IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT NO.: 5,843,780

ISSUED: December 1, 1998

FOR: PRIMATE EMBRYONIC STEM CELLS

DECLARATION OF DR. JEANNE F. LORING, PH.D.

SIR:

I, Jeanne F. Loring, do declare and state:

1. I received a B.S. in Molecular Biology in 1972 from the University of Washington and a Ph.D. in Developmental Neurobiology in 1979 from the University of Oregon.

2. I am currently a member of the faculty of the Burnham Institute for Medical Research, where I direct human embryonic stem (ES) cell research. I am Director of the Stem Cell Resource, NIH Human Embryonic Stem Cell Training Course, and Co-Director of the NIH Exploratory Center for Human Stem Cell Research. Prior to joining the faculty of the Burnham Institute in January 2004, I held research and management positions at Hana Biologics, GenPharm International, Incyte Genomics, and Arcos BioScience. I have served as member and chair of an NIH clinical neurosciences study section and serve as an advisor for the Alzheimer's

Association, the International Society for Stem Cell Research, the Bill and Melinda Gates Foundation and several stem cell and instrument companies.

3. I have extensive experience in ES cell derivation and culture, including deriving nine of the cell populations listed in 2001 on the NIH registry (CY12, CY30, CY40, CY51, CY81, CY82, CY91, CY92, CY10). I am a named inventor on several patents and patent applications in the fields of stem cell biology and transgenic technology, amongst others. I have authored more than fifty scientific papers, book chapters and essays, and given numerous public presentations regarding topics within my field of scientific expertise, including predominantly ES cells. A copy of my curriculum vitae is attached hereto as Exhibit 1.

4. I am familiar with U.S. Patent No. 5,843,780 to Thomson titled, "Primate Embryonic Stem Cells" ("the '780 patent"). I have reviewed the '780 patent and the entire prosecution history that led to its issuance. I have also specifically reviewed the '780 patent's claims.

5. I am aware that the initial application leading to the '780 patent was filed on January 20, 1995. At that time I was directing embryonic stem cell research at GenPharm International, a biotechnology company focused on using embryonic stem cells to generate medically useful cell lines and generically modified laboratory mouse models. My work focused on derivation of novel embryonic stem cell lines and methods for genetic manipulation of the cells. I was a recipient of NIH grants to fund development of methods for deriving embryonic stem cells from a variety of mammalian species, including the rat (NIH Grants #R43HD028869 and R44HD028869; March 1992 and December 1995).

6. I am familiar with Robertson, et al., "Isolation, Properties, and Karyotype Analysis of Pluripotential (EK) Cell Lines From Normal and Parthenogenetic Embryos," *Teratocarcinoma Stem Cells*, Cold Spring Harbor Laboratory, Cold Spring Harbor, volume 10, pp. 647-663 (1983) ("Robertson 1983") and Robertson, Elizabeth J., "Embryo-Derived Stem Cell Lines," *Teratocarcinomas and Embryonic Stem Cells; A Practical Approach*, Oxford: 1RL Press, Ch. 4:71-112 (1987) ("Robertson 1987"). I have reviewed Robertson 1983 and Robertson 1987 and specifically their teachings regarding the isolation of mammalian ES cells. I am also generally aware of Dr. Robertson's work, as she was among the first to isolate ES cells and I followed the methods provided in Robertson 1987 when I derived my new ES cell lines.

7. Robertson 1983 and Robertson 1987 each taught, in precise detail, a step-by-step process for deriving pluripotential mouse ES cells. The process detailed in Robertson 1983 and Robertson 1987 and the claims of the '780 patent differ only in that Robertson 1983 and Robertson 1987 isolated mouse ES cells while the '780 patent claims primate ES cells. At the time the first application leading to the '780 patent was filed, it was obvious to one of ordinary skill in the art of ES cell derivation that the process taught by Robertson 1983 and Robertson 1987 for isolating mouse ES cells could be used to isolate ES cells of other mammals, including primates as claimed in the '780 patent, with a reasonable expectation of success. In fact, the method for isolating primate ES cells described and claimed in the '780 patent is indeed exactly the same as the process taught by Robertson 1983 and Robertson 1987.

8. I am also familiar with Piedrahita, et al., "On The Isolation Embryonic Stem Cells:

Comparative Behavior Of Murine, Porcine And Ovine Embryos," *Theriogenology*, 34(5):879-901 (1990) ("Piedrahita"). I have reviewed Piedrahita and specifically its teaching regarding the isolation of ES cells for several different mammalian species.

9. Piedrahita taught a method of isolating murine, porcine and ovine ES cells. The only difference between Piedrahita and the claims of the '780 patent is that Piedrahita isolated murine, porcine and ovine ES cells while the '780 patent claims primate ES cells. However, at the time the first application leading to the '780 patent was filed, it was obvious to one of ordinary skill in the art of ES cell derivation that the process taught by Piedrahita for isolating murine, porcine and ovine ES cells could be used to isolate ES cells of other mammals, including primates as claimed in the '780 patent, with a reasonable expectation of success. In fact, the method for isolating primate ES cells described and claimed in the '780 patent is indeed exactly the same as the process taught by Piedrahita.

10. At the time the first application leading to the '780 patent was filed, one of ordinary skill in the art would have combined the teachings of Robertson 1983, Robertson 1987 and Piedrahita, as they each relate to the derivation of mammalian ES cells. Further, Robertson 1987 was written by the same author as Robertson 1983 and both Robertson 1987 and Piedrahita expressly cite Robertson 1983.

11. Robertson 1983, Robertson 1987 and Piedrahita combined teach virtually the same method for isolating ES cells of various mammalian species, including mouse, rodent, pig and sheep. The only difference between their combined teaching and the claims of the '780 patent is

that they isolated mouse, murine, porcine and ovine ES cells while the '780 patent claims primate ES cells. However, at the time the first application leading to the '780 patent was filed, it was obvious to one of ordinary skill in the art of ES cell derivation that the process taught by Robertson 1983, Robertson 1987 and Piedrahita for isolating mouse, murine, porcine and ovine ES cells could be used to isolate ES cells of other mammals, including primates as claimed in the '780 patent, with a reasonable expectation of success. In fact, the method for isolating primate ES cells described and claimed in the '780 patent is indeed exactly the same as the process taught by Robertson 1983, Robertson 1987 and Piedrahita.

12. Well before January 20, 1995, I participated in several conversations with other stem cell scientists regarding how the well-known techniques for deriving mouse and rat ES cells could also be used to isolate human ES cells.

13. On November 10, 1989, I spoke with Dr. Brigid Hogan of Vanderbilt University regarding the derivation of human ES cells, that they could as easily be obtained from humans as mice using the method set forth in Robertson 1983 and Robertson 1987. I noted the discussion in my notes from the conference hosted by the journal Nature entitled "Gene Manipulation in Biology and Human Disease" that was held November 9-10, 1989 at the Copley Plaza Hotel in Boston, MA. A copy of my notebook page that memorializes this conversation is attached hereto as Exhibit 2. Specifically, at the bottom of the page I noted “suggest [woman] making her own ES cells, from parth[enogenically] act[ivated] egg – turn some of those into blood cells.” This refers to a point raised by Dr. Hogan, who suggested that women could make ES cells from their

own eggs, parthenogenically activated. The ES cells derived from the parthenogenic blastocysts could be used to generate bone marrow stem cells as therapy for the woman. My note "But-would be homozygous!" refers to a follow up discussion I had with Dr. Hogan, noting that the ES cells made from parthenogenic embryos would be homozygous.

14. In 1993, while I was employed by GenPharm, I had a conversation with my supervisor at the time, Dr. Robert Kay, and a colleague, Dr. Manley Huang. We discussed obtaining embryos from Dr. Huang's brother, Dr. Tom Huang, who operated an in vitro fertilization clinic in Hawaii, in order to derive human ES cells using the method of Robertson 1983 and Robertson 1987. A copy of my notebook page that memorializes this conversation is attached hereto as Exhibit 3. Specifically, at the top of the page I noted “IVF??” immediately above “Mouse v. Rat” and “Human?” This represented that we were motivated to try using the known method for isolating mouse ES cells to derive human ES cells from embryos because we expected that it would work.

15. On January 12, 1994, I had a telephone conversation with Dr. Phil Iannaccone of Northwestern University about a poster he had presented at a conference I recently attended and our mutual interest in deriving non-mouse ES cells. We specifically discussed methods for deriving non-mouse ES cells and analyzing them. Dr. Iannaccone had derived a candidate rat ES cell line using the method of Robertson 1987 and we discussed other non-mouse ES cell line projects, including specifically human ES cells. At that time, my lab was actively pursuing obtaining IVF embryos for human ES cell derivation. Dr. Iannaccone mentioned to me that a

meeting about non-mouse ES cells was taking place in Australia at the time of our conversation. Dr. Iannaccone also told me that "someone" was already making human ES cells. A copy of my notebook page that memorializes this conversation is attached hereto as Exhibit 4. Specifically, at the very bottom of the page I noted "Someone, not Roger, making some human ES cells" and "Meeting now in Australia for non mouse ES."

16. I have not been compensated by either the Foundation for Taxpayer and Consumer Rights, the Public Patent Foundation or any other party in exchange for this declaration.

17. I declare that all statements made herein of my own knowledge are true and that all statements made herein on information are believed to be true. I further declare that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment or both under Section 1001, Title 18 of the United States Code.

_____ _____

Date JEANNE F. LORING, PH.D.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT NO.: 6,200,806

ISSUED: March 13, 2001

FOR: PRIMATE EMBRYONIC STEM CELLS

DECLARATION OF DR. JEANNE F. LORING, PH.D.

SIR:

I, Jeanne F. Loring, do declare and state:

1. I received a B.S. in Molecular Biology in 1972 from the University of Washington and a Ph.D. in Developmental Neurobiology in 1979 from the University of Oregon.

2. I am currently a member of the faculty of the Burnham Institute for Medical Research, where I direct human embryonic stem (ES) cell research. I am Director of the Stem Cell Resource, NIH Human Embryonic Stem Cell Training Course, and Co-Director of the NIH Exploratory Center for Human Stem Cell Research. Prior to joining the faculty of the Burnham Institute in January 2004, I held research and management positions at Hana Biologics, GenPharm International, Incyte Genomics, and Arcos BioScience. I have served as member and chair of an NIH clinical neurosciences study section and serve as an advisor for the Alzheimer's

Association, the International Society for Stem Cell Research, the Bill and Melinda Gates Foundation and several stem cell and instrument companies.

3. I have extensive experience in ES cell derivation and culture, including deriving nine of the cell populations listed in 2001 on the NIH registry (CY12, CY30, CY40, CY51, CY81, CY82, CY91, CY92, CY10). I am a named inventor on several patents and patent applications in the fields of stem cell biology and transgenic technology, amongst others. I have authored more than fifty scientific papers, book chapters and essays, and given numerous public presentations regarding topics within my field of scientific expertise, including predominantly ES cells. A copy of my curriculum vitae is attached hereto as Exhibit 1.

4. I am familiar with U.S. Patent No. 6,200,806 to Thomson titled, “Primate Embryonic Stem Cells” (“the '806 patent”). I have reviewed the '806 patent and the entire prosecution history that led to its issuance. I have also specifically reviewed the '806 patent's claims.

5. I am aware that the initial application leading to the '806 patent was filed on January 20, 1995. At that time I was directing embryonic stem cell research at GenPharm International, a biotechnology company focused on using embryonic stem cells to generate medically useful cell lines and generically modified laboratory mouse models. My work focused on derivation of novel embryonic stem cell lines and methods for genetic manipulation of the cells. I was a recipient of NIH grants to fund development of methods for deriving embryonic stem cells from a variety of mammalian species, including the rat (NIH Grants #R43HD028869 and R44HD028869; March 1992 and December 1995).

6. I am familiar with Robertson, et al., "Isolation, Properties, and Karyotype Analysis of Pluripotential (EK) Cell Lines From Normal and Parthenogenetic Embryos," *Teratocarcinoma Stem Cells*, Cold Spring Harbor Laboratory, Cold Spring Harbor, volume 10, pp. 647-663 (1983) ("Robertson 1983") and Robertson, Elizabeth J., "Embryo-Derived Stem Cell Lines," *Teratocarcinomas and Embryonic Stem Cells; A Practical Approach*, Oxford: 1RL Press, Ch. 4:71-112 (1987) ("Robertson 1987"). I have reviewed Robertson 1983 and Robertson 1987 and specifically their teachings regarding the isolation of mammalian ES cells. I am also generally aware of Dr. Robertson's work, as she was among the first to isolate ES cells and I followed the methods provided in Robertson 1987 when I derived my new ES cell lines.

7. Robertson 1983 and Robertson 1987 each taught, in precise detail, a step-by-step process for deriving pluripotential mouse ES cells. The process detailed in Robertson 1983 and Robertson 1987 and the claims of the '806 patent differ only in that Robertson 1983 and Robertson 1987 isolated mouse ES cells while the '806 patent claims human ES cells. At the time the first application leading to the '806 patent was filed, it was obvious to one of ordinary skill in the art of ES cell derivation that the process taught by Robertson 1983 and Robertson 1987 for isolating mouse ES cells could be used to isolate ES cells of other mammals, including humans as claimed in the '806 patent, with a reasonable expectation of success. In fact, the method for isolating human ES cells described and claimed in the '806 patent is indeed exactly the same as the process taught by Robertson 1983 and Robertson 1987.

8. I am also familiar with Piedrahita, et al., "On The Isolation Embryonic Stem Cells:

Comparative Behavior Of Murine, Porcine And Ovine Embryos," *Theriogenology*, 34(5):879-901 (1990) ("Piedrahita"). I have reviewed Piedrahita and specifically its teaching regarding the isolation of ES cells for several different mammalian species.

9. Piedrahita taught a method of isolating murine, porcine and ovine ES cells. The only difference between Piedrahita and the claims of the '806 patent is that Piedrahita isolated murine, porcine and ovine ES cells while the '806 patent claims human ES cells. However, at the time the first application leading to the '806 patent was filed, it was obvious to one of ordinary skill in the art of ES cell derivation that the process taught by Piedrahita for isolating murine, porcine and ovine ES cells could be used to isolate ES cells of other mammals, including humans as claimed in the '806 patent, with a reasonable expectation of success. In fact, the method for isolating human ES cells described and claimed in the '806 patent is indeed exactly the same as the process taught by Piedrahita.

10. At the time the first application leading to the '806 patent was filed, one of ordinary skill in the art would have combined the teachings of Robertson 1983, Robertson 1987 and Piedrahita, as they each relate to the derivation of mammalian ES cells. Further, Robertson 1987 was written by the same author as Robertson 1983 and both Robertson 1987 and Piedrahita expressly cite Robertson 1983.

11. Robertson 1983, Robertson 1987 and Piedrahita combined teach virtually the same method for isolating ES cells of various mammalian species, including mouse, rodent, pig and sheep. The only difference between their combined teaching and the claims of the '806 patent is

that they isolated mouse, murine, porcine and ovine ES cells while the '806 patent claims human ES cells. However, at the time the first application leading to the '806 patent was filed, it was obvious to one of ordinary skill in the art of ES cell derivation that the process taught by Robertson 1983, Robertson 1987 and Piedrahita for isolating mouse, murine, porcine and ovine ES cells could be used to isolate ES cells of other mammals, including humans as claimed in the '806 patent, with a reasonable expectation of success. In fact, the method for isolating human ES cells described and claimed in the '806 patent is indeed exactly the same as the process taught by Robertson 1983, Robertson 1987 and Piedrahita.

12. Well before January 20, 1995, I participated in several conversations with other stem cell scientists regarding how the well-known techniques for deriving mouse and rat ES cells could also be used to isolate human ES cells.

13. On November 10, 1989, I spoke with Dr. Brigid Hogan of Vanderbilt University regarding the derivation of human ES cells, that they could as easily be obtained from humans as mice using the method set forth in Robertson 1983 and Robertson 1987. I noted the discussion in my notes from the conference hosted by the journal Nature entitled "Gene Manipulation in Biology and Human Disease" that was held November 9-10, 1989 at the Copley Plaza Hotel in Boston, MA. A copy of my notebook page that memorializes this conversation is attached hereto as Exhibit 2. Specifically, at the bottom of the page I noted “suggest [woman] making her own ES cells, from parth[enogenically] act[ivated] egg – turn some of those into blood cells.” This refers to a point raised by Dr. Hogan, who suggested that women could make ES cells from their

own eggs, parthenogenically activated. The ES cells derived from the parthenogenic blastocysts could be used to generate bone marrow stem cells as therapy for the woman. My note "But-would be homozygous!" refers to a follow up discussion I had with Dr. Hogan, noting that the ES cells made from parthenogenic embryos would be homozygous.

14. In 1993, while I was employed by GenPharm, I had a conversation with my supervisor at the time, Dr. Robert Kay, and a colleague, Dr. Manley Huang. We discussed obtaining embryos from Dr. Huang's brother, Dr. Tom Huang, who operated an in vitro fertilization clinic in Hawaii, in order to derive human ES cells using the method of Robertson 1983 and Robertson 1987. A copy of my notebook page that memorializes this conversation is attached hereto as Exhibit 3. Specifically, at the top of the page I noted “IVF??” immediately above “Mouse v. Rat” and “Human?” This represented that we were motivated to try using the known method for isolating mouse ES cells to derive human ES cells from embryos because we expected that it would work.

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16. I have not been compensated by either the Foundation for Taxpayer and Consumer Rights, the Public Patent Foundation or any other party in exchange for this declaration.

17. I declare that all statements made herein of my own knowledge are true and that all statements made herein on information are believed to be true. I further declare that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment or both under Section 1001, Title 18 of the United States Code.

_____ _____

Date JEANNE F. LORING, PH.D.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT NO.: 7,029,913

ISSUED: April 18, 2006

FOR: PRIMATE EMBRYONIC STEM CELLS

DECLARATION OF DR. JEANNE F. LORING, PH.D.

SIR:

I, Jeanne F. Loring, do declare and state:

1. I received a B.S. in Molecular Biology in 1972 from the University of Washington and a Ph.D. in Developmental Neurobiology in 1979 from the University of Oregon.

2. I am currently a member of the faculty of the Burnham Institute for Medical Research, where I direct human embryonic stem (ES) cell research. I am Director of the Stem Cell Resource, NIH Human Embryonic Stem Cell Training Course, and Co-Director of the NIH Exploratory Center for Human Stem Cell Research. Prior to joining the faculty of the Burnham Institute in January 2004, I held research and management positions at Hana Biologics, GenPharm International, Incyte Genomics, and Arcos BioScience. I have served as member and chair of an NIH clinical neurosciences study section and serve as an advisor for the Alzheimer's

Association, the International Society for Stem Cell Research, the Bill and Melinda Gates Foundation and several stem cell and instrument companies.

3. I have extensive experience in ES cell derivation and culture, including deriving nine of the cell populations listed in 2001 on the NIH registry (CY12, CY30, CY40, CY51, CY81, CY82, CY91, CY92, CY10). I am a named inventor on several patents and patent applications in the fields of stem cell biology and transgenic technology, amongst others. I have authored more than fifty scientific papers, book chapters and essays, and given numerous public presentations regarding topics within my field of scientific expertise, including predominantly ES cells. A copy of my curriculum vitae is attached hereto as Exhibit 1.

4. I am familiar with U.S. Patent No. 7,029,913 to Thomson titled, "Primate Embryonic Stem Cells" ("the '913 patent"). I have reviewed the '913 patent and the entire prosecution history that led to its issuance. I have also specifically reviewed the '913 patent's claims.

5. I am aware that the initial application leading to the '913 patent was filed on January 20, 1995. At that time I was directing embryonic stem cell research at GenPharm International, a biotechnology company focused on using embryonic stem cells to generate medically useful cell lines and generically modified laboratory mouse models. My work focused on derivation of novel embryonic stem cell lines and methods for genetic manipulation of the cells. I was a recipient of NIH grants to fund development of methods for deriving embryonic stem cells from a variety of mammalian species, including the rat (NIH Grants #R43HD028869 and R44HD028869; March 1992 and December 1995).

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Comparative Behavior Of Murine, Porcine And Ovine Embryos," *Theriogenology*, 34(5):879-901 (1990) ("Piedrahita"). I have reviewed Piedrahita and specifically its teaching regarding the isolation of ES cells for several different mammalian species.

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own eggs, parthenogenically activated. The ES cells derived from the parthenogenic blastocysts could be used to generate bone marrow stem cells as therapy for the woman. My note "But-would be homozygous!" refers to a follow up discussion I had with Dr. Hogan, noting that the ES cells made from parthenogenic embryos would be homozygous.

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meeting about non-mouse ES cells was taking place in Australia at the time of our conversation. Dr. Iannaccone also told me that "someone" was already making human ES cells. A copy of my notebook page that memorializes this conversation is attached hereto as Exhibit 4. Specifically, at the very bottom of the page I noted "Someone, not Roger, making some human ES cells" and "Meeting now in Australia for non mouse ES."

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17. I declare that all statements made herein of my own knowledge are true and that all statements made herein on information are believed to be true. I further declare that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment or both under Section 1001, Title 18 of the United States Code.

_____ _____

Date JEANNE F. LORING, PH.D.

EXHIBIT 1

CURRICULUM VITAE

DR. JEANNE FRANCES LORING, PH.D.

Education

B.S. Molecular Biology (magna cum laude), University of Washington, Seattle, WA, 1972
Ph.D. Develop. Biology, University of Oregon, Eugene, OR, 1979
PostDoc Neurobiology, University of Iowa, Iowa City, IA, 1980-1981

Research and Professional Experience

1982-1987	Assistant Professor/ Lecturer in Embryology, Department of Zoology, University of California, Davis, CA.
1987-1989	Senior Staff Scientist, Parkinson's Disease Research Program, Hana Biologics, Inc. Alameda, CA.
1989-1995	Senior Scientist, Molecular Genetics. Head of Embryonic Stem Cell Research and Alzheimer's Disease Research Programs, GenPharm International, Inc. Mountain View, CA.
1995-1997	Senior Research Fellow, Molecular Neurobiology, Molecular Dynamics, Inc. Sunnyvale, CA
1997-2001	Senior Director (Transgenics and Neurobiology). Incyte Genomics, Inc., Palo Alto, CA
1997-1999	President and Founder, ARC Genomics, Foster City, CA.
1999-2002	Chief Scientific Officer and Founder, Arcos BioScience, Inc., San Mateo, CA. (merged with Cythera, Inc in 2002, and with Bresagen and Novacell in 2004)
2002-Pres.	Principal Biotechnology Consultant. Stem cells, Alzheimer's disease, microarray analysis. ArcGen, Inc. San Diego, CA.
2004-Pres.	Director of Human Stem Cell Resource, Co-director of NIH Exploratory Center, Adj Assoc Professor, Program on Stem Cells and Regeneration. Del E. Webb Center for Neuroscience and Aging, Burnham Institute for Medical Research, La Jolla, CA

Honors and Awards

Phi Beta Kappa (1972); National Merit Undergraduate Scholarship (Doherty Foundation) (1968-1972);; National Science Foundation Predoctoral Fellowship (individual award, 1973-1977); National Institutes of Health Predoctoral Traineeship, Genetics (1978-1979); National Institutes of Health Postdoctoral Fellowship, Neurobiology (1980).

Professional Societies: Society for Neuroscience**,** American Society for Neural Transplantation and Repair, International Society for Stem Cell Research (ISSCR)**,** American Society for Cell Biology, Society for Developmental Biology, American Society for Neurochemistry.

Scientific Review Boards

Ad hoc member, NIH Study Sections: Cell Biology-1; Immunology Special Emphasis Panel; MDCN-6, Stem Cell Research Special Emphasis Panel; Human ES Cell Infrastructure Grant Review, (1992-present)

NLS-3 (Neurological Sciences) Study Section, NIH (1995-1997)

Review Board of the Medical and Scientific Advisory Council, Alzheimer's Association (1996-present)

BDCN-3/CDIN (Brain Disorders and Clinical Neuroscience/Cell Death and Injury in Neurodegeneration) Study Section, NIH (1998-present; Chair, 2004-2006)

Patents:

Methods For Producing Recombinant Mammalian Cells Harboring A Yeast Artificial Chromosome. US Patent 5,981,175 (1999)

Down Syndrome Critical Region 1-Like 1 Proteins. US Patent 6,524,819 (2003)

Transgenic Mouse Expressing Human Tau Gene. US Patent 6,593,512 (2003)

Alzheimer's Disease-associated Genes. US Patent 6,682,888 (2004)

Representative Publications:

Loring, J.F., D.L. Barker, and C.A. Erickson. (1988) Migration and differentiation of neural crest and ventral neural tube cells *in vitro*: Implications to *in vivo* studies of the neural crest. J. Neuroscience 8: 1001-1015.

C.A. Erickson, J.F. Loring, and S. Lester. (1989) Patterns of HNK-1 immunoreactive neural crest cells in the rat embryo. Develop. Biol. 134: 112-118.

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Research Support Summary

1982-1987: Development of the vertebrate neural crest. Role on Project: Co-investigator. Funded by UC Davis and NIH.

1987-1989: Stem cell therapy for Parkinson's Disease. Role on Project: Project Director. Funded by Hana Biologics.

1989-1991: Homologous recombination in mouse embryonic stem cells. Role on Project: Project director. Funded by GenPharm International.

1991-1994: Development of genomic transgenic animal technology. Role on Project: Co-PI. Funded by NIST Advanced Technology Program. ($2M)

1992-1997: Derivation of Rat Embryonic Stem Cells. Role on Project: Principal Investigator.. Funded by NIH ($650K).

1998-2000: Development and validation of a microarray platform: Application to embryonic stem cells and Alzheimer's disease. Role on project: Senior Director. Funded by Incyte Genomics, Inc. (Budget ca $2.5M)

2001-2002: Gene expression profiles for transplantable cells. Role on project: Principal Investigator. (Arcos BioScience). Funded by NIH ($200K)

2002-2003: Development of human embryonic cell lines. Role on project: Co-PI (Cythera, Inc). Funded by NIH ($200K)

2003-2009: Human Embryonic Stem Cell Culture Training Course. Role on Project: Co-PI. Funded by NIH ($900K)

2005-2008: The Stem Cell Center at the Burnham Institute. Role on Project: Co-PI. Funded by NIH ($1.8M)

2005-2008: Stem Cells as Delivery Vehicles to Target Amyloid Plaques and Tangles. Role on Project: Principal Investigator. Funded by NIH ($240K)

2006-2009: Human Embryonic Stem Cells: Comprehensive Training Program. Role on Project: Principal Investigator: Funded by NIH ($450K)

EXHIBIT 2

NOVEMBER 10, 1989 NOTEBOOK PAGE

Q How to deliver genes in vivo - must use replication incomp viruses, and those don't get to all cells.
how about nature's solution —
mouse mammary tumor virus - ingested in milk, crosses gut epithel.; then gets to mam. epithel.
Mullegan - natural receptor mech.
ie for liver receptors - can infect over & over again to ↑ integr.
not integrated

liposomes — ↓ packages of DNA? target?

Q - suggest ♀ making her own ES cells - from parts act. eg - turn some of those into blood cells.
But - would be homozygous!

EXHIBIT 3

1993 NOTEBOOK PAGE

Bob ?

IVF ??
Mouse vs Rat
Human ?

Marley —
Tom

EXHIBIT 4

JANUARY 12, 1994 NOTEBOOK PAGE

1/12/94
Phil Iannaccone.
called me (312 # 503-5232)
pmi@nwu.edu.

Needs extent of chimerism
for paper - estrase, perhaps - polymorph
Has submitted Cell, Nature, Science
Development - rejected.
Will acknowledge me for methods
will send.
Has applied for patent -.
Univ. wants non exclusive.
(got R01 4 yrs.)
Patent paid for by Scion
Center Schmidt.
(assoc of Martin Evans??)
GS. had prev. contact of GP.
GS wants exclusive licensee.

ES cells not germline.

Testing: occult. technique re cond. that
(continued). make PVG rats happy no good for cells.
friend of Roger Pedersons
- Someone, not Roger, making
Some mechimerism ES.

Now in Australia for
non mouse ES.