**Supplementary Material**

**Supplementary Tables**

**Supplementary Table 2. The details of primers for reverse TCR cloning.** List of primers and each nucleotide sequences using to synthesize IVT templates for reverse TCR cloning.

| Primer name | Purpose | Sequence (5'→3') |
|-------------|---------|------------------|
| Universal switch_F | Used to amplify templates for CDR3 specific PCR | AAGCAGTGGTATCAACGCAGAGTACGGG |
| TRAC_R | | TCAGCTGGACACAGCCGCA |
| TRBC1_R | | TCAGAAATCTTTCCTTGA |
| TRBC2_R | | CTAGCCTCTGAAATCCTTTC |
| T7 TRDV1 F | Used for CDR3 specific PCR | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV1-1_F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV1-2 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV2 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV3 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV4 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV9-2 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV10 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV12-3 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV13-1 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV14DV4 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV17 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV20 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV21 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV22 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV23DV6 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV24 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV29DV5 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV38-2DV8 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRAV41 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV2 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV4-1, 2, 3_F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV6-3_F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV6-5 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV7-8_F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV7-9_F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV12-4_F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV16 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV19 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV20-1 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV27 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| T7 TRBV28 F | | CCCAAGCTTGGCCACATGCTGTTCTCCAGCCTGCTGTGTG |
| A0201 a1 CDR3_F | | TGTGCCCGGAACACCGGTAA |
| A0201 a1 CDR3_R | | AAAATAGAATCTGTTACCAG |
| A0201 a2 CDR3_F | | TGTGCCCGGAACACCGGTAA |
| A0201 a2 CDR3_R | | AAAATAGAATCTGTTACCAG |
| A0201 a3 CDR3_F | | TGTGCCCGGAACACCGGTAA |
| A0201 a3 CDR3_R | | AAAATAGAATCTGTTACCAG |
| A0201 b1 CDR3_F | | TGTGCCCGGAACACCGGTAA |
| A0201 b1 CDR3_R | | AAAATAGAATCTGTTACCAG |
| A0201 b2 CDR3_F | | TGTGCCCGGAACACCGGTAA |
| A0201 b2 CDR3_R | | AAAATAGAATCTGTTACCAG |
| A0201 b3 CDR3_F | | TGTGCCCGGAACACCGGTAA |
| A0201 b3 CDR3_R | | AAAATAGAATCTGTTACCAG |
| Primer Name       | Usage                                                                 |
|------------------|-----------------------------------------------------------------------|
| A0206 a1 CDR3 F  | Used for CDR3 specific PCR                                           |
| A0206 a1 CDR3 R  |                                                                       |
| A0206 a2 CDR3 F  |                                                                       |
| A0206 a2 CDR3 R  |                                                                       |
| A0206 b1 CDR3 F  |                                                                       |
| A0206 b1 CDR3 R  |                                                                       |
| A0206 b2 CDR3 F  |                                                                       |
| A0206 b2 CDR3 R  |                                                                       |
| B0702 a1 CDR3 F  |                                                                       |
| B0702 a1 CDR3 R  |                                                                       |
| B0702 a2 CDR3 F  |                                                                       |
| B0702 a2 CDR3 R  |                                                                       |
| B0702 a3 CDR3 F  |                                                                       |
| B0702 a3 CDR3 R  |                                                                       |
| B0702 a4 CDR3 F  |                                                                       |
| B0702 a4 CDR3 R  |                                                                       |
| B0702 a5 CDR3 F  |                                                                       |
| B0702 a5 CDR3 R  |                                                                       |
| B0702 a6 CDR3 F  |                                                                       |
| B0702 a6 CDR3 R  |                                                                       |
| A0206 a1 CDR3 F  |                                                                       |
| A0206 a1 CDR3 R  |                                                                       |
| A0206 a2 CDR3 F  |                                                                       |
| A0206 a2 CDR3 R  |                                                                       |
| B0702 a1 CDR3 F  |                                                                       |
| B0702 a1 CDR3 R  |                                                                       |
| B0702 a2 CDR3 F  |                                                                       |
| B0702 a2 CDR3 R  |                                                                       |
| B0702 a3 CDR3 F  |                                                                       |
| B0702 a3 CDR3 R  |                                                                       |
| B0702 a4 CDR3 F  |                                                                       |
| B0702 a4 CDR3 R  |                                                                       |
| B0702 a5 CDR3 F  |                                                                       |
| B0702 a5 CDR3 R  |                                                                       |
| B0702 a6 CDR3 F  |                                                                       |
| B0702 a6 CDR3 R  |                                                                       |
| B4006 a1 CDR3 F  |                                                                       |
| B4006 a1 CDR3 R  |                                                                       |
| B4006 a2 CDR3 F  |                                                                       |
| B4006 a2 CDR3 R  |                                                                       |
| B4006 a3 CDR3 F  |                                                                       |
| B4006 a3 CDR3 R  |                                                                       |
| B4006 a4 CDR3 F  |                                                                       |
| B4006 a4 CDR3 R  |                                                                       |
| B4006 a5 CDR3 F  |                                                                       |
| B4006 a5 CDR3 R  |                                                                       |
| B4006 a6 CDR3 F  |                                                                       |
| B4006 a6 CDR3 R  |                                                                       |
| B4006 b1 CDR3 F  |                                                                       |
| B4006 b1 CDR3 R  |                                                                       |
| B4006 b2 CDR3 F  |                                                                       |
| B4006 b2 CDR3 R  |                                                                       |
| B4006 b3 CDR3 F  |                                                                       |
| B4006 b3 CDR3 R  |                                                                       |
| B4006 b4 CDR3 F  |                                                                       |
| B4006 b4 CDR3 R  |                                                                       |
| B4006 b5 CDR3 F  |                                                                       |
| B4006 b5 CDR3 R  |                                                                       |
| B4006 b6 CDR3 F  |                                                                       |
| B4006 b6 CDR3 R  |                                                                       |
| B4006 a1 CDR3 F  |                                                                       |
| B4006 a1 CDR3 R  |                                                                       |
| B4006 a2 CDR3 F  |                                                                       |
| B4006 a2 CDR3 R  |                                                                       |
| B4006 a3 CDR3 F  |                                                                       |
| B4006 a3 CDR3 R  |                                                                       |
| CMV pp65 T7 F    | Used to amplify CMV pp65 templates for IVT                           |
| Beta-globin pA R | Used in overlapping PCR to synthesize the final IVT templates       |
| TRAC pA R        |                                                                       |
| TRBC1 pA R       |                                                                       |
| TRBC2 pA R       |                                                                       |
| T2A_R            |                                                                       |
| T2A TagBFP F     |                                                                       |
| TagBFP pA R      |                                                                       |
| T7_B4006 epitope_F | Used in overlapping PCR to synthesize the final IVT templates     |
| T7 plus F        |                                                                       |

**Supplementary Material**