Oscillating long non-coding RNAs are novel regulators of circadian-mediated processes

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Abstract

Long non-coding RNAs (lncRNAs) have emerged as new players in transcriptional and post-transcriptional regulation able to modulate various biological processes. Although widely studied in animals, only few plant lncRNAs have been characterized in detail.
Using an *Arabidopsis thaliana* lncRNA custom-made array, we identified several circadian-regulated lncRNAs that are expressed antisense to protein-coding genes. Many of these lncRNAs display an oscillatory pattern of expression that is antiphasic to their antisense partners.

We functionally characterized the natural antisense pair comprising *CDF5* (*CYCLING DOF FACTOR 5*) and *FLORE* (*CDF5 LONG NONCODING RNA*) and found that their antiphasic behavior reflects a mutual inhibition, which is required for their proper oscillation. Moreover, *CDF5* and *FLORE* oppositely regulate photoperiod-dependent flowering by modulating *FT* (*FLOWERING LOCUS T*) expression. *CDF*s encode transcriptional regulators involved in flowering time control and abiotic stress responses. Considering that other members of the *CDF* family have antisense lncRNAs, it is likely that these antiphasic modules could perform different biological functions.

Moreover, these regulators are conserved in both in dicot (*Arabidopsis*) and monocot (rice) species. Therefore, we anticipate they would perform relevant biological functions, acting as fine-tuning modulators of different circadian-mediated processes, and thus contribute to improve plant fitness.