



Major News Summary Wednesday, August 11, 2010

CIRM News

[UCLA Scientists Discover Protein that Shuttles RNA into Cell Mitochondria](#)

UCLA Newsroom, 08/09/2010

Full Text Below

In a new study, UCLA researchers have uncovered the role played by an essential cell protein called polynucleotide phosphorylase (PNPASE) in shuttling RNA into the mitochondria, the energy-producing "power plant" of the cell. The study was funded by the National Institutes of Health, the **California Institute for Regenerative Medicine**, the American Heart Association, the Leukemia and Lymphoma Society, and an NIH Nanomedicine Roadmap Grant.

Stem Cell Research (US)

[NeoStem and the Schepens Eye Research Institute to Study NeoStem's VSEL™ Technology in Retinal Diseases](#)

PR Newswire, 08/11/2010

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NeoStem, Inc., an international biopharmaceutical company with operations in the U.S. and China, announced today that it has entered into a sponsored research agreement (SRA) with the Schepens Eye Research Institute, a charitable corporation of Massachusetts and an affiliate of Harvard Medical School. NeoStem will collaborate with the Schepens Institute and sponsor research in the laboratories of principal investigators Drs. Michael Young, Ph.D., Director of the Institute's Minda de Gunzburg Center for Ocular Regeneration, and Kameran Lashkari, M.D. The focus of the research will be on the development of therapies for both age-related macular degeneration (AMD) and Glaucoma.

Stem Cell Research (International)

[Scientist Explores Repairing Brain Through Stem Cells](#)

TopNews United Kingdom, 08/11/2010

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Neuro-scientist, Bronwen Connor is excited to go to her workplace each day, which is because she has been able to find a new possibility that stem cells could have the potential to repair the human brain. The Associate Professor of Pharmacology at Auckland University was really happy with the brain when she appeared for the first year general psychology paper. Dr. Connor said that she has actually become addicted to the brain ever since she began her university studies. She said that she is more of a neuro-scientist than being a pharmacologist. As of for now, research in adult stem cells is quite new. In the year 1998, international scientists made the discovery that adult brains keep on producing stem cells.

[UCLA Scientists Discover Protein that Shuttles RNA into Cell Mitochondria](#)

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In a new study, UCLA researchers have uncovered the role played by an essential cell protein called polynucleotide phosphorylase (PNPASE) in shuttling RNA into the mitochondria, the energy-

producing "power plant" of the cell.

The import of nucleus-encoded small RNAs into a cell's mitochondria is essential for the replication, transcription and translation of the mitochondrial genome, but the mechanisms that deliver RNA into mitochondria have been poorly understood.

In the current study, scientists from UCLA's Jonsson Comprehensive Cancer Center, the UCLA Department of Chemistry and Biochemistry and the UCLA Department of Pathology and Laboratory Medicine found that when the expression of PNPASE was reduced, RNA import decreased, impairing the processing of mitochondrial genome-encoded RNAs. Reduced RNA processing inhibited the translation of proteins required to maintain the electron transport chain which handles the conversion of oxygen into adenosine triphosphate, or ATP, the energy currency of a cell.

With reduced PNPASE, unprocessed mitochondrial RNAs accumulated, protein translation was inhibited and energy production was compromised, leading to stalled cell growth.

The study was published Aug. 5 in the peer-reviewed journal *Cell*.

"This discovery tells us that PNPASE regulates the energy producing function of mitochondria by mediating cytoplasmic RNA import," said Dr. Michael Teitell, a professor of pathology and laboratory medicine, a Jonsson Cancer Center researcher and co-senior author of the study. "The study yields new insight for how cells function at a very fundamental level. This information provides a potential new pathway to control mitochondrial energy production and possibly impact the growth of cells, including certain types of cancer cells."

Mitochondria are described as cellular power plants because they generate most of a cell's energy supply. In addition to supplying energy, mitochondria also are involved in a broad range of other cellular processes, including signaling, differentiation, death, control of the cell cycle and growth.

The UCLA finding could have implications for studying and treating certain cancers that rely on cellular energy to grow and spread, as well as mitochondrial disorders such as neuromuscular diseases. It could also result in new ways to think about attacking neurodegenerative disorders such as Parkinson's and Alzheimer's diseases, which have recently been linked to the function of mitochondria.

"When we're talking about looking for ways to cure cancer, we fundamentally need to understand what makes cells grow and die, and the mitochondrion is right at the heart of these issues," said Carla Koehler, a professor of chemistry and biochemistry, a Jonsson Cancer Center researcher and co-senior author of the study. "This new and novel pathway for transporting RNA into the mitochondria is shedding new light on the evolving role and importance of mitochondria function in normal physiology and a wide variety of diseases. If we can understand how this pathway functions in healthy cells, we could potentially uncover defects that help in transforming normal cells into cancer cells."

PNPASE was identified in 2004 by Teitell and his team as they attempted to find proteins that interact with TCL1, a human lymphoma-promoting cancer gene that has been used to generate genetic models of lymphocyte cancer. Mass spectrometry uncovered PNPASE, which had a signature sequence that suggested it trafficked into and localized within the mitochondria of cells. Once localized, Teitell, Koehler and postdoctoral fellow Geng Wang turned their attention to the function of PNPASE, which generated the unexpected results reported in this study.

Prior to their discovery, it was not known what pathway was used to get RNA into the mitochondria. PNPASE mediates the movement of RNA from the cell cytoplasm, the area of the cell enclosed by the cell membrane, into the matrix of mitochondria, where the mitochondrial genome is located. The protein acts as receptor and binds to cytoplasmic RNAs that have a particular stem-loop signature sequence, mediating import, Teitell said.

Without this RNA import, the cell lacks the machinery to assemble the mitochondria's energy source, Koehler said.

"The cell would lose most of its ability to make energy," she said. "It would be crippled. Mitochondria are fantastically complex, and our study reveals another cellular pathway in which these tiny but important powerhouses participate in essential cell activities, such as the generation of energy essential for life."

The study was funded by the National Institutes of Health, the California Institute for Regenerative

Medicine, the American Heart Association, the Leukemia and Lymphoma Society, and an NIH Nanomedicine Roadmap Grant.

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Retinal degenerative diseases such as age-related macular degeneration (AMD) and Glaucoma are currently the leading cause of incurable blindness in the western world. 1.8 million Americans suffer from vision loss due to AMD and an additional 7 million people are at substantial risk of suffering vision loss from AMD. By 2013, some experts agree that the cost domestically relating to AMD will be nearly \$2.3 billion. Currently, 4 million Americans suffer from Glaucoma at a total cost of approximately \$1.5 billion dollars domestically.

The research will examine in animal models the regenerative potential of NeoStem's VSEL™ Technology in the visual system through the engraftment of very small embryonic-like stem cells. Very small embryonic-like stem cells are a heterogeneous population of stem cells found in adult bone marrow that have properties similar to those of embryonic stem cells. NeoStem has shown that very small embryonic-like stem cells can be mobilized into the peripheral blood, enabling a minimally invasive means for collecting what NeoStem believes to be an important population of stem cells that may have the potential to achieve the positive benefits associated with embryonic stem cells without the ethical or moral dilemmas or the potential negative effects associated with embryonic stem cells.

"Our research team is looking forward to leveraging our adult stem cell expertise to advance the understanding and development of very small embryonic like stem cells for the treatment of age-related macular degeneration and Glaucoma through our collaboration with the Schepens Institute," said Robin Smith, M.D., Chairman and CEO of NeoStem. "We are excited to gain access to the expertise in ocular regeneration offered by Drs. Michael Young, Kameran Lashkari and the Schepens Institute through this important project."

"We are enthusiastic about working with NeoStem to explore the regenerative potential of their human VSEL Technology," said Dr. Michael Young, one of the principal investigators in the study. "Our goal in this project is to gain a better understanding of the plasticity of stem cells from different compartments of the body, and the very small embryonic-like stem cells from NeoStem represent an exciting new source of cells with potential to repair the diseased central nervous system, including the retina."

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Stem cells dwell in the crater of the brain.

The best part that is associated with the stem cells is that they have the capability to repair the brain.

A stem cell is a cell that is not committed or is non-specialized cell, which has no clue of what cell it ultimately would turn into, since it may develop into one of the three various brain cells.

In order to replace the cells that fade away with time, the new cells grow in number to take the place of dying cells.