Functional analysis of axonemal dynein in *Paramecium*

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SUMMARY

Dynein is a molecular motor. Defects of axonemal dynein lead to human genetic diseases traced to ciliary dysfunction, such as Kartagener syndrome. Several research groups have shown that knockout of axonemal dynein causes abnormality of cilia movement and disrupted ciliogenesis in model organisms. However, there are still unsolved questions about the function of individual dynein proteins. *Paramecium* has been used as a model organism for analyzing cilia motility. In order to obtain more insight into the molecular mechanism of cilia motility, we have analyzed major proteins of the outer dynein arm. Dynein is composed of several proteins categorized by molecular weight: heavy chain, intermediate chain and light chain. The beta heavy chain of dynein head known as DNAH11 is involved in Kartagener syndrome. PtDNAH11-silenced *Paramecium* cells are motile but swim forward slowly and exhibit a reduced rate of digestive vacuole formation and growth. The gene for intermediate chain 1 (IC1), known as DNAi1, is also related to Kartagener syndrome. After PtIC1 knockdown, silenced cells showed the same phenotype as those lacking PtDNAH11. PtLC1 (p22) is an ortholog of *Chlamydomonas* and human light chain 1. PtLC1-silenced cells swim forward slowly but form normal digestive vacuoles, and the silenced cells showed high Ca^{2+} sensitivity. PtLC1 is possibly the same as the p29 identified by Hamasaki and co-workers.