**Supplementary Figure S1.** Three dimensional (3D) live cell imaging shows conjugation of cMLVs to the surface of CAR-T cells. Red: DiD-labeled cMLVs; Green: CFSE-labeled CAR-T cell.

**Supplementary Figure S2.** **(A)** Anti-CD19 CAR is stably expressed on the T cell surface. Flow cytometry analysis shows an average of 50% anti-CD19 CAR expression over total CD3+ T cells. The CAR-T cells were stained with rabbit anti-HA and followed by Alex647-anti-rabbit for CAR detection. **(B)** Conjugation of cMLV does not alter CAR-T cell function. Representative flow cytometry analysis of IFNγ+CD3+ T cells, which were conjugated with DiD-labeled cMLV to distinguish the cMLV conjugated population. CART and CART.cMLV(DiD) were co-cultured with SKOV3.CD19 for 6 hours, and intracellular IFN-γ expression was quantified. **(C)** *In vitro* cell cytotoxicity assay of CART and CART.cMLV against K562.CD19 shows no reduction of T cell cytotoxicity. Anti-CD19 CART cells were co-cultured with K562.CD19 cells for 4 hours and cytotoxicity was measured. The negative control is untransduced T cells. (n = 3, mean ± SD; ns, not significant; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001) **(D)** *In vitro* release rates (%) of SCH58261 in cMLVs either unconjugated (cMLV) or conjugated to CAR-T cells (CART.cMLV). Error bars represent the standard deviation of the mean of triplicate experiments.

**Supplementary Figure S3. (A)** A representative flow cytometry analysis of CART.tEGFR cells stained with APC-anti-hEGFR shows tEGFR is stably expressed on *in vitro* culture ofCAR.tEGFR cells 14 days post-transduction. **(B)** Tumor progression was measured with a digital caliper. **(C)** CART.cMLV(SCH) showed significant reduction of tumor size 48 hours after treatment. The summarized statistics of each treatment group at 48 hours post-therapy is shown in bar graphs. (n = 6, mean ± SD; ns, not significant; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001). **(D)** HPLC analysis of intratumoral SCH-58261 concentrations (ug/g) in mice treated with SCH, including the groups CART + cMLV(SCH), and CART.cMLV(SCH). (n = 3, mean ± SD; ns, not significant; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001; \*\*\*\*p<0.0001). **(E)** Cytotoxicity of cMLVs loaded with SCH58261 against SKOV-3 human ovarian cancer cells *in vitro*. Error bars represent the standard deviation of the mean of triplicate experiments.