

Stony Brook University

The Graduate School

Doctoral Defense Announcement

Abstract

Quantitative Measurement of the Cell Cycle:

Insights into Differentiation and Basement Membrane Invasion

By

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The cell cycle is critical for the existence of life on earth. Cell division is responsible for the production of the raw materials necessary to develop complex organisms. Regulation of the cell cycle is necessary for the processes of both development and disease. Many cell biological activities are regulated, directly or indirectly, by the cell cycle. One such behavior, basement membrane invasion, occurs exclusively in the G1/G0 stage of the cell cycle in both development and disease. In *Caenorhabditis elegans*, Anchor Cell (AC) invasion through the basement membrane is one such activity dependent on cell cycle arrest in G1/G0. The AC depends on both chromatin modification via the histone deacetylase *hda-1* and the activity of *cki-1*(p21/p27) to arrest the cell cycle downstream of the nuclear hormone receptor *nhr-67*(TLX). This cell cycle arrest is both necessary and sufficient to rescue the loss of *nhr-67*, indicating the critical importance of the cell cycle in basement membrane invasion. Direct measurement of cell cycle state is important to the furtherance of our understanding of cell biology. Therefore, I have developed a ratiometric cell cycle indicator for use in *C. elegans*, utilizing a portion of Human DNA Helicase B (DHB). Characterization of DHB in *C. elegans* demonstrates its ability to detect all four cell cycle states in various tissues across all developmental stages. I have used DHB probe the link between cell cycle and morphogenesis in *C. elegans*. DHB has allowed us to detect G0 phase for the first time in living animals, confirming the hypothesized association between cell cycle arrest cell differentiation.

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