A γ-tubulin ring complex-dependent pathway suppresses unscheduled ciliogenesis by promoting cilia disassembly

The primary cilium, a microtubule-based sensory organelle, undergoes cycles of assembly and disassembly that govern the cell cycle progression critical to cell proliferation and differentiation. Although cilia assembly has been studied extensively, the molecular mechanisms underlying cilia disassembly are less well understood.

γ-tubulin ring complex (γ-TuRC) serves as a master template for the formation of microtubules. Our previous work demonstrated that its activity is spatially and temporally regulated for assembling new microtubule arrays at different cell cycle stages. Recently, we uncovered a γ-TuRC-dependent pathway that promotes cilia disassembly and thereby prevents unscheduled cilia formation. We further demonstrate that Kif2A—a kinesin motor that bears microtubule-depolymerizing activity—is recruited to the cilium basal body in a γ-TuRC-dependent manner. Our mechanistic analyses show that γ-TuRC specifically recruits Kif2A via the GCP2 subunit and its binding partner Mzt2. Hence, despite the long-standing view that γ-TuRC mainly acts as a microtubule template, we illustrate that its functional heterogeneity at the basal body facilitates both microtubule nucleation and Kif2A recruitment-mediated regulation of ciliogenesis, ensuring cell cycle progression.