Both subunits of the circadian RNA-binding protein CHLAMY1 can integrate temperature information.

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Projects

Functional characterization of molecular components of the circadian clock of the green alga *Chlamydomonas reinhardtii*
Details

Abstract

The circadian RNA-binding protein CHLAMY1 from the green alga *Chlamydomonas reinhardtii* consists of two subunits named C1 and C3. Changes in the C1 level cause arrhythmicity of the phototaxis rhythm, while alterations in the level of C3 lead to acrophase shifts. Thus, CHLAMY1 is involved in maintaining period and phase of the circadian clock. Here, we analyzed the roles of the two subunits in the integration of temperature information, the basis for other key properties of circadian clocks, including entrainment by temperature cycles and temperature compensation. Applied temperatures (18 degrees C and 28 degrees C) were in the physiological range of *C. reinhardtii*. While C1 is hyperphosphorylated at low temperature, the C3 expression level is up-regulated at 18 degrees C. An inhibitor experiment showed that this up-regulation occurs at the transcriptional level. Promoter analysis studies along with single promoter element mutations revealed that individual replacement of two DREB1A-boxes lowered the amplitude of c3 up-regulation at 18 degrees C, while replacement of an E-box abolished it completely. Replacement of the E-box also caused arrhythmicity of circadian-controlled c3 expression. Thus, the E-box has a dual function for temperature-dependent up-regulation of c3 as well as for its circadian expression. We also found that the temperature-dependent regulation of C1 and C3 as well as temperature entrainment are altered in the clock mutant per1, indicating that a temperature-controlled network of C1, C3, and PER1 exists.

Identifier

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