**Supplementary legends**

**Supplement 1.** Gating strategy of peripheral blood leukocytes and splenocytes was shown to determine immune subpopulations for multi-color flow cytometry assay.

**Supplement 2. Effect of NK depletion antibody (NK1.1) on other immune cells.** Intraperitoneal injection of NK1.1 was performed for 5 times according to the protocol described in method. The efficiency of NK depletion was evaluated 3 days after final injection. Splenocytes were analyzed for T cell, B cell and NK cells by flow cytometry. A) The gating strategy used for analysis. B) N = 3 mice samples were pooled together for staining CD45, CD3, CD19, CD49b antibodies and percentage of each populations are shown in Bar diagram. Representative scatter plot shows the efficiency of NK depletion.

**Supplement 3. Effect of CD8 T depletion on other immune cells.** Intraperitoneal injection of CD8 T cells depletion antibody was performed for 5 times according to the protocol described in method. The efficiency of NK depletion was evaluated 3 days after final injection. Splenocytes were analyzed for T cell, B cell and NK cells by flow cytometry. Representative scatter plot shows the efficiency of CD8 T cells depletion without affecting other cells.

**Supplement 4. NanoString gene expression analysis in tumor microenvironment.** Pair-wise comparison between PD1 and TUSC2+PD1 combination treatment showed 13 significantly altered genes. P-value and fold changes of all 13 genes were listed. Linear model is used to evaluate the overall treatment effect and contrast is used to make pairwise comparisons of interest. The resulting p values are modeled using the beta-uniform mixture (BUM) model to determine a false discovery rate (FDR) cutoff and identify significantly differentially expressed genes.