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Selected Publication

Choi YK, Liu P, Sze SK, Dai C and Qi Z (2010) CDK5RAP2 stimulates microtubule nucleation by the γ-tubulin ring complex (2010) *J Cell Biol* 191:1089-1095

Research Aims and Interests

As an essential scaffold in the cytoplasm of eukaryotic cells, microtubules are dynamic polar filaments with one end often attached to microtubule-organizing centers, such as centrosomes and the Golgi complex, and the other end located distally from the organizing centers and usually fast growing. At the organizing centers, microtubule nucleation and organization require γ-tubulin, a protein that exists in a macromolecular complex called the γ-tubulin ring complex (γTuRC). At microtubule distal ends, a group of proteins accumulate to regulate microtubule dynamics and attachment to various subcellular structures. Our current research investigates the organization and regulation of the γTuRC and characterizes proteins that track microtubule distal tips. Our previous work includes the functional characterization of CDK5RAP2, a widely expressed protein whose mutations cause autosomal recessive primary microcephaly. CDK5RAP2 is involved in microtubule organization on centrosomes and microtubule regulation at the distal ends. On centrosomes, CDK5RAP2 associates with the γTuRC and regulates microtubule nucleation. At microtubule distal ends, CDK5RAP2 in association with EB1 modulates microtubule growth and dynamics. These findings would expand our understanding of the molecular principles governing dynamic microtubule organization in various cellular events and how defects in these mechanisms result in diseases.

We have also been trying to understand microtubule nucleation and organization by the γTuRC on centrosomes. A multidisciplinary approach combining biochemistry, proteomics, molecular and cell biology is employed to investigate the nature and assembly dynamics of the γTuRC, to understand its association with and regulation by CDK5RAP2, and to systematically identify proteins that associate with the γTuRC. Molecular description of the γTuRC and functional determination of its components and associated proteins will allow us to progress on understanding the control mechanisms of microtubule nucleation, dynamics, and array organization.