Supplementary Figure 1. Cell processing schema.

Following a two day apheresis collection, cells undergo CD34 bead selection, followed by CD25 bead selection of the CD34 negative flow-through fraction. After CD25 enrichment, cells were stained with mAb against CD4 and CD127 and then further purified by flow cytometric sorting of CD4+CD127(dim) cells. At the time of apheresis, a fraction of apheresis product is removed and cryopreserved to provide the CD3 fraction.

Supplementary Figure 2. Dose escalation schema and DLT definition.

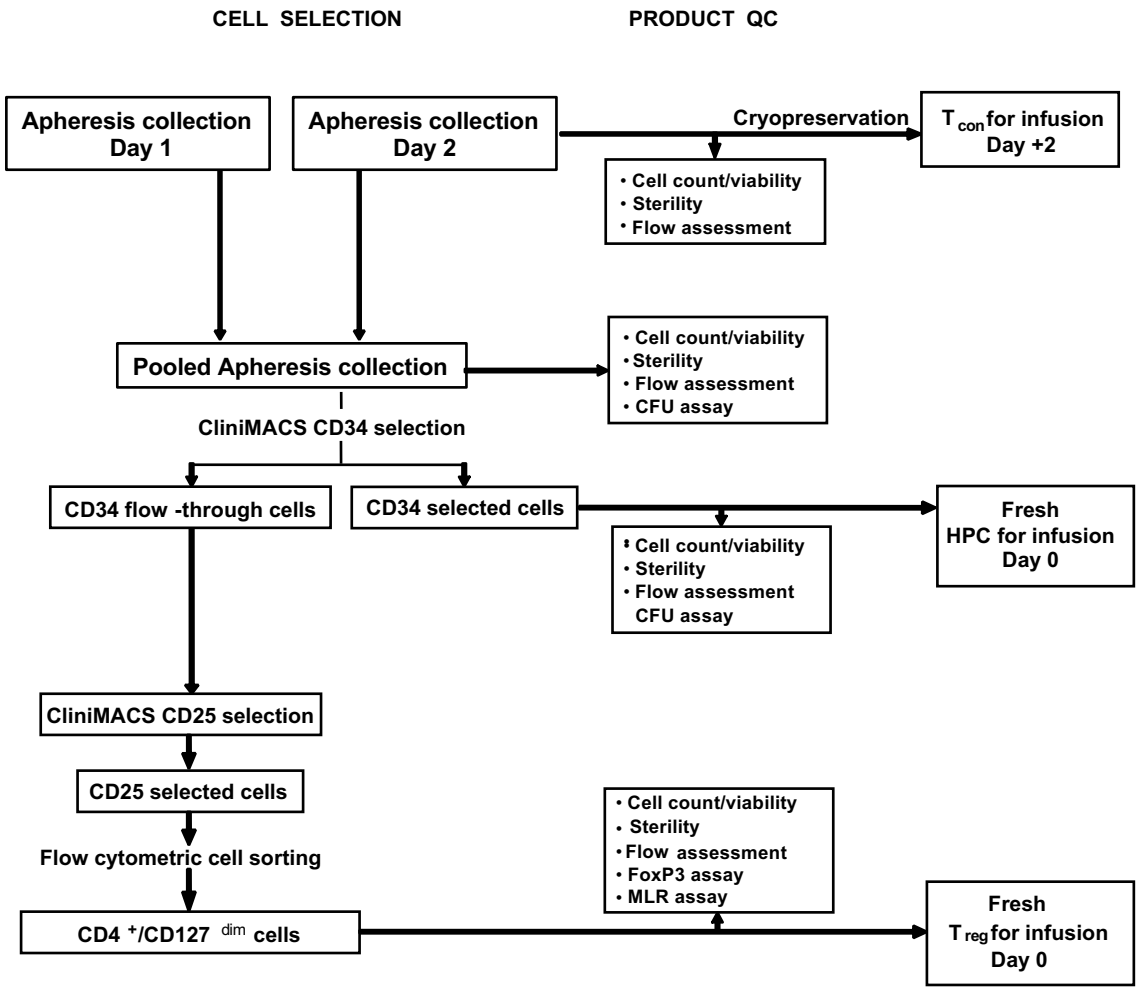
Supplementary Figure 3. Example mixed lymphocyte reaction suppression assay.

Proliferation of responder T cells were assessed by CFSE staining and flow cytometry (upper panels and lower left panel) and thymidine incorporation assay (lower right panel). Ratio of responders T cells (R) to target antigen presenting cells (S) and Treg (T) are provided. All assays repeated in triplicate, with significance of <0.01 (**) by two-tailed student T test.

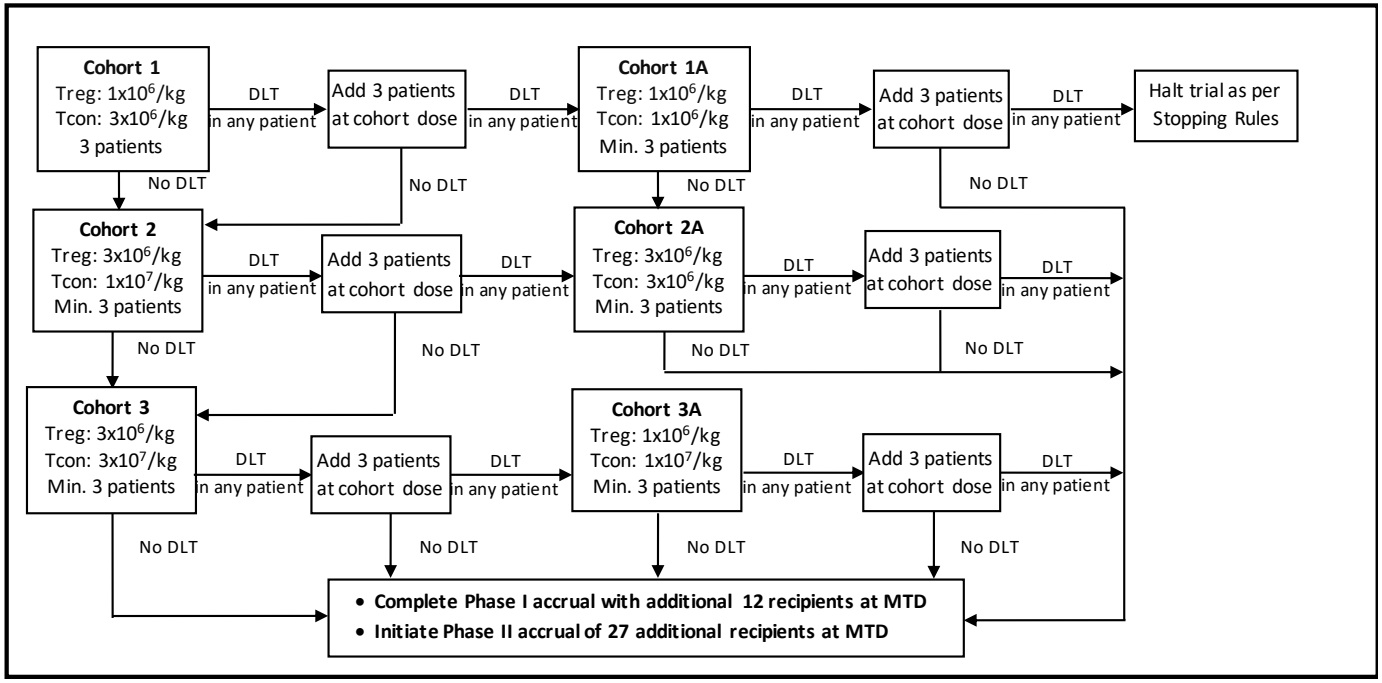
Supplementary Figure 4. Day of neutrophil and platelet engraftment after hematopoietic stem cell transplantation.

Supplementary Figure 5. Treg phenotype by treatment group. Peripheral blood Treg cell expression of surface and intracellular assessed by CyTOF on day +30 after HSCT. with Significance indicated as <0.05(*) and <0.01 (**) by two-tailed student T test.

Supplementary Figure 1.



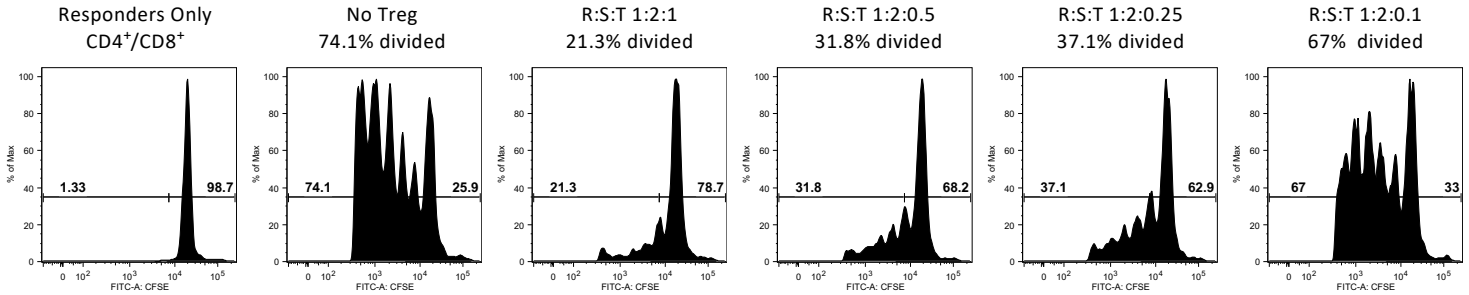
Supplementary Figure 2.

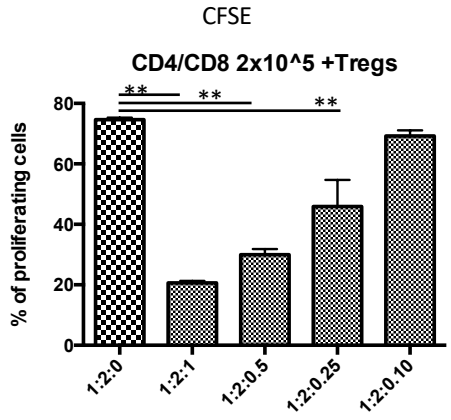


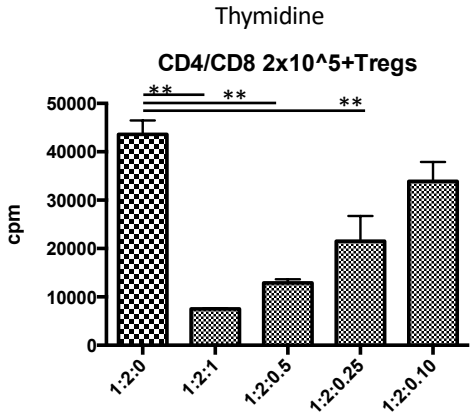
Dose Limiting Toxicity (DLT):

- **Acute GvHD > grade 2**
- **Grade 4 neutropenia lasting to 28 days after HCT**
- **Grade 3 to 5 cytokine/release syndrome/acute infusion reaction**

Supplementary Figure 3.







Supplementary Figure 4.

	Subject	Neutrophil engraftment (Day+)	Platelet engraftment (Day+)
	5126	11	17
Initial protocol:	5201	10	14
Frozen T_{reg}	5534	19	25
	5902	11	16
	6157	11	15
	6666	14	16
	6708	11	14
Modified protocol:	6784	12	10
Fresh T_{reg}	6820	12	10
	6857	11	9
	6948	14	10
	7011	15	22
	Range	9 (10 – 19)	16 (9 – 25)
	Median	11	16

Supplementary Figure 5