CLAIMS

1. A pharmaceutical composition for preventing or treating brain tumors, wherein the pharmaceutical composition comprises mesenchymal stem cells isolated from umbilical cord blood and/or mesenchymal stem cells expanded from said mesenchymal stem cells, wherein the brain tumor cell expresses at least one selected from the group consisting of IL-8 and GRO-α and is a glioma cell.

2. The pharmaceutical composition of claim 1, wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells function as a carrier for gene therapy for treating brain tumors.

3. The pharmaceutical composition of claim 1, wherein an anti-tumor gene is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

4. The pharmaceutical composition of claim 3, wherein the anti-tumor gene is selected from the group consisting of a tumor suppressor gene, an apoptosis-inducing factor gene, a cell cycle regulatory gene and an angiogenesis inhibitor gene.

5. The pharmaceutical composition of claim 4, wherein the tumor suppressor gene is selected from the group consisting of a gene of phosphatase and tensin homolog (PTEN), a gene of Maspin, a gene of RUNX3, a gene of Caveolin-1, a gene of nm23, a gene of Rb protein, a gene of Brush-1, a gene of inhibitor of tumor growth (ING-4), a gene of survivin, a gene of X chromosome linked inhibitor apoptosis protein (XIAP), a gene of neural apoptosis inhibitory protein (NAIP) and genes of proteins related to regulating said genes.

6. The pharmaceutical composition of claim 4, wherein the apoptosis inducing factor gene is selected from the group consisting of a gene of cytokine, a gene of interleukin, a gene of a tumor necrosis factor (TNF), a gene of interferon(INF-α, INF-β, INF-γ), a gene of a colony stimulating factor

(CSFs), a gene of p53, a gene of Apaf-1, a gene of TRAIL, a gene of Caspase, a gene of Bax, a gene of Bad, a gene of FADD, a gene of JNK, a gene of p38 kinase and genes of proteins related to regulating said genes.

7. The pharmaceutical composition of claim 4, wherein the cell cycle regulatory gene is selected from the group consisting of a gene of cdc2, a gene of Cyclin(Cyclin A, Cyclin D, Cyclin E), a gene of cdc25C, a gene of p21WAF, a gene of p16INK4, a gene of CDK(CDK1, CDK2, CDK4, CDK6), a gene of Rb protein, a gene of E2F, an antisense or siRNA thereof and genes of proteins related to regulating said genes.

8. The pharmaceutical composition of claim 4, wherein the angiogenesis inhibitor gene is selected from the group consisting of a gene of thrombospondin-1, a gene of endostatin, a gene of tumstatin, a gene of canstatin, a gene of vastatin, a gene of restin, a gene of a vascular endothelial growth inhibitor, a gene of maspin, a gene of angiopoietins, a gene of 16-kd prolactin fragment and a gene of endorepellin.

9. The pharmaceutical composition of claim 1, wherein a prodrug converting enzyme gene is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

10. The pharmaceutical composition of claim 9, wherein the prodrug converting enzyme gene is selected from cytosine deaminase gene and CYP2B1 gene.

11. The pharmaceutical composition of claim 1, wherein an antisense or siRNA of a gene related to brain tumor is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

12. The pharmaceutical composition of claim 11, wherein the gene related to brain tumor is selected from the group consisting of a gene of Ras family, a gene of c-myc, a gene of abl, a gene of erbB-1, a gene of EGF-R, a gene of Bax, a gene of Apaf-1 interacting protein (APIP), a gene of Wnt-

1-induced secreted protein 1 (WISP-1), a gene of Wnt, a gene of Raf-1, a gene of Src, a gene of Akt, a gene of Erk-1,2 and a gene of BcL-2.

13. The pharmaceutical composition of claim 1, wherein an oncolytic virus is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

14. The pharmaceutical composition of claim 13, wherein the oncolytic virus is selected from Herpes simplex virus and Reovirus type 3.

15. The pharmaceutical composition of any one of claims 1-14, wherein the brain tumor is selected from the group consisting of Astrocytoma, Pilocytic astrocytoma, Low-grade Astrocytoma, Anaplastic Astrocytoma, Glioblastoma Multiforme, Brain Stem Glioma, Ependymoma, Subependymoma, Mixed Glioma, Oligodendroglioma, Optic Nerve Glioma,and a combination thereof.

16. A composition for diagnosing brain tumor or monitoring brain tumor treatment progression, wherein the composition includes the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells, wherein the brain tumor cell expresses at least one selected from the group consisting of IL-8 and GRO-α and is a glioma cell, wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells are labeled with a detectable marker.

17. The composition of claim 16, wherein the detectable marker is selected from luciferase-containing enzyme-based fluorescent detector and Tat peptide-derivatized magnetic nanoparticles.

18. The composition of any one of claims 16 and 17, wherein the brain tumor is selected from the group consisting of Astrocytoma, Pilocytic astrocytoma, Low-grade Astrocytoma, Anaplastic Astrocytoma, Glioblastoma Multiforme, Brain Stem Glioma, Ependymoma, Subependymoma, Mixed Glioma, Oligodendroglioma, Optic Nerve Glioma, and a combination thereof.

19. A kit for treating brain tumor, comprising: a prodrug of anticancer drug; an umbilical cord blood-derived mesenchymal stem cell; and an expression vector having the prodrug converting enzyme gene, wherein the umbilical cord blood-derived mesenchymal stem cell is transfected with the expression vector having a gene encoding the prodrug converting enzyme, wherein the brain tumor cell expresses at least one selected from the group consisting of IL-8 and GRO-α and is a glioma cell, wherein the umbilical cord blood-derived mesenchymal stem cell is mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

20. The kit of claim 19, wherein the gene encoding the prodrug converting enzyme is selected from the consisting of a cytosine deaminase gene, a CYP2B1 gene and a combination thereof.

21. The kit of claim 19 or 20, wherein the brain tumor is selected from the group consisting of Astrocytoma, Pilocytic astrocytoma, Low-grade Astrocytoma, Anaplastic Astrocytoma, Glioblastoma Multiforme, Brain Stem Glioma, Ependymoma, Subependymoma, Mixed Glioma, Oligodendroglioma, Optic Nerve Glioma, anda combination thereof.

22. A gene therapy composition for transferring a therapeutical gene or product thereof to a cell, wherein the gene therapy composition comprises the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells, wherein the cell expresses at least one selected from the group consisting of IL-8 and GRO-α and induces tropism of the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells and the cell is a glioma cell.

23. The gene therapy composition of claim 22, wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells function as a carrier for gene therapy.

24. The gene therapy composition of claim 22, wherein an anti-tumor gene is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

25. The gene therapy composition of claim 24, wherein the anti-tumor gene is selected from the group consisting of a tumor suppressor gene, an apoptosis-inducing factor gene, a cell cycle regulatory gene and an angiogenesis inhibitor gene.

26. The gene therapy composition of claim 25, wherein the tumor suppressor gene is selected from the group consisting of a gene of phosphatase and tensin homolog (PTEN), a gene of Maspin, a gene of RUNX3, a gene of Caveolin-1, a gene of nm23, a gene of Rb protein, a gene of Brush-1, a gene of inhibitor of tumor growth (ING-4), a gene of survivin, a gene of X chromosome linked inhibitor apoptosis protein (XIAP), a gene of neural apoptosis inhibitory protein (NAIP), and genes of proteins related to regulating said genes.

27. The gene therapy composition of claim 25, wherein the apoptosis-inducing factor gene is selected from the group consisting of a gene of cytokine, a gene of interleukin, a gene of a tumor necrosis factor (TNF), a gene of interferon(INF-α, INF-β, INF-γ), a gene of a colony stimulating factor (CSFs), a gene of p53, a gene of Apaf-1, a gene of TRAIL, a gene of Caspase, a gene of Bax, a gene of Bad, a gene of FADD, a gene of JNK, a gene of p38 kinase, and genes of proteins related to regulating said genes.

28. The gene therapy composition of claim 25, wherein the cell cycle regulatory gene is selected from the group consisting of a gene of cdc2, a gene of Cyclin(Cyclin A, Cyclin D, Cyclin E), a gene of cdc25C, a gene of p21WAF, a gene of p16INK4, a gene of CDK(CDK1, CDK2, CDK4, CDK6), a gene of Rb protein, a gene of E2F, an antisense or siRNA thereof, and genes of proteins related to regulating said genes.

29. The gene therapy composition of claim 25, wherein the angiogenesis inhibitor gene is selected from the group consisting of a gene of thrombospondin-1, a gene of endostatin, a gene of tumstatin, a gene of canstatin, a gene of vastatin, a gene of restin, a gene of a vascular endothelial

growth inhibitor, a gene of maspin, a gene of angiopoietins, a gene of 16-kd prolactin fragment and a gene of endorepellin.

30. The gene therapy composition of claim 22, wherein a prodrug converting enzyme gene is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

31. The gene-therapy composition of claim 30, wherein the prodrug converting enzyme gene is selected from the group consisting of cytosine deaminase gene and a CYP2B1 gene.

32. The gene therapy composition of claim 22, wherein an antisense or siRNA of a gene related to tumor is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

33. The gene therapy composition of claim 32, wherein the gene related to tumor is selected from the group consisting of a gene of Ras family, a gene of c-myc, a gene of abl, a gene of erbB-1, a gene of EGF-R, a gene of Bax, a gene of an Apaf-1 interacting protein (APIP), a gene of Wnt-1-induced secreted protein 1 (WISP-1), a gene of Wnt, a gene of Raf-1, a gene of Src, a gene of Akt, a gene of Erk-1,2 and a gene of BcL-2.

34. The gene therapy composition of claim 22, wherein an oncolytic virus is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

35. The gene therapy composition of claim 34, wherein the oncolytic virus is selected from the group consisting of Herpes simplex virus and Reovirus type 3.

36. A composition for diagnosing a disease occurring in a site, comprising a cell or monitoring treatment procession of the disease, wherein the composition comprises the mesenchymal stem cells

isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells, wherein the cell expresses at least one selected from the group consisting of IL-8 and GRO-α and induces tropism of the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells and the cell is a glioma, wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells are labeled with a detectable marker.

37. The composition of claim 36, wherein the detectable marker is selected from the group consisting of a luciferase-containing enzyme based fluorescent detector and Tat peptide-derivatized magnetic nanoparticles.

38. The gene therapy composition of any one of claims 22 to 35, wherein the cell expressing IL-8 or GRO-α is a brain tumor cell.

39. The composition of any one of claims 36 to 37, wherein the cell expressing IL-8 or GRO-α is a brain tumor cell.

Claims

1. A pharmaceutical composition for preventing or treating brain tumors, wherein the pharmaceutical composition comprises mesenchymal stem cells isolated from umbilical cord blood and/or mesenchymal stem cells expanded from said mesenchymal stem cells,
wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells have a tropism for at least one selected from the group consisting of IL-8 and GRO-α and function as a carrier for gene therapy for brain tumors.

2. The pharmaceutical composition of claim 1, wherein an anti-tumor gene is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

3. The pharmaceutical composition of claim 2, wherein the anti-tumor gene is selected from the group consisting of a tumor suppressor gene, an apoptosis-inducing factor gene, a cell cycle regulatory gene and an angiogenesis inhibitor gene.

4. The pharmaceutical composition of claim 3, wherein the tumor suppressor gene is selected from the group consisting of a gene of phosphatase and tensin homolog (PTEN), a gene of Maspin, a gene of RUNX3, a gene of Caveolin-1, a gene of nm23, a gene of Rb protein, a gene of Brush-1, a gene of inhibitor of tumor growth (ING-4), a gene of survivin, a gene of X chromosome linked inhibitor apoptosis protein (XIAP), a gene of neural apoptosis inhibitory protein (NAIP) and genes of proteins related to regulating said genes.

5. The pharmaceutical composition of claim 3, wherein the apoptosis inducing factor gene is selected from the group consisting of a gene of cytokine, a gene of interleukin, a gene of a tumor necrosis factor (TNF), a gene of interferon(INF-α, INF-β, INF-γ), a gene of a colony stimulating factor (CSFs), a gene of p53, a gene of Apaf-1, a gene of TRAIL, a gene of Caspase, a gene of Bax, a gene of Bad, a gene of FADD, a gene of JNK, a gene of p38 kinase and genes of proteins related to regulating said genes.

6. The pharmaceutical composition of claim 3, wherein the cell cycle regulatory gene is selected from the group consisting of a gene of cdc2, a gene of Cyclin (Cyclin A, Cyclin D, Cyclin E), a gene of cdc25C, a gene of p21WAF, a gene of p16INK4, a gene of CDK (CDKI, CDK2, CDK4, CDK6), a gene of Rb protein, a gene of E2F, an antisense or SiRNA thereof and genes of proteins related to regulating said genes.

7. The pharmaceutical composition of claim 3, wherein the angiogenesis inhibitor gene is selected from the group consisting of a gene of thrombospondin-1 , a gene of endostatin, a gene of tumstatin, a gene of canstatin, a gene of vastatin, a gene of restin, a gene of a vascular endothelial growth inhibitor, a gene of maspin, a gene of angiopoietins, a gene of 16-kd prolactin fragment and a gene of endorepellin.

8. The pharmaceutical composition of claim 1, wherein a prodrug converting enzyme gene is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

9. The pharmaceutical composition of claim 8, wherein the prodrug converting enzyme gene is selected from cytosine deaminase gene and CYP2B1 gene.

10. The pharmaceutical composition of claim 1, wherein an antisense or SiRNA of a gene related to brain tumor is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

11. The pharmaceutical composition of claim 10, wherein the gene related to brain tumor is selected from the group consisting of a gene of Ras family, a gene of c-myc, a gene of abl, a gene of erbB-1, a gene of EGF-R, a gene of Bax, a gene of Apaf-1 interacting protein (APIP), a gene of Wnt-1 -induced secreted protein 1 (WISP-1), a gene of Wnt, a gene of Raf-1, a gene of Src, a gene of Akt, a gene of Erk-1, 2 and a gene of BcL-2.

12. The pharmaceutical composition of claim 1, wherein an oncolytic virus is introduced to the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells.

13. The pharmaceutical composition of claim 12, wherein the oncolytic virus is selected from Herpes simplex virus and Reovirus type 3

14. The pharmaceutical composition of any one of claims 1-13, wherein the brain tumor is selected from the group consisting of Astrocytoma, Pilocytic astrocytoma, Low-grade Astrocytoma, Anaplastic Astrocytoma, Glioblastoma Multiforme, Brain Stem Glioma, Ependymoma, Subependymoma, Ganglioneuroma, Mixed Glioma, Oligodendroglioma, Optic Nerve Glioma, Acoustic Neuroma, Chordoma, CNS Lymphoma, Craniopharyngioma, Hemangioblastoma, Medulloblastoma, Meningioma, Pineal Tumors, Pituitary Tumors, Primitive Neuroectodermal Tumors, Rhabdoid Tumors, Schwannoma, Cysts, Neurofibromatosis, Pseudotumor Cerebri and Tuberous Sclerosis.

15. A composition for diagnosing brain tumor or monitoring brain tumor treatment progression, wherein the composition includes mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells,
wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells have a tropism for at least one selected from the group consisting of IL-8 and GRO-α and are labeled with a detectable marker.

16. The composition of claim 15, wherein the detectable marker is selected from luciferase-containing enzyme-based fluorescent detector and Tat peptide-derivatized magnetic nanoparticles.

17. The composition of claims 15 or 16, wherein the brain tumor is selected from the group consisting of Astrocytoma, Pilocytic astrocytoma, Low-grade Astrocytoma, Anaplastic Astrocytoma, Glioblastoma Multiforme, Brain Stem Glioma, Ependymoma, Subependymoma, Ganglioneuroma, Mixed Glioma, Oligodendroglioma, Optic Nerve Glioma, Acoustic Neuroma, Chordoma, CNS Lymphoma, Craniopharyngioma, Hemangioblastoma, Medulloblastoma, Meningioma, Pineal Tumors, Pituitary Tumors, Primitive Neuroectodermal Tumors, Rhabdoid Tumors, Schwannoma, Cysts, Neurofibromatosis, Pseudotumor Cerebri and Tuberous Sclerosis.

18. A kit for treating brain tumor, comprising: an expression vector having a prodrug-converting enzyme gene; mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells; and a prodrug of anticancer drug,
wherein the mesenchymal stem cells isolated from umbilical cord blood and/or the mesenchymal stem cells expanded from said mesenchymal stem cells have a tropism for at least one selected from the group consisting of IL-8 and GRO-α and are transfected with the expression vector having a gene encoding the prodrug-converting enzyme.

19. The kit of claim 18, wherein the gene encoding the prodrug-converting enzyme is selected from a cytosine deaminase gene and a cytochrome P450 2B1 gene.

20. The kit of claims 18 or 19, wherein the brain tumor is selected from the group consisting of Astrocytoma, Pilocytic astrocytoma, Low-grade Astrocytoma, Anaplastic Astrocytoma, Glioblastoma Multiforme, Brain Stem Glioma, Ependymoma, Subependymoma, Gangliomeuroma, Mixed Glioma, Oligodendroglioma, Optic Nerve Glioma, Acoustic Neuroma, Chordoma, CNS Lymphoma, Craniopharyngioma, Hemangioblastoma, Medulloblastoma,

Meningioma, Pineal Tumors, Pituitary Tumors, Primitive Neuroectodermal Tumors, Rhabdoid Tumors, Schwannoma, Cysts, Neurofibromatosis, Pseudotumor Cerebri and Tuberous Sclerosis.