Nuclear Positioning in Fission Yeast Cells

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ABSTRACT

Symmetric cell division in *Schizosaccharomyces pombe* (fission yeast), is governed by interphase nuclear position. A centrally located nucleus would lead to the establishment of the cell plate along the median axis of the cell, hence resulting symmetric cell division. This positioning is established with the help of dynamic antiparallel microtubule bundles. Disrupting the microtubule dynamics or morphology leads to cell polarity defects and asymmetric cell division.
The microtubule associated protein, Mmb1p, functions as a glue between the mitochondria in the cell to the microtubule bundles. In the absence of Mmb1, the mitochondrial fission protein fragments the mitochondria, thus giving rise to a cell with several mitochondrial fragments. On the contrary, in the absence of the fission protein, Dnm-1, the mitochondria completely fuse and is present as a single large mitochondrial entity within the cell.
Changes in mitochondrial phenotype has never been reported to affect cell division or cell polarity. Data from the lab has shown that a subset of cells devoid of Mmb1P or Dnm1 shows asymmetric cell division and polarity defects. To understand the mechanism behind this finding, we set out to ask if the phenotype observed is a consequence of abnormal nuclear positioning during interphase. Yeast genetics and live cell microscopy are the tools used in this study to answer this question.
The objective of this study is to establish whether the absence of mitochondrial associated proteins, namely, Mmb1p and Dnm1, would affect nuclear positioning. In the process of trying to answer this question, I a) learned to make genetic crosses to obtain strains with desired mutations, b) visualized these strains using fluorescent confocal microscopy and Lastly, c) performed image and data analysis using the ImageJ software and MATLAB.
We observed the nuclear dynamics of wild type, Dnm1 delta and Mmb1p delta cells and plotted the distance of the nucleus from the cell centre throughout the time-lapse.
Upon analyzing the data, it appears that deleting the mitochondrial associated proteins, affects the positioning of the nucleus during interphase.

Keywords: *Schizosaccharomyces pombe*, Microtubules, mitochondria, Mmb1p, Dnm1

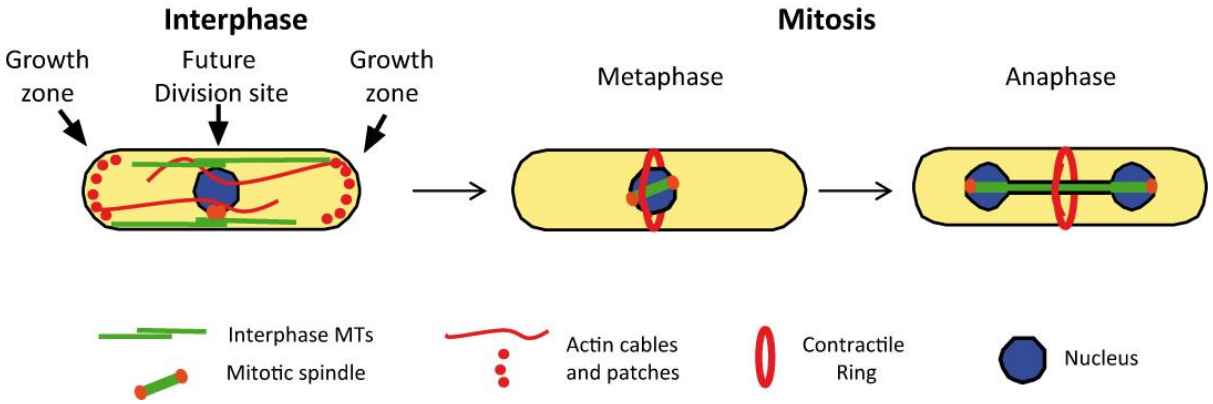

Figure 1. Steps leading to the formation of the cell plate in a wildtype fission yeast cell. Ref. Tran, P. & Paoletti, A. Cytoskeleton Architecture and Cellular Morphogenesis