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Enabling Technologies for Embryonic Stem Cell Functional Genomics

Status	Current
Competition	Development of New Technologies Competition
Sector	Development of New Technologies
Genome Centre	Genome Prairie
Project Leader	Geoff Hicks

Project Description

Embryonic stem (ES) cells have played an indispensable role in the discovery of the function of human disease genes and in creating mouse models of human disease. The “knockout” mouse, for example, allows researchers to identify gene function by examining the effect of gene alteration in ES cells and in mice derived from them. This powerful approach allows scientists to create animal models of disease, which can be used to study the causes of human disease and potential treatment or intervention strategies. With this proven and very powerful discovery tool, the International Knockout Mouse Consortium has established an integrated $100M worldwide effort that will rapidly and efficiently generate designed mutations in every gene in the mouse genome and make them freely available to all biomedical researchers. This resource is expected to have a wide reaching and significant impact across diverse scientific disciplines of a magnitude similar to those realized by the sequencing of the Human Genome.

ES cells have many other applications. Particularly with human ES cells now coming on line, ES cells have the potential to transform our knowledge of human disease and development and give rise to new classes of therapeutic agents – from novel drugs to cell-based therapies. Such studies are done only in cells and are approved by a national stem cell regulatory board to make certain legal and ethical aspects of using human stem cells are taken into consideration by an independent body.

To ensure Canada is strategically positioned to take full advantage of mouse and human ES cell resources, the scientists in this proposal identify several key barriers in the current state of ES cell technology and propose to develop novel technologies to overcome these barriers. The proposed technologies in this project will be developed using mouse ES cells, but can be applied by others to any model cell system. Each cutting edge technology is recently established in principle by the respective PIs and the current project application will allow a three-prong implementation strategy: development of the technology, validation of the technology, and delivery of the technology in a form that is readily accessible and immediately usable by the scientific community without specialized training. These enabling technologies are expected to significantly impact biomedical disease-focus research programs and biotech companies in Canada and thereby increase the rate at which new medical discoveries are moved into health care delivery.