



BEDFORD RESEARCH FOUNDATION

Massachusetts 501(c)(3) not for profit organization

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Stem Cells For *EveryBody* *Twenty Years of Progress*

Bedford Research Foundation is **TWENTY**



Founded in 1996 to conduct research that cannot be

funded by the National Institutes of Health, Bedford Research scientists have achieved ground-breaking milestones, including:

- **1998** Special Program of Assisted Reproduction (SPAR) designed to protect wives of HIV-infected men from infection during conception
- **1999** First SPAR Baby born to wife of man with hemophilia infected with HIV by a blood transfusion
- **2000** World's first program of egg donation for stem cell research
- **2001** BRF scientists co-author paper on artificially activated human eggs (parthenotes)
- **2002** First Activated Egg Symposium
- **2003** Textbook "Human Embryonic Stem Cells"
- **2004** Connecticut Law Review



- **2011** First circadian microscope system to observe mouse parthenote development for 5 days
- **2012** Fourth Spinal Cord Workshop "What are the Barriers to Cure?"
- **2013** Number of SPAR babies hits 200, all babies and mothers testing negative for HIV

"What is an Embryo?"

- **2006** Joint research program with University of Athens to understand egg development; study ongoing
- **2008** First detection of prostate cancer genes in semen specimens for screening test; study ongoing
- **2009** Discovery that circadian rhythms may be important to stem cell development; study ongoing
- **2009** First Spinal Cord Workshop "What are the Barriers to Cure?"
- **2010** First description of genes important to deriving stem cells from unfertilized human eggs
- **2010** First International Meeting on Spinal Cord and Neurodegenerative Diseases in Taiwan

- **2014** First observations of active circadian rhythm genes in early mouse embryos; study ongoing
- **2015** Program launched to create unique stem cells for *everybody* from unfertilized human eggs; study ongoing

Important note: To develop these innovative stem cells, BRF scientists will need human eggs donated for research. The first such generous donation has been made by a woman who had her eggs frozen several years ago. This work cannot be federally funded because of the Dickey-Wicker Amendment.

MORE NEWS INSIDE

FALL 2016 - WINTER 2017

Prostate Disease Research Update

Recruiting study subjects to develop a better screening test for prostate cancer

New Board Member Dr. Yael

Schwartz, Entrepreneur, joins the BRF Board

Donate to the Foundation

Your donations are essential for our research to continue



From the Director:

It is finally all coming together... My career in reproductive biology and AIDS began in 1983, with the goal of understanding the influence of viruses on early embryo development. Wonderful young scientists joined my laboratory for periods of training during the ensuing 33 years, and together we have made many discoveries that bring our laboratory skills to where they are today. We now have the foundation to begin to generate off-the-shelf stem cells for *everybody*.

Additionally, because we are a nimble institution, we were able to quickly change research direction to take advantage of a new technology, reported in 2013, that allows unprecedented precision in silencing genes. This advance has two immediately practical applications for our "off-the-shelf" stem cell research goals:

(1) It is now feasible to specifically silence the genes responsible for the proteins on cells that cause immune rejection. Just as Type "O" blood can be administered to almost everyone, such a neutralized cell could be transplanted into many individuals without leading to immune rejection. This would be a major step forward in generating "off-the-shelf" stem cells for *everybody*. Our successful experiments in mouse eggs pave the way to translate the work to stem cells from human eggs. Like blood banks, such a stem cell bank could be available in emergency rooms for acute treatments, such as heart attack, stroke and spinal cord injury.

(2) It is also feasible to replicate the natural mutation in 1% of humans that renders individuals resistant to infection by HIV, the virus that causes AIDS. The ability to precisely silence this gene without causing other changes in the cell, in the same way it is naturally inactivated in 1% of humans, paves the way to deriving a library of stem cells resistant to HIV infection. IF those cells can be developed into bone marrow stem cells, and IF those bone marrow

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Bedford Research Launches New Stem Cell Program

Dr. Joel Lawitts microinjects gene editing enzymes into unfertilized mouse eggs to neutralize a major histocompatibility gene that leads to tissue rejection in unmatched individuals. This is the first step in generating off-the-shelf stem cells for *everybody*.

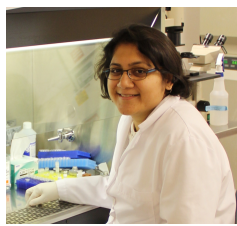
"Dr. Kiessling and her staff have shown their determination to tackle

some of the most difficult health problems of our time."

- Representative Ken Gordon



Meet Dr. Aparajita Chatterjee



Dr. Chatterjee, a Bedford resident, joins us from Boston Medical Center where she conducted infectious disease research for six years. A skilled molecular biologist and cell culture expert, she is spearheading the work to identify and characterize successful gene silencing in our mouse model parthenote stem cells. We are fortunate to have her.

Prostate Disease Research Update

Patient recruitment into the prostate cancer screening project is ongoing, and Bedford Research Scientists have developed methods for including specimens submitted to the laboratory for other types of testing. The goal of the project is to develop semen screening tests that improve diagnosis and staging of prostate cancer as well as reflect overall male health. Urologists from around the country have joined the research.



Dr. Robert Eyre

Our New Board Member!



Dr. Yael Schwartz, Entrepreneur in Residence at Worcester Polytechnic Institute, holds a PhD in endocrine physiology from a joint program of University of Massachusetts Medical School and WPI. She is president and CEO of Or-Genix Therapeutics.

Volunteer of the Year

We are very grateful for the help from our Volunteer of the Year, Deborah Weidman. A Bedford High School student, she has been instrumental to our circadian rhythms in stem cells research this year. She is planning to use her experience with BRF in her career in biomedical engineering. Thank you Deborah!



From the Director, cont'd

stem cells will function normally, they could be utilized as a powerful treatment, perhaps a cure, for HIV disease.

To help guide the work, we have meritorious individuals serving as our Ethics Advisory Board, our Human Subjects Committee and our Stem Cell Research Oversight Committee. Their guidance has allowed us to forge ahead into areas of stem cell development that larger institutions have shied away from because the work cannot be funded by our federal government. The "Dickey-Wicker Amendment" to the budget of the National Institutes of Health is renewed annually and prohibits funds to be used for studies of unfertilized human eggs. We have for years believed unfertilized eggs ("parthenotes") will be a broadly applicable source of human stem cells.

Human egg research MUST be privately funded, progress depends entirely on private donations. No federal dollars can be used to study activated human eggs or parthenote stem cells. BRF is uniquely positioned to push this exciting field forward! Thank you for your continued support.

Ann A Kiessling, PhD

Director, Bedford Research Foundation

Donate Today

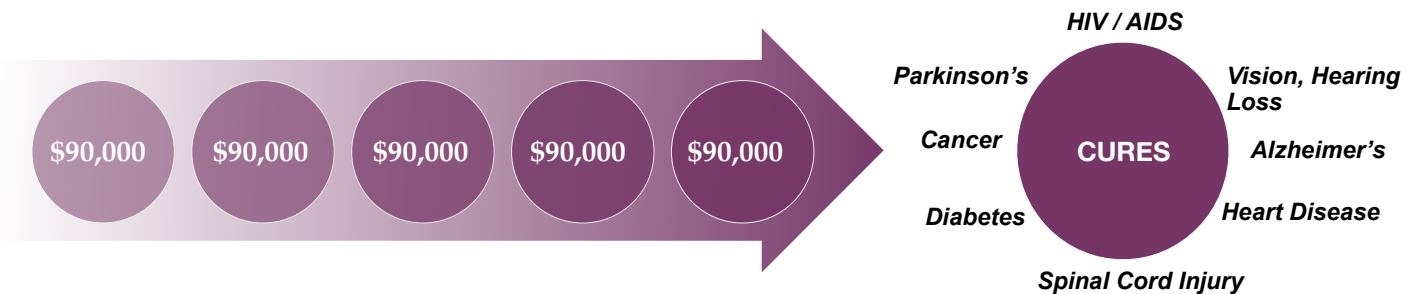
"Bedford Research scientists are developing stem cells from eggs, not from embryos, thus bypassing many of the ethical dilemmas associated with stem cell research."

-Sen. Michael J. Barrett
State Senator, Bedford,
MA.

Philanthropy Is The Key To Continued Progress

The Dickey-Wicker Amendment to the National Institutes of Health budget forbids federal funds to be used for research on unfertilized human eggs or parthenote stem cells

The average cost of each experiment is \$90,000. Because much of our overhead is covered by fee-for-service laboratory tests, 92% of every dollar you donate goes directly toward these experiments. This innovative funding model allows Bedford Research scientists greater flexibility to move quickly in promising new research directions. **Progress requires meeting our annual funding goal of \$450,000 in 2017.**



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News Inside

1 “Universal” Stem Cells For *EveryBody*

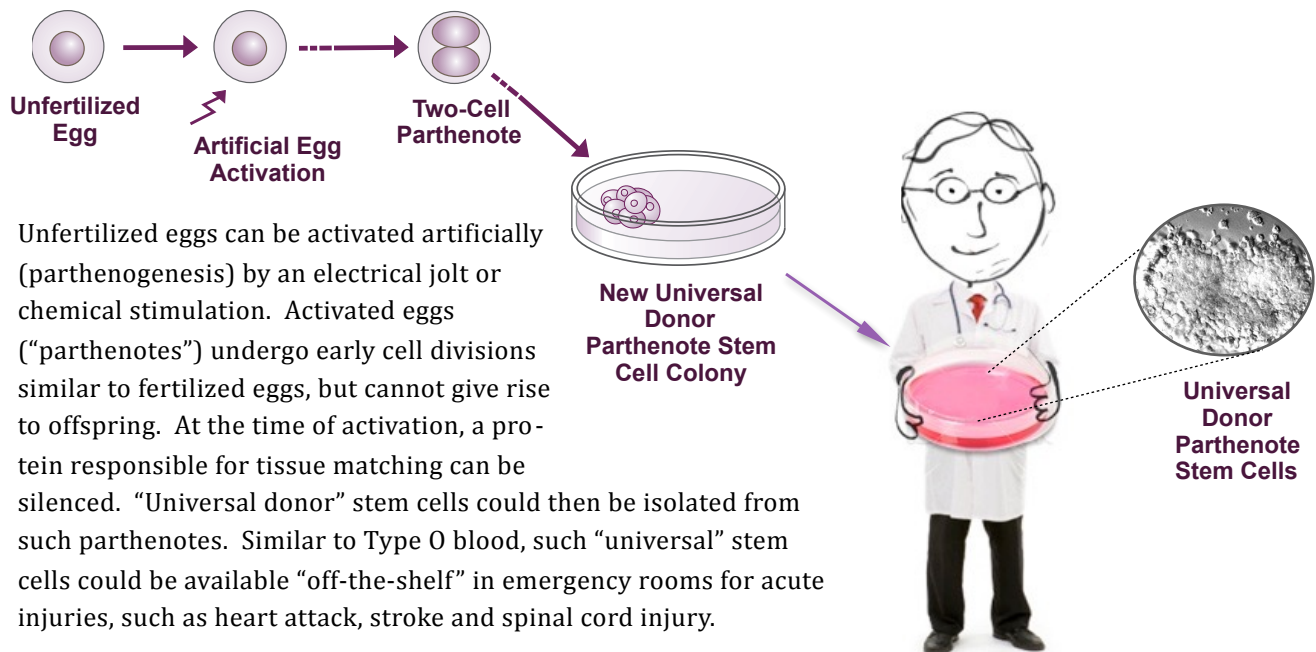
2 Bedford Research Is Twenty Years Old

3 Universal Mouse Model Stem Cell Resistant To HIV Infection

4 Learn More - Donate Now!



Stem Cells for *EveryBody*



Unfertilized eggs can be activated artificially (parthenogenesis) by an electrical jolt or chemical stimulation. Activated eggs (“parthenotes”) undergo early cell divisions similar to fertilized eggs, but cannot give rise to offspring. At the time of activation, a protein responsible for tissue matching can be silenced. “Universal donor” stem cells could then be isolated from such parthenotes. Similar to Type O blood, such “universal” stem cells could be available “off-the-shelf” in emergency rooms for acute injuries, such as heart attack, stroke and spinal cord injury.