Spindle positioning in budding yeast

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Chromosome segregation during cell division depends on a series of highly orchestrated interdependent interactions. Using an agent based approach we built a robust minimal computational model to capture mitotic events in budding yeasts of two major phyla: Ascomycota and Basidiomycota. This model convincingly reproduces experimental observations related to spindle alignment and nuclear migration during cell division in these yeasts. The model converges to the conclusion that biased nucleation of cytoplasmic microtubules is essential for directional nuclear migration. Two distinct pathways, based on the population of cytoplasmic microtubules and cortical dyneins, differentiate nuclear migration and spindle orientation in these two phyla. In addition, the model accurately predicts the contribution of specific classes of microtubules in chromosome segregation. Thus we present a model that offers a wider applicability to simulate the effects of perturbation of an event on the concerted process of the mitotic cell division [1].

[1] S. Sutradhar et al., Mol Biol Cell, mbc.E15-04-0236 (2015).