

Using monopolar spindles in *Caenorhabditis elegans* to study bipolar spindle function

Esther Dohmann Sophie Dumont, Garrett Greenan, Loren Hough, Tom McCloskey, Thomas Mueller-Reichert, Boo Shan Tseng and Anthony Hyman

Physiology Course 2006, Marine Biological Laboratory, Woods Hole, MA, 02543.

The faithful segregation of genetic material to daughter cells is the ultimate goal of mitosis. Cells employ a microtubule based bipolar spindle to ensure correct chromatid separation and the production of genetically identical daughter cells. This same structure is also used to introduce an asymmetry in the size of these daughter cells by displacing slightly toward the posterior during anaphase. Thus key events in the early embryo are a result of bipolar spindle orientation and positioning.

While it is assumed that the separation of the poles is largely responsible for chromatid separation in anaphase, we wanted to investigate the role of forces that might push chromatids apart independently of pole-kinetochore forces. To investigate this problem, we study chromatid movement in monopolar spindles.

A temperature-sensitive mutation in the kinase ZYG-1 abrogates its activity under non-permissive conditions. Up-shifted embryos are essentially normal in the first cell division due to the sperm contributed pair of centrioles, but the lack of ZYG-1 prevents subsequent centriole duplication. Therefore daughter cells inherit only one centriole from the mother and form monopolar spindles upon entry into mitosis.

Using *zyg-1* (*dh-1 ts*) worms we observe that sister chromatids congress, align on a metaphase plate and form a monopolar spindle which is half the size of a bipolar spindle. A reproducible separation of the sister chromatids occurs and we are investigating what forces are causing this movement. We have also analysed the positioning of the single centrosome and the monopolar spindle. Each monopolar spindle in *zyg-1 ts* embryos is orientated orthogonal to that of the wild type spindle. Furthermore we see increased oscillations of the single centrosome in the posterior cell of a two-cell stage embryo lacking functional ZYG-1, indicating that second centrosome is required to stabilize the position of the centrosome-nuclear complex.