CLAIMS

1. A composition comprising T cells enriched in γδ T cells and depleted in αβ T cells wherein the composition comprises greater than 60% γδ T cells, less than about 5% αβ T cells and less than about 25% natural killer (NK) cells, wherein at least about 70% of the cells in the composition are viable and wherein the composition is used as a cell graft infusion in an allogenic hematopoietic stem cell transplantation (HSCT) treatment regimen in a patient wherein the patient has been infused with haploidentical hematopoietic stem cells (HSCs) comprising peripheral blood stem cells (PBSC) prior to infusion with the composition and wherein the patient has further been infused with an agent which provides *in vivo* T cell depletion in the patient prior to infusion with the composition .

2. The composition of claim 1 wherein the composition comprises about 5 x 10^8 γδ T cells/kg or less of the patient's weight, about 1 x 10^7 γδ T cells/kg or less of the patient's weight, or about 5 x 10^6 γδ T cells/kg or less of the patient's weight.

3. The composition of claim 1 wherein the patient has further been infused with an agent which provides *in vivo* T cell depletion in the patient prior to infusion with the composition.

4. The composition of claim 3 wherein the patient is infused with haploidentical hematopoietic stem cells comprising peripheral blood stem cells (PBSC) on day 0.

5. The composition of claim 4 wherein the patient is infused with an agent which provides *in vivo* T cell depletion on about day +1 to day +10 relative to day 0.

6. The composition of claim 5 wherein the patient is infused with the composition on about day +7 to about day +25 relative to day 0; or on about day +7 to about day +9 relative to day 0.

7. The composition of claim 4 wherein the patient is to be administered a Graft vs. Host Disease (GvHD) prophylactic treatment regimen, wherein the patient is to be administered CY, mycophenolate mofetil (MMF), tacrolimus, or any combination thereof on one or more days starting at about day +5 relative to day 0 and continuing until about day +50 relative to day 0.

8. The composition of any one of claims 3 or 5 wherein the agent which provides *in vivo* T cell depletion is cyclophosphamide (CY).

9. The composition of claim 1 for use in the treatment of acute lymphoblastic leukemia (ALL); relapsed ALL; Hodgkin lymphoma (HL); Non-Hodgkin lymphoma (NHL); relapsed HL or NHL; acute myeloid leukemia (AML); relapsed AML; chronic myeloid leukemia (CML); myelodysplastic syndrome (MDS); refractory MDS; astrocytoma; Atypical Teratoid Rhaboid Tumor; brain stem glioma; choroid plexus tumors, carcinoma and papilloma; craniopharyngioma; desmoplastic infantile astrocytoma; germ cell tumor; medulloblastoma; neurofibromatosis; oligodendroglioma; optic glioma; neuroblastoma; Ewing's Sarcoma; or Primitive Neuroectodermal Tumor, wherein the treatment comprises HSCT treatment regimen and wherein the composition is used as a cell graft infusion.

10. The composition of claim 9 wherein the composition comprises about 5 x 10^8 γδ T cells/kg or less of the patient's weight, about 1 x 10^7 γδ T cells/kg or less of the patient's weight, or about 5 x 10^6 γδ T cells/kg or less of the patient's weight.

11. Use of a composition comprising T cells enriched in γδ T cells and depleted in αβ T cells in the manufacture of a medicament as a cell graft infusion in an allogenic hematopoietic stem cell transplantation (HSCT) treatment regimen, wherein the composition comprises greater than 60% γδ T cells, less than about 5% *αβ* T cells and less than about 25% natural killer (NK) cells and at least about 70% of the cells in the composition are viable, and wherein the HSCT treatment regimen is to be infused in a patient that is to be infused with haploidentical hematopoietic stem cells (HSCs) comprising peripheral blood stem cells (PBSC) and with an agent which provides *in vivo* T cell depletion in the patient prior to infusion with the composition.

12. The use of claim 11, wherein the composition comprises about 5 x 10^8 γδ T cells/kg or less of the patient's weight, about 1 x 10^7 γδ T cells/kg or less of the patient's weight, or about 5 x 10^6 γδ T cells/kg or less of the patient's weight.

13. The use of claim 11 wherein the patient is infused with haploidentical hematopoietic stem cells comprising peripheral blood stem cells (PBSC) on day 0.

14. The use of claim 13 wherein the patient is infused with the agent which provides *in vivo* T cell depletion on about day +1 to day +10 relative to day 0.

15. The use of claim 14 wherein the patient is infused with the composition on about day +7 to about day +25 relative to day 0; or on about day +7 to about day +9 relative to day 0.

16. The use of claim 13 wherein the patient is to be administered a Graft vs. Host Disease (GvHD) prophylactic treatment regimen, wherein the patient is to be administered CY, mycophenolate mofetil (MMF), tacrolimus, or any combination thereof on one or more days starting at about day +5 relative to day 0 and continuing until about day +50 relative to day 0.

17. The use of claim 11 or claim 14, wherein the agent which provides *in vivo* T cell depletion is cyclophosphamide (CY).

18. The use of claim 11 for the treatment of acute lymphoblastic leukemia (ALL); relapsed ALL; Hodgkin lymphoma (HL); Non-Hodgkin lymphoma (NHL); relapsed HL or NHL; acute myeloid leukemia (AML); relapsed AML; chronic myeloid leukemia (CML); myelodysplastic syndrome (MDS); refractory MDS; astrocytoma; Atypical Teratoid Rhaboid Tumor; brain stem glioma; choroid plexus tumors, carcinoma and papilloma; craniopharyngioma; desmoplastic infantile astrocytoma; germ cell tumor; medulloblastoma; neurofibromatosis; oligodendroglioma; optic glioma; neuroblastoma; Ewing's Sarcoma; or Primitive Neuroectodermal Tumor, wherein the treatment comprises HSCT treatment regimen and wherein the composition is used as a cell graft infusion.

19. The use of claim 18, wherein the composition comprises about 5 x 10^8 γδ T cells/kg or less of the patient's weight, about 1 x 10^7 γδ T cells/kg or less of the patient's weight, or about 5 x 10^6 γδ T cells/kg or less of the patient's weight.