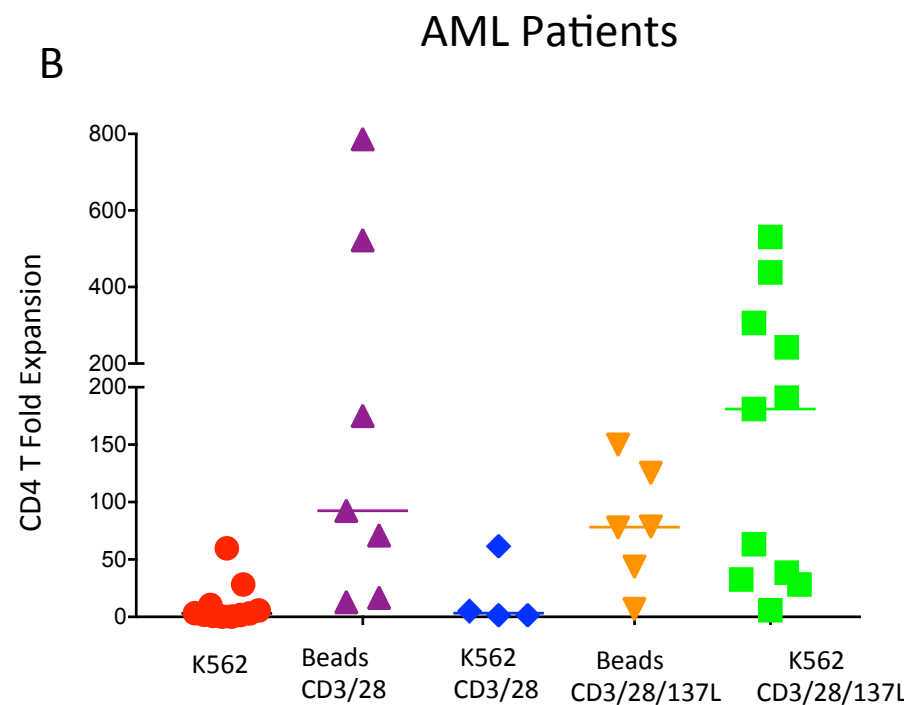
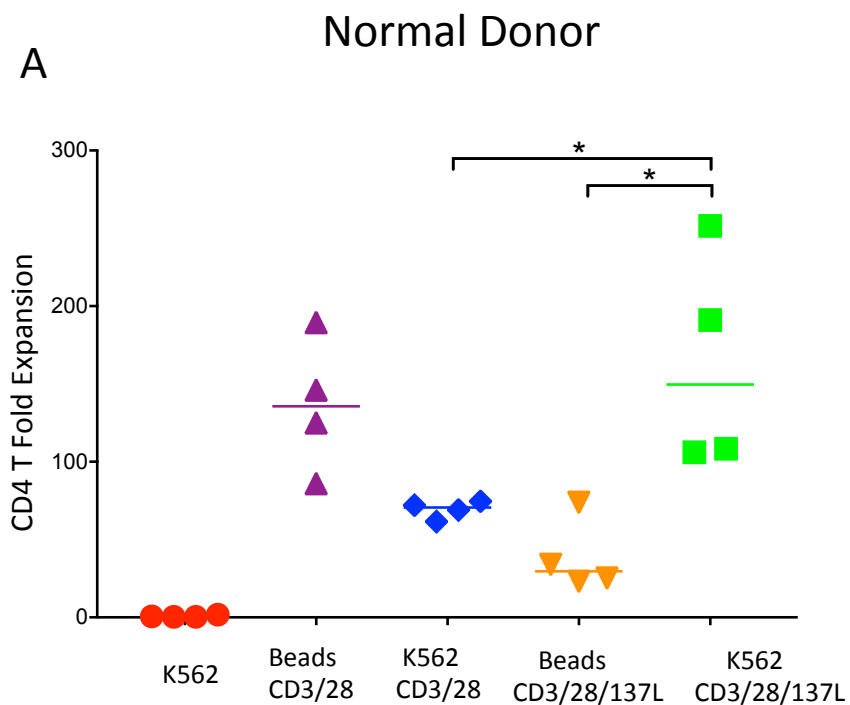
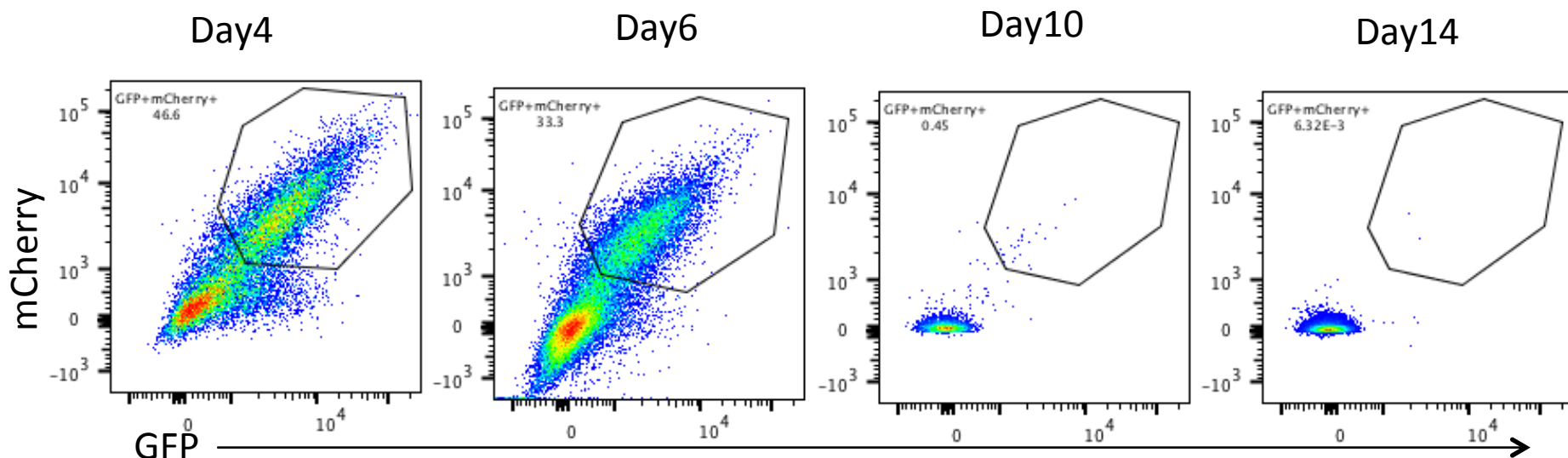


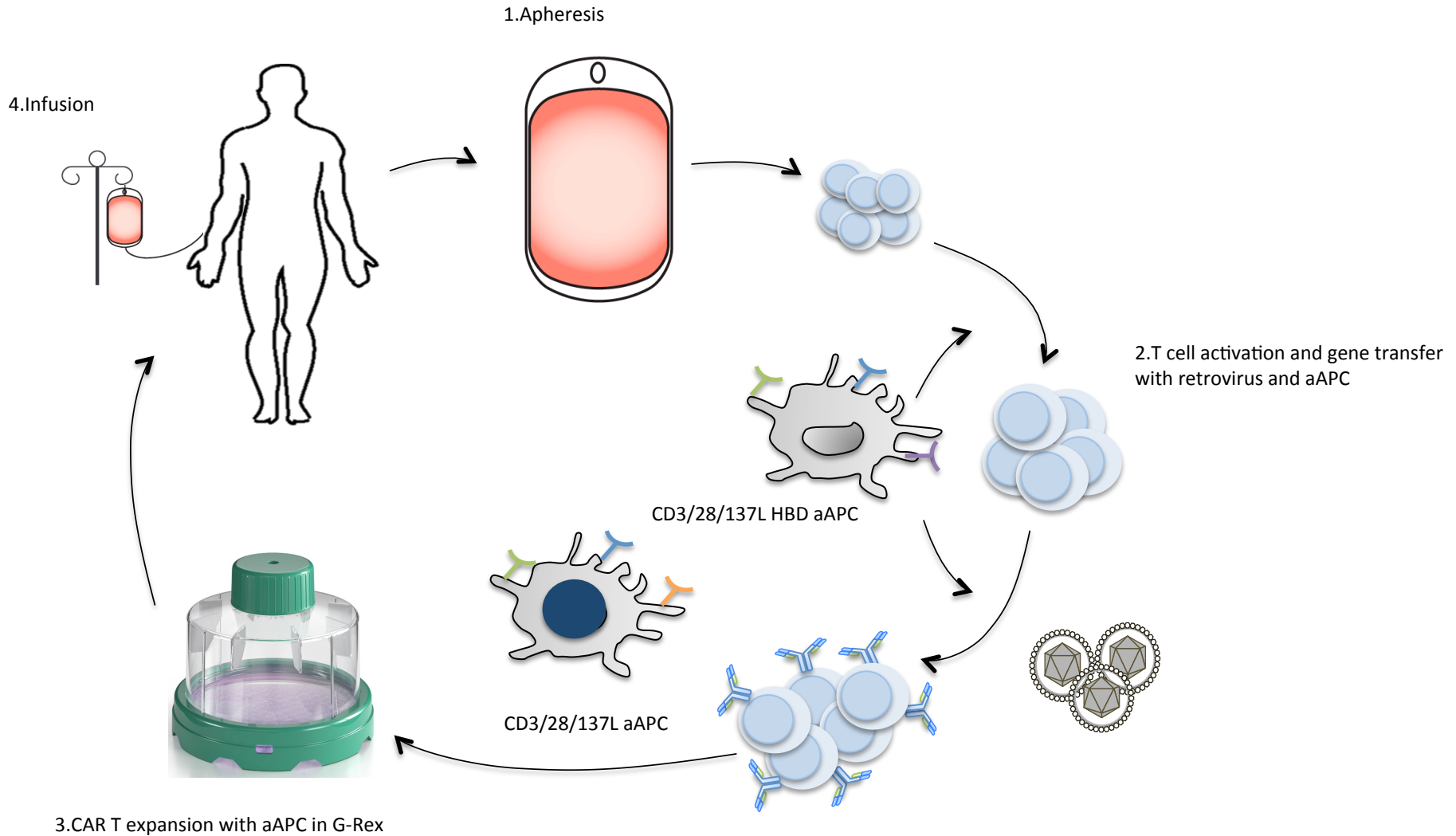
Supplemental Figure 1. Gating Strategy of CD4 and CD8 T cell subsets. The same donor T cells had flow phenotype on day 0 and day 14 while the cells were cultured with K562 empty, K562 CD3/28/137L or CD3/28/137L beads, first gated on live CD3 T cells, then CD4 and CD8, and CD45RO and CD45RA on CD8 T cells. CD45RO<sup>-</sup>CD45RA<sup>-</sup> are effector T cells, CD45RO<sup>+</sup>CD45RA<sup>+</sup> are Naïve T cells, CD45RO<sup>+</sup>CD45RA<sup>-</sup>CCR7<sup>+</sup> are central memory T cells (TCM), CD45RO<sup>+</sup>CD45RA<sup>-</sup>CCR7<sup>-</sup> are effector memory T cells (TEM).



Supplemental Figure 2. T cells isolated from peripheral blood mononuclear cells of healthy donors (left) or AML patients (right) were stimulated with aAPCs or beads for 2 weeks in serum free media in G-REX. T cell expansion was measured by flow cytometer. **(A)** CD4 T cell fold expansion from healthy donors **(B)** CD4 T cell fold expansion from AML patients



Supplemental Figure 3. Human T cells were co-cultured with irradiated aAPCs K562 CD3/CD28/CD137L. CD3<sup>+</sup> T cells were isolated from normal donor's PBMCs, aAPCs were irradiated at 100Gy, T cells and aAPCs were cultured at 3:1 ratio, cells were collected at day 4, day 6, day 10 and day 14. flow cytometry was performed for GFP and mCherry, which are tagged to hCD3scFv and hCD28scFv respectively. As the dot plot demonstrates, aAPCs are gradually diminished after T cell activation.



Supplemental Figure 4. Flow chart of human CAR T cells scaled up production with aAPC. Production begins with (1) leukapheresis of the patient and is then followed by selection of T cells (2), and activation with gene engineering aAPC, which express anti-CD3 scFV + anti-CD28 scFV + Heparin binding domain (HBD). After a few days the activated T cells are incubated with retroviral supernatant to transfer the CAR gene (3). Expansion, washing, and formulation will allow infusion back into the patient (4).