# Empire State Stem Cell Board
# Full Board Committee Meeting Minutes
**May 21, 2010**

The Empire State Stem Cell Board Funding Committee held a meeting on Friday, May 21, 2010, at the Department of Health offices, 90 Church Street, New York, New York. Commissioner Richard F. Daines, M.D., presided as Chairperson.

**Funding Committee Members Present:**

Dr. Richard F. Daines, Chairperson
Mr. Kenneth Adams
Dr. Bradford Berk*
Mr. Robin Elliott
Dr. David Hohn, Vice Chair*
Dr. Bruce Holm*
Dr. Mario Loomis
Dr. Allen Spiegel
Ms. Madelyn Wils

* via videoconference

**Funding Committee Members Absent:**

Dr. Gerald Fischbach
Dr. Hilda Hutcherson
Dr. Michael Stocker

**Ethics Committee Members Present:**

Fr. Thomas Berg
Ms. Brooke Ellison*
Dr. Samuel Gorovitz
Dr. Robert Klitzman
Rev. H. Hugh Maynard-Reid
Dr. Samuel Packer
Mr. Robert Swidler

*via videoconference

**Ethics Committee Members Absent:**

Ms. Nancy Dubler
Dr. Vivian Lee

**Department of Health Staff Present:**

Dr. David Anders
Ms. Bonnie Brautigam
Dr. Kathy Chou
Mr. Thomas Conway
Ms. Judy Doesschate
Ms. Susie Han
Dr. Matthew Kohn
Ms. Beth Roxland
Ms. Lakia Rucker
Dr. Lawrence Sturman
Dr. Ann Willey
Ms. Carrie Zoubul

**Observers Present:**

Ms. Laurel DeGeorge
Ms. Ellen Ferranti
Mr. Samuel Gandy
Ms. Anna Granat
Ms. Shauna Katz
Dr. David Levy
Ms. Caroline Marshall
Mr. David McKeon
Ms. Barbara Meara
Ms. Kathleen Pickering
Ms. Kelly Ryan
Mr. Thomas Sakmar

## Approval of Minutes for the December 11, 2009, Full Board Meeting

Dr. Daines directed members to the draft minutes for the December 11, 2009, meeting of the Empire State Stem Cell Board that were included in their agenda packets and asked for a motion to approve the minutes. Dr. Packer so moved and Ms. Wils seconded the motion. The motion passed.

## Program Updates

Dr. Sturman mentioned that a chart had been provided to members that showed the status of awards and contracts and highlighted the following information:

1. Most consortia planning contractors have submitted reimbursement vouchers and final progress reports are due by June 30, 2010.
2. $7.2 million of the $32.4 million awarded to the initial eight Shared Equipment and Facilities contracts has been paid.
3. Eighty-five (85) of the 98 contractors for Targeted and Innovative Investigator Initiated Research (IIRP) and Innovative Development Exploratory Award (IDEA) contracts have submitted their first vouchers, which total $12.1 million of the $69.7 million under contract.
4. Contracts for Summer Undergraduate Internships, Undergraduate Curriculum Development and Targeted hESC Research are being processed and have anticipated start dates of May 1, July 1 and September 12010, respectively.
5. The Institutional Training Request for Applications (RFA) titled "Empire State Institutional Training Programs in Stem Cell Research for Pre and Postdoctoral Fellows" was issued on May 13 2010 and applications are due by June 30.2010
6. Short Term Faculty Training Opportunities and Research Training for Medical, Dental and Veterinary Students RFAs that earmark an additional $2.5 million for training will be issued upon DOH approval.
7. The Funding Committee approved another RFA to support IIRP and IDEA awards in the amount of $25 million and an RFA that has earmarked $80 million to support the Consortia to Accelerate Therapeutic Applications of Stem Cells.

Dr. Sturman also advised members of the action taken earlier in the day by the Funding Committee concerning award recommendations and the issuance of a new RFA for Stem Cell Research Experience for Pre-College Teachers. Dr. Sturman concluded by noting that a Request for Proposals will be issued for activities related to Scientific Oversight of the Consortia to provide ongoing guidance to NYSTEM regarding the progress and success of the consortia contracts.

## Interim Report on Educational Initiatives Workgroup

Dr. Sturman then turned the floor over to Mr. Robin Elliott, Chair of the Educational Initiative Workgroup, to update the Board on that group's activities.

Mr. Elliott advised members that the workgroup was comprised of Ms. Ellison; Dr. Gorovitz and Dr. Packer from the Ethics Committee; Ms. Mary Dickerman, a former Education Consultant at The Sterling and Francine Clark Art Institute; and Ms. Olivia Flatto, Director of Internal Affairs for the New York Stem Cell Foundation. He stated that the workgroup's task

was to identify additional informal educational opportunities that go beyond college and high school curriculum or training activities for presentation to the Board. He noted that the easiest idea to date was to do a museum exhibit and that the workgroup identified three candidates for further discussion. Mr. Elliott stated that several workgroup members were impressed with a museum exhibit they visited in Baltimore but had concerns because it focused only on stem cell research within Maryland. He noted that the workgroup agreed that any museum exhibit that might be funded by the Board should have a broader approach and not focus only on research within New York State.

Mr. Elliott advised members that the workgroup is also looking at options for using the internet and asked staff to provide the workgroup with an inventory of existing exhibits, programs, information and other resources available through an internet search. He concluded noting that the workgroup is expected to meet either in person or via teleconference once or twice over the summer.

In response to a question from Dr. Gorovitz, Dr. Sturman advised members that the RFA for journalism programs would be presented to the Funding Committee at its next meeting.

**Presentation: Recent Developments in Stem Cell Research in New York and Around the World**

Dr. Daines reminded members that they had requested periodic updates involving stem cell research and then turned the floor over to Dr. David Anders and his staff to present information regarding recent developments in stem cell research.

Dr. Anders advised members that he would be turning the floor over to his colleagues, Drs. Matthew Kohn and Kathy Chou, to provide information about stem cell science developments in the state and how they relate to national and international developments. Dr. Anders then provided the Board with a brief overview of the NYSTEM research portfolio.

Dr. Anders reminded members of the initial Institutional Development Awards that were made to 25 different institutions that provided support for stem cell related projects, including shared equipment and facilities, research supplements to stem cell research projects and bridging funds. Dr. Anders stated that the initial awards also provided specialized training in stem cell research to jump start the program. He advised members that the initial awards had a significant impact in several respects: 1. allowing the opportunity for many of the institutions to revisit or to begin a dialogue about what their priorities would be in the stem cell research arena and to develop a plan; 2. providing access to many valuable shared resources; and 3. supporting stem cell related research that has been cited in numerous publications.

Dr. Anders mentioned that the bread and butter of the NYSTEM program has been the provision of direct support for research, including 78 IIRP and IDEA awards and 20 targeted research awards for induced pluripotent stem cell research projects that were approved for funding in 2008 and another 52 IIRP and IDEA awards and 3 targeted awards recommended for funding in 2010. Dr. Anders also reminded members that the Board approved nine awards for shared resources and equipment in 2008 and approved seven additional shared research facilities for funding earlier in the meeting.

Dr. Anders reminded members that the Annual NYSTEM Grantees Meeting was scheduled for the following week and that it would feature over 40 talks with presenters from 18 different institutions around the state. Dr. Anders concluded by noting that Dr. Kohn would be presenting information on specific developments in the field of induced pluripotency and that Dr. Chou would be presenting some developments about trans-differentiation and tissue engineering. He then tuned the floor over to Dr. Kohn.

Dr. Kohn noted that induced pluripotent stem cell research is currently one of the hottest areas of stem cell research. He advised members that in 2006 Dr. Shinya Yamanaka first reported reprogramming somatic mouse cells into induced embryonic stem cell-like pluripotent stem cells (iPSCs) using four separate retroviruses that contain transcription factors: Oct4, Sox2, Klf4 and c-Myc, and that two of these factors are known tumor-promoting oncogenes. Dr. Kohn stated that the following year, Dr. Yamanaka and Dr. James Thomson independently reported reprogramming human skin cells using the same or an overlapping set of factors. Dr. Kohn advised members that iPSCs derived through these techniques have been used to model a number of genetic diseases in cell cultures. He listed the diseases modeled using iPSCs to date and highlighted the fact that New York State researchers developed iPSCs that model Alzheimer's disease, familial dysautonomia and Leopard and Noonan syndromes.

Dr. Kohn advised members that the retroviruses used in reprogramming integrate into the genome and have the potential to cause deleterious mutations. He said laboratories have been improving upon this method by using non-integrating adenoviruses that combine all four factors into a single vector, excisable vectors, or proteins instead of genes. He stated that several groups have developed small molecules that can replace one or more of the four reprogramming factors and further reduce the risk of harmful viral integration. Dr. Kohn noted that additional reports demonstrate that it is easier to reprogram less mature cells. For example, neural stem cells only require Oct4 to reprogram because these cells already express the other three factors, making the process simpler and safer.

Dr. Kohn informed members that three groups accomplished a major feat with mouse iPSCs in 2009 by demonstrating that they could produce viable animals through tetraploid complementation, which is the ultimate test of pluripotency. He advised members that the iPSCs must form the entire embryo body since the host embryo that the iPSCs are combined with is manipulated to form only placental tissue. Dr. Kohn also stated that in 2009, five separate groups published reports that concluded inactivation of tumor suppressor pathways aids the reprogramming process. Since two of the four reprogramming factors are known oncogenes and one test for pluripotency is the ability of embryonic stem cells (ESCs) and iPSCs to form tumors, a major concern for the use of ESC and iPSC-derived stem cell therapies is their tumor-forming propensity. Dr. Kohn added that the reports emphasized the need to carefully monitor this as the cells move toward the clinic and that one report showed that the original tissue source of mouse iPSCs affects their propensity to form tumors after differentiation into neural cells. He stated that one paper comparing gene expression profiles of ESCs, IPSCs and somatic cells reported that ESC and iPSC profiles cluster closely together and are separated from somatic cell types, but are distinct from each other. Dr. Kohn also stated that two reports found specific differences in iPSCs compared to ESCs: one showing a failure to reprogram a specific locus in human iPSCs; and one showing a stochastic, or random, reprogramming of a specific locus in mouse iPSCs that correlated with their potency.

Dr. Kohn informed members that since their initial derivation in 1998, human ESCs showed distinct differences when compared to mouse ESCs. He mentioned that one recent paper demonstrated that human ESCs and iPSCs could be converted into a mouse ESC-like state, a "naïve" pluripotent state, by treatment with chemical inhibitors of signaling molecules. He advised members that this opens up the possibility of routine genetic manipulation of these cells through homologous recombination, a technique that has been highly inefficient in earlier human ESCs and iPSCs. Dr. Kohn stated that scientists are beginning to generate disease models and develop methods to produce large numbers of specific cell types from both human iPSCs and ESCs in the lab. He noted that the disease models should be useful both for understanding the pathology of the diseases and for drug discovery, and that iPS and ES cells may be useful for cell-based therapies. Dr. Kohn concluded by noting that a number of these disease models and in vitro produced cells have been developed by New York State investigators, many of whom are recipients of NYSTEM support. Dr. Kohn then turned the floor over to Dr. Kathy Chou.

Dr. Chou's presentation focused on recent stem cell research developments worldwide using trans-differentiation and tissue engineering approaches. She advised members that the creation of differentiated cells from another cell type often requires researchers to take the cell a step back to a less differentiated cell state. Dr. Chou explained that trans-differentiation is an alternative method that offers an efficient, direct route that could have implications for disease treatment. She stated that the journal, *Nature*, reported that Dr. Douglas Melton and colleagues at Harvard Stem Cell Institute have successfully turned pancreatic exocrine cells into insulin-producing beta cells; the cells that die off in type I diabetes. Dr. Chou added that another study led by Dr. Marius Wernig at Stanford University found that the right combination of genes could transform mouse skin cells into functional nerve cells in a petri dish, bypassing the need to become pluripotent stem cells first. She noted that although there are still many obstacles to replicating the research findings in human beings and finding non-viral or safer approaches in the process, trans-differentiation/direct reprogramming offered another angle to tackle the debilitating problems related to human health.

Dr. Chou then stated that tissue engineering concept originated from the organ/tissue transplant field for the purpose of replacing the recipient's damaged organ/tissue with a working one and that in most countries, there is generally a shortage of suitable organs for transplantation. She stated that tissue engineering is an interdisciplinary field that applies the principles of engineering and life sciences toward the development of biological substitutes that restore, maintain or improve tissue function or a whole organ. Dr. Chou stated that the three basic components of biological tissues are cells, scaffolds and signals, which resemble the tissue engineering triad. She noted that the advancements in stem cell research serve as a valuable resource in providing different types of cells to coax with biodegradable scaffolds and form a functional construct. Dr. Chou also stated that the biodegradable materials and porous architectures are keys to make successful scaffolds for implant. She noted that with the right signals (e.g. proteins, growth factors, peptides, etc.) cells within scaffolds would be able to differentiate into specific lineages or the circulating stem cells would be recruited into the scaffolds.

Dr. Chou advised the members that Dr. Doris Taylor, from the University of Minnesota, applied a technique called perfusion de-cellularized process to strip cells off rat and pig hearts and used the remaining framework of extracellular matrix to engineer a bio-artificial heart. She stated that the first tissue-engineered trachea transplant using a patient's own stem cells harvested from bone marrow was performed by doctors in Spain and published in the *Lancet*.

Dr. Chou added that recently a similar procedure was performed on a ten year old boy in the United Kingdom. She also stated that a NYSTEM funded investigator, Dr. Gordana Vunjak-Novakovic at Columbia University, was featured in the New York Times about her research progress on engineering anatomically shaped human bone grafts with custom made bioreactors. Dr. Chou then stated that Dr. Emmanuel Tzanakakis, from the State University of New York at Buffalo, is using NYSTEM funds to scale up the culture of embryonic stem cells with micro-carrier beads and Dr. Helen Lu, at Columbia University, is making nano-fiber-based scaffolds for rotator cuff repair and augmentation. She noted that both of their findings were published in the journal *Tissue Engineering*. Dr. Chou concluded by stating that the future challenges of combining tissue engineering and stem cell based therapies include long term integration/safety and the formation of stable vasculature networks to sustain the functional implants.

**Adjourn**

Dr. Daines then asked for a motion to adjourn the meeting of the full Board. Dr. Gorovitz so moved. Dr. Klitzman seconded the motion. The motion passed.

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*Janet Cohn, J.D.*
*Executive Secretary to the*
*Empire State Stem Cell Board*
*Approved: December 17, 2010*