**Supplemental Information**

**Engineering PEG10 assembled endogenous** **virus-like particles with genetically encoded neoantigen peptides for cancer vaccination**

Ruijing Tang1,2,3,5, Luobin Guo1,2,3,5, Tingyu Wei1,2,3, Tingting Chen1,2,3, Huan Yang1,2,3, Honghao Ye1,2,3, Fangzhou Lin1,2,3, Yongyi Zeng1,2,3, Haijun Yu4, Zhixiong Cai1,2,3,\*, and Xiaolong Liu1,2,3,\*

1 The United Innovation of Mengchao Hepatobiliary Technology Key Laboratory of Fujian Province, Mengchao Hepatobiliary Hospital of Fujian Medical University, Fuzhou 350025, P. R. China;

2 The Liver Center of Fujian Province, Fujian Medical University, Fuzhou 350025, P. R. China;

3 Mengchao Med-X Center, Fuzhou University, Fuzhou 350025, P. R. China;

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**Supplementary File 1a. The sequences of plasmids used in the study**

|  |  |
| --- | --- |
| 1. pcDNA3.1-gag-//-eGFP-HA: the sequence of gag-//-eGFP-HA as shown in right was inserted into the pCDH back bone through BglII and XhoI. | agatctgcattcgccaccatggctgctgcaggtggttcatcaaactgcccgccccctccccctccccctcctcccaacaacaacaacaacaacaacaccccaaagagcccaggcgtgcctgacgccgaagatgatgatgaacgcagacacgatgagctccctgaagacatcaacaactttgacgaagacatgaacaggcagtttgagaatatgaacctgctggatcaggtggagttgcttgcacagagctacagtctgctggatcatttagatgactttgatgatgatgatgaagacgatgactttgatccagaacctgaccaggatgagctccctgagtacagtgacgatgatgacctggagcttcagggtgctgcagcagcccctatcccaaactttttctccgatgatgactgccttgaagaccttcctgagaagttcgatggcaaccctgacatgctgggtcctttcatgtatcagtgccagctcttcatggaaaagagcaccagagatttctcagttgaccgcatccgtgtgtgcttcgtgacaagcatgctgatcggccgtgccgcccgctgggctactgccaagctgcaaagatgtacttacctgatgcacaactacactgcctttatgatggagctgaagcatgtctttgaagaccctcagagacgtgaagctgccaaacgcaagatcagacgtctgcgccagggccctgggcctgttgtggactactccaatgcattccagatgattgcccaggacctggattggactgagcctgccctgatggatcagttccaggaaggtctcaacccagacattcgcgcagagctgtctcgccaggaggcccccaagaccctggctgctctgattactgcctgtattcacatcgagagaaggctggctcgtgacgctgctgcaaagcccgatccttcacccagagccttggtgatgcctccaaacagccagaccgatcccaccgagcctgtgggaggtgcccgcatgcgcctgtccaaggaagaaaaggagagacgccgcaaaatgaatttgtgtctctactgtggcaatggaggccatttcgccgacacgtgtccagcgaaagcctccaagaattcgatggtgagcaagggcgaggagctgttcaccggggtggtgcccatcctggtcgagctggacggcgacgtaaacggccacaagttcagcgtgtccggcgagggcgagggcgatgccacctacggcaagctgaccctgaagttcatctgcaccaccggcaagctgcccgtgccctggcccaccctcgtgaccaccctgacctacggcgtgcagtgcttcagccgctaccccgaccacatgaagcagcacgacttcttcaagtccgccatgcccgaaggctacgtccaggagcgcaccatcttcttcaaggacgacggcaactacaagacccgcgccgaggtgaagttcgagggcgacaccctggtgaaccgcatcgagctgaagggcatcgacttcaaggaggacggcaacatcctggggcacaagctggagtacaactacaacagccacaacgtctatatcatggccgacaagcagaagaacggcatcaaggtgaacttcaagatccgccacaacatcgaggacggcagcgtgcagctcgccgaccactaccagcagaacacccccatcggcgacggccccgtgctgctgcccgacaaccactacctgagcacccagtccgccctgagcaaagaccccaacgagaagcgcgatcacatggtcctgctggagttcgtgaccgccgccgggatcactctcggcatggacgagctgtacaagtatccgtatgatgttccggattatgcatagtaactcgag |
| 1. pcDNA3.1-gag-GS-eGFP-HA: the sequence of gag-GS-eGFP-HA as shown in right was inserted into the pCDH back bone through BglII and XhoI. | agatctgcattcgccaccatggctgctgcaggtggttcatcaaactgcccgccccctccccctccccctcctcccaacaacaacaacaacaacaacaccccaaagagcccaggcgtgcctgacgccgaagatgatgatgaacgcagacacgatgagctccctgaagacatcaacaactttgacgaagacatgaacaggcagtttgagaatatgaacctgctggatcaggtggagttgcttgcacagagctacagtctgctggatcatttagatgactttgatgatgatgatgaagacgatgactttgatccagaacctgaccaggatgagctccctgagtacagtgacgatgatgacctggagcttcagggtgctgcagcagcccctatcccaaactttttctccgatgatgactgccttgaagaccttcctgagaagttcgatggcaaccctgacatgctgggtcctttcatgtatcagtgccagctcttcatggaaaagagcaccagagatttctcagttgaccgcatccgtgtgtgcttcgtgacaagcatgctgatcggccgtgccgcccgctgggctactgccaagctgcaaagatgtacttacctgatgcacaactacactgcctttatgatggagctgaagcatgtctttgaagaccctcagagacgtgaagctgccaaacgcaagatcagacgtctgcgccagggccctgggcctgttgtggactactccaatgcattccagatgattgcccaggacctggattggactgagcctgccctgatggatcagttccaggaaggtctcaacccagacattcgcgcagagctgtctcgccaggaggcccccaagaccctggctgctctgattactgcctgtattcacatcgagagaaggctggctcgtgacgctgctgcaaagcccgatccttcacccagagccttggtgatgcctccaaacaagaattcgggaggcggagggagcggaggcggagggagtggaggcggcggatctatggtgagcaagggcgaggagctgttcaccggggtggtgcccatcctggtcgagctggacggcgacgtaaacggccacaagttcagcgtgtccggcgagggcgagggcgatgccacctacggcaagctgaccctgaagttcatctgcaccaccggcaagctgcccgtgccctggcccaccctcgtgaccaccctgacctacggcgtgcagtgcttcagccgctaccccgaccacatgaagcagcacgacttcttcaagtccgccatgcccgaaggctacgtccaggagcgcaccatcttcttcaaggacgacggcaactacaagacccgcgccgaggtgaagttcgagggcgacaccctggtgaaccgcatcgagctgaagggcatcgacttcaaggaggacggcaacatcctggggcacaagctggagtacaactacaacagccacaacgtctatatcatggccgacaagcagaagaacggcatcaaggtgaacttcaagatccgccacaacatcgaggacggcagcgtgcagctcgccgaccactaccagcagaacacccccatcggcgacggccccgtgctgctgcccgacaaccactacctgagcacccagtccgccctgagcaaagaccccaacgagaagcgcgatcacatggtcctgctggagttcgtgaccgccgccgggatcactctcggcatggacgagctgtacaagtatccgtatgatgttccggattatgcatagtaactcgag |
| 1. pcDNA3.1-gag-//-pol-eGFP-HA: the sequence of gag-//-pol-eGFP-HA as shown in right was inserted into the pCDH back bone through BglII and XhaI. | agatctgcattcgccaccatggctgctgcaggtggttcatcaaactgcccgccccctccccctccccctcctcccaacaacaacaacaacaacaacaccccaaagagcccaggcgtgcctgacgccgaagatgatgatgaacgcagacacgatgagctccctgaagacatcaacaactttgacgaagacatgaacaggcagtttgagaatatgaacctgctggatcaggtggagttgcttgcacagagctacagtctgctggatcatttagatgactttgatgatgatgatgaagacgatgactttgatccagaacctgaccaggatgagctccctgagtacagtgacgatgatgacctggagcttcagggtgctgcagcagcccctatcccaaactttttctccgatgatgactgccttgaagaccttcctgagaagttcgatggcaaccctgacatgctgggtcctttcatgtatcagtgccagctcttcatggaaaagagcaccagagatttctcagttgaccgcatccgtgtgtgcttcgtgacaagcatgctgatcggccgtgccgcccgctgggctactgccaagctgcaaagatgtacttacctgatgcacaactacactgcctttatgatggagctgaagcatgtctttgaagaccctcagagacgtgaagctgccaaacgcaagatcagacgtctgcgccagggccctgggcctgttgtggactactccaatgcattccagatgattgcccaggacctggattggactgagcctgccctgatggatcagttccaggaaggtctcaacccagacattcgcgcagagctgtctcgccaggaggcccccaagaccctggctgctctgattactgcctgtattcacatcgagagaaggctggctcgtgacgctgctgcaaagcccgatccttcacccagagccttggtgatgcctccaaacagccagaccgatcccaccgagcctgtgggaggtgcccgcatgcgcctgtccaaggaagaaaaggagagacgccgcaaaatgaatttgtgtctctactgtggcaatggaggccatttcgccgacacgtgtccagcgaaagcctccaagaattcgccgccgggaaactccccggccccgctgtagggggaccttcagcgacagggccagaacgaataaggtccccaccctccgaggcttcgactcagcacctgcaagtgatgctccagattcatatgccgggcagacccaccctgtttgtccgagctatgattgattctggtgcatctggcaacttcattgatcaagactttgtcatacaaaatgcaattcctctcagaatcaaagactggccagtgatggtggaagctattgatgggcatccaattgcctcgggcccaatcattttggaaacccaccacctgatagttgatctgggagaccaccgtgagatactgtcatttgatgtgactcagtctccattctttcctattgtcctaggaatAcgttggctctctactcacgacccacacatcacctggagtactcgctccatagtcttcaactctgattactgtcggttgagatgccgaatgttcgctcagatcccaagcaacctgctctttaccgttccccaaccaaatctccacccctatctcctgcatcatgtacacccccatgtacaccctcacatgcatcaacaccttcatcaacacctgcatcagtttcttcatcctgatccacatcagtatccacacccagacccccattaccatcatcaccagcaggctgatatgcagcatcagctgcaacagtatttgtatcagtacttgtactaccatctgtaccctgtcatgcatcatcatcttcctcctgaccaacatgaacatctgcacgaatatcttcaccaatacctccatcagtaccttcaccaattcctccaccaccatcttcaccctgacttgcaccaatatttgtaccagtatcttcacaaccacatgaatccagatccacatcaccatccccatccagatccccctcaggatccacatcaccctccacatcaggatccccatcaggatcctccacatcaggatccacatcaggatgcacatcaggatccccatatggatccacacctgcatcagcaccagcatccgcagccgcagccgcatccacaacagcatcctaaccatcctcagcagccaccattcttctaccacatggctggattcagaatttaccaccctgtaaggtattactatattcagaatgtgtatacacctgttgatgagcatgtctatccgggtcaccgggtggttgaccctaacattgagatgattcctggagcgcacagcctgcccagtggacatttgtactcaatgtctgagtctgaaatgaatgctctgcgaaatttcgtggacaggaatgttaaagatgggctcatgactcccactgtggcgcccaatggagcccaagtcctgcaagtgaaaagagggtggaaactccaagtcacttacaattgccgagctccacagagtggcaccatccaaaatcagtacctacgcatgtctcttccaaatatgggagaccctgcacacctggcaagctatggtgaatttgtccaagttcctggctacccatatccagcctatgtttactatacaagcccgcatatgatgactgcgtggtacccagtaggacgagatgtacatggacgaataatcgttgtgcctgttgtaatcacctggtctcaaaatacgaaccgccagcctccggtgccccagtatcctcctccgcagccacctccaccaccaccaccacctccaccgccaccaccacctccaccagcatcatcctgcagtgctgcgggaggcggagggagcggaggcggagggagtggaggcggcggatctctcgaggccaccatggtgagcaagggcgaggagctgttcaccggggtggtgcccatcctggtcgagctggacggcgacgtaaacggccacaagttcagcgtgtccggcgagggcgagggcgatgccacctacggcaagctgaccctgaagttcatctgcaccaccggcaagctgcccgtgccctggcccaccctcgtgaccaccctgacctacggcgtgcagtgcttcagccgctaccccgaccacatgaagcagcacgacttcttcaagtccgccatgcccgaaggctacgtccaggagcgcaccatcttcttcaaggacgacggcaactacaagacccgcgccgaggtgaagttcgagggcgacaccctggtgaaccgcatcgagctgaagggcatcgacttcaaggaggacggcaacatcctggggcacaagctggagtacaactacaacagccacaacgtctatatcatggccgacaagcagaagaacggcatcaaggtgaacttcaagatccgccacaacatcgaggacggcagcgtgcagctcgccgaccactaccagcagaacacccccatcggcgacggccccgtgctgctgcccgacaaccactacctgagcacccagtccgccctgagcaaagaccccaacgagaagcgcgatcacatggtcctgctggagttcgtgaccgccgccgggatcactctcggcatggacgagctgtacaagtatccgtatgatgttccggattatgcatagtaatctaga |
| 1. pcDNA3.1-gag-neoantigens: the sequence of gag-neoantigens as shown in right was inserted into the pCDH back bone through BglII and XhoI. | agatctgcattcgccaccatggctgctgcaggtggttcatcaaactgcccgccccctccccctccccctcctcccaacaacaacaacaacaacaacaccccaaagagcccaggcgtgcctgacgccgaagatgatgatgaacgcagacacgatgagctccctgaagacatcaacaactttgacgaagacatgaacaggcagtttgagaatatgaacctgctggatcaggtggagttgcttgcacagagctacagtctgctggatcatttagatgactttgatgatgatgatgaagacgatgactttgatccagaacctgaccaggatgagctccctgagtacagtgacgatgatgacctggagcttcagggtgctgcagcagcccctatcccaaactttttctccgatgatgactgccttgaagaccttcctgagaagttcgatggcaaccctgacatgctgggtcctttcatgtatcagtgccagctcttcatggaaaagagcaccagagatttctcagttgaccgcatccgtgtgtgcttcgtgacaagcatgctgatcggccgtgccgcccgctgggctactgccaagctgcaaagatgtacttacctgatgcacaactacactgcctttatgatggagctgaagcatgtctttgaagaccctcagagacgtgaagctgccaaacgcaagatcagacgtctgcgccagggccctgggcctgttgtggactactccaatgcattccagatgattgcccaggacctggattggactgagcctgccctgatggatcagttccaggaaggtctcaacccagacattcgcgcagagctgtctcgccaggaggcccccaagaccctggctgctctgattactgcctgtattcacatcgagagaaggctggctcgtgacgctgctgcaaagcccgatccttcacccagagccttggtgatgcctccaaacagccagaccgatcccaccgagcctgtgggaggtgcccgcatgcgcctgtccaaggaagaaaaggagagacgccgcaaaatgaatttgtgtctctactgtggcaatggaggccatttcgccgacacgtgtccagcgaaagcctccaagaattcgggaggcggagggagcggaggcggagggagtggaggcggcggatctatgaaggcccgaaactacctgcagtttctgccctcgaaaaccaaggtggctggaggcggagggagccgaggagaacactaccggtacaaggtcagcctccccgggggccagcacgccggaggcggagggagccatgttctctgggacttaaagcagatgtttcggtgtgctgtcttgaaaaacggaggcggagggagctgggacacttgtaccacttacaagtggcaaaagacactggaaggtcatgatggaggcggagggagcctatcaacgtacagaacagcttgcacgttacgatttgtacagaagcgatgcggaggcggagggagcctgtacactcacttcctgcagttgccactggcagccaccgggttctccgtgggaggcggagggagcaaaaggtggttatattggcaacctactctcactaagatggggtttgtgtcatgataactcgag |
| 1. pCDH-DEC-205-mCherry: the sequence of DEC-205-mCherry as shown in right was inserted into the pCDH back bone through XbaI and NotI. | tctagagccaccatgcggacgggccgggtgaccccgggcctggcggcggggctactcctgctgttgctgcggtccttcgggcttgtggagccttctgagagctcaggtaatgatccattcaccatcgtccatgaaaacactggcaagtgcatccagccgctgtctgactgggtagtggcccaggactgtagcggaactaacaacatgttgtggaagtgggtgtcccagcaccgcctctttcacctggaatcccagaagtgcctcggcctcgatattaccaaagccacggacaacctgcgaatgttcagctgtgactccaccgtcatgctgtggtggaaatgtgagcaccattcgctgtacaccgctgcccagtacaggctagctctgaaagatggatatgccgtagccaatacgaatacatctgatgtctggaagaagggaggctccgaggaaaacctttgtgcccagccttatcatgagatatacaccagagatgggaattcctacgggagaccttgtgaattccctttcttgattggtgagacatggtaccatgactgcattcatgatgaagatcatagtgggccatggtgtgccactaccctaagttatgaatatgatcaaaagtggggcatctgcctactaccagaaagtggctgtgaaggtaactgggaaaagaatgagcagattggaagttgctaccaatttaataatcaggaaattctgtcttggaaagaagcttatgtttcctgtcagaaccaaggagctgacttactgagcatccacagtgctgccgaattagcctacattacgggaaaagaggacattgctagacttgtttggcttggactgaatcagctctattctgcgagaggttgggaatggtcagacttcaggccactcaaatttcttaactgggatccaggcacgcccgttgcacctgtgattggtgggtcaagctgtgccagaatggacacagagtccgggctgtggcaaagtgtttcctgtgaatctcagcagccttacgtctgcaagaagccactgaacaacacgctggagctcccagatgtttggacttacacagatacccactgccatgtgggctggctgccaaataatgggttttgctatctgctggcgaatgaaagtagttcctgggatgcagcacatttgaaatgcaaagccttcggtgcagacctcatcagcatgcactccttagcagatgtggaggtggttgtcacgaaactccataatggggatgtcaaaaaagaaatatggacaggccttaaaaacacaaacagccctgctttgttccagtggtcggacggaacggaagttactctaacgtactggaatgagaatgagccgagtgttcccttcaacaagactcccaactgtgtttcctatttaggaaagttaggtcagtggaaagtccagtcctgtgagaagaaactcagatatgtatgcaagaaaaagggagaaataactaaggatgcagagtcggataagctgtgtccgccagacgagggctggaagagacatggagaaacctgttacaagatttatgagaaagaggcccctttcggaacgaactgcaacctgaccatcactagcaggttcgagcaggaattcttgaattatatgatgaagaactatgataagtcccttcggaagtacttctggactggcctgagagaccctgactctcgaggagaatacagttgggccgttgctcagggagtaaagcaggctgtgaccttttccaactggaattttcttgaaccggcgtctccaggcgggtgcgtggctatgtctactggaaagactcttggcaagtgggaagtgaagaactgcagaagcttccgtgctctttcaatatgcaagaaagtgagcgaaccccaggagcctgaagaagcagcccccaagcccgacgacccctgtcctgaaggctggcacactttcccctccagcctttcttgttataaggtgttccatatagaaagaatcgtaagaaagaggaactgggaagaagccgaaaggttctgccaagcccttggagctcacctacccagcttcagtcgtagagaggaaattaaggactttgtgcatttgttaaaggaccagttcagtgggcagcgttggttgtggattggtctgaataagagaagccctgatttacaagggtcctggcagtggagtgaccggacaccagtgtctgctgtgatgatggagccggagtttcaacaggattttgacatcagagactgtgctgccatcaaggtccttgatgtaccttggcgaagagtctggcatctctatgaggacaaggactatgcttactggaaaccttttgcttgtgatgccaagcttgagtgggtgtgccagattccaaaaggtagcactccccagatgccagactggtataatccagagcgcactggaattcatgggcccccagttataattgaaggaagtgaatactggtttgttgctgatccccacttaaactacgaagaagccgtcttatactgtgctagcaatcacagctttcttgccacgataacatcgttcacaggactaaaagctatcaaaaacaaactagcaaatatttctggcgaggaacagaagtggtgggtgaaaacgagtgagaatccaattgatcgttactttctaggctcgcgccgccgcctgtggcaccatttccccatgacgtttggagatgaatgtttgcacatgtcagccaagacgtggcttgttgacttaagtaaacgagcggactgtaatgccaagttgcccttcatctgtgaaagatacaatgtctcttcattagagaaatacagcccagatcctgcagccaaagtacagtgcactgagaagtggattccttttcaaaataagtgcttcctaaaggtcaactctgggcccgttacgttttctcaagcaagcggcatttgtcattcctacggcggcacccttccttccgtgctgagccggggtgaacaagatttcattatatccttgcttcctgaaatggaagctagtctatggattggtctgcgctggactgcctacgaaaggataaacagatggacagacaacagagagctgacctacagcaactttcacccactgctggtcggtcggaggctgagcataccaacgaatttctttgatgatgagtcccacttccactgcgccttgattcttaatctcaaaaagtcaccgcttactgggacctggaattttacttcctgttcagaacgacactctctgtctctctgtcaaaaatactcagagactgaagacggacagccctgggagaacacttcaaaaacagtgaagtatctaaataacctatacaaaatcatctcgaagcccctgacgtggcacggcgctctgaaggagtgcatgaaagagaagatgaggttggtgagcatcacagacccttaccagcaggccttcctcgcagtgcaggccaccctgcgcaacagctccttctggatcggactctccagtcaagatgatgaactcaactttggttggtcagatgggaaacgtcttcaatttagtaactgggctggaagcaatgagcaacttgatgactgcgtgatattagacacagatggattctggaaaacagctgactgtgatgataaccagcctggcgccatttgctactatccaggaaatgagactgaggaggaggtcagagcactggacactgctaaatgcccgtctcctgtacagagcaccccatggataccattccagaactcctgctacaatttcatgattaccaacaacaggcataagacagtcacaccggaggaagtgcagtccacgtgcgagaagctgcattcgaaagcacacagtctgagcattcggaatgaggaggagaatacctttgttgtggaacagcttctgtacttcaattatattgcctcatgggtcatgttaggaataacctatgaaaacaattctttgatgtggtttgataaaactgcattgtcctacacacactggagaacgggaagaccaactgtgaaaaatggcaaatttttggctggtctaagtactgatggattctgggatattcagtctttcaatgttattgaagaaacacttcatttttaccagcacagtatttctgcttgtaaaattgaaatggttgactatgaggacaaacacaatggcaccctgccacagttcattccatataaggacggcgtctacagcgttattcagaagaaggtgacgtggtatgaagcattgaacgcgtgctctcaaagtgggggagagttggccagtgttcacaacccaaatgggaagctctttctggaagacattgtgaaccgtgacggattccctctctgggttgggctctcaagtcatgatggaagcgaatcgagtttcgaatggtccgatggcagagcatttgactatgtcccatggcagagcctacaatctcccggagactgtgtcgtcttatatccaaaaggaatttggagacgtgaaaaatgcctgtctgttaaggatggtgctatttgttacaagcctacaaaagataaaaagctgatctttcatgtaaaatcatcaaaatgtccagtggcaaagagggatggtccccagtgggtccagtatgggggccactgttacgcttcggaccaggtactgcacagcttctcagaggccaaacaagtgtgtcaagagcttgatcattcggcaactgttgtcaccatagcagatgaaaatgagaataagtttgtgagcagactgatgagggagaactataatattactatgagagtttggcttggcctgtctcagcattcactcgatcagtcttggagttggctcgatggattagatgtgacatttgtcaaatgggaaaataaaactaaggatggtgatgggaaatgtagcattttaatagcttcaaatgaaacctggagaaaagtccattgctcacgtggctatgcaagagctgtctgcaaaattcctctgagcccggactacacaggcatagccatcctgtttgccgtgctgtgcctcttagggctcatcagcttggcgatttggttcctcttgcaacgatcccatatccgctggaccggcttctcctcggttcggtatgaacatggaaccaacgaagacgaggtgatgctcccttctttccacgacaccggtggttctggaggttcaatggtgagcaagggcgaggaggataacatggccatcatcaaggagttcatgcgcttcaaggtgcacatggagggctccgtgaacggccacgagttcgagatcgagggcgagggcgagggccgcccctacgagggcacccagaccgccaagctgaaggtgaccaagggtggccccctgcccttcgcctgggacatcctgtcccctcagttcatgtacggctccaaggcctacgtgaagcaccccgccgacatccccgactacttgaagctgtccttccccgagggcttcaagtgggagcgcgtgatgaacttcgaggacggcggcgtggtgaccgtgacccaggactcctccctgcaggacggcgagttcatctacaaggtgaagctgcgcggcaccaacttcccctccgacggccccgtaatgcagaagaagaccatgggctgggaggcctcctccgagcggatgtaccccgaggacggcgccctgaagggcgagatcaagcagaggctgaagctgaaggacggcggccactacgacgctgaggtcaagaccacctacaaggccaagaagcccgtgcagctgcccggcgcctacaacgtcaacatcaagttggacatcacctcccacaacgaggactacaccatcgtggaacagtacgaacgcgccgagggccgccactccaccggcggcatggacgagctgtacaagtaatgagcggccgc |
| 1. pcDNA3.1-gag-HBc 18-27: the sequence of gag-HBc 18-27 as shown in right was inserted into the pCDH back bone through BglII and XhoI. | agatctgcattcgccaccatggctgctgcaggtggttcatcaaactgcccgccccctccccctccccctcctcccaacaacaacaacaacaacaacaccccaaagagcccaggcgtgcctgacgccgaagatgatgatgaacgcagacacgatgagctccctgaagacatcaacaactttgacgaagacatgaacaggcagtttgagaatatgaacctgctggatcaggtggagttgcttgcacagagctacagtctgctggatcatttagatgactttgatgatgatgatgaagacgatgactttgatccagaacctgaccaggatgagctccctgagtacagtgacgatgatgacctggagcttcagggtgctgcagcagcccctatcccaaactttttctccgatgatgactgccttgaagaccttcctgagaagttcgatggcaaccctgacatgctgggtcctttcatgtatcagtgccagctcttcatggaaaagagcaccagagatttctcagttgaccgcatccgtgtgtgcttcgtgacaagcatgctgatcggccgtgccgcccgctgggctactgccaagctgcaaagatgtacttacctgatgcacaactacactgcctttatgatggagctgaagcatgtctttgaagaccctcagagacgtgaagctgccaaacgcaagatcagacgtctgcgccagggccctgggcctgttgtggactactccaatgcattccagatgattgcccaggacctggattggactgagcctgccctgatggatcagttccaggaaggtctcaacccagacattcgcgcagagctgtctcgccaggaggcccccaagaccctggctgctctgattactgcctgtattcacatcgagagaaggctggctcgtgacgctgctgcaaagcccgatccttcacccagagccttggtgatgcctccaaacagccagaccgatcccaccgagcctgtgggaggtgcccgcatgcgcctgtccaaggaagaaaaggagagacgccgcaaaatgaatttgtgtctctactgtggcaatggaggccatttcgccgacacgtgtccagcgaaagcctccaagaattcgggaggcggagggagctttcttccaagcgacttctttccaagtgtgtgataactcgag |

**Supplementary File 1b. Antibodies used in the study**

|  |  |  |  |
| --- | --- | --- | --- |
| Target | Clone | Source | Usage |
| CD11c-APC | N418 | Biolegend (#117310) | Flow cytometry |
| CD80-PE | 16-10A1 | Biolegend (#104708) | Flow cytometry |
| CD86-PeCy7 | GL-1 | Biolegend (#105014) | Flow cytometry |
| MHC-II-PE | M5/114.15.2 | eBioscience (#17-5321-82) | Flow cytometry |
| CD3-FITC | 17A2 | Biolegend (#100204) | Flow cytometry |
| CD8-APC | 53-5.8 | Biolegend (#140410) | Flow cytometry |
| CD44-PeCy7 | IM7 | Biolegend (#103030) | Flow cytometry |
| CD62L-PerCP | MEL-14 | Biolegend (#104430) | Flow cytometry |
| 4-1BB-APC | 17B5 | Biolegend (#106110) | Flow cytometry |
| 4-1BB-APC | 4B4-1 | BD Pharmingen (#550890) | Flow cytometry |
| HLA-A\*02-FITC | BB7.2 | Abcam (#ab27728) | Flow cytometry |
| CD4 | EPR19514 | Abcam (#ab183685) | Immunohistochemistry |
| CD8 | EPR21769 | Abcam (#ab217344) | Immunohistochemistry |
| CD8 | EPR21769 | Abcam (#ab217344) | Immunofluorescence |
| PD-1 | EPR20665 | Abcam (#ab214421) | Immunofluorescence |
| TIM-3 | EPR22241 | Abcam (#ab241332) | Immunofluorescence |
| CTLA-4 | CAL49 | Abcam (#ab237712) | Immunofluorescence |
| HA tag | C29F4 | CST (#3724) | Western Blot |
| GFP | D5.1 | CST (#2956) | Western Blot |
| P65 | D14E12 | CST (#8242) | Western Blot |
| phospho-P65 | 93H1 | CST (#3033) | Western Blot |
| Myd88 | D80F5 | CST (#4283) | Western Blot |
| Actin | 13E5 | CST (#4970) | Western Blot |
| CD9 | E8L5J | CST (#98327) | Western Blot |