CLAIMS

1. Use of a composition comprising T cells enriched in γδ T cells and depleted in αβ T cells in the manufacture of a medicament for the treatment of cancer, wherein the composition is to be used 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 as determined by flow cytometric analysis using cell viability stain, and wherein the HSCT treatment regimen comprises a patient 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 prior to infusion with the composition.

2. The use 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 use of claim 1 wherein the patient is to be infused with haploidentical hematopoietic stem cells comprising peripheral blood stem cells (PBSC) on day 0.

4. The use of claim 3 wherein the patient is to be infused with the agent which provides *in vivo* T cell depletion on about day +1 to day +10 relative to day 0.

5. The use of claim 4 wherein the patient is to be 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.

6. The use of claim 3 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.

7. The use of claim 1 or claim 4, wherein the agent which provides *in vivo* T cell depletion is cyclophosphamide (CY).

8. The use of claim 1 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.

9. The use of claim 8, 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.

10. The use of claim 3, wherein the patient is to be administered a preparative chemotherapy regimen prior to day 0.

11. The use of claim 10, wherein the preparative chemotherapy regimen is selected from elected from Fludarabine/Busulfan/total body irradiation for myeloid diseases; total body irradiation/cyclophosphamide (TBI/CY) for acute lymphoblastic leukemia (ALL) or aggressive Non-Hodgkin lymphoma (NHL) or Hodgkin lymphoma (HL) in patients < 40 years of age with no major comorbidities; and Fludarabine/total body irradiation for ALL or lymphoma in patients who are older than 40 years, or at any age with major comorbidities that portends high non-relapse mortality (NRM) with high intensity TBI/CY.

12. The use of claim 1, wherein the composition enriched in γδ T cells and depleted in αβ T cells is prepared by expanding a population of expanded γδ T cells *ex vivo*.

13. The use of claim 1, wherein the PBSCs to be infused are part of a pool of PBSCs from a haploidentical donor, wherein a portion of the PBSCs from the pool are used to produce the cell composition comprising T cells enriched in γδ T cells and depleted in αβ T cells.