

# The Newark Institute for Regenerative Medicine

## — TAKING STEM CELL SCIENCE FROM THEORY TO THERAPIES

WHILE THE HEALING POTENTIAL OF STEM CELLS IS GREAT, THE PATH TO CREATING EFFECTIVE THERAPIES BASED ON THESE BASIC BIOLOGICAL UNITS IS A CHALLENGING ONE. PRODUCED BY OUR BODIES IN AN UNDIFFERENTIATED STATE, STEM CELLS EVENTUALLY SPECIALIZE THROUGH NATURAL PROCESSES TO BUILD AND MAINTAIN SPECIFIC TISSUES AND ORGANS. DIRECTING THIS SPECIALIZATION, WHICH TODAY SEEMS VERY FEASIBLE, PROMISES TO YIELD TREATMENTS FOR A LIST OF AFFLICTIONS THAT CONTINUES TO GROW. THESE INCLUDE PARKINSON'S, DIABETES, ALZHEIMER'S, CANCER, AND TRAUMATIC BRAIN AND SPINAL INJURIES.

However, enthusiasm about such promise must be tempered with a realistic assessment of where the development of stem cell therapies now stands. Most of the exciting research under way has yet to be moved toward therapeutic reality. Treena Livingston Arinzeh, NJIT associate professor of biomedical engineering and stem cell researcher, says that basic research in this transformative scientific field must be taken to another level – in the case of stem cells, closer to proven therapies and the patients who can benefit from them.

Such a step was taken in December 2006, when New Jersey Governor Jon Corzine signed legislation to fund construction of a major stem cell research facility at NJIT as well as complementary facilities in New Brunswick, Camden, Allendale, and Belleville. The legislation, which had been previously approved by the New Jersey



Working to expand the frontiers of biomedical engineering and stem cell research: Associate Professor Treena Livingston Arinzeh (center) with graduate student Yee-Shuan Lee and postdoctoral fellow Norbert Weber

State Senate and Assembly, allocates \$50 million for construction of the NJIT facility in Newark.

The bill will advance NJIT's leadership in establishing the Newark Institute for Regenerative Medicine, dedicated to creating technologies to translate basic stem cell research into practical and deliverable therapies. The Institute's program is also designed to provide the foundations for creating a stem cell industry, integrating efforts across the state, nation and globe to accelerate the translation of basic research into cures.

The Institute will be housed in a new 100,000-square-foot facility in University Heights Science Park, in the heart of Newark's Innovation Zone. The structure will connect to the newest of the three buildings that comprise NJIT's technology business incubator. The facility will include laboratories dedicated to processing and classifying cellular materials, maintaining secure cryostorage, preparing and culturing cells, and conducting quality assurance of adult stem cell lines and derived therapeutic products.

### A powerful catalyst

The Institute's stem cell work promises to create a vital new segment for New Jersey's economy, already strongly linked to the pharmaceutical, medical device, and life sciences industries. It is also expected to be a powerful catalyst for the development of innovative medical equipment, control systems, information technology, and support services.

"Taking stem cells from the petri dish to clinical practice requires process technology that doesn't yet exist. Filling that void creates the opportunity for New Jersey to define the industry and reap the benefit of growth in jobs and the corporate tax base," says Donald H. Sebastian, senior vice president for research and development at NJIT. According to Sebastian, in addition to supplying stem cell lines for basic research and clinical trials, the Institute's comprehensive pilot-scale operations will provide a test bed for a wide range of custom equipment manufacturers who will be drawn to the Newark Innovation Zone to gain convenient access to the showcase facility.

"This stem cell research facility and proposed research funding for which we may compete will enhance our research effort in the life sciences and in biomedical engineering, and pave the way for development of stem cell therapy delivery products and processes here in Newark," said NJIT President Robert A. Altenkirch at the time Governor Corzine signed the bill. Altenkirch also acknowledged members of the NJIT community

who were instrumental in securing the facilities funding, particularly the efforts of Sebastian and Arinzeh; and he expressed his appreciation for the efforts of the sponsors and co-sponsors of the bill, especially the leadership of Senate President Richard J. Codey, Senator Paul Sarlo, and Assemblyman Neil M. Cohen.

### From isolation to distribution

Isolation procedures to ensure the purity of stem cells used in clinical applications and cell-characterization techniques will be core bio-process technologies to be developed at the Institute. Pioneering stem cell therapies have been based on direct injection of cells in an affected area, and it is critical to make sure that these cells are actually stem cells, which can be achieved through cell-isolation procedures. In addition, the capacity of cells to remain stem cells after multiple processing steps prior to clinical use is essential, and their capacity to differentiate into maturer cell types appropriate for therapy must also be verified prior to use.

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In many cases, direct injection of certain stem cells into the affected area is not an optimal therapeutic approach. Differentiated stem cells and stem cells delivered in combination with biomaterials are needed to improve performance. The processing environment for growing these cells at the Institute will share many characteristics of the differentiation stage, but is likely to require longer holding times and larger-scale components. The final stage will be the distribution of stem cell-based therapies that meet the most exacting standards for quality and patient compatibility.

In helping to create a stem cell industry from stem cell science, the Newark Institute for Regenerative Medicine is a significant addition to NJIT's host city, and to New Jersey's economy. Most importantly, it is a major investment of intellectual and financial resources in alleviating the effects of disease and injury for people everywhere. ■

AUTHOR: Jean M. Llewellyn is executive director of university communications at NJIT.

*For more about stem cell research at NJIT, see "Stem Cell Pioneer" in the winter 2005 issue, available online at <http://magazine.njit.edu>*