NYSTEM: Igniting a Thriving Stem Cell Research Community

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INTRODUCTION

In 2007, New York state leaders responded to the state’s great research institutions, and to restrictions on federal funding, by creating the Empire State Stem Cell Board. The goals were to ignite the growth of a thriving stem cell research community within New York, to stimulate the local economy, and to provide support for efforts to discover treatments and cures for debilitating diseases and injuries.

The New York State Legislature, working with then-Lieutenant Governor David Paterson, created the ESSCB and the New York State Stem Cell Science (NYSTEM) program within the Department of Health. The 11-year program is funded at approximately $550 million overall. Despite the state’s difficult economic climate, it retains the enthusiastic support of the governor.

Mindful of the ethical questions raised by stem cell research, the legislature created two committees within the Board: an ethics committee to develop research standards and a funding committee to set the research agenda and to conceive and approve requests for applications (RFAs). As Commissioner of Health, I serve as Board chair and make the final funding decisions.

ESSCB Ethics Committee members include prominent bioethicists, religious leaders, and medical educators. Funding Committee members include hospital and medical school administrators, practicing physicians and scientists, advocates, and experts in economic development.

The mission of the NYSTEM program is to foster a strong stem cell research community in New York State and to accelerate the growth of scientific knowledge about stem cell biology and the development of therapies and diagnostic methods under the highest ethical, scientific, and medical standards for the purpose of alleviating disease and improving human health [1].

The focus on ethical standards distinguishes New York’s program. One of the first issues the Ethics Committee took on was whether to permit NYSTEM-funded investigators to compensate oocyte donors who agree to participate in research for their time, burden, and inconvenience, on a par with donors to in vitro fertilization programs. After months of expert presentations, literature review, and debate, a majority of the committee concluded that compensation for research participation was appropriate, and the Funding Committee agreed. The Board issued a resolution on June 11, 2009, permitting such compensation by NYSTEM contractors and requiring strict oversight by an embryonic stem cell research oversight committee (ESCORD) to ensure that compensation would not result in an undue inducement on prospective donors. It also prohibited payment based on the number or quality of oocytes donated. From there, the Ethics Committee went on to draft and refine five model-informed consent forms for donation of biological materials for research purposes, including donation of oocytes. The forms and the Board’s resolution can be seen at the NYSTEM website at http://stemcell.ny.gov/news.

Another distinctive decision the Board made early on was to permit its investigators to collaborate with scientists from outside New York on NYSTEM-funded awards. Although only New York institutions may apply for and directly receive funding, the Board wished to encourage rapid progress and optimal results by permitting principal investigators to collaborate with colleagues from around the world. This decision is widely recognized by researchers as a major advantage of NYSTEM support.

Contributing in a Major Way

The New York research community is particularly strong in the neurosciences. NYSTEM funded Lorenz Studer’s research at Memorial Sloan-Kettering Cancer Center demonstrating that human embryonic stem cells (hESCs) can be differentiated into the specific neuronal cell type that is affected in Parkinson’s disease [2]. These neurons engraft into animal models of Parkinson’s and ameliorate the effects of the disease.

NYSTEM funding also contributed to work by Asa Abeliovich, at Columbia University Medical Center, showing that fibroblasts—skin cells—from Alzheimer’s patients can be converted directly into functional neurons that display disease pathology [3]. Research from Sally Temple’s...
group at the Neural Stem Cell Institute, demonstrating the presence of multipotent stem cells in the eye, was also supported by NYSTEM [4].

With NYSTEM fiscal support, Shahin Rafat at Weill Cornell Medical Center converted hESCs into blood vessel-forming endothelial cells [5] that contribute to liver regeneration through production of growth factors [6]. These endothelial cells can also expand cord blood stem and progenitor cells, increasing the yield of umbilical cord blood for potential use in bone marrow replacement therapy [7].

NYSTEM has also sponsored research in the area of tissue regeneration for joint replacement. Jeremy Mao, at Columbia, has shown that infusing growth factors into a biomimetic scaffold yields fully regenerated cartilage in an arthritis disease model [8].

Upcoming Clinical Significance

Although the NYSTEM program is still too young to have had a direct impact on the lives of patients, the Board recently approved three “consortia”—major disease-specific collaborative projects—that we hope will lead to clinical trials within or shortly after the contract period. One of the consortia recently approved is expected to be in clinical trials within the next 4 years, with the other two following shortly. These include an hESC-based therapy for Parkinson’s disease; a neural progenitor cell-based therapy for multiple sclerosis; and a therapy for age-related macular degeneration based on a population of stem cells found in the retina, raising the possibility of an autologous source of cells.

In addition, our shared facilities’ funding has had a significant impact on the growth and development of New York’s stem cell research community. NYSTEM now supports 14 unique resources that provide stem cell culture, fluorescence-activated cell sorting, and imaging expertise at multiple institutions, as well as a high-throughput screening facility at Columbia’s medical campus and a state-of-the-art cGMP facility at the University of Rochester.

These awards have facilitated the development of new stem cell-based disease models, such as induced pluripotent stem cell (iPSC)-based models for Noonan and LEOPARD syndromes at Mount Sinai School of Medicine and the first cell-based models for familial dysautonomia at Memorial Sloan-Kettering.

What’s Next?
The Board issued a strategic plan in May 2008 setting forth its vision for the first 5 years [1]. The plan listed targets for four areas of funding: research at 65%–80%, scientific training at 4%–10%, infrastructure development at 10%–15%, and ELsie (ethical, legal, and social issues and education) at 3%–5%. Now in the fifth year of that plan, NYSTEM is meeting its goals.

Recognizing that major scientific breakthroughs are often the result of basic research, the Board proposed a research agenda that allows for basic, translational, and clinical research. NYSTEM and the Board are currently working on the second strategic plan.

Upcoming Funding Priorities

The NYSTEM program has a history, albeit a short one, of funding basic research into both pluripotent and adult stem cells. We expect to continue such funding in the future.

The largest portion of our funding has gone to support investigator-initiated research projects, most of which would be considered basic research. However, we have begun to fund translational research, and the Board has expressed its commitment to continue. We expect to reissue the RFA for generic investigator-initiated projects, a mainstay of the program, in the near future. Furthermore, we anticipate continued support for shared facilities. Thus, we expect to fund a mix of basic and translational research through the duration of the program.

A Public Advocate

The Board works to influence new legislation and clinical practices in support of the public good. As such, we submitted comments to the National Institutes of Health (NIH) in response to the Draft Guidelines for Human Stem Cell Research in 2009, urging the NIH to expand funding to include research using hESC lines created with non-NIH funds.

The Board submission also argued that the NIH should align its provisions with prior guidelines, rather than create novel requirements, and harmonize with the guidelines of the National Academy of Sciences (NAS) and/or the International Society for Stem Cell Research (ISSCR). Additionally, the Board suggested that NIH grandfather the hESC lines previously approved for funding under President George W. Bush, so that scientists could continue current research projects rather than start from scratch. As for clinical practice, the Board requires awardees to submit research protocols involving human totipotent, pluripotent, neural, and gonadal progenitor stem cells to ESCROs for review, to ensure compliance with NAS or ISSCR guidelines. The Board also has made influential policy decisions, such as its position on donor compensation referred to earlier.

This is all very important for now and for the future. Patients’ expectations have been influenced by the media. The discoveries of hESCs in 1998 and iPSCs in mice and humans in 2006 and 2007 contributed to the excitement. Some press coverage describing the promise of stem cell therapies, however, has led desperate people to turn to unfounded, costly “stem cell tourism.” Although progress with hESCs and iPSCs has been rapid, the first clinical trials for cell therapies derived from hESCs have only just started, and the routine and responsible use of both is still many years away.

Education is vital. Although it may not result immediately in increased funding for stem cell research, direct communication with the public appears to be the most useful activity for the program and for our funded scientists. This can take the form of public lectures or visits to schools, articles in local newspapers, or participation in interviews on television and radio programs. In this way we help educate the public on the process by which basic research findings can lead to therapies, the serendipity sometimes involved, the length of time and amount of money needed, and the role of government in funding such research. These activities build support in the community, which translates into support from government and private donors.

Meet Nirav R. Shah, M.D., M.P.H.

Dr. Shah is the 15th New York State Commissioner of Health. He heads one of the nation’s leading public health agencies, with a budget of more than $50 billion, and administers the state’s public health insurance programs, which cover 5 million New Yorkers. The department also regulates hospitals and other health care facilities, conducts research in a premier biomedical laboratory, and supports public health and prevention initiatives.
A native of Buffalo, Dr. Shah is board-certified in internal medicine and is an honors graduate of Harvard College and Yale School of Medicine. He was a Robert Wood Johnson Clinical Scholar at the University of California, Los Angeles, and a National Research Service Award Fellow at New York University. Before becoming commissioner, he was an attending physician at Bellevue Hospital Center in Manhattan, associate investigator at the Geisinger Center for Health Research in central Pennsylvania, and assistant professor of medicine in the Section of Value and Comparative Effectiveness at New York University’s Langone Medical Center.

Dr. Shah has been a leading researcher in the use of large-scale clinical laboratories and electronic health records to improve the effectiveness and efficiency of care. He is a nationally recognized thought leader in patient safety and quality, comparative effectiveness, and the methods needed to transition to lower-cost, patient-centered health care for the 21st century. His vision for New York is one of a state where every resident has access to affordable health insurance coverage, high-quality care, and early screening and other services to prevent chronic disease and improve overall health.

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