University of Massachusetts Medical School
UMASS

GRADUATE SCHOOL OF BIOMEDICAL SCIENCES
INTERDISCIPLINARY GRADUATION PROGRAM

Ph.D. THESIS DEFENSE

DANIEL KEIFENHEIM

Mentor: Nick Rhind, PhD

WEDNESDAY 6/17/2015 AT 10:00 a.m.

LRB 816

"Cell Size Control in the Fission Yeast *Schizosaccharomyces pombe*"

The coordination between cell growth and division is a highly regulated process that is intimately linked to the cell cycle. Efforts to identify an independent mechanism that measures cell size have been unsuccessful. Instead, we propose that size control is an intrinsic function of the basic cell cycle machinery.

My work shows that, in the fission yeast Schizosaccharomyces pombe, Cdc25 accumulates in a size dependent manner. This accumulation of Cdc25 occurs over a large range of cell sizes. Additionally, experiments with short pulses of cycloheximide have shown that Cdc25 is inherently unstable protein that quickly returns to a size dependent equilibrium in the cell suggesting that Cdc25 concentration is dependent on size and not time. Thus, Cdc25 can act as a sizer for the cell. However, cells are still viable when Cdc25 is constitutively expressed suggesting that there is another sizer in the case that Cdc25 expression is compromised.

Cdc13 is a likely candidate due to the similar characteristics when compared to Cdc25 and the ability to activate Cdc2. Cdc13 accumulates during the cell cycle in a similar manner to Cdc25. I show that in the absence of Cdc2 tyrosine phosphorylation, the cell size is sensitive to Cdc13 activity showing that Cdc13 accumulation can determine when cells enter mitosis.

These results suggests a two sizer model where Cdc25 is the main sizer with Cdc13 acting as a backup sizer in the event of Cdc25 expression is compromised

Mentor(s)
Nick Rhind, PhD

Dissertation Exam Committee
Dannel McCollum, PhD (Chair)
Job Dekker, PhD
Jennifer Benanti, PhD
Peter Pryciak, PhD
James Moseley, PhD