BEDFORD STEM CELL
RESEARCH FOUNDATION

The Potential for Miracles

Recent advances in stem cell research have raised the hope of curing diseases once believed to be incurable: heart failure, spinal cord injury, diabetes, Alzheimer's, Parkinson's, AIDS. These diseases are the result of the death of specific types of cells, such as nerves and the cells in the pancreas that produce insulin. For reasons that are not understood, new cells do not automatically replace defective cells in some tissues such as spinal cord, brain and pancreas.

Other tissues, such as skin and blood, routinely replace dying cells with new cells recruited from reserve supplies that maintain the potential to become active and multiply when needed. [FIG 1] Such cells are called stem cells.

Skin stem cells are examples of adult stem cells, so-called because they can become only one type of tissue, e.g. skin. In contrast, cells from early embryos are pluripotent, that is, they have the potential to become all types of tissues. Experiments with laboratory mice have demonstrated that pluripotent stem cells can replace dead cells in all organs including the heart, which does not have its own supply of stem cells. These encouraging results have spawned studies to apply stem cell therapy to humans.

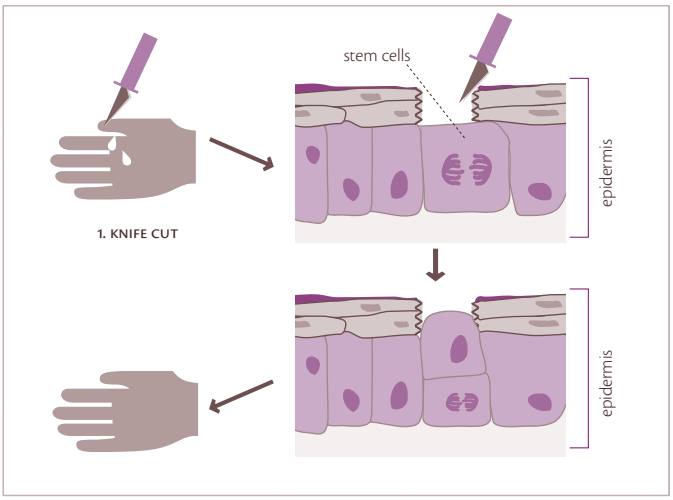

FIG 1. Adult skin stem cells in epidermis generate new cells for healing process.

***Founded in 1996,* the Bedford Stem Cell Research Foundation is a biomedical institute that exists to conduct stem cell and related research for diseases and conditions that currently have no effective methods of treatment or cure.**

The Foundation

Bedford Stem Cell Research Foundation is at the forefront of stem cell and related research. Founded in 1996, the Foundation has an established community of scientists investigating stem cell therapies. Committed to conducting ethical research, the Foundation relies on its Ethics Advisory Board to assist with the complex moral questions raised by some aspects of stem cell research. The Ethics Advisory Board, like the Foundation's Board of Trustees, has no financial stake in the research; the progress of stem cell science and the health of those afflicted are their sole concern.

Unlike most of the pluripotent stem cell research being conducted in the United States with stem cells derived from "left-over" embryos in fertility clinics, BSCRF's research efforts focus on using unfertilized human eggs to derive stem cells. There are several advantages to using unfertilized human eggs, including greater therapeutic compatibility. Two methods exist for deriving stem cells from unfertilized eggs, Parthenogenesis and Nuclear Transplantation. BSCRF scientists are currently pursuing both.

Stem Cells from Unfertilized Eggs (Parthenotes)

Unfertilized human eggs can be activated in the laboratory (FIG 2), without sperm, to begin to divide into smaller cells that will give rise to stem cells that carry the same potential as embryonic stem cells. This process for deriving stem cells, known as Parthenogenesis, was first reported in monkey eggs by BSCRF Trustee, Dr. Jose Cibelli, in 2001. Dr. Cibelli and BSCRF Director, Dr. Ann Kiessling, extended the work to human eggs in 2001. Their research showed for the first time that, like the monkey eggs, human eggs can also be activated in the laboratory to divide into many cells, giving hope that a line of human parthenote stem cells could be developed. Lack of funding stopped the research, however, before stem cells were developed.

In 2004, thanks to the generous support of the Foundation benefactors, the work began again. At the same time, The Centre for Life in Newcastle, England, also recognized the potential for Parthenote stem cells, and announced a similar program. Currently, The Centre, and The BSCRF are the only two facilities in the world that have announced plans to conduct this research.

Stem Cells from Nuclear Transplantation (Ovasomes)

Nuclear transplantation, sometimes referred to as "therapeutic cloning," involves transferring the genes from a patient (contained within the nucleus of his/her adult cell) into an egg whose own genes have been removed. Scientists trying to understand how cells become committed to specific tissues and organs first developed this technology over two decades ago.

The scientists discovered that the genes from some adult cells were capable of directing the egg to develop into an offspring, thus proving the adult cells still contained all the original genes from the fertilized egg. This line of research has yielded highly important information about how eggs develop into embryos, and about many diseases.

The research also led to cloning Dolly the sheep in 1997, an event that has caused fear the technology could be used to clone a human. Although the early steps in the process (FIG 2) are similar, the purpose of the nuclear transplant blastocyst is to provide stem cells, not embryos. Laws prohibiting human reproduction by nuclear transplantation, but supporting stem cell derivation, have been enacted by a few states, including Massachusetts.

Most stem cell research conducted in the United States utilizes embryonic stem cells that are harvested from eggs that have been fertilized by sperm. These stem cells are not only highly controversial, they also present the same risk of tissue rejection as any other tissue or organ transplant procedure. In contrast, Parthenote and Ovasome Stem Cells can be custom-derived for each patient. As recently reported in Science magazine (July, 2006), the BSCRF egg donor program for stem cell research is unique in the world.

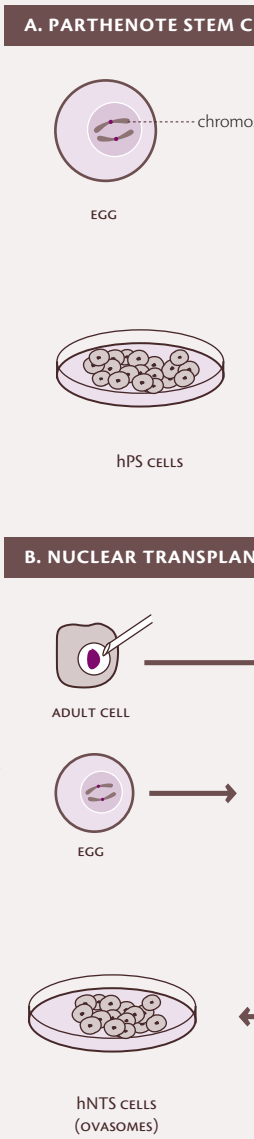

FIG 2. Schematic of the derivation
activated artificially without sper
egg's genes (within chromosomes
the blastocyst are the new parthe
eggs that have had their genes re
into smaller cells to the blastocys

Currently at the Foundation

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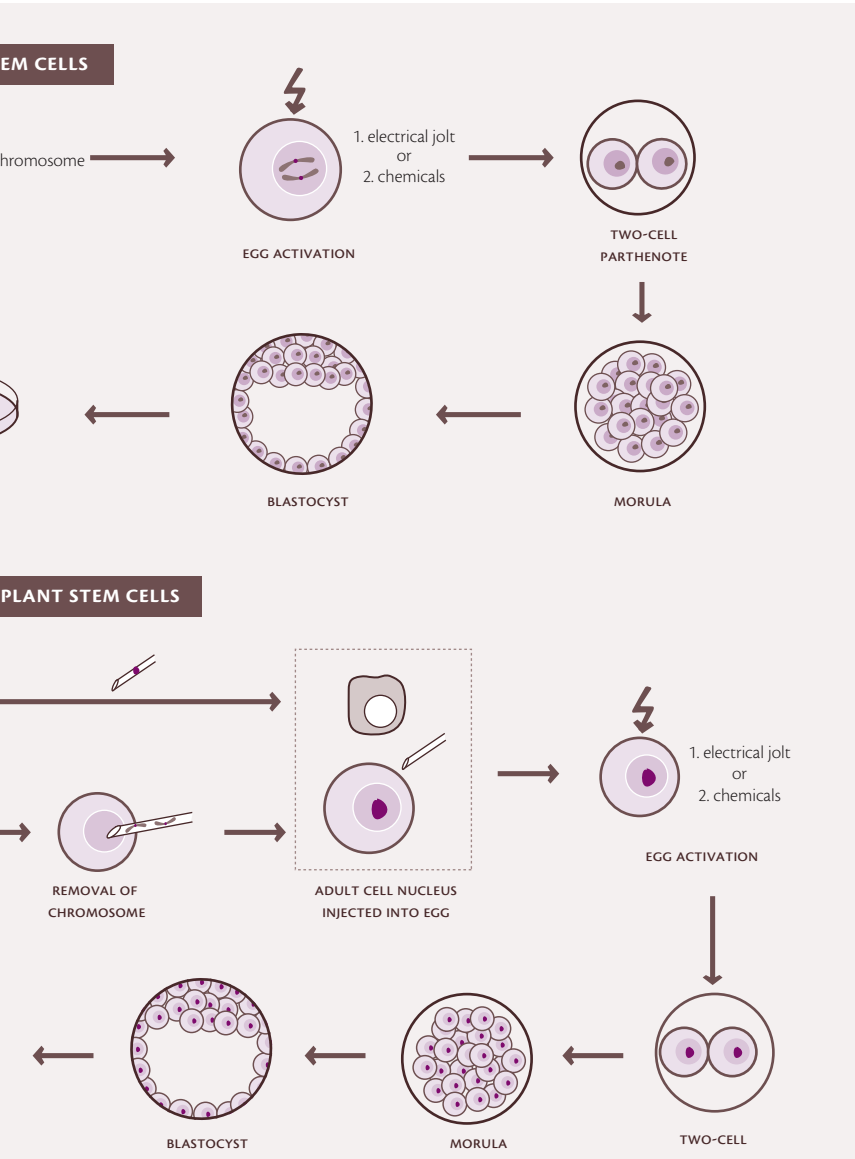
Human Egg Donor Program Since 2001, the Foundation has pioneered the nation's only program for procuring unfertilized human eggs specifically for stem cell research. Lack of funding halted the work in 2003 and again in 2006. Private contributions are needed to resume the research.

The egg donors are young mothers who believe in the importance of stem cell research. The goal of the egg donor program is to derive "pluripotent" stem cells – cells capable of developing into all cell types using unfertilized eggs that have been activated artificially.

An Ethics Advisory Board chaired by Professor Ron Green of Dartmouth College originally developed the program's basic guidelines. The program has recently been reviewed, and approved, by an independent human subjects review board, as well as the BSCRF Ethics Advisory Board, chaired by Professor Arthur Applbaum, Kennedy School of Government.

2007 Activated Egg Symposium This year's Activated Egg Symposium will be held at Northeastern University's Henderson House on November 9, 2007. Dr. Ian Wilmut, Professor of Reproductive Science, University of Edinburgh, will give the keynote address: "From Stem Cell Research to the Clinic."

Launched in 2002, The Activated Egg Symposium provides a unique forum for researchers studying eggs from many species, including human. Prominent researchers from academia and the private sector attend annually.



vation of pluripotent stem cells from unfertilized eggs. [A] Parthenote stem cells develop from eggs t sperm; the activated egg cleaves into smaller cells, each of which contains a complete copy of the somes). The morula stage is 16 to 64 cells; the blastocyst stage is 150 cells; the cells on the inside of parthenote stem cells. [B] Nuclear Transplant (NT) stem cells (ovasomes) develop from activated nes removed and replaced with the genes from the patient in need. The reconstructed egg cleaves stocyst stage; the cells on the inside of the blastocyst are the new NT stem cells (ovasomes).

ABOUT THE DIRECTOR Dr. Ann Kiessling has pursued her dual interest in virology and reproductive biology since receiving her doctorate from Oregon State University. She has published over one hundred scientific papers covering both areas of research and is Associate Professor of Surgery at Harvard Medical School.

BSCRF Launches New Research Initiatives ||| Neurospheres is the term that describes immature nerves growing in laboratory culture. The lack of an abundant supply of neurospheres has stifled research on cures for neurogenerative conditions such as spinal cord injury, multiple sclerosis and Parkinson's disease. BSCRF scientists are currently studying neurosphere development from four human embryonic stem (ES) cell lines derived from Harvard University as model systems.

In an effort to raise matching funds and other private financial support, BSCRF has appointed Ron Wudarsky, Senior Development Officer. Mr. Wudarsky brings to the Foundation nearly 30 years of professional development and nonprofit administration experience. Funds will support a team of stem cell scientists and neurobiologists to develop neurospheres from the four human ES lines. Knowledge gained will provide the necessary groundwork for developing neurospheres and mature nerve cells for patients in need. We must raise $280,000 annually for five years to match the challenge grant. Private funds are necessary for these studies because of the federal government moratorium on funding research on stem cell lines derived after 2001.

"We're very excited about our results to date," said BSCRF Director, Dr. Ann A. Kiessling. "Matching the challenge grant is our top priority. The U.S. put a man on the moon in 8 years, which proves the power of focus, believing it is possible, and sufficient resources. Patients in need all over the world deserve the same effort.

Bedford Stem Cell Research Foundation

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Getting Involved

BSCRF research cannot be funded by federal grants-in-aid because of the U.S. funding moratorium. BSCRF has lower operating costs than larger teaching and medical institutions. For this reason, funds are utilized more efficiently, and more research results from each donation received.

To ensure the safety of the egg donors, human egg studies are costly: $60,000 each. Funding in 2005 supported one experiment every two months, but the Foundation's goal is two experiments per month – an annual cost of $1.4 million.

The tax-exempt status granted to qualified public charities highlights the U.S. Government's belief that taxpayers have the right to directly support activities they feel are important. To advance the treatment opportunities, to maintain and grow its community of scholars and scientists, to enlarge the potential for miracles, the Foundation needs private benefactors to raise funds to continue its mission.

[ ] Yes, I will support the Bedford Stem Cell Research Foundation.

[ ] Enclosed is my gift of $_____

Name:_____

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Please enclose the name and address of anyone you would like to be notified of your contribution to the Foundation.

Please mail contributions to Bedford Stem Cell Research Foundation, P.O. Box 1028, Bedford, MA 01730.

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Research Update: 2007

Bedford Stem Cell
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