**Supplemental Materials and Methods**

***Animal experiments***

NU/J mice and NSG mice were purchased from Jackson Laboratories (Bar Harbor, ME). All of the mice were housed under pathogen-free conditions; food and water were provided *ad libitum*. All experimental procedures were conducted in accordance with institutional guidelines for animal care and use.

***Retroviral production and CAR T-cell generation***

The vector encoding the HER2-directed CAR incorporating the CD28 costimulatory endodomain (2nd generation HER2.28ζ.CAR), the fusion protein EGFP-firefly luciferase, and the methodology for the production of retrovirus and CAR T-cells have been described previously ([11](#_ENREF_11)).

***Flow cytometry***

The following monoclonal antibodies conjugated with fluorochrome were used: anti-human CD3, CD4, CD8, CD25, CD56, CD69, CD80, CD83, CD86, CD47, PD-1, PD-L1, Tim-3, Lag-3, recombinant human HER2-Fc chimera and anti-Fc (for detection of HER2.CAR) (BD Bioscience, BioLegends, R&D systems).

Cells were stained with these Abs for 30 minutes at 4 ºC. Live/dead discrimination was accomplished via the inclusion of 7AAD (BD Pharmingen). To obtain live cell numbers, Counting Beads (Life Technologies) were added prior to flow. Stained cells were analyzed using a Gallios flow cytometer with Kaluza software (BD Bioscience) according to manufacturer’s instructions.

***MTS assay***

Ten thousand cells per well were seeded into 96-well plates. Cells were infected with Onc.Ad, HD*PDL1* or CAd-VEC*PD-L1* (Onc.Ad:HDAd =1:10) at the indicated doses and incubated at 37 ºC for 96 hours. Cell viability was analyzed by MTS assay according to manufacture’s instruction (Promega). Cell viability was normalized to those of untreated cells.

***Quantification of vector genome DNA in Ad-infected cells and in Ad-injected tumors***

Total DNA was extracted from infected cells or tumors using a DNeasy Blood and Tissue Kit (QIAGEN). DNA samples were analyzed by quantitative real-time PCR (10 minutes at 95 °C and then 45 cycles of 10 seconds at 95 °C, 15 seconds at 60 °C, and 30 seconds at 72 °C) using a Bio-Rad iQ5 real-time PCR detection system (Bio-Rad), and Applied Biosystems SYBR green PCR master mix (Life Technologies). The following primer sequences were designed and used for the analysis of Onc.Ad backbone: Forward: 5’- TCCGGTTTCTATGCCAAACCT-3’ and Reverse: 5’- TCCTCCGGTGATAATGACAAGA-3’; HDAd backbone: Forward: 5’- TCTGAATAATTTTGTGTTACTCATAGCGCG-3’ and Reverse: 5’- CCCATAAGCTCCTTTTAACTTGTTAAAGTC-3’. To control for template variation among samples, the level of glyceraldehyde-3-phosphate dehydrogenase (GAPDH) was determined for each sample using specific primers Forward: 5’- CATGCCTTCTTGCCTCTTGTCTCTTAGAT-3’ and Reverse: 5’- CCATGGGTGGAATCATATTGGAACATGTAA-3’ ([4](#_ENREF_4)).

***Histological analysis***

Tumors were collected from mice 10 days after HER2.CAR T-cell infusion and were fixed in 4% PFA. Tumors were embedded in OTC compound (Sakura Finetek) ([19](#_ENREF_19)). We prepared 7 μm thick frozen sections blocked with 5% donkey-serum and 0.1% Triton-X in PBS, and then incubated with rabbit polyclonal anti-adenovirus type 5 (ab6982; Abcam Inc.) and mouse monoclonal anti-human CD3 (CI:A3-1; eBioscience). After rinsing, slides were incubated with secondary antibodies (1/1,500 dilution; Alexa Fluor 544-conjugated donkey anti-rabbit IgG and Alexa Fluor 488-conjugated donkey anti-mouse IgG; Invitrogen). Sections were mounted with Prolong Gold with DAPI (Invitrogen), and microscopy was performed using a Zeiss Axioplan 2 microscope and Axio Vision software.

***T cell proliferation assay***

Human cancer cells were seeded in 12-well plates and infected with 1,000 viral particles (vp) per cell of HDAds or treated with 10 µg/ mL of anti-human PD-L1 IgG, Isotype IgG (Biolegend). HER2.CAR T-cells labeled with carboxyfluorescein succinimidyl ester (CFSE; Molecular Probes) were added 24 hours post-infection (effector to target ratio of 1:20) and cultured for five additional days. T-cells were analyzed for CFSE dilution.