The Stem Cell Matrix: a map of the molecular pathways that define pluripotent cells

Grant Award Details

The Stem Cell Matrix: a map of the molecular pathways that define pluripotent cells

Grant Type: Tools and Technologies I

Grant Number: RT1-01108

Investigator:

Name:	Jeanne Loring
Institution:	Scripps Research Institute
Type:	PI

Human Stem Cell Use: Embryonic Stem Cell, iPS Cell

Award Value: $1,133,552

Status: Closed

Progress Reports

Reporting Period: Year 1

View Report

Reporting Period: Year 2 + NCE

View Report

Grant Application Details

Application Title: The Stem Cell Matrix: a map of the molecular pathways that define pluripotent cells

Public Abstract:

Human embryonic stem cells (hESC) are being considered for a wide range of research and therapeutic uses. Cell therapy is the most challenging of the potential clinical applications and its success will depend on the ability to guide differentiation of hESC into clinically useful cell types. The ideal cell types would possess three features: the capacity to restore lost functions, the ability to survive after transplantation, and the absence of malignant potential.

A major roadblock in the development of stem cell therapies is the lack of tools for quality control, characterization, and identification of human pluripotent stem cells and differentiated populations. As new cell lines are developed and new differentiation techniques are tested, the need for validation of the cells becomes more and more critical if the cells are to be used in a clinical setting. We have developed a new method for unequivocally identifying pluripotent stem cell populations using molecular analysis tools developed for the Human Genome Project. We have identified a molecular fingerprint that is shared by all pluripotent cells, human or mouse, embryo-derived or produced from adult cells through new induced pluripotence technologies. Using the more than 10 million pieces of data we generated by analyzing hundreds of cell lines, we created a database called the The Stem Cell Matrix, which is intended to fill a critical knowledge gap in the field of human pluripotent cell biology. By collaborating with a company that has developed a powerful new search engine, we will be able to search these data for clues that will tell us whether a specific cell line is pluripotent, identify chemicals that may improve methods for reprogramming, and eventually link data from clinical trials with data on the genes that are active in the cells before they are transplanted. Our overall goal is to build on our proven technology to grow the database, providing a service that all CIRM-funded investigators can use for quality control and identification of the cells they are developing for research and clinical applications. An advantage of our approach is that the search engine can link our information to a much larger database on cancer cells, which will make it possible for stem cell researchers to develop new insights by comparing stem cells and cancer cells.

Statement of Benefit to California:

The State of California, like the rest of the nation, faces immense challenges to its health care system, with soaring medical costs and an aging population. Pluripotent stem cells hold the potential to revolutionize medicine and health care by providing new treatments for incurable conditions such as diabetes, Parkinson's disease, and spinal cord injuries. Stem cell therapies, however, are in an early stage, and research conducted over the next few years will be critical to development of therapies that are safe and effective.

We have developed a new technology that harnesses the powerful tools developed for the Human Genome Project to ensure quality control and simplify characterization of human stem cells used for research and clinical therapy. The technology links smoothly with databases and search engines that are being developed by the high tech industry. We propose to further develop this technology and make it available and accessible to stem cell researchers and clinicians throughout California. Ultimately, this technology, the discoveries it will enable, and its synergies with the high tech industry will benefit California by attracting highly skilled jobs and tax revenues, and by making the State a leader in a field that is poised to be the economic engine of the future.
