

Biophysics of spindle assembly and microtubule associated condensates

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Microtubules are the main structural component of the mitotic spindle, the macromolecular machine responsible for capturing and segregating chromosomes during eukaryotic cell division. In this talk I will mainly discuss how microtubules are nucleated and organized in spindles that lack centrosomes. By reconstituting microtubule nucleation from purified chromosomes in meiotic *Xenopus* egg extract, we found that chromosomes alone can form spindles. We visualized microtubule nucleation near chromosomes using total internal reflection fluorescence microscopy to find that this occurs through branching microtubule nucleation. By inhibiting molecular motors, we find that the organization of the resultant polar branched networks is consistent with a theoretical model where the effectors for branching nucleation are released by chromosomes, forming a concentration gradient that spatially biases branching nucleation. In the presence of motors, these branched networks are organized into spindles. I will then briefly discuss different ways that biomolecular condensates may impact microtubule processes relevant for spindle assembly.