MunJu Kim, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL, USA
Katarzyna A. Rejniak, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL, USA

The Role of Intracellular Mechanical Factors in Microtubule Bundling

Microtubules, the component of cell cytoskeleton, play versatile roles in different cellular processes, such as maintenance of cell structure, the backbone of intracellular transport, formation of the mitotic spindle, and reorientation of intracellular organelles. More importantly, some of their functions rely on the mechanical properties, such as the elasticity of microtubules or the way that microtubules interact with surrounding media. In this presentation we will discuss the microtubule bundling observed in circulating tumor cells after taxane-based chemotherapy. It is widely accepted that the tubulin stabilizing effect of taxanes is responsible for the bundling phenomena, and it is also suggested that the pattern of microtubule bundles may have potential prognostic value in assessing patient response to treatment. However, the underlying mechanisms are not clear and a variety of factors contributing to microtubule bundling need to be understood to better serve as a prognostic tool. We designed a computational model that captures mechanical behavior of growing microtubules in response to the tubulin stabilization, and tested computationally various cytoskeletal and morphological conditions to identify the possible mechanisms of microtubule bundling. Therefore, our model is able to establish a direct relationship between microtubule reorganization and taxane-based therapy.