Long noncoding RNAs for pluripotency and cell fate commitment

Grant Award Details

Long noncoding RNAs for pluripotency and cell fate commitment

Grant Type: Basic Biology IV

Grant Number: RB4-05763

Project Objective: This program explores the role of long noncoding RNAs (lncRNA) in the epigenetic control hESC fate. Goals are to identify a family of lncRNAs that bind to and stabilize WDR5, a subunit of the MLL/trithorax complex, and to test a hypothesis that lncRNAs regulate WDR5-MLL activity through the ubiquitin-proteasome pathway.

Investigator:

Name:	Howard Chang
Institution:	Stanford University
Type:	PI

Human Stem Cell Use: Embryonic Stem Cell

Award Value: $1,386,627

Status: Closed

Progress Reports

Reporting Period: Year 1

View Report

Reporting Period: Year 2

View Report

Reporting Period: Year 3

View Report

Grant Application Details

Application Title:	Long noncoding RNAs for pluripotency and cell fate commitment
Public Abstract:	The human body is composed of thousands of cell types, which all came originally from embryonic stem cells. Although all these cell types have the same genetic blueprint, different genes are active in different cells to give each its distinctiveness. The process by which the genes remember whether they are in liver, brain, or skin cells is called “epigenetics.” A central problem in regenerative medicine is to understand the epigenetic program so that human embryonic stem cells can be efficiently turned into the cell types required for each specific patient. The goal of the proposed research is to better understand the epigenetic program in human embryonic stem cells and adult cells. We want to tap into the natural mechanisms by which the body normally “remembers” what kinds of cells reside in each tissue and apply them to regenerative therapies. Specifically, the research will study the roles of a newly discovered type of genes, termed “long noncoding RNAs" or lncRNAs. A better understanding of lncRNAs can improve regenerative medicine in several ways. First, specific lncRNAs can be used as markers to track and predict when cells are acquiring or forgetting specific cell fates. Second, manipulation of lncRNAs and their protein partners may allow cells to change or commit to specific cell fates. This research will specifically focus on how stem cells commit to specific cell fates, by locking genes into the "ON" state.
Statement of Benefit to California:	The proposed research can benefit the state of the California in three ways. First, the research will generate important knowledge on new ways to manipulate cell fate potentials of stem cells and mature adult cells. This information could speed the development of regenerative medicine in California, benefiting patients with currently untreatable diseases. Secondly, this research will develop new molecules and engineered stem cell lines that can be used to manipulate cell fates. These technological advances may have commercial value for the biotechnology industry. Finally, the proposed research will train young scientists to become skilled in human stem cell research. Graduate Ph.D. students and postdoctoral fellows in this California-based institution will gain the hands-on experience and expertise of manipulating human stem cells and of reprogramming adult cells. The training and experience of these young scientists will prepare them to develop new regenerative therapies, launch new companies based on stem cells, or teach future students about regenerative medicine.