

Roles of outer and inner dynein arms in the control of ciliary waveform in *Paramecium tetraurelia*

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SUMMARY

In *Paramecium*, a ciliary beat cycle consists of an effective and a recovery stroke. A normal ciliary waveform is necessary for normal swimming behavior. However, the molecular mechanism for controlling the ciliary waveform remains unclear. We specifically examined genes termed the outer dynein arm light chain 1 (ODA LC1) and the inner dynein arm intermediate chain 1 (IDA IC1). We examined the ciliary movements in *Paramecium tetraurelia*, in which the individual genes were silenced using RNAi with the feeding method. The reactivated cilia on the cortical sheets from non-silenced cells showed the normal beat cycle that consists of an effective and a recovery stroke in the presence of micromolar cGMP, but not without cGMP, which indicates that cGMP is necessary for the normal ciliary waveform. In the case of the ODA LC1-silenced cells, the change in the ciliary waveform in response to cGMP was quite normal. In contrast, the reactivated cilia from the IDA IC1-silenced cells showed a simple gyration without the phase of the effective stroke, irrespective of cGMP concentration. These results indicate that the IDA is responsible for controlling the ciliary waveform in response to cGMP.