYFGPG	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15789.1	[119]
			YICSARGGETQYFGPG YICSATGGGETQYFGPG YICSATAGTSYNEQFFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78474.1 AVK78672.1 AVK78885.1	[85]
			YICSASPGGGSYEQFFGPG YICSATPRLAGGTDTQYFGPG	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15775.1 AAG15772.1	[119]
			YICSAGVGGQETQYFGPG	TCR recognition of HLA-DQ2-gliadin complexes associated with Celiac Disease	4OZI_F	[196]
			YICSALDAGGETQYFGPG	TCR beta chain from a cross reactive T cell clone in a study of cell mimicry and epitope specificity in rheumatic heart disease	AAW33960.1	[132]
			YICSAKGGGPDSDTQYFGPG	TCR beta chain specific to pyruvate dehydrogenase in a patient with primary biliary cirrhosis	AAC03519.1	144]
			YICSAREPRKGGETQYFGPG YICSARGPTQFYEQYFGPG	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55235.1 ANO55348.1	[64]
			YICSAGQGDRVGETQYFGPG	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56584.1	[64]
			YICSASSGAGGGNEQFFGPG YICSATTSTGGNEQFFGPG	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56116.1 ANO56109.1	[64]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 3(b)	YICSAGGGTHFF GPG	YICSARGGGGALG SYNEQFFGPG YICSALGGISTDTQ YFGPG	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10525.1 AIE10800.1	[72]
			YICSASGLTDTQY FGPG	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54299.1	[64]
			YICSARVGSLGGE QFFGPG	TCR beta chain from the lymph node of a patient with classical Hodgkin's lymphoma	CAC48305.1	[103]
			YICSAVRGADTQY FGPG YICSARDGGTDTQ YFGPG	T cell infiltrates obtained from a patient with calcific aortic stenosis	ABO27020.1 ABO27056.1	[73]
			YICSADGGTEAFFG QG YICSARDPLAGET QYFGPG YICSARGDGDEQFFG PG	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55621.1 ANO55558.1 ANO55614.1	[64]
			YICSATAGGLETQYF GPG YICSAISSGGRETQY FGPG	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54499.1 ANO54507.1	[64]
			YICSASGSTFTDT QYFGPG YLCASNAVGGGT QYFGPG	CD4+ TCR beta chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55658.1 ANO55740.1	[64]
			YICSAIGGAGDTQ YFGPG YICSATLAGGTDT QYFGPG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57168.1 ADQ57163.1	[87]
			YICSAVSGGSTYEQ YFGPG	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO54973.1	[64]
			YICSARSSGWGADT QYFGPG	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO55018.1	[64]
			YICSALQGAGRDT QYFGPG	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO56825.1	[64]
			YICSATSSGGLYT QYFGPG	TCR clone from CSF in schizophrenia patients	AAT72843.1	[109]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 3(b)	YICSAGGGTH FFGPG	YICSASLAGGVRR TDTQYFGPG	TCR clone from CSF in schizophrenia patients	AAT72852.1	[109]
			YICSASSG-HNEQFFGPG	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK15745.1	[97]
			YICSASSGGAGVD TQYFGPG	Melanocyte-specific CD8+ TCR	AAO40277.1	[105]
			YICSASGLAGVET QYFGPG YICSVSGGSSYQE TQYFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78715.1 AVK78695.1	[85]
			YICSAQGTDTQYFG PG YICSARGSTSGSYN EQFFGPG YICSPGQGAYNEQF FGPG	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56098.1 ANO56154.1 ANO56156.1	[64]
			YICSAQSPSGGAD TQYFGPG YICSASSGALSYNE QFFGPG	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO55967.1 ANO56058.1	[64]
			YICSASGLGSPYN EQFFGPG	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56390.1	[64]
			YICSARDARLAGG RHEQFFGPG YLCSVGRGGGEQ FFGPG	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55941.1 ANO55883.1	[64]
			YICSARDGAGVG DTQYFGPG	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10523.1	[72]
			YICSANRDRGSGD TQYFGPG YICSARDLQGAGE TQYFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78587.1 AVK78641.1	[85]
			YICSARDSSGGTY EQYFGPG YICSASGFGAGTY EQYFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78729.1 AVK78813.1	[85]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 3(b)	YICSAGGGTHFFGPG	YLCASGGGSDEQFFGPG	Clonotypes from muscle-infiltrating lymphocytes from a patient (case2) with human T lymphotropic virus type 1 polymyositis	BAC01020.1	[104]
			YICSASIGGAGVNEQFFGPG	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO54616.1	[64]
			YICSASGDAGTGRLDQYFGPG YICSASHGDEQFFGPG	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56756.1 ANO56638.1	[64]
			YICSARAGTSGREYNEQFFGPG	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32376.1	[74]
			YLCSSSGGTSSYNEQFFGPG	CD8+ TCR beta chain from synovium in an HLA B27+ patient with Reactive Arthritis	CAB95671.1	[83]
			YICSAGGRVATGAWEQYFGPG YFCAAGGGLAGKGLGDTQYFGPG	Herpes simplex virus specific CD4+ T lymphocyte obtained peripheral blood	AAV28685.1 AAV28673.1	[99]
			YICSAFPGTDTQYFGPG YICSASSGGKNEQFFGPG YICSARDRSSGTNEQFFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78722.1 AVK78572.1 AVK78557.1	[85]
			YICSARDPHPGGRDTQYFGPG YICSARHPSPGVGETQYFGPG	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15776.1 AAG15811.1	[119]
			YICSASPSGGAVVTDTQYFGPG	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54232.1	[64]
			YLCSAVGTGGSTSEQFFGPG YICSARLAGTDTQYFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78930.1 AVK78424.1	[85]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 3(b)	YICSAGGGTHFF GPG	YFCASGGGGETQYF GPG	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54348.1	[64]
			YICSARRQGTDTQY FGPG YICSASPGQGTDTQ YFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78849.1 AVK78457.1	[85]
			YICSAFRVSGSGEQ YFGPG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57166.1	[87]
			YLCASSFDRGGGT QYFGPG	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56793.1	[64]
			YICSARRGMGTDT QYFGPG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78580.1	[85]
	HUN-1 4(b)	CSARDAGLSYEQ Clonal Expansion	CSARDAARSYEQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78454.1	[85]
	HUN-1 5(b)	LCASSQGGTNEK	CASSQGGTGE	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10709.1	[72]
			CASSQGGYNE	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*0702; B*44031	AAK07570.1	[108]
			CASSHPGGTNEK	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54679.1	[64]
			CASSDRGGTNEK	TCR beta chain in a patient with celiac disease	ABF14439.1	[149]
			LCASSQAGTDE LCASSQARATNEK	Clonotypes from muscle-infiltrating lymphocytes from a patient (case2) with human T lymphotropic virus type 1 polymyositis	BAC01021.1 BAC01019.1	[104]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 5(b)	LCASSQGGTNEK	LCASSQGGSNQ	CD4+ TCR beta chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55690.1	[64]
			LCSVGQGGTNEK	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84637.1	[65]
			CASSQGRGTGLKNEK	CD8+ T-lymphocyte specific to lymphotropic virus type 1 Tax11-19 peptide complexes; HLA-A2	BAB18692.1	[118]
	HUN-1 7(b)	CASSLNSGITDTQ	CASSLTQGITDTQ	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10671.1	[72]
			CASSLTSG-TDTQ	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31105.1	[74]
			CASSLSSGASTDTQ	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55406.1	[64]
			CASSLDSASTDTQ	CD4+ TCR beta chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO56163.1	[64]
			CAS--NTGITDTQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78650.1	[85]
			CASS--SGVTDTQ	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54891.1	[64]
			CASSLTS-VTDTQ	TCR beta chains in rheumatoid arthritis synovial tissue	AAB27282.1	[166]
	HUN-1 8(b)	CASSYDSSQNIQY	CASSYDSS	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOJ91144.1	[78]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 8(b)	CASSYDSSQNIQY	CASSYDSS	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOP32539.1	[78]
			CASSYDSS	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB1972995.1	[75]
			CASSYGGERNIQY	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55305.1	[64]
	HUN-1 10(b)	FCASSGDRGVISSYNE	FCASSGDRDAGSSY	Human Hepatitis C Virus specific TCR clone-132	ADQ19392.1	[100]
			FCASSSDRG--RAYNE	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03870.1	[31]
			FCASS--KGVVFSYNE	CD8+ TCR beta chain from synovium in an HLA B27+ patient with Reactive Arthritis	CAB95682.1	[83]
			FCASSGD---ILAYNE	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81445.1	[80]
			FCASSADR---FSYNE	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78873.1	[85]
			FCASSFNRG---SYNE	CD4+ T cell in a patient with ataxia telangiectasia	CAD24844.1	[120]
			FCASSGEGRG--RTYNE	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54613.1	[64]
	HUN-1 11(b)	FCASSPDRTGRTEAF	FCASSPDR	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54529.1	[64]
			FCASSPDR	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55143.1	[64]
			FCASSPDR FCASSQDPVGNTEAF	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren’s Syndrome	ANO56092.1 ANO56140.1	[64]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 11(b)	FCASSPDRTGR TEAF	FCASSQDRTG FCASS--RT-RTEAF	TCR beta chain in a patient with celiac disease	ABF14430.1 ABF14427.1	[149]
			FCASSPDRDG	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55486.1	[64]
			CASSPDR-G-TEAF	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AOO95311.1	[80]
			FCASSPD-SGRDTEAF CASSQDRTGWNTE AF CASSSDR-GNTEAF	CD4+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34252.1 CAC34097.1 CAC34222.1	[92]
			FCASSPPDRVG-TEAF	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56304.1	[64]
			FCASSPDREG—EAF FCASSPDQN--TEAF FCASS-EKEGRTEAF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78663.1 AVK78720.1 AVK78861.1	[85]
			FCASSPLPTGSTE AF CASSQG-TGRTEAF	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54375.1 ANO54405.1	[64]
			CASSSRDR-GRTEAF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56942.1	[64]
			FCASSRDR-G-TEAF	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55786.1	[64]
			CASSTDIQGRTEA F	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56410.1	[64]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 11(b)	FCASSPDRTGRT EAF	CASSL--TGRTEAF	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76011.1	[74]
			FCAST-- RTGGRTEAF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32420.1	[74]
			CASSPARTGSTD	TCR beta chain from patient with chronic cardiac allograft rejection, endomyocardial biopsy	AAG15835.1	[119]
			FCASSQERTGPT	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren’s Syndrome	ANO55573.1	[64]
			FCASSPNRN-- TEAF	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren’s Syndrome	ANO54539.1	[64]
			FCASSPQQAGDT EAF FCASST- HSGRTEAF FCASSPSRVN- TEAF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10441.1 AIE10486.1 AIE10695.1	[72]
			FCASSSDREN- TEAF	TCR beta chain isolated from muscle from an inclusion body myositis patient	CAJ00283.1	[197]
			FCASSQG— GRTEAF FCASSPGREAGRT D	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78759.1 AVK78927.1	[85]
			FCAS--- RTGLTEAF FCASSPSW- GSTEAF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29359.1 AAF29330.1	[86]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 11(b)	FCASSPDRTGRTEAF	FCASSP--TVNTEAF	CD4+ TCR beta chain in multiple sclerosis brain lesions	CAC03924.1	[31]
			CASSSDRAN-TEAF	Tumour-infiltrating lymphocytes in oral squamous cell carcinoma	AAB50822.1	[198]
	HUN-1 12(b)	CASSYIGTGLVGELF	CASS-LGTGLAGELF	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56512.1	[64]
			CASSYRGT---GELF	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15766.1	[119]
	HUN-1 13(b)	CASSSTGSEETQY Clonal Expansion	CASSSTSGQEETQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10484.1	[72]
			CASSESTG-EETQY CASSSIGSADTQY	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56625.1 ANO56514.1	[64]
			CASSWT-SEETQY CASSST-SEGTQY	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29345.1 AAF29309.1	[86]
			CASSLGGSEETQY	Myelin basic protein specific T-cell receptor	AAB25613.1	[133]
			CASSLSSGGEETQY	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83277.1	[133]
			CASSSPGTGEETQY	CD8+ T-lymphocyte specific to lymphotropic virus type 1 Tax11-19 peptide complexes; HLA-A2	BAB18703.1	[118]

TABLE 57. CONTINUED

Patient HUN-1	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-1 14(b)	CASSLGDRGLSYEQY	CASSL-DPGLSYEQY	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56880.1	[64]
			CASSQGLGGRGLSYEQY	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84627.1	[65]
			CASSLDGDRA-SYEQY	TCR beta chain in a patient with celiac disease	ABF14438.1	[149]
			CASSLNDRGVGLSSYEQY	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK75978.1	[88]
	HUN-1 18(b)	LCAWSPGQGVNSPL Clonal Expansion	CASSPGQGANSPL	CD4+ TCR beta chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55765.1	[64]
	HUN-1 20(b)	CASSWGSGSNYGY Clonal Expansion	CASSWDSSSNY-Y	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOK57826.1	[78]
			CASAWGSGSSFDY ASSWGSGSNY	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOO08025.1 MOO07479.1	[78]
	HUN-1 23(b)	CASSGSGSRTYNEQ	CASSGEGRGRTYNEQ	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54613.1	[64]
	HUN-1 24(b)	FCASIPSGSEQFF	CASSTLPSGSEQFF	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76058.1	[88]

TABLE 58. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT HUN - TISSUE 2 AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 2(b)	CASSLLPGQGMN TEA Clonal Expansion	PGQGMNTEA	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56409.1	[64]
			CASSL-AGQGVNTEA	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89839.1	[87]
			CASSLLIGQSG NTEA	TCR beta chain in peripheral blood from a patient post-transfusion graft-versus-host disease	BAA09409.1	[157]
			CASSLV---GMNTEA	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10672.1	[72]
	HUN-2 4(b)	YICSAQGVTEAF	YICSARDGVTE AF	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55907.1	[64]
			YICSADGGTEA F	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55621.1	[64]
			YICSASGRTEAF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56868.1	[64]
			YICSADRGVNT EAF	TCR clone reactive to human renal cell carcinomas	ABO16435.1	[64]
	HUN-2 5(b)	ICSARSANYGY	ICSARGGISGN YGY	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56162.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 5(b)	ICSARSANYGY	ICSAR-ENYGY	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO54969.1	[64]
			ICSASGSNYGY	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54816.1	[64]
			ICSARTGGYGY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78829.1	[85]
	HUN-2 6(b)	ICSASLGIDEQFF	ICSASHG-DEQFF	CD4+ TCR beta chain isolated from Subject10 salivary glands of a patient with Sjogren's Syndrome	ANO56638.1	[64]
			ICSASIGGAGVNEQFF	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54616.1	[64]
	HUN-2 7(b)	YICSALGPYEQY	YICSASLTPYEQY	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72631.1	[76]
			YICSARDPYEQY	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57267.1	[87]
			YICSANRGPYEQY YICSAATSGPYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78740.1 AVK78804.1	[85]
			YLCASSLGPYEQY	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54695.1	[64]
			YICSARAPGLGTYEQY	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56936.1	[64]
			YICSARGPTQFYEQY	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55348.1	[64]
	HUN-2 8(b)	CSARDAGLSYEQ	CSARDAARSYEQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78454.1	[85]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 9(b)	LCASSDGGKFYGYTF	LCASSLGGQFY GYTF	CD4+ TCR beta chain in multiple sclerosis brain lesion	CAC03927.1	[31]
			LCASSWTGG-FYGYTF	CD4+ T lymphocyte obtained from lymph nodes of patient A5 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34180.1	[92]
			LCASSDAGGRDY GYTF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10592.1	[72]
			LCASSWDGGG-YGYTF	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54494.1	[64]
			LCASSIGGN-YGYTF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78674.1	[85]
			CASSEGVGFYGY TF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57019.1	[87]
			CATSDGGD-YGYTF	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO55006.1	[64]
			LCASSQGAGYY GYTF	Clonotypes from muscle-infiltrating lymphocytes from a patient (case3) with human T lymphotropic virus type 1 polymyositis	BAC01025.1	[104]
			LCASSEGD--YGYTF	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient3 with chronic beryllium disease	AAD55162.1	[91]
			LCASSPQEGG--YGYTF	CD4+ TCR beta chain isolated from Subject10 peripheral blood	ANO55268.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 10(b)	YLCSVQKGGGRL NTEA	YLCSV--- GGHMNTEA	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO27028.1	[73]
			YLCASSQ--- GRLNTEA	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57252.1	[87]
	HUN-2 12(b)	CSVEGGNEQYF	CSVEGGSSYEQY F	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81483.1	[80]
			CSVEGEREGNE QFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57287.1	[87]
	HUN-2 13(b)	CASSLMGGHTE AFF	CASSLTGQGHTE AFF CASSLTGEGHTE AFF CASSLATGG- TEAFF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29333.1 AAF29344.1 AAF29261.1	[86]
			CASSMSAMG-- TEAFF	CD8+ T cell cross-recognition of distinct influenza A strains in humans; EM2 TCR in complex with HLAB*37:01-NP338	6MTM_E	[199]
			CASSLRGGNTEA FF CASSLGGGGTEA FF CASSFTGGNTEA FF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57287.1 ADQ57029.1 ADQ57055.1	[87]
			CASSLVGGYTEA FF	CD4+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34126.1	[92]
			CASSLGGG- TEAFF CASSLVGMNTE AFF CASSLLGQLNTEAFF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10653.1 AIE10672.1 AIE10549.1	[72]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 13(b)	CASSLMGGHTEAFF	CASSL-GG-TEAFF CASSL--GNTEAFF	HIV-specific CD8+ T cell lymphocytes	AFD18164.1 QCR99121.1	[117]
			CASSLVGTGNTEAFF	CD4+ TCR beta chain isolated from Subject5 peripheral blood	ANO54696.1	[64]
			CASSLEGTGNTEAFF CASSFLIGG-TEAFF CASS-QGGRTEAFF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78736.1 AVK78789.1 AVK78759.1	[85]
			CASSLTGTGVTEAFF	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72617.1	[76]
			CASSLRGRGETEAFF CASSQGGGYTEAFF	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54305.1 ANO54346.1	[64]
			CASSLRQGGLTEAFF	Human Hepatitis C Virus specific TCR clone-36	ADQ19336.1	[100]
			CASSL-GGRRTEAFF	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54267.1	[64]
			CASSLSTGG-TEAFF	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren’s Syndrome	ANO56310.1	[64]
			CASSLIG-NTEAFF CASSLIRYM--NTEAFF	TCR beta isolated from patient with untreated recent onset juvenile dermatomyositis	AAF36826.1 AAD30383.1	[200]
			CASSLM-ENTEAFF CASSLGAGKTEAFF CASTPIGGNTEAFF	CD4+ TCR beta chain isolated from Subject2 salivary glands of a patient with Sjogren’s Syndrome	ANO55665.1 ANO55651.1 ANO55772.1	[64]
			CASSVLG-HTEAFF	Synovial T-lymphocyte in a patient with *Yersinia enterocolitica 03* induced acute Reiter’s syndrome; HLA-B27	CAA60057.1	[201]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 13(b)	CASSLMGGHTEAFF	CASSLTGLNTEAFF	TCR V beta chain expressed in CD8+ ulcerative colitis	AAB36338.1	[111]
			CASSL-AGNTEAFF	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56097.1	[64]
			CASRLIGGGTEAFF	TCR beta chain from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR37239.1	[102]
			CASS--GGYTEAFF	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55561.1	[64]
			CASSLTG-RTEAFF CASSLVGLGDNTEAFF	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76011.1 AEK76017.1	[88]
			CASSL-GQNTEAFF	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO54543.1	[64]
			CASSL-GQNTEAFF	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54965.1	[64]
			CASSLVGLRGNTEAF	TCR beta in a study of infiltrating oligoclonal T cells in the brain of children with AIDS	AAM03350.1	[59]
			CASS-MSGLNTEAFF	Anti-DNA autoantibody-inducing T cells in a human lupus patient	AAA80081.1	[126]
			CASSLVM--NTEAFF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57009.1	[87]
			CASSQVPGGNTEAFF	Small nuclear ribonucleoprotein reactive T cell from connective tissue disease patient	AAC24868.1	[97, 164]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 13(b)	CASSLMGGHTEAF F	CASSIAGSNTE AFF	CD4+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAV32379.1	[74]
			CASSVLGGMEN TEAFF	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54052.1	[64]
			CASSYMGDRV NTEAFF	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03985.1	[82]
			CASSLQRM-- NTEAFF	CD4+ TCR beta chain from MS lesion brain tissue	CAC03914.1	[31]
			CASSLLGGAGT VNTEAFF	TCR clone in chronic pediatric HIV-1 infection	AAC72544.1	[202]
			CASSLLIGQSGN TEAFF	TCR beta chain in peripheral blood from a patient post-transfusion graft-versus-host disease	BAA09409.1	[157]
			CASSLIGG- AEAFF CASGLLGREGG NTEAFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57138.1 ADQ57070.1	[87]
	HUN-2 15(b)	LCASSGVSGQTTDTQ	CASSGGSGQT	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOO58831.1	[78]
			CASSGTSGPST DTQ	TCR in pediatric acquired severe aplastic anemia	ACN65196.1	[155]
			CASS- VEGQSTDTQ CASSATSGMN TDTQ	TCR beta chain isolated from a HLA-B27 positive patient with reactive arthritis	AAF81848.1 AAF81850.1	[79]
			CASS- VSGGSTDTQ	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56351.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 15(b)	LCASSGVSGQTTDTQ	CASSWDVSGRATDTQ	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72661.1	[76]
			LCASSSSSGTVTDTQ	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15761.1	[119]
			LCASSSTSGSRTDTQ LCASSLLSGTSTDTQ	Activated and effector memory T cells clonally expanded in bicuspid valve in a case of calcific aortic stenosis	AEK75993.1 AEK75992.1	[88]
			LCASSGQGG-TADTQ	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54383.1	[64]
			LCASSLVSGRAGDTQ	T cell from an inflamed joint isolated from a patient with reactive arthritis; HLA-B27+	AAA57041.1	[203]
			CASSEVGGKNTDTQ	TCR beta cells from lung tissue in a patient with emphysema	AAV52853.1	[91]
			LCASTPVGGRSTDTQ	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76044.1	[88]
	HUN-2 16(b)	CASSLWYTGEL	CASSLWF-GEL CASSLWF-GEL	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOO41516.1 MOP30967.1	[78]
	HUN-2 18(b)	FCASSLSYEQ	CASSLSYEQ	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56871.1	[64]
			FCASSLGSSYEQ	Anti-melanoma cytolytic T cell	AAA87225.1	[204]
			FCASSLSY	CD8+ T-lymphocyte specific to lymphotropic virus type 1 Tax11-19 peptide complexes; HLA-A2	BAB18694.1	[118]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 18(b)	FCASSLSYEQ	FCASSASYEQ FCASSLSGQGVYEQ FCASSLRGFGRDSYEQ	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78512.1 AVK78756.1 AVK78654.1	[85]
			FCASSLSQYE	Oligoclonal CD4+ TCR in rheumatoid joints	AAB34435.1	[170]
			CASSLAYEQ FCASSFSYE CASSLGYEQ	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81509.1 AMT81590.1 AMT81488.1	[80]
			CASSFSYEQ FCASSLFTGGPSYEQ	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29244.1 AAF29285.1	[86]
			FCASSSLSGYEQ	TCR beta chain isolated from synovial fluid of a patient with spondyloarthropathy	AAN78477.1	[135]
			FCASSLLAYEQ	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO27021.1	[73]
			FCASSLLVTSYEQ	CD4+ T cell in a patient with ataxia telangiectasia	CAD24848.1	[120]
			FCASSLAGTSYEQ	Ki67 T lymphocyte obtained from lymph nodes of patient A5 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34184.1	[92]
			FCASSLMADSYEQ	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55471.1	[64]
			FCASSLGSFSYEQ	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10654.1	[72]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 18(b)	FCASSLSYEQ	FCASSLGSTYEQ	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72616.1	[76]
			FCASSLADPYEQ	CD8+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34082.1	[92]
			FCASSLTRTYEQ	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89835.1	[87]
			FCASSLSRQGAYEQ	TCR beta chain from the lymph node of a patient with classical Hodgkin's lymphoma	CAC48312.1	[103]
			FCASSLSPGHLYEQ	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56203.1	[64]
	HUN-2 19(b)	CASSSRTDGSEWYF	CARGSRADGSSWY CASLTPSTDGSIWYF	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOP44655.1 MOR49847.1	[78]
			CASSPRVDSSGWY	Memory B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCB12017.1	[89]
			CARSRHTDGSDSNYDWYF	CD19lo Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOQ08628.1	[78]
	HUN-2 20(b)	CASSLIGGDREYEQY	CASSLLGGDL-YEQY	TCR beta chain isolated from synovial fluid of a patient with spondyloarthropathy	AAN60080.1	[135]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 20(b)	CASSLIGGDREYEQY	CASSL---DRAYEQY	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29230.1	[86]
			CASSLAGGGSAYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10631.1	[72]
			CASSLEGGN--YEQY	T cell isolated from a patient with chronic myeloid leukemia and B-cell acute lymphoblastic leukemia; P210(BCR-ABL positive)	ADF84456.1	[205]
			CASSLAGG---YEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81527.1	[80]
			CASSLRGG---YEQY CASSLAGG--AYEQY	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55162.1 ANO55071.1	[64]
			CASSLEGG---YEQY	CD4+ T lymphocyte obtained from lymph nodes of patient A7 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34232.1	[92]
			CASSLTGGT--YEQY	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15821.1	[119]
			CASSLR--DRVYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57072.1	[87]
			CASSNL---DRDYEQY	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO26889.1	[73]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 20(b)	CASSLIGGDREYEQY	CASSLVG----YEQY	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29240.1	[86]
			CASS----DRAYEQY	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03954.1	[82]
	HUN-2 21(b)	FCASRPLVRVEEQYF Clonal Expansion	FCASS--VRVETQYF	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54069.1	[64]
			FCASRPQGREETQYF	TCR beta chain from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR37264.1	[102]
			FCASRDWGLVR-NEQYF	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55084.1	[64]
			FCASRP--REIETQYF	TCR beta isolated from patient with untreated recent onset juvenile dermatomyositis	AAD30372.1	[200]
			FCASRPGLMSAQPEQYF	A6 wild-type TCR HLA-A*0201 with high affinity complex to human T cell lymphotropic virus type 111-19 peptide (A2-Tax)	4GRM_B	[206]
	HUN-2 22(b)	CATSETTGAYEQY	CASSITTGAYYEQY	TCR clone isolated from peripheral blood in a study of HLA-B27+ monozygotic twins with ankylosing spondylitis	CAC16893.1	[207]
			CATS-RTGSYEQY	T lymphocyte obtained from lymph nodes of patient A10 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34250.1	[92]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 22(b)	CATSETTGAYEQY	ASSLTSGAYEQY	Small nuclear ribonucleoprotein-specific TCR beta chain from a patient with connective tissue disease	AAB30340.2	[208]
			CASSQETSGRAYEQY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10707.1	[72]
			CASSQLTSGAYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31438.1	[74]
			CASSPEQTGSYEQY CASSPSTGGYEQY CASSPTPGVYEQY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78881.1 AVK78919.1 AVK78573.1	[85]
			CASSLEGTGSYEQY	CD4+ TCR beta chain isolated from Subject3 peripheral blood	[64]	[64]
			CASSESGGTYEQY	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57024.1	[87]
			CASSPTSGIYEQY	TCR antigen complexes at an immunodominant epitope in HIV-1 infection	3VXM_E	[139]
			CAISELSGGYEQY	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56195.1	[64]
			CASSGSTGRYEQY	TCR beta cells from lung tissue in a patient with emphysema	AAV52860.1	[91]
			CASS-TAGTYEQY	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25648.1	[128]
			CASSVAPGAYEQY	TCR beta chain in peripheral blood from a patient post-transfusion graft-versus-host disease	BAA09388.1	[157]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 22(b)	CATSETTGAYEQY	CAISES--AYEQY	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54252.1	[64]
			CASSPGTGGYEQY	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15783.1	[119]
			CASSQETGFYEQY	CD8+ T-lymphocyte specific to lymphotropic virus type 1 Tax11-19 peptide complexes; HLA-A2	BAB18719.1	[118]
			CASSEVSAGTGVYEQY	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81625.1	[80]
			CSARDTTGYRAYEQY	CD4+ TCR beta chain isolated from Subject3 peripheral blood	ANO54806.1	[64]
	HUN-2 23(b)	FCASSPGTGGAEAFF	FCASSPGTGG CASSLATGGTEAFF FCASSPSWGSTEAFF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29312.1 AAF29261.1 AAF29330.1	[86]
			CASSPGTGNTEAF	Oligoclonal Expansions among Specific V Expressing T Cells in Human Chagas Disease	ABR67604.1	[125]
			SAPGTGGTEAFF FCASSSGRPGVAEAFF FCASSQGTVNTEAFF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78550.1 AVK78684.1 AVK78558.1	[85]
			FCASSPIGTGLGTEAFF	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54314.1	[64]
			FCASSGGTGGVTEAFF	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren’s Syndrome	ANO55613.1	[64]
			FCASSRSTGGSEAFF	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54145.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 23(b)	FCASSPGTGGAEAFF	FCASSVGGGGTEAFF	CD4+ TCR beta chain isolated from Subject2 peripheral blood	ANO54258.1	[64]
			FCASSPGM-GTEAFF	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56627.1	[64]
			FCASSSG-GGTEAFF FCASS-G-GGTEAFF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10728.1 AIE10619.1	[72]
			FCASSLGGGGTEAFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57029.1	[87]
			FCASSEMTGGGEAFF	CD4+ TCR beta chain isolated from Subject9 peripheral blood	ANO55145.1	[64]
			CASSSPGTGDLEAFF	HIV-specific T-cell antigen receptor beta chain	AAB31474.1	[151]
			FCASSQG-GRAEAFF FCASGPGTGGVGNTEAFF	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55443.1 ANO55374.1	[64]
			CASSLSTGGTEAFF FCASSPPDRVGT---EAFF	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56310.1 ANO56304.1	[64]
			CASS--TGGTEAFF	TCR beta chain isolated from synovial fluid of a patient with spondyloarthropathy	AAN78481.1	[135]
			CASSEGTGNPEAFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57203.1	[87]
			CASSPGTGGYEQYF CASSAGTGQAGGTEAFF	TCR beta chain from patient with chronic cardiac allograft rejection, right coronary artery	AAG15783.1 AAG15752.1	[119]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 23(b)	FCASSPGTGGAE AFF	CASSP-TGDTEAFF	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31108.1	[74]
			CASS--TGGTEAFF	HIV-specific CD8+ T cell lymphocytes	QCR99142.1	[117]
			CASSQGTGRTEA FF FCASSPLPTGSTE AFF	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54405.1 ANO54375.1	[64]
			CARAPGTGGAA AF	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB1959792.1	[75]
			FCASSTGTGINTE AFF	TCR beta chain clonotypes in synovial tissues of rheumatoid arthritis	AAB36315.1	[152]
			FCASSLTGTGVT EAFF FCASSPGTGGVK GTGELFF	CD4+ T cell obtained from the synovial fluid of patients with rheumatoid arthritis	AAC72617.1 AAC72569.1	[76]
			FCASTP-TGFGTEAFF	T lymphocyte obtained from lymph nodes of patient A5 in a study of T cell subpopulations in non-Hodgkin’s lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34174.1	[92]
			FCASSPATGGRE QYF	Tetanus toxoid specific TCR beta chain	AAB25568.1	[209]
			FCASSQGTGSNE QFF	TCR VB9 gene sequence associated with diffuse large B-cell lymphoma	ACF49255.1	[124]
			FCASSPGQVNTE AFF	Perivascular T cell beta chain in multiple sclerosis brain lesions	CAC03792.1	[31]
			FCASRPGT--VEAFF	CD4+ TCR beta chain isolated from Subject7 peripheral blood	ANO54329.1	[64]
			FCASS---GGTEAFF	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren’s Syndrome	ANO55572.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 23(b)	FCASSPGTGGAE AFF	FCASSPTDGDTE AFF	T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34131.1	[92]
			FCASSSGTG--- AFF	CD4+ TCR beta chain in multiple sclerosis brain lesion	CAC03903.1	[31]
			CASSAGTGQAGG TEAFF	TCR beta chain from patient with chronic cardiac allograft rejection, left anterior descending coronary artery	AAG15742.1	[119]
			FCASSPGLNT--- EAFF FCASTEQGAGG TEAFF FCASSRGTGAL MNTEAFF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78628.1 AVK78887.1 AVK78371.1	[85]
			FCASSPDSGRDT EAFF	T lymphocyte obtained from lymph nodes of patient A11 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34252.1	[92]
			FCASSPLWEGGI GNTEAFF	CD8+ TCR beta chain in multiple sclerosis brain lesion	CAC03776.1	[31]
	HUN-2 24(b)	ASSLDVRGNYGY	ASSLS-RGNYGY	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55601.1	[64]
	HUN-2 25(b)	ASSLVGLAGAFTD TQ	ASSLDGLAG-- TDTQ	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10639.1	[72]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 26(b)	LCASSVAGFHEQYF	CASSVAG-GEQYF	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55597.1	[64]
			LCASSGTSAGFHEQYF	T lymphocyte obtained from lymph nodes of patient A11 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34207.1	[92]
			LCASSLVAGIYEQYF LCASSTAGTYEQYF	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25632.1 AAB25648.1	[128]
			LCASSPAGPFYEQYF LCASSSAGGAFSHEQYF	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10430.1 AIE10473.1	[72]
			CASSGTGYFHEQYF	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83281.1	[133]
			LCASSVQGAYEQYF	TCR beta chain isolated from synovial fluid of a patient with spondyloarthropathy	AAN78480.1	[135]
			LCASSLAGGYEQYF LCASSLAGGNEQFF	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81527.1 AMT81517.1	[80]
			CASSVGQGSHEQYF	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55829.1	[64]
			CASSPTGFNEQYF	CD8+ TCR beta clone isolated from whole tissue in a patient with active psoriatic arthritis, HLA B*0702	AAM92226.1	[161]
			CASSVGRLAGGHEQYF	CD4+ TCR beta chain isolated from Subject6 peripheral blood	ANO54939.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 26(b)	LCASSVAGFHEQYF	LCASSATGFSYEQYF	TCR beta in rheumatoid synovium	AAC14928.1	[146]
			LCASSIGTGAHEQYF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32399.1	[74]
			LCASTLAGDFAEQYF	Tetanus toxoid specific TCR beta chain	AAB25556.1	[209]
			LCASSMGTGAHEQYF	Human Hepatitis C Virus specific TCR-clone 84	ADQ19344.1	[100]
			CASSVAGGAY-EQYF LCASSLVGY-EQYF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29363.1 AAF29240.1	[86]
			CASSVAGSRSYEQYF	Synovial T-lymphocyte in a patient with *Yersinia enterocolitica 03* induced acute Reiter's syndrome; HLA-B27	CAA60085.1	[201]
			CASSSGVAGGREQYF	Anti-DNA autoantibody-inducing T cells in a human lupus patient	AAA80098.1	[126]
			LCASSMGLFYEQYF	CD8+ TCR beta chain in multiple sclerosis brain lesion	CAC03939.1	[31]
			LCASSLSGTYEQYF	CD8+ TCR clone in Rasmussen encephalitis	AOO95299.1	[80]
			LCASSVAPQGGYGEQYF	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84569.1	[65]
			CASSVEAFNEQFF	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO27038.1	[73]
			LCASSLSGRFNEQFF	CD4+ T cell obtained from the synovial fluid of patient CS1 with rheumatoid arthritis	AAC72557.1	[76]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 26(b)	LCASSVAGFHEQYF	LCASSLAGGYNEQFF	Clonotypes from muscle-infiltrating lymphocytes from a patient (case2) with human T lymphotropic virus type 1 polymyositis	BAC01035.1	[104]
			LCASSLALAFNEQFF	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK75973.1	[88]
			LCASSLLSGSGFYEQYF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56902.1	[64]
			LCASS---FDPNHEQYF	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55905.1	[64]
			LCASSLELAGYNEQFF	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25611.1	[128]
			CASSVAGRGSYNEQFF	CD4+ TCR beta chain isolated from Subject1 peripheral blood	ANO54086.1	[64]
			LCASSLAGSSYNEQFF	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56180.1	[64]
			LCASSVESSGGYNEQFF	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56051.1	[64]
	HUN-2 27(b)	LCASSSADRPYGQYFGP	CASSLAD-PYEQYFGP	T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34082.1	[92]
			LCASSNLDRDYEQYFGP CASSVAEADRRYEQYFGP LCASSSIAGPAYEQYGP	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO26889.1 ABO26971.1 ABO26932.1	[73]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 27(b)	LCASSSADRPYGQYFGP	CASSMSAGTPYEQYFGP	Anti-GRP peptide antigen TCR in synovial T cells	AAB50659.2	[210]
			LCASSLRDRVYEQYFGP LCASSHGLAE-PYEQYFGP	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57072.1 ADQ57199.1	[87]
			CASS--DRAYEQYFGP	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03954.1	[82]
			LCASSSGD—YEQYFG LCASSATTRDRDYEQYFG	CD4+T cell from peripheral blood and bronchoalveolar lavage of patient2 with chronic beryllium disease	AAD55191.1 AAD55201.1	[91]
			ASSSTGRTYEQYFGP	TCR beta chain in peripheral blood from a patient post-transfusion graft-versus-host disease	BAA09405.1	[157]
			LCASTSSGGSPYEQYFGP LCASSFSGTSPYEQYFGP	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10497.1 AIE10616.1	[72]
			LCASSALAG-PYEQYFGP LCASSSS---YEQYFGP	CD8+ T cell isolated from patients suffering from Rasmussen encephalitis	AMT81612.1 AMT81482.1	[80]
			LCASSLDGREPYEQYFGP	TCR beta chain in a patient with celiac disease	ABF14436.1	[149]
			LCASSS--QPHYEQYFGP LCASSG-EQPYEQYFGP	Activated and effector memory T cells clonally expanded in tricuspid valve in a case of calcific aortic stenosis	AEK76014.1 AEK76033.1	[88]
			LCASSS--RSSYEQYFGP	TCR beta chain in a molecular study for universal HLA-A*0201-restricted CD8+ T cell immunity against influenza viruses	5HHM_E	[137]
			LCASSGSTGR-YEQYFGP LCASSAPGQSYEQYFGP	TCR beta cells from lung tissue in a patient with emphysema	AAV52860.1 AAV52846.1	[91]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 27(b)	LCASSSADRPYGQYFGP	CASSLEHST-RPYEQYFGP	Viral superantigen-9 stimulation to human T cells	AAC51976.1	[93]
			LCASSQVNRVYEQYFGP	CD4+ TCR beta chain in a study of T cells in lung of patients with hypersensitivity pneumonitis	AAP84256.1	[131]
			LCASSAQGRLYEQYFGP LCASS---RPNRELYEQYFGP	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32419.1 AAW31103.1	[74]
			LCASSS---PYEQFFGP	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32402.1	[74]
			LCASSTGTGPYEQYFGP	TCR clone of myelin basic protein-reactive T cells in MS patients	AAA98122.1	[123]
			CASSARDRPYNEQFFGP	CD4+ TCR beta chain isolated from Subject8 peripheral blood	ANO55408.1	[64]
			LCASSITGNPYEQYFGP	Anti-snRNP reactive T cell clone isolated from a patient with connective tissue disease	AAK15744.1	[97]
			LCASSTAG-TYEQYFGP	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25648.1	[128]
			LCASSFRDSSYEQYFGP	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56071.1	[64]
			LCASSNPD-VYEQYFGP	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56393.1	[64]
			LCASSS---PGGYEQYFGP	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56263.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 27(b)	LCASSSADRPY GQYFGP	LCASSQFSPPRT RPYEQYFGP LCASSQDNRNSY EQYFGP	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78383.1 AVK78762.1	[85]
			LCASSTGGRNSY EQYFGP LCASSTGGRNSY EQYFGP	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56938.1 ANO56896.1	[64]
			LCASSPTSSPPYEQ YFGP	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83273.1	[133]
			LCASSQREGAGS PYEQYFGP	TCR isolated in gut biopsy from a celiac patient	ABG91734.1	[211]
			LCASSSAMTSGS SYEQYFGP	TCR beta chain specific to Herpes simplex cross-reactivity with varicella-zoster viruses	AMT81373.1	[212]
			LCASTSGGSAYEQ YFGP	CD8+ TCR beta clone isolated from whole tissue in a patient with active psoriatic arthritis, HLA B*0702	AAM92196.1	[161]
			LCASSQETSGRA YEQYFGP	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10707.1	[72]
			LCATSRGGASSG RAYEQYFGP	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55597.1	[64]
	HUN-2 28(b)	FCASSREGTNY GY	CASSWERTNYG Y	TCR in pediatric acquired severe aplastic anemia	ACN65147.1	[155]
			CASSP-GTNYGY	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84619.1	[65]
			CASSGRSGTNYG CASSLDGVNYGY	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25636.1 AAB25606.1	[128]
			FCASSFKQGTNY GY	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55872.1	[64]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 28(b)	FCASSREGTNYGY	FCASSVEGGPNYGY	CD4+ TCR beta chain isolated from Subject4 peripheral blood	ANO54536.1	[64]
			FCASSQ-GTANYGY	CD8+ TCR beta-chain in myeloma	CAC06609.1	[98]
			FCASRRQGPNYGY	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56493.1	[64]
			FCASSDQGSNYGY	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56131.1	[64]
			FCAS-RNGANYGY	CD8+ TCR beta chain in multiple sclerosis brain lesion	CAC03890.1	[31]
			CASSARAGTDYGY FCASSVGGTLTNYGY	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78830.1 AVK78692.1	[85]
			FCAS-RPGXNYGY	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03787.1	[31]
			FCASSQVGTVYGY	CD4+ TCR beta chain isolated from Subject9 peripheral blood in a patient with Sjogren's Syndrome	ANO55142.1	[64]
			CATSRDGTDYGY	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10272.1	[72]
			CA--REGTEYGY	Naive B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCD51407.1	[89]

TABLE 58. CONTINUED

Patient HUN-2	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	HUN-2 28(b)	FCASSREGTN YGY	FCASSVGGT LTNYGY	T lymphocyte obtained from lymph nodes of patient A16 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	AVK78692.1	[92]
			FCATSERTG ANYGY	T cell infiltrates obtained from the aortic valve in a patient with calcific aortic stenosis	ABO26895.1	[73]
			FCASSR-- TVDYGY	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*27052; B*5701	AAK07586.1	[108]
			FCASTLQGS NYGY	CD4+ TCR beta chain isolated from Subject3 peripheral blood in a patient with Sjogren's Syndrome	ANO54933.1	[64]
			FCASSYGGR --TNYGY	Oligoclonal CD4+ TCR in rheumatoid joints	AAB34438.1	[170]
			FCASS-- GPCVTNYGY	Infiltrating T lymphocytes in brain tissue of a patient with chronic encephalitis of Rasmussen	AAB03950.1	[82]
			FCASSQEAV SMNYGY	CD8+ T-lymphocyte specific to lymphotropic virus type 1 Tax11-19 peptide complexes	BAB18683.1	[118]
			CAKSRDSTS YGY	Memory B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCB56020.1	[89]

TABLE 59. CLONES SHARING HOMOLOGY WITH ALPHA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT ROW AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	ROW 3(a)	TYLCASRGSGN Clonal Expansion	CASRGSGN	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOP21663.1	[78]
			YLCASRSSG	TCR alpha and beta chains specific for similar myelin basic protein peptide/major histocompatibility complexes	S57876	[153]
			TYLCAARSGSGN	CD4+ TCR alpha chain isolated from Subject4 salivary glands of a patient with Sjogren’s Syndrome	ANO55991.1	[64]
			TYLCAERGSQGN	CD4+ TCR alpha chain isolated from Subject2 salivary glands of a patient with Sjogren’s Syndrome	ANO55676.1	[64]
			TYLCAVSRGFGN	Dominant TCR-alpha self-recognition of Ag Melan-A/MART-1; HLA-A2	AAN12376.1	[105]
			TYLCAVRGAGN	CD4+ TCR alpha chain isolated from Subject8 peripheral blood in a patient with Sjogren’s Syndrome	ANO55402.1	[64]
			TYLCASADRGS TYLCATRGGSN	CD4+ TCR alpha chain isolated from Subject1 peripheral blood in a patient with Sjogren’s Syndrome	ANO54089.1 ANO54124.1	[64]
			TYLCALTRGPGN	TCR NYE_S3 bound to HLA A2*01-SLLMWITQV	6RP9_D	[213]
			TYFCAARNSGN	CD4+ TCR alpha chain isolated from Subject4 peripheral blood in a patient with Sjogren’s Syndrome	ANO54449.1	[64]
	ROW 6(a)	LCALVSAGNM Clonal Expansion	LCA-VSAGNM	TCR alpha chain isolated from rheumatoid synovium	AAB97054.1	[214]

TABLE 59. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	ROW 7(a)	TYLCASSLPALP	YLCASSLP	CD4+ T cell obtained from the synovial fluid of patient CS-2 with rheumatoid arthritis	AAC72692.1	[76]
			YLCASSLP	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57012.1	[87]
	ROW 8(a)	CAASSNYGQN	CAASGNYG QN	CD4+ TCR alpha chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56171.1	[64]
			CASSSNYG	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOQ35795.1	[78]
			CAASEDYG QN	CD4+ TCR alpha chain isolated from Subject4 peripheral blood in a patient with Sjogren's Syndrome	ANO54468.1	[64]
			CAAN-NYGQN	Myelin basic protein-specific T cells in multiple sclerosis	AAB30924.1	[182]
	ROW 10(a)	YCAVEDYSNYQ Clonal Expansion	CAREDYSN YQ CASLTVEDY SNYE	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MON66347.1 MOM24621.1	[78]
			CASEDYSNY	Memory B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCG72656.1	[89]
			CAREDYSN Y CAREDYSN Y CAVEDYGD Y	Naive B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCC42022.1 MCG66071.1 MCC43541.1	[89]

TABLE 59. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	ROW 10(a)	YCAVEDYSNYQ Clonal Expansion	CAREDYSNY CAREDYSNY CAREDYSNY E	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOQ69596.1 MOO27879.1 MOP43049.1	[78]
			CAREDYSN Y	Unswitched memory B cell in lymph node germinal centers linked to poor affinity maturation	MOK31393.1	[78]
			YCAVEDRW SNYQ	CD4+ TCR alpha chain isolated from Subject4 peripheral blood in a patient with Sjogren’s Syndrome	ANO54285.1	[64]
			CAREDYSN YH	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOQ45104.1	[78]
	ROW 13(a)	YICAVPRGGSQ	YICAVPNYG GSQ	TCR alpha chain form a patient with leukocyte leukemia	AAC60622.2	[141]
			YICAVTHG GSQ	Acetylcholine-specific TCR alpha chain	AAB25004.1	[215]
			YICAAPWG GNQ	CD4+ TCR alpha chain isolated from Subject9 salivary glands of a patient with Sjogren’s Syndrome	ANO56621.1	[64]
	ROW 15(a)	YFCAAVASSGGS	YFCAASASA GG YFCAASASA GG	CD4+ TCR alpha chain isolated from Subject8 salivary glands of a patient with Sjogren’s Syndrome	ANO56893.1 ANO56922.1	[64]
			YFCAASASG GG	TCR auto-antigen in a Type 1 Diabetes patient	QHU23672.1	[163]
			YFCAASVG NSGGS	CD4+ TCR alpha chain isolated from Subject8 peripheral blood in a patient with Sjogren’s Syndrome	ANO55513.1	[64]

TABLE 59. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	ROW 16(a)	CALSENDYK	CALSEAYSN DYK	CD4+ TCR alpha chain isolated from peripheral blood in a study of MHC 1 bound EBV viral epitopes; HLA-B*3508	CAJ26317.1	[216]
	ROW 18(a)	YLCAVLDTGR Clonal Expansion	YLCAALDTG R	T cell from an inflamed joint isolated from a patient with reactive arthritis; HLA-B27+	AAA57039.1	[203]
			YLCAVLNA G	TCR beta chain isolated from muscle from an inclusion body myositis patient	CAJ00285.1	[197]
	ROW 21(a)	YICVVSSPITGNQ	YICTVSNPIS NN YICTVSNPIS NN	Precursor signaling lymphocytic activation molecule isoforms; reference to measles virus and morbillivirus hemagglutinin interactions, including leukemia and system lupus erythematosus	NP_00131768 3.1 NP_003028.1	[217]
	ROW 22(a)	YLCAVEGGSE	YLCAVGGSS E	Hantavirus glycoprotein G1; pfam01567; Kenkeme virus	YP_00936229 1.1	[218]
			YLCAVGGSS E	Hantavirus glycoprotein G1; pfam01567; Artybash virus	QBL54786.1	[219]
			YLCAVEGR GS	CD4+ TCR alpha chain isolated from Subject6 peripheral blood	ANO54943.1	[64]

TABLE 59. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
α-chain TCR transcripts	ROW 22(a)	YLCAVEGGSE	YLCAVDGGEE	TCR from peripheral blood of an HSV-2 infected subject, stimulated with herpes simplex virus-2 VP22 gene	ABR37248.1	[102]
			YLCAVDGEGGSQ	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10831.1	[72]
			YLCAVVDSQGGSE	CD4+ TCR alpha chain isolated from Subject8 peripheral blood in a patient with Sjogren's Syndrome	ANO55514.1	[64]
			YLCAVEPDAAQGGSE	CD4+ TCR alpha chain isolated from Subject3 peripheral blood in a patient with Sjogren's Syndrome	ANO54767.1	[64]

TABLE 60. CLONES SHARING HOMOLOGY WITH BETA-CHAIN TCR SEQUENCES FROM THE BRAIN PLAQUE OF PATIENT ROW AND TCR TRANSCRIPTS IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 1(b)	LCASTGRGDQDSGAN Clonal Expansion	LCASTPRGDR-SGAN	CD8+ TCR beta chain from MS lesion brain tissue	CAC03841.1	[31]
			LCASSSRG-QGAGAN	CD4+ T lymphocyte obtained from lymph nodes of patient A11 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34251.1	[92]
	ROW 2(b)	ASSYFPRTEAF Clonal Expansion	ASSYLGPRTEAF	HIV-specific CD8+ T cell lymphocytes	QCR99123.1	[117]
	ROW 3(b)	ICSASGQGATEAF	ICSASKAGGGATEAF	CD4+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34133.1	[92]
			ICSAPGTGGTEAF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78550.1	[85]
			ICSATGQMNTEAF	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56389.1	[64]
			ICSASGR--TEAF	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren's Syndrome	ANO56868.1	[64]
			ICSASTGGSTEAF	CD4+ TCR beta chain isolated from Subject5 peripheral blood in a patient with Sjogren's Syndrome	ANO54627.1	[64]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 4(b)	YICSAPAQGGNTI	YICSAPARGG	CD4+ TCR beta chain from MS lesion brain tissue	CAC03837.1	[31]
			YICSAPGQG YICSASAQGSGNTI	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78955.1 AVK78482.1	[85]
			YICSAPALGGDT	CD4+ TCR alpha chain isolated from Subject8 peripheral blood in a patient with Sjogren's Syndrome	ANO55469.1	[64]
			YICSASASGGN	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26906.1	[73]
			YICSARDQTGNTI	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84647.1	[65]
			YICSAR-QGSYGNTI	CD4+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34162.1	[92]
	ROW 5(b)	CSARDGRESYNS	ARDGREGYN AREGRESY ARDGRDGYN	Human immunoglobulin engaging memory and naïve B cells after influenza vaccination	MBB2121071.1 MBB2068070.1 MBB2102468.1	[75]
			CSARDQGR-SYNS	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78609.1	[85]
			ARDGREGGYNS ARDGRDGYNS	Naive B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCG85832.1 MCG68322.1	[89]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 5(b)	CSARDGRESYNS	ARDGRDGYNS ARDGRDGYNS	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOR29637.1 MOP46748.1	[78]
			ARDGRDGYNS	Memory B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCB05835.1	[89]
			ARDGRDGYN	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOR62793.1	[78]
	ROW 6(b)	ICSAKKAGGPYSYNE	AKKAGGPYS	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOR45268.1	[78]
	ROW 7(b)	FYICRATGEKLQFFG	FYICSARTGDEKL-FFG FYICSARTGIGEKL-FFG FYICSATGGGET-QYFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78456.1 AVK78497.1 AVK78672.1	[85]
			FYICSARADTGE-L-FFG FYICSAGTGGATNEKL-FFG	CD4+ TCR beta chain isolated from Subject2 salivary glands of a patient with Sjogren's Syndrome	ANO55666.1 ANO55691.1	[64]
			FYICSAKRNEKL-FFG	TCR beta chain from a cross reactive T cell clone in a study of cell mimicry and epitope specificity in rheumatic heart disease	AAW33958.1	[132]
			FYICSGTGEETQYFG FYICSARDSDGEKL-FFG FYICSAGSLGGEKL-FFG	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10814.1 AIE10524.1 AIE10798.1	[72]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 7(b)	FYICRATGEKLQ FFG	FYICSARQAGLE KL-FFG	CD4+ T lymphocyte obtained from lymph nodes of patient A6 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34193.1	[92]
			YLCASSRGTGEK L-FFG	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56093.1	[64]
			FYICSASPTGET- QYFG	Synovial TCR from peripheral blood in a study of early arthritis	AAC08956.1	[220]
			FYICSALQGATN EKL-FFG	CD4+ TCR beta chain isolated from Subject8 peripheral blood in a patient with Sjogren's Syndrome	ANO55440.1	[64]
			FYICSALLEATNE KL-FFG FYICSATRTVLNE KL-FFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78465.1 AVK78401.1	[85]
			FYICSASRPGGQ EKL-FFG	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56045.1	[64]
			FYICSASKTVNEK L-FFG	CD4+ TCR beta chain isolated from Subject2 peripheral blood in a patient with Sjogren's Syndrome	ANO54266.1	[64]
			FYICSATGGPLR DEAFFG FYICSASVPSLGE --QFFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78440.1 AVK78823.1	[85]
			FYICSASTDSATN EKL-FFG	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56571.1	[64]
			FYICSARATGRPY E--QYFG	CD4+ TCR beta chain isolated from Subject3 peripheral blood in a patient with Sjogren's Syndrome	ANO54826.1	[64]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 7(b)	FYICRATGEKL QFFG	FYICSAPDRSINE KL-FFG	Neoplastic T cells in angioimmunoblastic T-cell lymphoma, subscapular lymph node	CAH56740.1	[94]
			FYICSATSGGYN E--QFFG	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31104.1	[74]
			FYICSASASGGN EKL-FFG	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26906.1	[73]
			FYICSATAGTSYN E--QFFG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78885.1	[85]
			FYICSASGLGSPY NE--QFFG	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56390.1	[64]
			FYICSASGRAGES NE--QFFG	CD4+ TCR beta isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10529.1	[72]
	ROW 8(b)	YICSAQTGTG TSRVTGEL	YICSAQSGTG	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57050.1	[87]
			YICSANTGTG	CD4+ TCR beta chain isolated from Subject2 peripheral blood in a patient with Sjogren's Syndrome	ANO54741.1	[64]
	ROW 9(b)	LCASRPTGSY NE Clonal Expansion	CASRTGSY CASKTGSYN	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78540.1 AVK78877.1	[85]
			CASRSGSY	Naive B cell immunoglobulin heavy chain junction in peripheral blood in myasthenia gravis patients	MCG46426.1	[89]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 9(b)	LCASRPTGSYNE Clonal Expansion	CASRSGSY CARRTGSY	Naive B cell in lymph node germinal centers linked to poor affinity maturation	MOP56234.1 MOQ45537.1	[78]
			CASSQDRTG SYN	HIV-specific CD8+ T cell lymphocytes	QCR99116.1	[117]
			CASRTYSGSY D	Memory B cell in lymph node germinal centers linked to poor affinity maturation	MOJ91631.1	[78]
	ROW 11(b)	CASSSQGATNEK	CASSTQGPT NEK	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78565.1	[85]
			CASSSPSSTN EK	CD8+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin’s lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34087.1	[92]
			CASSS-GGTNEK	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29367.1	[86]
			CASSDRGGT NEK	TCR beta chain in a patient with celiac disease	ABF14439.1	[149]
			CASSSPGAG ANEK	CD4+ TCR beta chain isolated from Subject8 salivary glands of a patient with Sjogren’s Syndrome	ANO56875.1	[72]
			CASSRDLGA TNEK	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10719.1	[72]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 11(b)	CASSSQGATNEK	CASSSGDSTNEK	TCR beta chain from a cross reactive T cell clone in a study of cell mimicry and epitope specificity in rheumatic heart disease	AAW33955.1	[132]
	ROW 12(b)	LCASSPRDEKLF Clonal Expansion	CASSRRDNEKLF CASSPRQGANE KLF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78422.1 AVK78708.1	[85]
			LCASS-MDEKLF LCASS-MDEKLF	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56522.1 ANO56485.1	[64]
			LCASSPSRINEKL F	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56309.1	[64]
			CASSPGAWDEK LF	CD4+ TCR beta chain isolated from Subject9 peripheral blood in a patient with Sjogren's Syndrome	ANO55095.1	[64]
			LCASSAQGEKLF	CD4+ TCR beta chain isolated from Subject5 peripheral blood in a patient with Sjogren's Syndrome	ANO54621.1	[64]
			LCASSRRGRDDE KLF	Human Hepatitis C Virus specific TCR clone-33	ADQ19294.1	[100]
			LCASSPFGRLWA TNEKLF	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10680.1	[72]
	ROW 13(b)	FCASRDQETQ Clonal Expansion	FCASRDQGT FCASRDQGT	CD4+ TCR beta chain isolated from Subject9 salivary glands of a patient with Sjogren's Syndrome	ANO56491.1 ANO56619.1	[64]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 13(b)	FCASRDQETQ Clonal Expansion	FCASSRGQETQ	TCR VB17 gene sequence associated with diffuse large B-cell lymphoma	ACF49254.1	[124]
			FCASRLGQETQ	CD4+ TCR beta chain isolated from Subject7 salivary glands of a patient with Sjogren's Syndrome	ANO55815.1	[64]
			FCASRFWDSQE TQ	CD4+ TCR beta chain isolated from Subject2 peripheral blood in a patient with Sjogren's Syndrome	ANO54259.1	[64]
			FCASRPGQGDQ ETQ	Myelin basic protein-specific T cell clone in an HLA-DR2 multiple sclerosis patient	AAN08405.1	[107]
			FCASREEGFQET Q	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03868.1	[31]
			FCASRQTSGQET Q	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10349.1	[72]
			CASRDRTGVYQ ETQ	TCR beta chain from tumor cells in peripheral T-cell lymphoma	AAX83280.1	[133]
	ROW 14(b)	FCASRPRQGKGS PLH	FCASR-RQGGNSPLH FCASSPSGGRVS PLH	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10583.1 AIE10693.1	[72]
			FCASSFQPRQGP NSPLH	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29357.1	[86]
			FCASR-R-GIGSPLH FCASSPRD-RGFSPLH FCASSPRQG	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78831.1 AVK78784.1 AVK78708.1	[85]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 14(b)	FCASRPRQ GKGSPLH	FCASSPRQGRNQ PQH	Neoplastic T cells in angioimmunoblastic T-cell lymphoma, subscapular lymph node	CAH56754.1	[94]
			FCASRPRE	TCR beta isolated from patient with untreated recent onset juvenile dermatomyositis	AAD30372.1	[200]
	ROW 15(b)	LCAWNPG GGSNQP Clonal Expansion	LCASSPGGESNQP	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10435.1	[72]
			LCASSPTGGSNQP	CD4+ T cell obtained from the synovial fluid of patient CS-1 with rheumatoid arthritis	AAC72592.1	[76]
	ROW 16(b)	FCASSPYRD EQYF	FCASSPFRGDTQY F	TCR clone isolated from peripheral blood in a study of HLA-B27+ monozygotic twins with ankylosing spondylitis	CAC16914.1	[207]
			FCASSPTSDYEQY F	CD4+ TCR beta chain isolated from Subject1 salivary glands of a patient with Sjogren's Syndrome	ANO55611.1	[64]
			FCASSPARETQYF	CD4+ TCR beta chain isolated from Subject4 salivary glands of a patient with Sjogren's Syndrome	ANO56053.1	[64]
			FCASS-YNRVRDEQYF FCASSPGTPY--EQYF	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26898.1 ABO27044.1	[73]
			CASSPNRNEQFF	TCR beta chain in peripheral blood from a patient post-transfusion graft-versus-host disease	BAA09385.1	[157]
			FCASSPGPFKDEQ YF	CD4+ TCR beta chain isolated from Subject5 peripheral blood in a patient with Sjogren's Syndrome	ANO54672.1	[64]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 16(b)	FCASSPYRDEQYF	FCASSPRGY—EQYF FCASSPRGGAY—EQYF FCASSPPGGPY—EQYF FCASSPGTQVY--EQYF	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10443.1 AIE10442.1 AIE10687.1 AIE10437.1	[72]
			FCASSPTXY--EQYF	CD8+ TCR beta chain from MS lesion brain tissue	CAC03899.1	[31]
			FCASS--RDRAEQYF	TCR beta chain in a patient with celiac disease	ABF14428.1	[149]
			FCASSPFRDQPQHF FCASSQYWDSSYEQYF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78924.1 AVK78691.1	[85]
			FCASSPPSRAAGDEQYF	CD4+ TCR beta chain isolated from Subject7 peripheral blood in a patient with Sjogren's Syndrome	ANO54300.1	[64]
			FCASSQYRGVADTQYF FCASSPRTDAY--EQYF	CD4+ TCR beta chain isolated from Subject3 peripheral blood in a patient with Sjogren's Syndrome	ANO54804.1 ANO54825.1	[64]
			FCASSPTTNY—EQYF FCASSPTSEY--EQYF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29362.1 AAF29306.1	[86]
			FCASSPGGPY--EQYF	CD4+ TCR beta chain isolated from Subject6 salivary glands of a patient with Sjogren's Syndrome	ANO56383.1	[64]
			FCASSPRADY--EQYF	T cell line responsive to beta2-glycoprotein I in a study of antiphospholipid syndrome	AAL26569.1	[221]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 16(b)	FCASSPYRDE QYF	FCASSPYPGTVFY EQYF	TCR beta chain isolated from an HLA-B27 positive patient with reactive arthritis	AAF81856.1	[79]
			FCASSPYPLASTDT QYF FCASS-YPLGEGKDEQYF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57061.1 ADQ57064.1	[87]
			FCASSPGLAYY--EQYF	Melanocyte-specific CD8+ TCR	AAO40273.1	[105]
			FCASSPAEFGY--EQYF	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03982.1	[31]
			FCASSPTPGVY--EQYF FCASSPTGGPY--EQYF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78573.1 AVK78755.1	[85]
			FCASSP-RGTSGMNEQYF	CD4+ T cell obtained from the synovial fluid of patient CS-3 with rheumatoid arthritis	AAC72662.1	[76]
	ROW 17(b)	FCASSLGPDR VAGYTF	FCASSLGPD	HIV-specific CD8+ T cell beta chain	QCR99127.1	[117]
			FCASSLGH-RVAGYTF	CD4+ TCR beta chain isolated from Subject3 salivary glands of a patient with Sjogren's Syndrome	ANO56251.1	[64]
			FCASSLSPGRV CASSLGP--IYGYTF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57045.1 ADQ57054.1	[87]
			CASSLG-DRDYGYTF	CD4+ TCR beta chain isolated from Subject5 salivary glands of a patient with Sjogren's Syndrome	ANO56208.1	[64]
			FCASSPGTD-VYGYTF	CD4+ T lymphocyte obtained from lymph nodes of patient A4 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34127.1	[92]

TABLE 60. CONTINUED

Patient ROW	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
β-chain TCR transcript	ROW 17(b)	FCASSLGPDR VAGYTF	CASSLGAGDR-- GYTF	CD8+ T lymphocyte obtained from lymph nodes of patient A1 in a study of T cell subpopulations in non-Hodgkin's lymphoma of angioimmunoblastic lymphadenopathy with dysproteinemia	CAC34085.1	[92]
			CASSLGRD--- GYTF	CD8+ TCR alpha chain from peripheral blood of patients with cancer	BAN84593.1	[65]
			FCASSVGP— VNYGYTF FCASSL--D-- TGYTF	T cell infiltrates obtained from valve lesions in a patient with calcific aortic stenosis	ABO26912.1 ABO27011.1	[73]
			FCASSLQGP--- YGYTF FCASSL--- RGAGDGYTF	TCR beta chain obtained from peripheral blood in early phase of pediatric human immunodeficiency virus infection	AAF29287.1 AAF29307.1	[86]
			FCASSLG-- QIYGYTF	CD8+ TCR clone from peripheral blood in a study of psoriatic arthritis; HLA B*0702; B*44031	AAK07572.1	[108]
			CASSLALNRVFD GYTF FCASSVVT- RVGGYTF FCASSFG-- RGDGYTF	Circulating CD4+ T cell isolated in a study of persistent HIV-1 latent reservoirs	AVK78922.1 AVK78509.1 AVK78532.1	[85]
			FCASSLS-- RIGGGYTF	CD4+ TCR alpha isolated from tumor infiltrating CD4+ T cells obtained from human colorectal carcinomas	AIE10667.1	[72]
			FCASSLTTERIPVY GYTF	Autologous melanoma specific infiltrating T cell lymphocytes	AAA59126.1	[171]
			FCASSFGSRGGP D---GYTF	CD8+ TCR beta chain from an MS patient given glatiramer acetate therapy	AAV31734.1	[74]

TABLE 61. PATIENT TCR CLONES SHARING HOMOLOGY WITH MYELIN PROTEINS IDENTIFIED IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
AMS-HA	β-TCR1	YFCASSLEVYSGNT Clonal Expansion	YFCASS----SGNT	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57210.1	[87]
	β-TCR2	CASSYRGDGYTF Clonal Expansion	CASSTFRGEGYTF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57094.1	[87]
	β-TCR3	CASSSVGQPQH	CASRSGGQPQH	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57217.1	[87]
	β-TCR4b	FCASSTGLALVKEF FGP	FCASSPGLAGYEQ FFGP	CD8+ T cell isolated from PBMCs in a healthy subject stimulated with myelin binding protein	HM236623.1	[87]
	β-TCR 3-1b	YLCASRPGGRIQE TQ	YFCASRPGQG-DQETQ	Myelin basic protein-specific T cell clone in an HLA-DR2 multiple sclerosis patient	AAN08405.1	[107]
LR	β-TCR LR-1(b)	ICSARSGGET EQFFQ Clonal Expansion	ICSARRG-DTEQFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57242.1	[87]
	β-TCR LR-10(b)	FCASSQDIQETQY FG Clonal Expansion	FCASSP--QETQYFG	TCR clone of myelin basic protein-reactive T cells in MS patients	AAA98124.1	[123]
	β-TCR LR-10(b)	FCASSQDIQETQY FG Clonal Expansion	FCASSQDVTSGGL GDTQYFG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADP89868.1	[87]
CAL-1	β-TCR 6-1b	ASSLGTGTRETQY Clonal Expansion	ASSLGSGTLQETQ Y	myelin basic protein specific T-cell receptor	AAB25615.1	[128]
	β-TCR 4-1b	IYLCSIRDGRFTDTQ Clonal Expansion	IYLCSVGREGR-PDTQ	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57180.1	[87]
	β-TCR 4-4b	YLCSAGTGVGHEQ FF	YLCASSSGSGSGY EQYF YFCASSETGAGNE QFF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57007.1 ADQ57170.1	[87]

TABLE 61. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
CAL-1	β-TCR 4-8(b)	YLCSGRTGAPQEQ YF	YLCASSTGTPSYE QYF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57036.1	[87]
4063	α-TCR 1(a)	YFCAAYNNND Clonal Expansion	YFCALSGYNNND	Myelin basic protein (84-102) specific TCR alpha chain	AAB31425.1	[38]
	β-TCR 2(b)	LCASREGVGTDTQ Clonal Expansion	LCASSLEGISTDTQ LCASSEGEVTDTQ	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89834.1	[87]
	β-TCR 7(b)	LCASSADSYEQY Clonal Expansion	LCASSQEASYEQY LCASSTAGTYEQY	Myelin basic protein specific T-cell receptor	AAB25666.1 AAB25648.1	[128]
	β-TCR 7(b)	LCASSADSYEQY Clonal Expansion	LCASSHGLAEPYE QY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57199.1	[87]
	β-TCR 16(b)	CASSDGNTEA	CASSSDSNTEA	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57173.1	[87]
	β-TCR 17(b)	FCASSVGINTEA	FCASSVGI	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57028.1	[87]
	β-TCR 18(b)	FCASSQGRGSNG YGYG	FCASSQGRSSN FCASSQGRSSN	TCR beta chains specific for similar myelin basic protein peptide/major histocompatibility complexes	PIR: S57878 PIR: S57879	[153]
	β-TCR 18(b)	FCASSQGRGSNG YGYG	FCASSQGPGSGD FGY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57214.1	[87]
	β-TCR 24(b)	LCASSADHYEQY	LCASSHGLAEPYE QY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57199.1	[87]
	β-TCR 4-5(b)	LCSVESRGGYTF	LCSVEYRYGYYGY TF	TCR clone of myelin basic protein-reactive T cells in MS patients	AAA98128.1	[123]
	β-TCR 4-10(b)	YLCSVENDRGADE QYF	YLCSVDEE-GIADTQYF YLCSVEGEREGNE QFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57074.1 ADQ57287.1	[87]

TABLE 61. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
4063	β-TCR 4-10(b)	YLCSVENDRGADE QYF	YLCSVE-DRGLTMWSSYNE QFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57275.1	[87]
	β-TCR 8-1(b)	VYFCASSLRGDR SVRGYTFG Clonal Expansion	VYFCASSTFRGE-- --GYTFG	CD4+ T cells stimulated with myelin basic protein in a healthy subject	ADQ57094.1	[87]
	β-TCR 8-1(b)	VYFCASSLRGDR SVRGYTFG Clonal Expansion	YFCASSL---- SAWDLLRGYTFG	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57216.1	[87]
	β-TCR 8-1(b)	VYFCASSLRGDR SVRGYTFG Clonal Expansion	YFCASSEALRGLD- ---GYTFG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57021.1	[87]
	β-TCR 13-5(b)	FCASSYFGVTEAF	CASSFFLQGATEA F	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ56995.1	[87]
	β-TCR 13-10(b)	YFCASRGTSGRS TDT	YFCASRIAGT--- STDT	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57189.1	[87]
HUN-1	α-TCR 11(a)	YFCAVLYSSA Clonal Expansion	YFCAAMYSSA	Myelin basic protein-specific T cells in multiple sclerosis	AAB30923.1	[182]
	β-TCR 1(b)	YICSAEQGNTEA Clonal Expansion	YLCSVEAGNTEA	CD8+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57198.1	[87]
	β-TCR 1(b)	YICSAEQGNTEA Clonal Expansion	YLCSVEYRQGNTE A	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57181.1	[87]
	β-TCR 3(b)	YICSAGGGTHFF GPG	YICSAIGGAGDTQ YFGPG YICSATLAGGTDT QYFGPG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57168.1 ADQ57163.1	[87]
	β-TCR 3(b)	YICSAGGGTHFF GPG	YICSAFRVSGSGEQ YFGPG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57166.1	[87]
	β-TCR 13(b)	CASSSTGSEETQY Clonal Expansion	CASSLGGSEETQY	Myelin basic protein specific T-cell receptor	AAB25613.1	[128]

TABLE 61. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
HUN-2	α-TCR 18(a)	AIYFCAASFSGG	ALYFCASSFRGG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57179.1	[87]
	β-TCR 2(b)	CASSLLPGQGM NTEA Clonal Expansion	CASSL-AGQGVNTEA	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89839.1	[87]
	β-TCR 7(b)	YICSALGPYEQY	YICSARDPYEQY	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57267.1	[87]
	β-TCR 9(b)	LCASSDGGKFYGY TF	CASSEGVGFYGYTF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57019.1	[87]
	β-TCR 10(b)	YLCSVQKGGGRL NTEA	YLCASSQ---GRLNTEA	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57252.1	[87]
	β-TCR 12(b)	CSVEGGNEQYF	CSVEGEREGNEQ FF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57287.1	[87]
	β-TCR 13(b)	CASSLMGGHTEA FF	CASSLRGGNTEAFF CASSLGGGGTEAFF CASSFTGGNTEAFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57287.1 ADQ57029.1 ADQ57055.1	[87]
	β-TCR 13(b)	CASSLMGGHTEA FF	CASSLIGG-AEAFF CASGLLGREGGN TEAFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57138.1 ADQ57070.1	[87]
	β-TCR 13(b)	CASSLMGGHTEA FF	CASSLVM--NTEAFF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57009.1	[87]
	β-TCR 18(b)	FCASSLSYEQ	FCASSLTRTYEQ	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89835.1	[87]
	β-TCR 20(b)	CASSLIGGDREYE QY	CASSLR--DRVYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57072.1	[87]
	β-TCR 22(b)	CATSETTGAYEQY	CASS-TAGTYEQY	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25648.1	[128]

TABLE 61. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
HUN-2	β-TCR 22(b)	CATSETTGAYEQY	CASSESGGTYEQY	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57024.1	[87]
	β-TCR 23(b)	FCASSPGTGGAEAFF	FCASSLGGGGTEAFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57029.1	[87]
	β-TCR 23(b)	FCASSPGTGGAEAFF	CASSEGTGNPEAFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57203.1	[87]
	β-TCR 26(b)	LCASSVAGFHEQYF	LCASSLVAGIYEQYF LCASSTAGTYEQYF	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25632.1 AAB25648.1	[128]
	β-TCR 26(b)	LCASSVAGFHEQYF	LCASSLELAGYNEQFF	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25611.1	[128]
	β-TCR 27(b)	LCASSSADRPYGQYFGP	LCASSLRDRVYEQYFGP LCASSHGLAE-PYEQYFGP	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57072.1 ADQ57199.1	[87]
	β-TCR 27(b)	LCASSSADRPYGQYFGP	LCASSTGTGPYEQYFGP	TCR clone of myelin basic protein-reactive T cells in MS patients	AAA98122.1	[123]
	β-TCR 27(b)	LCASSSADRPYGQYFGP	LCASSTAG-TYEQYFGP	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25648.1	[128]
	β-TCR 28(b)	FCASSREGTNYGY	CASSGRSGTNYG CASSLDGVNYGY	Myelin basic protein specific T-cell receptor; HLA phenotype 1	AAB25636.1 AAB25606.1	[128]
ROW	α-TCR 3(a)	TYLCASRGSGN Clonal Expansion	YLCASRSSG	TCR alpha and beta chains specific for similar myelin basic protein peptide/major histocompatibility complexes	S57876	[153]
	α-TCR 7(a)	TYLCASSLPALP	YLCASSLP	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57012.1	[87]
	α-TCR 8(a)	CAASSNYGQN	CAAN-NYGQN	Myelin basic protein-specific T cells in MS	AAB30924.1	[182]
	β-TCR 8(b)	YICSAQTGTGTSRVTGEL	YICSAQSGTG	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57050.1	[87]

TABLE 61. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
ROW	β-TCR 13(b)	FCASRDQETQ Clonal Expansion	FCASRPGQGDQETQ	Myelin basic protein-specific T cell clone in an HLA-DR2 multiple sclerosis patient	AAN08405.1	[107]
	β-TCR 16(b)	FCASSPYRDEQYF	FCASSPYPLASTDTQYF FCASS-YPLGEGKDEQYF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57061.1 ADQ57064.1	[87]
	β-TCR 17(b)	FCASSLGPDRVAGYTF	FCASSLSPGRV CASSLGP--IYGYTF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57045.1 ADQ57054.1	[87]

TABLE 62. TCR CLONES FROM AUTOPSY BRAIN PLAQUES AND CSF FROM PATIENTS WITH MS AND MS-LIKE DISEASE SHARE SEQUENCE HOMOLOGIES WITH OTHER MS PATIENTS IDENTIFIED IN THE GENBANK/EMBL/SWISSPROT DATABASES.

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
AMS-HA	β-TCR1	YFCASSLEVY SGNT Clonal Expansion	YFCASSLQV	CD8+ TCR beta chain from a multiple sclerosis patient given glatiramer acetate therapy	AAV32397.1	[74]
			YFCASS---- SGNT	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57210.1	[87]
			YFCATSLRTG EVY	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03984.1	[82]
			YFCASS--- YSKGGNT	CD8+ T cell isolate from a multiple sclerosis brain lesion	CAC03816.1	[31]
	β-TCR2	CASSYRGD GYTF Clonal Expansion	CASSTFRGE GYTF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57094.1	[87]
			CASSFGSRG GPDGYTF	CD8+ TCR beta chain from a multiple sclerosis patient given glatiramer acetate therapy	AAV31734.1	[74]
	β-TCR3	CASSSVGQP QH	CASRSGGQP QH	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57217.1	[87]
			CASSPGKVW VGQPQH	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03906.1	[31]
	β-TCR4	LCASSSPNT KRDRLAYEQ Y	LCASSRPN-- RE-L-YEQY	CD8+ TCR beta chain from a multiple sclerosis patient given glatiramer acetate therapy	AAW31103.1	[74]
	β-TCR6	CASSSANYG Y	CASSTSVNY GY CASSWTAAN YGY	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03869.1 CAC03880.1	[31]
	β-TCR4b	FCASSTGLA LVKEFFGP	FCASSFGTSG DNEQFFG	CD8+ T cell isolate from a multiple sclerosis brain lesion	AJ405782.1	[31]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
AMS-HA	β-TCR 3-1b	YLCASRPGG RIQETQ	YFCASRPGQ G-DQETQ	Myelin basic protein-specific T cell clone in an HLA-DR2 multiple sclerosis patient	AAN08405.1	[107]
	β-TCR 13-3b	FCASSPSGR SSYEQ	FCASSVLAGG PYEQ	CD4+ T cell isolate from a multiple sclerosis brain lesion	AJ405796.1	[31]
LR	β-TCR LR1(b)	ICSARS GGETE QFFQ Clonal Expansion	ICSARRG-DTEQFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57242.1	[87]
			ICSATSGGYN EQFF	CD8+ TCR beta chain from a multiple sclerosis patient given glatiramer acetate therapy	AAW31104.1	[74]
			ICSARQG— NEQFF	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03771.1	[31]
			ICSARAGGA SYEQYF	CD8+ TCR beta chain from multiple sclerosis brain lesions	CAC03812.1	[31]
			ICSARAGTSG REYNEQFF	CD4+ TCR beta chain from a multiple sclerosis patient given glatiramer acetate therapy	AAV32376.1	[74]
			ICSARDLTSG ANNEQFF	TCR from a patient with multiple sclerosis with unconventional self peptide-major histocompatibility complex binding	1YMM_E	[116]
	β-TCR LR6(b)	ICSARVSQG APNTEA Clonal Expansion	ICSAREGFPG APNTEA	CD4+ TCR beta chain from multiple sclerosis brain lesions	CAC03931.1	[31]
	β-TCR LR7(b)	ICSARQSY EQY	ICSARAGGA SYEQY	CD4+ TCR beta chain from multiple sclerosis brain lesions	CAC03812.1	[31]
			ICSARERDSL YEQY	CD8+ TCR beta chain from multiple sclerosis brain lesions	CAC03966.1	[31]
	β-TCR LR8(b)	CSARGGGDS YEQ Clonal Expansion	CSARAGGAS YEQ	CD4+ TCR beta chain from multiple sclerosis brain lesions	CAC03812.1	[31]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
LR	β-TCR LR9(b)	CATSDEQE GYGYT	CATSRDQ-GYGYT	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03907.1	[31]
	β-TCR LR10(b)	FCASSQDIQ ETQYFG Clonal Expansion	FCASSQDVT SGGLGDTQY FG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADP89868.1	[87]
CAL-1	β-TCR 6-1(b)	ASSLGTGT RETQY Clonal Expansion	ASSLGT-VQETQY	CD8+ TCR beta chain from a multiple sclerosis patient given glatiramer acetate therapy	AAV32421.1	[74]
	β-TCR 4-1(b)	IYLCSIRDGR FTDTQ Clonal Expansion	IYLCSVGREG R-PDTQ	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57180.1	[87]
	β-TCR 4-3(b)	YLCSGSGSL HANEQF	YLCASSGGL-AGVNEQF	CD8+ TCR beta chain from multiple sclerosis lesion brain tissue	CAC03777.1	[31]
	β-TCR 4-4(b)	YLCSAGTGV GHEQFF	YLCASSSGSG SGYEQYF YFCASSETGA GNEQFF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57007.1 ADQ57170.1	[87]
			YLCASSTGLG SSYNEQFF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32377.1	[74]
	β-TCR 4-6(b)	YLCSVRAGY EQY	YLCSVVTGKS R-GYEQY YLCSVVSGSS YEQY	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03972.1 AAB03973.1	[82]
			YICSARAGG ASYEQY	CD4+ TCR beta chain from multiple sclerosis brain lesion	CAC03812.1 CAC03767.1	[31]
			YLCSVLTSGR ADGSYEQY	CD8+ TCR beta chain from multiple sclerosis brain lesion	CAC03767.1	[31]
	β-TCR 4-6(b)	YLCSGRTGA PQEQYF	YLCASSTGTP SYEQYF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57036.1	[87]
4063	β-TCR 1(b)	LCASSPVG SSYNE Clonal Expansion	LCASSPTGN PSSYNE	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32384.1	[74]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
4063	β-TCR 2(b)	LCASREGV GTDTQ Clonal Expansion	LCASSLEGIST DTQ LCASSEGEVT DTQ	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89834.1	[87]
	β-TCR 3(b)	YFCATAGT GEGNYGY Clonal Expansion	YFCATTGTG	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03975.1	[82]
			YFCASSLLGQ GNYGY YFCASSSAGS GGYGY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31454.1 AAV32370.1	[74]
			YFCATSSLLD GNYGY	CD8+ TCR beta chain from multiple sclerosis brain lesion	CAC03968.1	[31]
	β-TCR 7(b)	LCASSADS YEQY Clonal Expansion	CASSSNSYE QY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32383.1	[74]
			LCASSQDAAL HSYEQY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31427.1	[74]
			LCASSHGLAE PYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57199.1	[87]
	β-TCR 10(b)	YICSAPFGTS GNEQF	YICSARAGTS GREYNEQF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32376.1	[74]
			YICSA--- TSGGYNEQF	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31104.1	[74]
	β-TCR 12(b)	LCASSIPTG GSYNE	LCASSIVTGY SYNE LCASSFRAG VSYNE	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32416.1 AAV32422.1	[74]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
4063	β-TCR 12(b)	LCASSIPTG GSYNE	LCASSLGTGT SYNE	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32382.1	[74]
	β-TCR 16(b)	CASSDGNTE A	CASSSDSNTE A	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57173.1	[87]
	β-TCR 17(b)	FCASSVGIN TEA	FCASSVGI	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57028.1	[87]
			FCASSVAPL MNTEA	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03829.1	[31]
	β-TCR 18(b)	FCASSQGR GSNGYGYG	FCASSQGPG SGDFGY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57214.1	[87]
			FCASSSA-GSGGYGY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32370.1	[74]
			FCASSEGQGR GGYTFG	CD4+ TCR beta chain in multiple sclerosis brain lesion	CAC03844.1	[31]
	β-TCR 19(b)	CASSLVGRE DKLFF	CASSL--RRGEEKLFF	TCR in peripheral blood isolated from an HLA-DR2 multiple sclerosis patient 2	CAA69603.1	[156]
	β-TCR 20(b)	CASSPDCYE QY	CASSSNSYE QY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32383.1	[74]
	β-TCR 21(b)	CASSPEGYE QY	CASS-EGYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31436.1	[74]
			CASSPAEFGY EQY	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03982.1	[31]
			CASSPTXYEQ Y	CD8+ TCR beta chain from multiple sclerosis brain lesion	CAC03899.1	[31]
	β-TCR 22(b)	FCASSTEDY EQY	FCASS-EGYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31436.1	[74]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
4063	β-TCR 23(b)	CASSYRDTY EQY	CASSLRDVTY EQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31731.1	[74]
	β-TCR 24(b)	LCASSADHY EQY	CASSSNSYE QY	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32383.1	[74]
			LCASSHGLAE PYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57199.1	[87]
	β-TCR 25(b)	FCASRGTGF YNEQ Clonal Expansion	FCASRGRGF PY-EQ FCASSKGTSA YNEQ	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31442.1 AAV31441.1	[74]
			FCASREPSG-GFYNEQ	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03960.1	[31]
	β-TCR 13-3(b)	FCASTQSGV LTGEL	FCASSMTGV NTGEL	Perivascular T cell beta chain in multiple sclerosis brain lesions	CAC03905.1	[31]
	β-TCR 13-5(b)	FCASSYFGV TEAF	FCASTRFGG TEAF	Perivascular TCR beta chain in brain multiple sclerosis lesion	CAC03796.1	[31]
			FCASSYMGD RVNTEAF	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03985.1	[82]
			CASSFFLQG ATEAF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ56995.1	[87]
	β-TCR 13-6(b)	FCASSKPPV GSTEAF	CASSTP--GSTEAF	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31444.1	[74]
	β-TCR 13-10(b)	YFCASRGTS GRSTDT	YFCASRPGTS G	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31425.1	[74]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
4063	β-TCR 13-10(b)	YFCASRGTS GRSTDT	YFCASRIAGT ---STDT	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57189.1	[87]
	β-TCR 4-5(b)	LCSVESRGG YTF	LCSVEYRYGY YGYTF	TCR clone of myelin basic protein-reactive T cells in multiple sclerosis patients	AAA98128.1	[123]
	β-TCR 4-7(b)	IYLCSLPSGT DTQ	YLCASSLTSG TDTQ	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31105.1	[74]
	β-TCR 4-10(b)	YLCSVENDR GADEQYF	YLCSVDEE-GIADTQYF YLCSVEGERE GNEQFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57074.1 ADQ57287.1	[87]
			YLCSVE-DRGLTMWSS YNEQFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57275.1	[87]
	β-TCR 8-1(b)	VYFCASSL RGDRSVR GYTFG Clonal Expansion	YFCASSLSKG QRANYGYTF G	CD8+ TCR beta chain in brain multiple sclerosis lesion	CAC03952.1	[31]
			YFCASSEALR GLD---- GYTFG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57021.1	[87]
			YFCASSL---- SAWDLLRGY TFG	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57216.1	[87]
HUN-1	α-TCR 3(a)	SYFCASYS SA Clonal Expansion	YFCASSYSSA	CD4+ TCR alpha chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32398.1	[74]
	α-TCR 11(a)	YFCAVLYS SA Clonal Expansion	YFCAAMYSS A	Myelin basic protein-specific T cells in multiple sclerosis	AAB30923.1	[182]
	α-TCR 12(a)	VYFCAHA GGT Clonal Expansion	VYFCAHPG	Infiltrating T lymphocytes obtained from brain tissue in patient MS-5 sample A affected by chronic encephalitis of Rasmussen	AAB03909.1	[82]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
HUN-1	α-TCR 18(a)	YLCGANPPR GRLNFG	YLCASSPPRG QGNNSPLHF G	CD4+ T cell from multiple sclerosis brain lesion	CAC03915.1	[31]
	β-TCR 1(b)	YICSAEQG NTEA Clonal Expansion	YLCSVEAGN TEA	CD8+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57198.1	[87]
			YICSASQGG AMNTEA	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03978.1	[31]
			YLCSVEYRQ GNTEA	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57181.1	[87]
	β-TCR 3(b)	YICSAGGG THFFGPG	YICSAIGGAG DTQYFGPG YICSATLAGG TDTQYFGPG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57168.1 ADQ57163.1	[87]
			YICSARAGTS GREYNEQFF GPG	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32376.1	[74]
			YICSAFRVSGS GEQYFGPG	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57166.1	[87]
	β-TCR 7(b)	CASSLNSG ITDTQ	CASSLTSG- TDTQ	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31105.1	[74]
	β-TCR 10(b)	FCASSGDR GVISSYNE	FCASSSDRG- -RAYNE	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03870.1	[31]
	β-TCR 11(b)	FCASSPDR TGRTEAF	FCAST-- RTGGRTEAF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32420.1	[74]
			FCASSP-- TVNTEAF	CD4+ TCR beta chain in multiple sclerosis brain lesions	CAC03924.1	[31]
HUN-2	α-TCR 18(a)	AIYFCAASFS GG	ALYFCASSFR GG	CD4+ T cells stimulated with proteolipid protein from a patient with MS	ADQ57179.1	[87]
	β-TCR 2(b)	CASSLLPGQ GMNTEA Clonal Expansion	CASSL- AGQGVNTE A	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89839.1	[87]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
HUN-2	β-TCR 7(b)	YICSALGPYE QY	YICSARDPYE QY	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57267.1	[87]
	β-TCR 9(b)	LCASSDGGK FYGYTF	LCASSLGGQ FYGYTF	CD4+ TCR beta chain in multiple sclerosis brain lesion	CAC03927.1	[31]
			CASSEGVGFY GYTF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57019.1	[87]
	β-TCR 10(b)	YLCSVQKGG GRLNTEA	YLCASSQ--- GRLNTEA	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57252.1	[87]
	β-TCR 12(b)	CSVEGERE GNEQFF	CSVEGEREG NEQFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57287.1	[87]
	β-TCR 13(b)	CASSLMGG HTEAFF	CASSLRGGN TEAFF CASSLGGGG TEAFF CASSFTGGN TEAFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57287.1 ADQ57029.1 ADQ57055.1	[87]
			CASSLVM-- NTEAFF	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57009.1	[87]
			CASSLIGG- AEAFF CASGLLGRE GGNTEAFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57138.1 ADQ57070.1	[87]
	β-TCR 18(b)	FCASSLSYE Q	FCASSLTRTY EQ	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADP89835.1	[87]
	β-TCR 20(b)	CASSLIGGD REYEQY	CASSLR-- DRVYEQY	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57072.1	[87]
	β-TCR 22(b)	CATSETTGA YEQY	CASSQLTSG AYEQY	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV31438.1	[74]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
HUN-2	β-TCR 22(b)	CATSETTGA YEQY	CASSESGGTY EQY	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57024.1	[87]
	β-TCR 23(b)	FCASSPGTG GAEAFF	FCASSLGGGG TEAFF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57029.1	[87]
			CASSEGTGNP EAFF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57203.1	[87]
			CASSP-TGDTEAFF	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31108.1	[74]
			FCASSPGQVN TEAFF	Perivascular T cell beta chain in multiple sclerosis brain lesions	CAC03792.1	[31]
			FCASSSGTG---AFF	CD4+ TCR beta chain in multiple sclerosis brain lesion	CAC03903.1	[31]
			FCASSPLWEG GIGNTEAFF	CD8+ TCR beta chain in multiple sclerosis brain lesion	CAC03776.1	[31]
	β-TCR 26(b)	LCASSVAGF HEQYF	LCASSIGTGAH EQYF	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32399.1	[74]
			LCASSMGLFY EQYF	CD8+ TCR beta chain in multiple sclerosis brain lesion	CAC03939.1	[31]
	β-TCR 27(b)	LCASSSADR PYGQYFGP	LCASSLRDRVY EQYFGP LCASSHGLAE-PYEQYFGP	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57072.1 ADQ57199.1	[87]
			LCASSAQGRLYE QYFGP LCASS---RPNRELYEQYF GP	CD8+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32419.1 AAW31103.1	[74]
			LCASSS---PYEQFFGP	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAV32402.1	[74]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
HUN-2	β-TCR 27(b)	LCASSSADR PYGQYFGP	LCASSTGTGPY EQYFGP	TCR clone of myelin basic protein-reactive T cells in multiple sclerosis patients	AAA98122.1	[123]
	β-TCR 28(b)	FCASSREGT NYGY	FCAS-RNGANYGY	CD8+ TCR beta chain in multiple sclerosis brain lesion	CAC03890.1	[31]
			FCAS-RPGXNYGY	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03787.1	[31]
ROW	α-TCR 7(a)	TYLCASSLPA LP	YLCASSLP	CD4+ T cells stimulated with proteolipid protein from a patient with multiple sclerosis	ADQ57012.1	[87]
	α-TCR 8(a)	CAASSNYG QN	CAAN-NYGQN	Myelin basic protein-specific T cells in multiple sclerosis	AAB30924.1	[182]
	β-TCR 1(b)	LCASTGRG DQDSGAN Clonal Expansion	LCASTPRGDR-SGAN	CD8+ TCR beta chain from multiple sclerosis brain lesion	CAC03841.1	[31]
	β-TCR 4(b)	YICSAPAQG GNTI	YICSAPARGG	CD4+ TCR beta chain from multiple sclerosis brain lesion	CAC03837.1	[31]
	β-TCR 7(b)	FYICRATGE KLQFFG	FYICSATSGG YNE--QFFG	CD4+ TCR beta chain from a patient with multiple sclerosis receiving glatiramer acetate therapy	AAW31104.1	[74]
	β-TCR 8(b)	YICSAQTGT GTSRVTGEL	YICSAQSGTG	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57050.1	[87]
	β-TCR 13(b)	FCASRDQ ETQ Clonal Expansion	FCASRPGQG DQETQ	Myelin basic protein-specific T cell clone in an HLA-DR2 multiple sclerosis patient	AAN08405.1	[107]
			FCASREEGF QETQ	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03868.1	[31]
	β-TCR 16(b)	FCASSPYRD EQYF	FCASSPTXY-- EQYF	CD8+ TCR beta chain from multiple sclerosis brain lesion	CAC03899.1	[31]
			FCASSPYPLAST DTQYF FCASS-YPLGEGKDEQ YF	CD8+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57061.1 ADQ57064.1	[87]

TABLE 62. CONTINUED

Patient	Clone	CDR3 Sequence	Homologous CDR3	Source	Accession No.	Reference
ROW	β-TCR 16(b)	FCASSPYRD EQYF	FCASSPAEFGY --EQYF	Perivascular TCR beta chain in multiple sclerosis brain lesion	CAC03982.1	[31]
	β-TCR 17(b)	FCASSLGPD RVAGYTF	FCASSLSPGR V CASSLGP-- IYGYTF	CD4+ T cells stimulated with myelin basic protein from a patient with multiple sclerosis	ADQ57045.1 ADQ57054.1	[87]

COMPARISON OF MOG PEPTIDES TO SEQUENCE HOMOLOGIES WITH VIRAL ANTIGENS REPORTED IN THE GENBANK/EMBL/SWISSPROT DATABASES (SPECIFIC AIM #4).

Oleszak et al., (2001) reported the presence of clonally expanded TCR transcripts from the CSF of a pediatric patient with MS-like demyelinating inflammatory disease, as demonstrated by MRI (Figure 22), following infection with Hepatitis A virus [8]. Our laboratory developed an approach to identify the antigens recognized by in vivo expanded monoclonal/oligoclonal T cells. Immune responses to these antigen(s) may be responsible for the initiation and very likely the propagation of chronic inflammatory diseases. This approach is comprised of the following parts: (a) Construction of full-length copies of the clonally expanded α- and β-chains TCR transcripts. (b) Expression of all possible combinations of α- and β-chain TCR into a TCR-negative mutant of Jurkat T cells or into normal T-cell lines using the Murine Stem Cell Virus (MSCV) retroviral expression system. (c) Identification of putative antigen(s) or peptides recognized by the transduced T cells expressing the clonally expanded TCR using appropriate assays and appropriate APC. These T-cell lines expressing these clonally expanded TCR recognized three myelin oligodendrocyte protein (MOG) peptides, but did not recognize MBP or PLP peptides (Zhang X., X. Chen, W. Lin, K. Peng, D. Monos, A. Tsygankov, S. Lu, C.D. Katsetos, H. Hardison, A. Legido, S. Vucevic, Z. Obradovic, C.D. Platsoucas, and E.L. Oleszak. Manuscript in preparation).

We investigated whether these MOG peptides exhibit sequence homologies with viral antigens reported in the GenBank/EMBL/SWISSProt databases. These peptides shared homology with peptides of the Hepatitis A virus. We analyzed each MOG peptide sequence and compared them to viral peptides reported in the GenBank/EMBL database using BLAST

software. Analysis showed sequence homologies between MOG peptides and several viruses. Results are described below.

FIGURE 22. MRI SHOWING MULTIPHASIC DISSEMINATED ENCEPHALOMYELITIS FOLLOWING HEPATITIS A VIRUS INFECTION. The MRI image below shows a 7-year-old patient (AMS-HA) who developed two episodes of inflammatory demyelinating disease, consistent with childhood Multiple Sclerosis, separated by a 5-month period shortly after hepatitis A viral infection. Demyelinating disease has been demonstrated by MRI, which revealed substantial demyelinating lesions predominantly in the white matter of this patient, widely spread through neuroaxis [8].

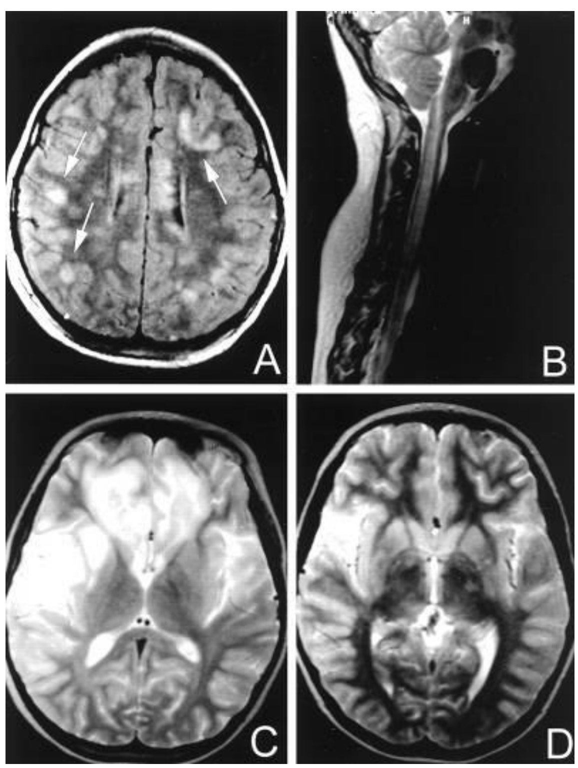


TABLE 63. MOG PEPTIDES RECOGNIZED BY T-CELL LINES EXPRESSING CLONALLY EXPANDED TCR IN THE CSF OF PATIENT AMS-HA WITH MS-LIKE DISEASE SHARE SEQUENCE HOMOLOGY WITH VIRAL PEPTIDES PREVIOUSLY REPORTED IN THE GENBANK/EMBL/SWISSPROT DATABASES.

MOG Peptide	MOG Peptide Sequence	Homologous Viral Peptide Sequence	Source	Accession No.	Reference
MOG 173-187	LRVPCWKITLFVIVP	WKITL	Chain 1, Human Rhinovirus 1a Coat Protein	1R1A_1	[222]
		LRVPC	Human herpesvirus 2 strain HG52; conserved herpesvirus fusion regulator complex gH-gL	3M1C_B	[223]
		FVIVP	6-hydroxymethyl-7,8-dihydropterin pyrophosphokinase from Haemophilus influenzae	1CBK_A	[224]
		PCWK	Respiratory syncytial virus fusion glycoprotein	3RRR_B	[225]
		PCWK	Chain A, fusion glycoprotein, respiratory syncytial virus		[226]
		VPVWKDA DTTLF	Chain A, clade A/E 93TH057 HIV-1 gp120 core	6ONE_A	[227]
		VPVWKEA TTTLF WNNTL	HIV-1 gp120 with gp41-Interactive Region	3JWD_A	[228]
		VPVWKEA TTTLF	HIV-1 HIV Envelope Glycoprotein GP160	5FUU_A	[229]
		VPVWKDA ETTLF	Chain A, HIV Envelope Glycoprotein GP120	6E5P_A	[230]
		VPVWKDA ETTLF	Chain E, HIV Envelope Glycoprotein GP160	6XRT_E	[231]
		VPVWKDA ETTLF	Chain G, HIV Envelope Glycoprotein GP160	5CEZ_G	[232]
		VPVWKDA ETTLF	Chain C, HIV Envelope Glycoprotein GP120	5C7K_C	[233]

TABLE 63. CONTINUED

MOG Peptide	MOG Peptide Sequence	Homologous Viral Peptide Sequence	Source	Accession No.	Reference
MOG 141-155	TVGLVFLCLQYRLRG	TVGLVFL	Non-structural protein NS4b, Japanese encephalitis virus	NP_775673.1	[234]
		EYRLRG	Flavivirus polyprotein, Japanese encephalitis virus	NP_059434.1	[234]
		CLRYRLR	Chain A, Regulatory protein E2 Binding Domain; human papillomavirus type 18	1F9F_A	[235]
		LQYRL	Chain A, human cytomegalovirus glycoprotein UL141; Human herpesvirus 5 strain Merlin	4I9X_A 4JM0_A	[236]
		GLVFL	Cryo-EM structures of Alphacoronavirus spike glycoprotein [Human coronavirus 229E]	6IXA_A	[237]
		GLVFL	Chain A, spike glycoprotein; Human coronavirus HCoV-229E	6U7H_A	[238]
		CLQY	Cryo-EM structure of infectious bronchitis coronavirus spike protein	6CV0_A	[239]
		FLCL	Human Enteric adenovirus serotype 41 short fiber head	2BZU_A	[240]
		LQYR	Non-structural protein 1 N-terminal	4KW3_A	[241]
		LQYR LQYR	Human papillomavirus L1 capsid proteins	2R5J_A 2R5H_A	[242]
		VGLFFLC LQYR	Human herpesvirus 6B capsid and capsid-associated tegument complexes	6Q1F_5	[243]
		EYRLRG	Dengue virus helicase/nucleoside triphosphatase catalytic domain	2BHR_A	[244]
		EYRLRG	Catalytic domain of Japanese encephalitis virus NS3 helicase/nucleoside triphosphatase	2Z83_A	[245]

TABLE 63. CONTINUED

MOG Peptide	MOG Peptide Sequence	Homologous Viral Peptide Sequence	Source	Accession No.	Reference
MOG 141-155	TVGLVFLCLQYRLRG	GLVFIC	Hemagglutinin from the Fifth-Epidemic-Wave A(H7N9) Influenza Viruses	6WXL_B	[246]
		LCLGLRLR	Capsid-associated tegument complex inside the Epstein-Barr virus; Human herpesvirus 4 strain B95-8	6W2D_v	[247]
		FLCLGFIPQ Y GLAALCL	Cryo-EM structures of herpes simplex virus type 1 portal vertex and packaged genome	6ODM_G	[248]
MOG 193-207	VALIICYNWLHRRLA	LHRRL	Human herpesvirus 5 strain AD169, chain g	5VKU_g	[249]
		HRRLA	West Nile virus, RNA polymerase domain, non-structural protein 5	2HCN_A	[250]
		NWLH	Influenza A virus hemagglutinin head interface	6XPZ_A	[251]
		WLHR	Human adenovirus 5 DNA binding protein	1ADU_A	[252]
		NWLH	Rotavirus Inner capsid protein VP2	3GZU_A	[253]
		NWLH	Human cytomegalovirus, chain H, large tegument protein deneddylase, human beta herpesvirus 5	7ET3_H	[254]
		LIIC	Large structural protein, Rabies SAD-B19 L-P virus polymerase complex	6UEB_A	[255]
		HRRL	Major capsid protein, herpes simplex virus type 2 C-capsid with capsid-vertex-specific component	5ZZ8_A	[256]
		HRRL	Human alpha herpesvirus 2 capsid protein	5ZAP_A	[257]
		HRRL	Human alpha herpesvirus 1 strain KOS, portal vertex-adjacent capsid protein	6ODM_S	[248]

TABLE 63. CONTINUED

MOG Peptide	MOG Peptide Sequence	Homologous Viral Peptide Sequence	Source	Accession No.	Reference
MOG 193-207	VALIICYNWLHRRLA	DWLHR	Conserved hydrophobic pocket of flavivirus methyltransferase	3LKZ_A	[258]
		DWLHR	Japanese encephalitis virus NS5 methyltransferase-polymerase interface	4K6M_A	[259]
		VICYN	Human alpha herpesvirus 3, triplex capsid protein 2, structures of varicella-zoster virus capsids	6LGL_j	[260]
		LILCY	Enterovirus D68 in complex with two monoclonal antibodies; capsid protein VP3	6AJ0_C	[261]
		WLLRR	Zika virus non-structural protein 5	5WZ3_A	[262]
		WLLRR	RNA-directed RNA polymerase non-structural protein 5; Zika virus	6LD1_A	[263]
		WLFRHLA	Yellow fever virus 17D non-structural protein 5; cap-0 specific nucleoside-2-O-methyltransferase of flaviviridae	6QSN_A	[264]
		VAMLIC	Chain A, non-structural protein 2, Rotavirus A	6AUK_A	[265]
		ALVACY	Human metapneumovirus fusion glycoprotein F0	4DAG_A	[266]
		ALII---W	H1 and H7 Influenza hemagglutinin subtypes	1TI8_A	[267]
		II—NGRW	Human orthopneumovirus, respiratory syncytial virus RNA polymerase	6UEN_A	[268]

CHAPTER 5

CONCLUSION

We report here studies investigating the involvement of alpha- beta-chain TCR in the immunopathogenesis of MS, with the objective to improve our understanding of the etiology and immunopathogenesis of the disease and to elucidate the molecular and cellular mechanisms involved. Our overall objective is to obtain new insights in MS which will permit the development of new therapeutic modalities for the prevention and treatment of the disease. Although substantial progress has been recently made, a large number of patients are suffering with MS, which is a disease associated with considerable morbidity. According to the National Multiple Sclerosis Society, approximately 1 million adults (913,925) suffered with MS in the US in 2017.

As was discussed in the introduction, MS is a demyelinating disease of the CNS mediated by T cells [269]. The immune response in MS is directed against myelin components and certain other antigens. The major components of myelin are myelin basic protein (MBP), proteolipid protein (PLP) also known as lipophillin], myelin oligodendrocyte glycoprotein (MOG) and a few others. MS occurs in genetically susceptible individuals and it is possibly triggered by a viral infection [109, 270]. It has been proposed that in MS, T cells in certain genetically susceptible individuals respond to a viral infection by recognizing viral antigens, and specifically viral peptides in association with self-MHC, which may cross-react by molecular mimicry with host antigens, or more correctly antigenic epitopes possibly of myelin or other neuro-antigens expressed in the CNS of these patients. Molecular mimicry is defined as the presence of linear

or conformational cross-reactive epitopes shared between microbial (viruses, bacteria, parasites, or others) and host antigens [109]. Molecular mimicry may involve cross-recognition of viral or host determinants by T cells or antibodies. Therefore, an immune response initiated or elicited by a virus(es) or other microorganisms may be subsequently propagated by host antigenic determinants resulting in autoimmune disease, long after the viral or the microbial infection has been cleared.

Studies by several research groups has established that MS is an autoimmune disease, and that T and B lymphocytes and autoantibodies are the most important components of the immune system responsible for the immunopathogenesis of the disease [271-273]. "High avidity myelin-specific CD4+ T cells" recognizing MBP, PLP, or MOG peptides have been identified in patients with MS [272]. Certain of these peptides are similar or identical to peptides which when injected in susceptible strains of rodents induce experimental autoimmune encephalomyelitis (EAE), a model for MS [273]. It is likely that additional target antigens may be involved in the immunopathogenesis of MS. CD8+ T cells were also found in autopsy brain specimen from patients with MS [31] and they are substantially more abundant (up to 10-fold more) than CD4+ T lymphocytes in autopsy brain from these patients. CD8+ T cells contain cytotoxic T lymphocytes which appear to be the main effector cells in the CNS of patients with MS resulting in T cell damage, because their target cells, oligodendrocyte and neurons, express only HLA class I and not HLA class II molecules [274, 275]. Also, certain EAE rodent models based on CD8+ T cells have been developed [276].

B cells are also important in the immunopathogenesis of MS. B cells in patients with MS present through their HLA Class molecules antigenic peptides to T cells [277, 278].

Autoantibodies have also been reported in certain patients with MS, and in approximately one third of these patients, myelin-specific autoantibodies that could damage myelin and/or axons in patients with MS have been identified [279]. These autoantibody responses to protein antigens require helper T cells for the generation of memory B cells, immunoglobulin class switching, and affinity maturation [280].

The association of MS with the HLA-DR15 haplotype has been reported to confer up to 60% of the MS disease risk in Caucasians, while other non-MHC markers may account for up to 20% of the MS disease risk [281, 282]. This haplotype was previously designated HLA-DR2. Certain HLA class I haplotypes are have also been implicated with MS [283, 284].

Substantial evidence has accumulated supporting the notion that MS is a specific antigen-driven T-cell autoimmune trimolecular complex disease. The three components of the trimolecular complex, TCR/peptide(antigen)/MHC, have been identified as key players in the immunopathogenesis of the disease, and specifically: (1) the clonal expansion of individual T-cell clones in MS lesions; (2) the association of MS with certain HLA Class I and Class II haplotypes; and (3) the identification of self (myelin antigens/neuroantigens) and non-self (viral antigens), likely associated with the development of MS.

Antigen recognition is perhaps the most important function of T cells and the TCR is the most critical molecule in this process. TCRs are the molecules responsible for the recognition of antigen and more correctly for the recognition by the vast majority of the alpha/beta TCR of antigenic peptides in association with self MHC. A very large number of different alpha/beta TCR+ T cell clones have been identified and each one is defined by a unique TCR. Each

individual T-cell clone has a unique clonotypic alpha/beta TCR, which is the fingerprint of this individual T-cell clone and is the molecule that recognizes the antigenic epitope (peptide plus MHC) that may induce this T-cell clone to proliferate and differentiate [285, 286]. The size of the alpha/beta TCR repertoire is very large and the maximum theoretical number of alpha/beta TCR is $1x10^{19}$ [287]. The maximum theoretical number of alpha-chain TCR transcripts is 10^{7} and the maximum theoretical number of beta-chain TCR transcripts is $1x10^{12}$ [287]. However, the actual number of functional T-cell clones in the peripheral blood and lymphoid organs is greatly reduced by thymic selection. It has been estimated that only 2% of the thymocytes survive thymic selection and circulate as mature alpha/beta TCR+ T-cell clones outside of the thymus [287].

Several research groups have reported on the number of different TCR transcripts present on PBMC. Arstila et al., (1999) reported that $1x10^{6}$ different beta-chain TCR transcripts are expressed in T-cell clones in PBMC from normal donors [288]. Also, they commented that each beta- chain TCR could be paired with 25 or higher numbers of alpha-chain TCR transcripts. Warren et al., , using high throughput sequencing, also reported $1x10^{6}$ beta-chain TCR transcripts in PBMC from normal donors [289]. Robins et al., (2009) have provided a higher estimate, using deep sequencing and a Poisson statistical model, of 3-4 x 10^{6} different beta-chain TCR transcripts in PBMC from normal donors [290]. Qi et al., (2014) reported a greatly higher estimate of different beta-chain TCR transcripts in PBMC from normal donors, consisting of $100x10^{6}$ different beta-chain TCR transcripts using next generation sequencing and non-parametric statistics [291]. The evidence is very strong that the size of the T-cell repertoire is very large and there is a very high number of different alpha- and beta-chain TCR transcripts

sufficient to recognize any conceivable antigenic epitope [10]. In consideration of the above, the probability of finding by chance multiple identical copies of alpha- and beta-chain TCR transcripts in an independent sample to T lymphocytes is very small. As a result, the presence of multiple identical copies of alpha- or beta-chain TCR transcripts in an independent sample of T lymphocytes can be explained only by proliferation, clonal expansion and differentiation, in vivo, of individual T-cell clones in response to specific antigen(s), self or non-self, that they recognize, which remain to be identified [8, 10, 54, 59, 60, 119, 244, 292, 293].

In the studies reported here, all alpha- and beta-chain TCR transcripts that were identified were novel and typical either of alpha- or beta-chain TCR transcripts. Although in patients with MS clonal expansions were identified, identical clonally expanded alpha- or beta-chain TCR transcripts were not found in different patients with the exception of one clone, revealing in general the absence of sharing of identical TCR transcripts among different patients. This is in agreement with our previous studies [8, 10, 54, 59, 60, 119, 244, 292, 293] and those of other investigators [64, 76, 126, 195]. Likewise, entire CDR3 regions are not shared in general between different patients with the same disease, although substantial TCR CDR3 region homologies have been demonstrated between different patients with the same or different diseases and normal donors (see references above). It should be noted that there is extensive promiscuity in the interactions of alpha/beta TCRs with peptide/MHC complexes and a number of reasons may be responsible for this extensive promiscuity [294]:

(a) Different T-cell clones with different alpha/beta TCR may recognize peptides bound to different MHC class I or class II molecules. Furthermore, different peptides from the same antigen may be recognized by T cells;

(b) Several hundred different peptides bind to the same MHC allele and these different peptide-single MHC complexes are recognized by different alpha/beta TCR heterodimers;

(c) Different antigenic epitopes present in a single peptide:MHC complex may be recognized by multiple different alpha/beta TCR heterodimers;

(d) A single peptide:MHC epitope may be recognized by a number of different alpha/beta TCR heterodimers;

(e) A number of amino acids in the CDR3 region are TCR clone-specific and may be, at least in part, coded by randomly added non-templated nucleotides (N-nucleotides) during the generation of the T-cell repertoire and not by nucleotides that belong to the V, D (beta chain only) and J region segments [64]. T-cell clones expressing TCR with non-templated amino acid motifs may have undergone selection by antigenic stimulation during thymic development [64].

It is important that studies of clonal expansions of TCR are carried out using uncultured, either fresh or cryopreserved T cells after collection of the specimens, and not T cells that have been expanded in vitro in culture using growth factors, such as rIL-2. T-cell lines that have been expanded in culture with rIL-2 have been shown to be comprised of different proportions of individual T-cell clones versus those present in fresh uncultured T cells from the same patient and demonstrate different properties, such as the production of different cytokines [295]. Also, the growth rates of different T-cell clones in culture with rIL-2 are different [296].

For these studies we developed/optimized a single cell-sorting, single-cell PCR and single-cell sequencing approach that allows us to analyze both alpha- and beta-TCR transcripts.

After several approaches were evaluated, the best results were obtained by further developing/ optimizing the Variable Region Multiplex Reverse Transcription PCR (VRM RT-PCR). We applied VRM RT-PCR for the single-cell PCR/sequencing of PBMC populations and primarily memory T cells (CD3+CD8+CD45RO+, CD3+CD4+CD45RO+, and CD3+CD20+) from normal donors and patients with MS with the objective to identify clonally expanded T-cell populations.

Unique TCR transcripts, when compared to each other, were observed in PBMC from normal donors in over 80% of the experiments carried out, typical of polyclonal populations of T cells. CD45RO is a glycoprotein expressed on activated memory T cells and other cells [11]. In additional studies we investigated the small population of the CD3+CD20+ T cells which are reportedly ranged from 0.1-6.8% of all circulating CD3+ T cells in PBMC from healthy individuals [41, 42]. These T cells appear to play an important role in the immunopathogenesis of MS, however, little information is available about their function, specificity and other characteristics.

We applied VRM RT-PCR for the single-cell PCR/sequencing of PBMC populations and primarily memory T cells (CD3+CD8+CD45RO+ and CD3+CD8+CD20+) from patients with MS with the objective to determine at the single-cell level whether they contain clonally expanded T-cell populations. In contrast to the findings with these PBMC populations from normal donors, clonally expanded T cells were identified in these T-cell populations (CD3+CD8+CD45RO+ and CD3+CD8+CD20+) from PBMC from patients with MS.

The single-cell PCR and single-cell sequencing VRM RT-PCR method that we developed is addressing a number of limitations in the field, including the following:

- Clonal expansions in autoimmune diseases and cancer are usually identified using bulk PCR and tissue specimen or cerebrospinal fluid (CSF)- often it is difficult to obtain these specimen.
- MS brain tissue specimen can only be obtained by autopsy with very few exceptions (rare biopsy specimens when lymphoma is suspected).
- CSF is also rarely available in adult patients with MS.
- Furthermore, tissue banks usually store and provide fixed tissue specimen from which it is difficult to obtain these results.

This single-cell PCR and single-cell sequencing VRM RT-PCR method that we developed has a number of advantages, as follows:

- Single cell PCR provides a reliable and simple approach; reducing the time required to obtain results.
- Allows a versatile method that may be used to sort and sequencing alpha- and beta-chain TCR in individual T cells from the peripheral blood which is much easier to obtain and from other tissues as well.
- In addition to permitting the identification at the single-cell level of the clonally expanded alpha- and beta-chain TCR transcripts, our approach also permits the identification of the pairing of the alpha- and beta-chains of the TCR in single T cells.
- This single-cell PCR and single-cell sequencing VRM RT-PCR method is a core technology and can be applied to TCR in autoimmune diseases, cancer or patients with transplants.

Also, it can be used to study clonal expansions of antibody-producing B cells and to identify the sequences of the antibodies produced.

In previous studies our laboratory identified a molecular mimicry between certain MOG peptides and Hepatitis A peptides. Both were recognized by clonally expanded TCR in the CSF of a pediatric patient with MS-like demyelinating disease. In the studies reported here, we examined sequence homology to viral antigens of 3 MOG peptides, which were recognized by T cells expressing clonally expanded TCR transcripts in the CSF of patient AMS-HA. Significant homologies of all 3 MOG peptides were identified, to many structural and nonstructural peptides of many viruses, including HSV, CMV, EBV, coronaviruses, HIV, flaviviruses (Zika virus, Japanese Encephalitis virus, Dengue virus), Influenza, metapneumoviruses and RSV. It is of interest that all these viruses are either neurotropic or cause encephalitis/encephalopathy. As a result, it is important to determine whether MOG play a physiological role in neurological manifestations of these virally induced diseases.

It is well established that in HLA-DR2+ individuals, T cells recognize an immunodominant epitope of MBP (84-102). In elegant studies, Wucherpfennig & Strominger [9] demonstrated structural similarity between viral epitopes recognized by T cells and a self-epitope (MBP) which was examined. The MHC class II and TCR contact are known. These residues were subjected to mutational analysis and the resulting “peptides” were screened against microbial antigens previously reported in the databases. A total of 129 peptides which fulfilled these criteria were synthesized and tested to determine whether they can activate T cell clones from MS patients. Seven viral peptides and one bacterial peptide activated three T cell lines from MS patients.

Only one peptide shares significant sequence homology with MBP (molecular mimic). The remaining peptides showed minimal or no linear homology to MBP. This paper provides evidence that a single TCR may recognize distinct, but structurally related, epitopes from many infectious agents.

As it was mentioned earlier, environmental factors likely play an important role in the etiology/ pathogenesis of MS. Several viruses have been proposed to be associated with MS, including measles, mumps, John Cunnigham virus (JCV), many herpesviruses (human herpes virus 1 and 6, varicella zoster (VZV), cytomegalovirus (CMV) and Epstein-Barr virus (EBV) as well as certain human endogenous viruses [109, 297, 298]. However, it is not known how often viral infections mediate immune responses against myelin.

Molecular mimicry between microbial (viral or other) and host epitopes is responsible for a number of autoimmune diseases. Herpes stromal keratitis is the result of T-cell responses to corneal infection with HSV. These T cells recognize both UL6 protein of HSV and a cross-reactive self-corneal epitope [282]. In our studies, a few TCR CDR3 were found to be homologous to viral proteins and these will be explored in future studies.

Molecular mimicry has been implicated in Sjogren syndrome. A cross reactivity has been reported between Coxsackie 2 B protein and Ro60kD self-antigen [299]. However, Coxsakcie B4 virus p2C protein shows significant homology with glutamic acid decarboxylase (GAD63) and infection with this virus induces Type 1 diabetes [300, 301]. T cells specific for EBNA1 have been found in patients with MS. Antibodies specific for EBNA1 cross react with GlialCam (adhesion molecule) [39]. Whether these antibodies are responsible, in part, for the

pathological process in patients with MS is not clear. However, EBV has been implicated also in the etiology of SLE, of rheumatoid arthritis, as well as of Sjogren syndrome [302, 303]. These examples show that multiple viral peptides may cross-react with multiple host antigens causing a number of autoimmune diseases.

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VITA

LISA (MERRITT) KEYES JONES
Old Dominion University
College of Sciences
4402 Elkhorn Ave, Norfolk, VA 23529

EDUCATION

Doctor of Philosophy, Biomedical Sciences December 2022
Old Dominion University, Norfolk, VA

Master of Science, Pharmacology and Toxicology December 2007
Virginia Commonwealth University, Richmond, VA
Thesis Dissertation: 'Endocannabinoid Modulation of Nicotine Dependence'

Bachelor of Science, Animal and Poultry Science May 2002
Virginia Polytechnic Institute and State University, Blacksburg, VA

TEACHING EXPERIENCE

<u>Associate Professor, Biology, Rappahannock Community College, Glenns, VA</u>
<u>August 2013-present</u>

- Teach lecture and labs for General Biology, Anatomy & Physiology, and Microbiology
- Continued professional development as a participant and presenter at peer conferences, fulfilled institutional responsibilities, chaired committees, and participated in community service programs; detailed documentation of activities, awards, and recognition reported in annual evaluations.

PUBLICATIONS

- **Clonally expanded alpha-chain T-cell receptor (TCR) transcripts are present in aneurysmal lesions of patients with Abdominal Aortic Aneurysm (AAA).** Lu S, White JV, Judy RI, Merritt LL, Lin WL, Zhang X, Solomides C, Nwaneshiudu I, Gaughan J, Monos DS, Oleszak EL, Platsoucas CD. *PLoS One*. 2019 Jul 16;14(7); DOI: https://doi.org/10.1371/journal.pone.0218990

- **The Endogenous Cannabinoid System Modulates Nicotine Reward and Dependence** Merritt, L. L., Martin, B. R., Walters, C., Lichtman, A. H., & Damaj, M. I. (2008). The endogenous cannabinoid system modulates nicotine reward and dependence. *The Journal of pharmacology and experimental therapeutics*, *326*(2), 483–492. https://doi.org/10.1124/jpet.108.138321