**Supplemental Figure 1. Variable expression levels of PD-L1 on HNSCC cells.** HNSCC cells displayed a spectrum of staining intensity of PD-L1 on their cell membrane. H.&E. and PD-L1 immunoperoxidase staining were assessed. Representative pictures of strong, moderate, and weak staining of PD-L1 were shown (right panels), in the corresponding tumor islands shown in the left panels. Pictures were taken at 400×.

**Supplemental Figure 2. PD-1 ligation with bead-coated PD-L1 suppresses p-STAT1 and T-bet upon TCR stimulation, while anti-PD-1 blockade could reverse the suppressive effects of PD-1.** Total TIL were stimulated with anti-CD3/-CD28/hIgG1 or anti-CD3/-CD28/PD-L1 coated beads (bead: cell=10:1) for 48h in the presence of 100ug/mL hIgG4 or anti-PD-1 (BMS-936558), then p-STAT1, T-bet and p-S6 were analyzed by flow cytometry. Summary data of MFI of p-STAT1 (Y701)+ (A), T-bet+ (B) and p-S6 (S235/236)+ (C) in CD8+ and CD4+ TIL with indicated conditions is shown (n=7). Statistical significance was determined by Wilcoxon (non-parametric paired) test. \*p<0.05.

**Supplemental Figure 3. Fusaruside triggers the tyrosine phosphorylation of SHP-2 in human T lymphocytes from PBMC.** CD8 and CD4 T cells were isolated from PBMC from a healthy donor.Then they were cultured with 0, 10, 20, 50uM fusaruside for 6h. After incubation, the cell lysates were subjected to western blot analysis. Densitometry analysis was done by ImageJ (US National Institutes of Health). The western blot result (A) and densitometry analysis (B) are shown.