



# BEDFORD STEM CELL RESEARCH FOUNDATION

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

P: 617-281-7902 E: [info@bedfordresearch.org](mailto:info@bedfordresearch.org) W: [www.bedfordresearch.org](http://www.bedfordresearch.org)

## Four Years of the Spinal Cord Workshop

*At the Frontier of Stem Cell Research and Spinal Cord Injury*



The 2009 Workshop in partnership with University of Georgia and the Shepherd Center

Since 2008, the Spinal Cord Workshop has brought together international leaders in surgery and basic science to debate and develop a list of the challenges to cures for spinal cord injury. The goal of the workshop is to develop a “white paper,” listing the obstacles.

The workshop has brought to light such problems as how researchers use animal models to test theories, how to measure outcomes from studies (i.e. what defines success?), and the distribution of funds.

Additionally, the researchers have pointed out a significant lack of corporate involvement because of the limited market size, considering that spinal cord injury, while

devastating, effects only 11,000 new patients every year. Therefore, most corporations are unwilling to invest in SCI treatments, even if discoveries could cascade to help a host of other diseases in the future.

Participants have expressed the importance of intimate workshops like this one, to allow for a space to share not only scientific discoveries, but also failures. Much of scientific progress is failure and in the current “success story only” environment, scientists and physicians don’t have the chance to share the side of the research that leads to many important discoveries: what doesn’t work in the lab.

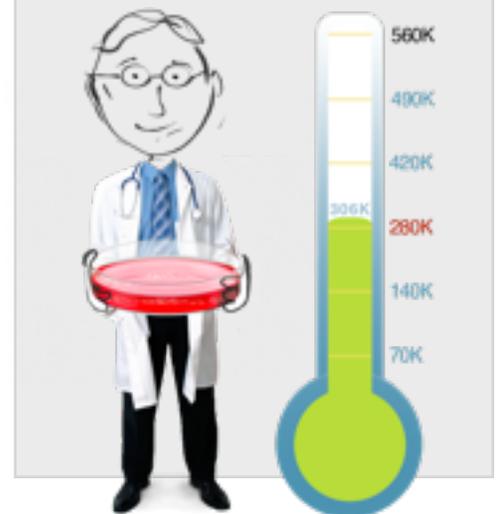
The reports from these clinician scientists

are easily accessible at the Foundation’s website. For more information about this year’s spinal cord workshop, [www.SpinalCordWorkshop.org](http://www.SpinalCordWorkshop.org) to read an interview with Dr. Kiessling about what she learned this year, and what you can do (in addition to donating) to help.

### Help Us Reach Our Goal

As of November 2012, the Foundation has raised \$375,000 towards the testis stem cell project. We need another \$185,000 to reach the total of \$560,000 to complete the study. Please help us pursue this promising research.

*Your donation makes a difference!*



#### MORE NEWS INSIDE

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*Thanks to private donations, scientists are in Phase 3 of the testis stem cell project.*

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##### **Prostate Cancer Research Update**

*Dr. Robert Eyre and Dr. Joseph Ciccone, work with BSCRF scientists.*

#### FALL 2011 - WINTER 2011

# The 2013 Activated Egg Symposium

**Nov 8, 2013:** Dr. Mario Capecchi will keynote the tenth annual AES. Dr. Capecchi is a Distinguished Professor of Human Genetics & Biology at the University of Utah School of Medicine, an Investigator with the Howard Hughes Medical Institute, and a Nobel Laureate for Physiology & Medicine, 2007.

Dr. Capecchi is best known for his pioneering work on the development of "gene targeting" in mouse embryonic stem (ES) cells. This technology allows scientists to create mice with mutations

in any desired gene. The power of this technology is that the investigator chooses both which gene to mutate and how to mutate it. This allows scientists to evaluate in detail the function of any gene of the mouse.



**2013 Keynote: Mario Capecchi, PhD**

# Testis Stem Cell Project

Thanks to private donations, BSCRF scientists are in Phase 3 of the testis stem cell project.

Testis tissue may be a readily available source of patient-specific stem cells for men, and may take less time to develop and characterize than the iPS cells Professor Yamanaka received the Nobel Prize for this year. Bedford Research scientists are taking advantage of their more than two decades of experience with testis tissues to collaborate with Dr. Martin Dym, Georgetown University, who reported deriving pluripotent stem cells from testis biopsies in 2009.



Dr. Dym has generously shared some of the cryopreserved tissues used in his original report so Bedford Research scientists can improve the stem cell derivation process.

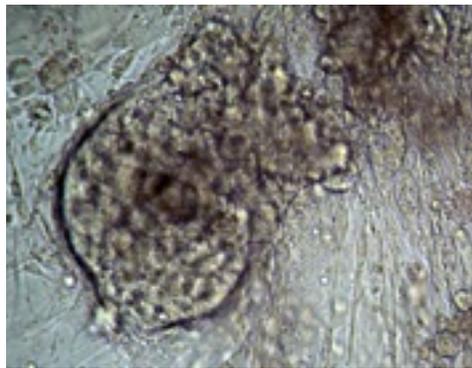
Phase 4 will use fresh biopsies from male volunteers for this study to establish the success rate. Phase 4 will begin in 2013, if funds are available.

# First Circadian Incubator Videomicroscope

Three years ago Bedford Research Foundation scientists discovered that circadian rhythm genes may be important for stem cells. If true, new ways of culturing them need to be developed.

The question is: what circadian signals to test? A signal common to all mammals is a daily fluctuation in body temperature.

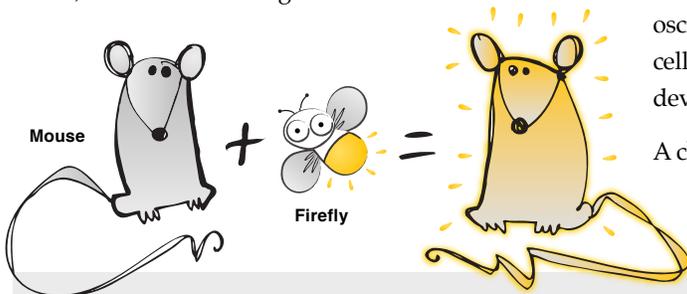
BRF scientists are taking advantage of a mouse strain that has been engineered to glow when the circadian rhythm genes are active. BRF scientists derived two embryonic stem cell lines from this mouse strain, and are conducting studies to



Mouse developing heart cells actually beating in culture. See the video on our website.

determine if circadian temperature oscillations play a role in stem cell growth and tissue development.

A characteristic of embryonic stem cells is the ability to aggregate together and form embryonic muscle cells of the heart. Work is in progress to see if this process involves expression of circadian rhythm genes.



The PER2Luc mouse has circadian genes coupled with firefly "Luciferase" genes. When the circadian genes turn "on" they glow, dimly, like a firefly.

# 2012 New Jersey Stem Cell Symposium Keynote

Dr. Kiessling was the Keynote Speaker at the Symposium on September 19, 2012, "Totipotency, Pluripotency and Growth Factors." The sixth annual symposium attracted over 240 scientists.



# SPAR Presented at HIV Forum in Washington, D.C.

A roundtable, "Safe Conception and Reproductive Options for HIV-Infected Individuals" organized by the Forum for Collaborative HIV Research, UC Berkeley School of Public Health, featured a presentation about SPAR by Dr. Kiessling. The Foundation's specialized HIV-infertility program now has over 170 healthy babies, [www.SemenTesting.org](http://www.SemenTesting.org).

## Prostate Cancer Research Project Update



Dr. Robert Eyre Dr. Joseph Ciccone Clinton McCabe

**Dr. Robert Eyre, and his colleague, Dr. Joseph Ciccone, collaborate with Bedford Research scientists to develop improved early detection tests for prostate cancer.**

Following up work Dr. Eyre reported at the New England chapter of the American Urologic Association, the team is recruiting men needing prostate biopsy for cancer detection to also provide specimens for the new Bedford Research screening test.

The test under development will screen semen specimens, half of which are fluids and cells from the prostate gland, for the presence of genes that are over-expressed and under-expressed specifically in prostate cancer.

Recent concerns about the lack of specificity of the PSA test, currently the only available screening test for prostate cancer besides prostate biopsy, have increased the importance of this study. The goal is to provide physicians and their patients with a more accurate screening test for cancer, that also distinguishes aggressive cancers from slow-growing tumors. The research is being coordinated at BSCRF by Clinton McCabe.

## A New Branch Of Medicine

### LETTER FROM THE DIRECTOR ABOUT RESEARCH AT THE FOUNDATION

*Fifty years ago, John B. Gurdon discovered frogs could develop from the genetic material of a single adult cell transplanted into a frog egg, the first cloned animal. The experiment was done not to clone frogs, but to ask a question: do adult cells contain all the genetic information needed for embryonic development?*

***John Gurdon's experiment answered the question, genetic information is not lost in adult tissues, it is selectively turned off or on.***

*This heralded a new era of cell discovery that took 50 years for the Nobel Committee to recognize and award Professor Gurdon the Nobel Prize in Physiology and Medicine this year. For the next 34 years, however, it was believed that only frogs, not mammals, could be cloned from adult cells, a viewpoint astoundingly reversed by the successful cloning of Dolly the sheep in 1996.*

*Embryonic stem cells were derived from mouse embryos in the early 1980's and from human embryos in 1998. The remarkable capacity of embryonic stem cells to multiply in culture, and become every cell type in the body, heralded a new era of regenerative medicine.*

***We are now nearly a decade and a half into that era, with astounding scientific progress being made all over the world, but little in the way of therapies. Why?***

*What are the obstacles to translating laboratory discoveries into off-the-shelf therapies? Is it the way the experiments are designed in the laboratories that does not translate into the safety studies required by the Food and Drug Administration? Is it unnecessary bureaucracy? Is it lack of coordination among the groups needed to go from bench to bedside?*



19 identical albino frogs created by nuclear transplantation into unfertilized eggs.

*One known barrier to stem cell therapy is the need for transplanted cells to not be rejected as "foreign." Cell rejection would be avoided if stem cells could be derived from the patient's own cells, rather than from a stem cell bank. Toward this end, Shinya Yamanaka discovered in 2007 a new method to re-program adult cells into pluripotent cells, thus replacing eggs. The discovery so captured the attention of the global scientific community that laboratories all over the world quickly confirmed Yamanaka's findings, thus lifting*

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# BEDFORD STEM CELL RESEARCH FOUNDATION

PO Box 1028  
Bedford, MA 01730

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Dr. Yamanaka's discovery of induced pluripotent stem cells may eliminate the need for embryos.

stem cell research out of the controversy associated with human embryos. Dr. Yamanaka shared the Nobel prize this year with Professor Gurdon.

The prospect of regenerating damaged tissues and organs is arguably the most exciting development of modern medicine. Spinal cord injury seems especially suited for regenerative medicine because the injury is usually a well-defined lesion in an otherwise healthy adult. This year's 2012 Spinal Cord Workshop is a frank discussion among leaders in the field to pinpoint, and hence correct, the principal barriers to cure SCI. Once identified, those barriers could

also apply to other diseases, such as heart disease, diabetes, Parkinson's Disease, stroke, multiple sclerosis, AIDS, and cancer.

**We are witnessing the development of a new branch of medicine, with all its growing pains.**

At this time, there is no consensus on the best source of stem cells, the best way to program pluripotent stem cells into the tissue needed, and how best to guard against unwanted growth of stem cells that could lead to cancer. Bedford Research Foundation scientists remain focused on how to improve the efficiency of deriving patient-specific stem cells from naturally pluripotent sources, including unfertilized eggs and testis, and whether or not the discovery by BRF scientists a few years ago that circadian rhythms may play a role is true.

My frustration about how much more BSCRF could accomplish each day with more people, more money, is balanced by pride in our ability to do more with less, and by gratitude to the supporters and committee members who believe in our mission. Our administrative costs are low, our ratio of new information/research dollar spent is high, our goals are lofty.

With gratitude for your support,

Ann A. Kiessling, Ph.D.



Dr. Steven L. Stice, Dr. Hans Keirstead, Dr. Ann A. Kiessling and Dr. Wise Young at the first Spinal Cord Workshop in 2008.

FOUNDED IN 1996, 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. WWW.BEDFORDRESEARCH.ORG