Mechanism for establishing the “nine-ness” of the basal body

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SUMMARY

Basal bodies have a highly conserved structure, consisting of nine triplet microtubules arranged in a rotational symmetry. How this arrangement is determined is poorly understood. By analyzing two *Chlamydomonas* mutants, *bld10* and *bld12*, we found that the cartwheel, a structure with a hub and nine radiating spokes, is crucial for stabilizing the 9-fold symmetry. The mutant, *bld10*, has a null mutation in a coiled-coil protein, Bld10p, that localizes to the cartwheel, and totally lacks basal bodies. Intriguingly, when a truncated Bld10p is expressed in *bld10*, basal bodies with eight triplets are frequently assembled. From the morphology of the cartwheel spoke in the abnormal basal body, we conclude that Bld10p is a major component of the spoke tip, and that the eight-triplet basal bodies are formed because the diameter of the cartwheel becomes smaller by truncation. The other mutant, *bld12*, frequently has basal bodies with abnormal triplet numbers, varying from 7 to 11. *BLD12* codes for a homolog of SAS-6, a protein essential for centriole formation in *C. elegans*. Evidence suggests that *Chlamydomonas* SAS-6 functions in arranging the radial array of the cartwheel spokes as a component of the central part of the cartwheel. The cartwheel must be crucial for stable formation of the 9-fold symmetrical structure of the basal body.