

Dear Faculty, IGERT Fellows, IGERT Associates and Students,

You are cordially invited to attend a Seminar presented by Vincent On. Please plan to attend.

Vincent On

IGERT Fellow

Date: Friday, October 30th, 2015

Location: Chung 218 (VISLAB)

Time: 11:00am

StemCellQC: A Smart-Detection Multiplexing Toolkit for Evaluation of Cellular Processes, Quality, and Biomarkers of Harm

Abstract:

There is a foundational need for quality control tools in stem cell laboratories engaged in basic research, regenerative therapies, and toxicological studies. These tools require automated methods for evaluating cell processes and quality during in vitro passaging, expansion, maintenance, and differentiation. In this paper, an unbiased, automated multi-feature toolkit, StemCellQC, is presented that non-invasively extracts information on cell quality and cellular processes from time-lapse phase-contrast videos. Twenty four (24) morphological and dynamic features were analyzed in healthy, unhealthy, and dying human embryonic stem cell (hESC) colonies to identify those features that were affected in each group. Multiple features differed in the healthy versus unhealthy/dying groups, and these features were linked to growth, motility, and death. Biomarkers were discovered that predicted cell processes before they were detectable by manual observation. StemCellQC distinguished healthy and unhealthy/dying hESC colonies with 96% accuracy by non-invasively measuring and tracking dynamic and morphological features over 48 hours. Changes in cellular processes can be monitored by StemCellQC and predictions can be made about the quality of pluripotent stem cell colonies. This toolkit reduced the time and resources required to track multiple pluripotent stem cell colonies and eliminated handling errors and false classifications due to human bias. StemCellQC provided both user-specified and classifier-determined analysis in cases where the affected features are not intuitive or anticipated. Video analysis algorithms allowed assessment of biological phenomena at the next level of smart-detection analysis which can aid facilities where maintaining stem cell quality and/or monitoring changes in cellular processes are essential. In the future StemCellQC can be expanded to include other features, cell types, treatments, and differentiating cells.

