

T-Select MHC Tetramer

HLA-DRB1*11:01 TT p₂₈₂₉₋₈₄₄ Tetramer -MQYIKANSKFIGITEL (20 tests)

For Research Use Only. Not for use in diagnostic procedures.

Background

T lymphocytes play a central role in immune system. Total T cell and T cell subset counts are measured by detection of various cell surface molecules. Enumeration of CD4⁺ antigen-specific T cells requires cognate recognition of the T cell receptor (TCR) by a class II MHC/peptide complex. This can be done using T-Select MHC class II Tetramers which are composed of four MHC class II molecules each bound to the specific peptide and conjugated with a fluorescent protein. Thus, T-Select MHC Tetramer assays allow quantitation of the total T cell population specific for a given peptide complexed with a particular MHC molecule. Furthermore, since binding does not depend on functional pathways, this population includes specific CD4⁺ T cells regardless of functional status. Measurements may be performed in whole blood or isolated lymphocyte/mononuclear cell preparations. In some cases where frequency is low, it may be necessary to perform an *in vitro* cell expansion. Specific cell staining is accomplished by incubating the sample with the T-Select MHC Tetramer reagent, then washing away excess Tetramer. The number of Tetramer positive lymphocytes is then determined by flow cytometry.

This Tetramer reagent comprises human class II HLA-DRB1*11:01 and epitope peptide derived from Tetanus Toxin (TT) p₂, and it can detect HLA-DRB1*11:01-restricted TT p₂-specific CD4⁺ T cells by flow cytometry.

Tetanus is caused by the action of a highly potent neurotoxin, tetanospasmin, which is produced during the growth of the anaerobic bacterium *Clostridium tetani* (*Cl. tetani*). Tetanus toxin (TT) is an antigen known to induce strong T cell specific immune responses and is synthesized inside *Cl. tetani* bacterial cells as a single polypeptide chain of 150,000 molecular weight. Studies of TT-specific CD4⁺ T-cell epitopes suggest that most individuals exhibit cellular immune responses to a few identical TT epitopes. TT can be inactivated by formaldehyde to yield tetanus toxoid. Tetanus toxoid is used as a vaccine to immunize adults.

A Tetramer, which is constructed with the same allele (HLA-DRB1*11:01) of interest and an irrelevant peptide, may be used as a negative control Tetramer.

HLA Restriction

HLA-DRB1*11:01

Origin and Sequence of This Epitope

Tetanus Toxin (TT p₂, 829-844 aa, MQYIKANSKFIGITEL)

References for TT p₂₈₂₉₋₈₄₄

- 1) Demotz S, *et al. J Immunol* **142**: 394 (1989)
- 2) Okita D, *et al. J Infect Dis* **175**: 382 (1990)
- 3) Moro M, *et al. BMC Immunol* **6**: 24 (2005)
- 4) Scriba TJ, *et al. J Immunol* **175**: 6334-6343 (2005)
- 5) James EA, *et al. Int Immunol* **19**: 1291-1301 (2007)
- 6) Cecconi V, *et al. Cytometry A* **73A**: 1010-1018 (2008)

Reagents

200 µL liquid - 10 µL/test

The Tetramer is dissolved in an aqueous buffer containing 0.5 mM EDTA, 0.2% BSA, 10 mM Tris-HCl (pH 8.0), 150 mM NaCl, and 0.1% Proclin™ 150.

Conjugates

TC-M812-1

Streptavidin-Phycoerythrin (SA-PE)

Excites at 486-580 nm

Emits at 586-590 nm

TC-M812-2

Streptavidin-Allophycocyanin (SA-APC)

Excites at 633-635 nm

Emits at 660-680 nm

Evidence of Deterioration

Any change in the physical appearance of this reagent may indicate deterioration and the reagent should not be used. The normal appearance is a clear, colorless to pink (PE Tetramer), or light blue (APC Tetramer).

Storage Conditions

Store at 2 to 8°C. Do not freeze. Minimize exposure to light. The expiration date is indicated on the vial label.

Usage

This reagent is for use with standard flow cytometry methodologies.

References for T-Select MHC Tetramer

- Altman JD, *et al. Science* **274**: 94-96 (1996)
McMichael AJ, *et al. J Exp Med* **187**: 1367-1371 (1998)
Bodinier M, *et al. Nat Med* **6**: 707-710 (2000)

Statement of Warnings

1. Specimens, samples and material coming in contact with them should be handled as if capable of transmitting infection and disposed of with proper precautions.
2. Never pipette by mouth and avoid contact of samples with skin and mucous membranes.
3. Minimize exposure of reagent to light during storage or incubation.
4. Avoid microbial contamination of reagent or erroneous results may occur.
5. Use Good Laboratory Practices (GLP) when handling this reagent.

Materials Required But Not Supplied

- 12 x 75 mm polypropylene test tubes
- Transfer pipettes
- Pipettors and disposable pipette tips
- Vortex mixer
- Centrifuge capable of 150 x g or 400 x g
- Aspirator
- PBS
- Red blood cell lysis reagent
- Anti-CD4-FITC, Beckman Coulter, Inc., PN A07750
- 7-AAD Viability Dye, Beckman Coulter, Inc., PN A07704
- Clear Back (human FcR blocking reagent), MBL, PN MTG-001

Procedure for Whole Blood

1. Collect blood by venipuncture into a blood collection tube containing an appropriate anti-coagulant.
2. Add 10 µL of T-Select MHC Tetramer to each 12 x 75 mm test tube.
3. Add 200 µL of whole blood into each test tube.
4. Vortex gently.
5. Incubate for 30-60 minutes at 2-8°C or room temperature (15-25°C) protected from light.
6. Add any additional antibodies (e.g. anti-CD4) and vortex gently.
7. Incubate for 30 minutes at 2-8°C protected from light.
8. Lyse red blood cells using commercially available

reagents.

9. Prepare samples according to description of the package insert.
10. Store prepared samples at 2-8°C protected from light for a minimum of 1 hour (maximum 24 hours) prior to analysis by flow cytometry.

Procedure for Peripheral Blood Mononuclear Cells

1. Prepare peripheral blood mononuclear cells (PBMC) according to established procedures. Cells should be re-suspended at a concentration of 2×10^7 cells/mL. 50 µL of sample is required for each T-Select MHC Tetramer determination.
2. Add 10 µL of Clear Back (human FcR blocking reagent, MBL, PN MTG-001) to each 12 x 75 mm test tube.
3. Add 50 µL PBMC into each test tube (e.g. 1×10^6 cells per tube).
4. Incubate for 5 minutes at room temperature.
5. Add 10 µL of T-Select MHC Tetramer and vortex gently.
6. Incubate for 30-60 minutes at 2-8°C or room temperature (15-25°C) protected from light.
7. Add any additional antibodies (e.g. anti-CD4) and vortex gently.
8. Incubate for 30 minutes at 2-8°C protected from light.
9. Add 3 mL of PBS or FCM buffer (2% FCS/0.09% NaN₃/PBS).
10. Centrifuge tubes at 400 x g for 5 minutes.
11. Aspirate or decant the supernatant.
12. Resuspend the pellet in 500 µL of PBS with 0.5% formaldehyde.
13. Store prepared samples at 2-8°C protected from light for a minimum of 1 hour (maximum 24 hours) prior to analysis by flow cytometry.

Limitations

1. For optimal results with whole blood, retain specimens in blood collection tubes at room temperature, while rocking, prior to staining and analyzing. Refrigerated specimens may give aberrant results.
2. Recommended cell viability for venous blood specimens is > 90%.
3. Prolonged exposure of cells to lytic reagents may cause white blood cell destruction and loss of cells in the population of interest.
4. All red blood cells may not lyse under the following conditions: nucleated red blood cells, abnormal protein concentration or hemoglobinopathies. This may cause falsely decreased results due to unlysed red blood cells being counted as leukocytes.

Technical Hints

- A. If PBMC culture is needed, we recommend the use of heparin as an anti-coagulant.
- B. Clear Back reagent (human FcR blocking reagent) may effectively block non-specific binding caused by macrophages or endocytosis, resulting in clear staining when cells are stained with MHC Tetramer and antibodies. Please refer to the data sheet (MBL, PN MTG-001) for details.
- C. A Tetramer that is constructed with the same allele of interest and an irrelevant peptide may be used as a negative control.
- D. The use of CD45 antibody and gating of the lymphocyte population are recommended in order to reduce contamination of unlysed or nucleated red blood cells in the gate.
- E. Apoptotic, necrotic, and/or damaged cells are sources of interference in the analysis of viable cells by flow cytometry. Cell viability should be determined by 7-aminoactinomycin D (7-AAD) staining; intact viable cells remain unstained (negative).
- F. Cells do not require fixation prior to analysis if the stained cells are analyzed by flow cytometry within several hours.

Related Products

T-Select Human class II Tetramers

TC-M801-1	HLA-DRB1*01:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M801-2	HLA-DRB1*01:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-APC
TC-M802-1	HLA-DRB1*01:01 HIV gag ₂₉₅₋₃₀₇ Tetramer-PE
TC-M802-2	HLA-DRB1*01:01 HIV gag ₂₉₅₋₃₀₇ Tetramer-APC
TC-M803-1	HLA-DRB1*01:01 EBV EBNA1 ₅₁₅₋₅₂₇ Tetramer-PE
TC-M803-2	HLA-DRB1*01:01 EBV EBNA1 ₅₁₅₋₅₂₇ Tetramer-APC
TC-M804-1	HLA-DRB1*01:01 Influenza HA ₃₀₆₋₃₁₈ Tetramer-PE
TC-M804-2	HLA-DRB1*01:01 Influenza HA ₃₀₆₋₃₁₈ Tetramer-APC
TC-M805-1	HLA-DRB1*04:05 human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M805-2	HLA-DRB1*04:05 human CLIP ₁₀₃₋₁₁₇ Tetramer-APC
TC-M806-1	HLA-DRB1*04:05 Influenza HA ₃₀₆₋₃₁₈ Tetramer-PE
TC-M806-2	HLA-DRB1*04:05 Influenza HA ₃₀₆₋₃₁₈ Tetramer-APC
TC-M807-1	HLA-DRB1*11:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M807-2	HLA-DRB1*11:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-APC
TC-M808-1	HLA-DRB1*11:01 Influenza HA ₃₀₆₋₃₁₈ Tetramer-PE
TC-M808-2	HLA-DRB1*11:01 Influenza HA ₃₀₆₋₃₁₈ Tetramer-APC
TC-M809-1	HLA-DRB1*04:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M809-2	HLA-DRB1*04:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-APC
TC-M810-1	HLA-DRB1*04:01 Influenza HA ₃₀₆₋₃₁₈ Tetramer-PE
TC-M810-2	HLA-DRB1*04:01 Influenza HA ₃₀₆₋₃₁₈ Tetramer-APC
TC-M811-1	HLA-DRB1*04:01 GAD65 ₅₅₅₋₅₆₇ Tetramer-PE
TC-M811-2	HLA-DRB1*04:01 GAD65 ₅₅₅₋₅₆₇ Tetramer-APC
TC-M812-1	HLA-DRB1*11:01 TT p2 ₈₂₉₋₈₄₄ Tetramer-PE
TC-M812-2	HLA-DRB1*11:01 TT p2 ₈₂₉₋₈₄₄ Tetramer-APC
TC-M815-1	HLA-DRB1*01:01 HTLV-1 Tax ₁₅₅₋₁₆₇ Tetramer-PE
TC-M815-2	HLA-DRB1*01:01 HTLV-1 Tax ₁₅₅₋₁₆₇ Tetramer-APC
TC-M816-1	HLA-DRB1*15:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M816-2	HLA-DRB1*15:01 human CLIP ₁₀₃₋₁₁₇ Tetramer-APC
TC-M817-1	HLA-DRB1*15:02 human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M817-2	HLA-DRB1*15:02 human CLIP ₁₀₃₋₁₁₇ Tetramer-APC

T-Select Mouse class II Tetramers

TC-M703-1	I-A ^d OVA ₃₂₃₋₃₃₉ Tetramer-PE
TC-M704-1	I-A ^b MOG ₃₅₋₅₅ Tetramer-PE
TC-M706-1	I-A ^b E α ₅₂₋₆₈ Tetramer-PE
TC-M707-1	I-A ^b ESAT-6 ₁₋₂₀ Tetramer-PE
TC-M710-1	I-A ^b OVA ₃₂₃₋₃₃₉ Tetramer-PE
TC-M715-1	I-A ^b human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M716-1	I-A ^b Influenza NP ₃₁₁₋₃₂₅ Tetramer-PE
TC-M720-1	I-A ^d human CLIP ₁₀₃₋₁₁₇ Tetramer-PE
TC-M721-1	I-A ^b <i>L. monocytogenes</i> LLO ₁₉₀₋₂₀₁ Tetramer-PE
TC-M722-1	I-A ^b mouse 2W1S Tetramer-PE
TC-M724-1	I-A ^b LCMV GP ₁₂₆₋₁₄₀ Tetramer-PE

Others

MTG-001 Clear Back (Human FcR blocking reagent)

Please check our website
(<https://www.mbl-chinawide.cn>) for up-to-date
information on products and custom MHC Tetramers.

Experimental Data

PBMCs from HLA-DRB1*11:01-positive healthy donors were collected from freshly isolated heparinized peripheral blood according to standard methods. Plasma was collected before PBMC separation by centrifugation at 3,000 rpm for 10 minutes, and stored at -80 °C.

Aliquots of the PBMCs (1×10^6 cells) were stained with TT p2 Tetramer (MBL, PN TC-M812-1) and CD4 antibody (day 0). Another aliquots of PBMCs ($1-3 \times 10^6$ cells/mL) were incubated in culture tubes (Round-Bottom Tube, Falcon®, PN 352059) in the presence of a synthetic peptide (10 µg/mL of MQYIKANSKFIGITEL) and 5% (v/v) autologous plasma. After 48 h, an equal volume of medium containing 100 U/mL interleukin-2 (IL-2) was added to each culture tube, and every 2 to 3 days thereafter half of the medium was replaced with fresh medium containing IL-2 (50 U/mL). After 14 days, aliquots of these cells were stained with these MHC Tetramers, CD4 antibody, and 7-AAD (after MLPC).

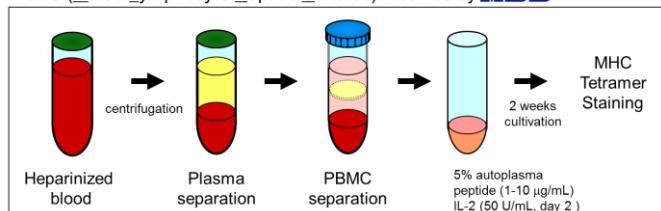
Result

The lymphocyte population was defined by an FSC/SSC gate (R1), and the viable cell population was defined by an FSC/7-AAD (R2). Data were analyzed by double gating on the lymphocyte and viable cell population (R1 and R2). Numbers in the top right quadrants represent the percentage of MHC Tetramer-positive cells in the total CD4⁺ cells.

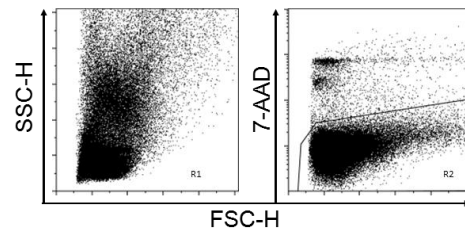
To confirm specificity of MHC Tetramer staining, cells were stained with specific and negative control MHC Tetramer. DRB1*11:01 human CLIP₁₀₃₋₁₁₇ Tetramer (MBL, PN TC-M807-1) was used as a negative control, containing the peptide PVSKMRMATPLLMQA, CLIP.

Results showed that HLA-DRB1*11:01-restricted TT p2₈₂₉₋₈₄₄ (MQYIKANSKFIGITEL)-specific CD4⁺ T cells were detectable in the peptide stimulated PBMCs.

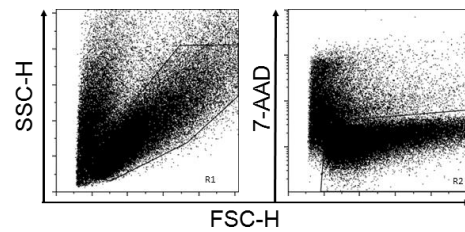
MLPC (Mixed-Lymphocyte-Peptide Cultures) modified by **MBL**



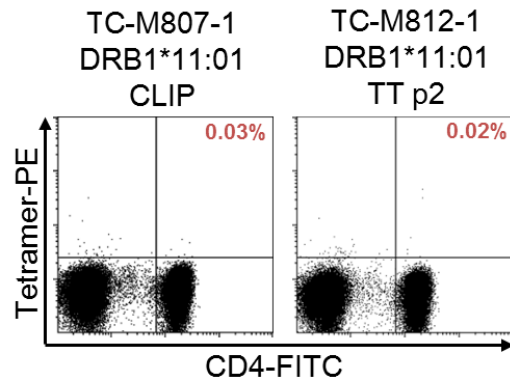
<Day 0>



<after MLPC>



<Day 0>



+ TT p2 peptide
(final conc. 10 µg/mL)

<after MLPC>

