Supplementary legends:

Suppl. Figure 1. MDSC purity. MDSCs were isolated from spleen and bone marrow of tumor bearing animals. Single cell suspensions of spleen and bone marrow were subjected to Percoll fractionation. Immature myeloid cells were enriched in fraction 2. Fraction 2 cells were stained with anti-Ly6C, CD115, CD11b. $Ly6C^+$ MDSCs were purified by MACS. Staining shows this population to be >96% $CD11b^+Gr\text{-}1^+$.

Suppl. Figure 2. Effective Feridex labeling of MDSCs. $Ly6C^+$ MDSCs were isolated from tumor-bearing mice, incubated with Feridex nanoparticles, and suspended in 0.4ml 2% agarose gel at the designated cell number. **a)** T2 weighted GRE (upper panels) and GRASP (lower panels) MRI images are shown for representative cuts. **b)** From this data a standard curve has been drawn (R^2=0.9251). **c)** Iron-labeled MDSCs were also spun onto glass slides using a cytospin machine and stained with Perl's Prussian Blue to show the presence of iron oxide.

Suppl. Figure 3. VSV does not alter the ability of MDSCs to migrate to tumor sites. Experimental conditions from Figure 3 were replicated using MDSCs passively loaded with VSV-GFP (MOI: 300). Representative mice were sacrificed daily up to day 3 (n=3 per day). The percentage and number of PKH26 positive cells were assessed via FACS.

Suppl. Figure 4. Antibody conjugation improves viral delivery to tumor sites. The same experiment as in Figure 5a was performed. Cells were analyzed via FACS for GFP expression. The cells that had antibody-conjugated

VSV demonstrated significantly greater GFP expression. 2.39×10^4 vs. 2.94×10^4 at MOI: 10, p=0.007; 2.78×10^4 vs. 3.86×10^4 MOI:30, p=0.038; 3.34×10^4 vs. 7.49×10^4 MOI:100, p<0.0001; 3.44×10^4 vs. 8.27×10^4 MOI:300, p<0.0001; 6.19×10^4 vs. 1.23×10^5 at MOI:1000, p=0.002.

Suppl. Figure 5. VSV-MDSCs exhibit more tumor specificity than free virus. Same histologic sections as in Figure 6a are shown at 10× magnification.

Suppl. Figure 6. VSV-MDSC treatment does not result in any appreciable neuropathological toxicity.

No pathological changes or abnormalities were noted upon review of the brains, spinal cords, and peripheral nerve roots of mice in which long-term survival had been achieved following MDSC+Ab+VSV(M3) therapy. Representative sections of H&E staining of the cerebellum, cerebral cortex, spinal cords, and peripheral nerves revealed no disruption of purkinje cell viability, neuron concentration, morphology, axonal myelination, or nuclear density.

Suppl. Figure 7. The survival curves of LLC lung cancer-bearing mice after various treatments. C57BL6 mice were inoculated with 2×10^5 LLC cells via tail vein. Ten days after inoculation, mice were randomized to the following treatment groups: MDSC + Ab + VSV(M3), MDSC + Ab + irradiated VSV(M3), Free VSV(M3), MDSC alone or PBS. MDSC conjugation to viral particles was performed as previously described. For the irradiated VSV(M3) group, viral particles were subjected to UV irradiation for 1 hour prior to conjugation with MDSCs. Treatment with MDSC + Ab + VSV(M3) resulted in a significant survival

benefit over treatment with PBS ($p=0.01$), MDSC alone ($p=0.002$), or free VSV(M3) ($p=0.02$).