Facets of Histone Acetylation Required for Light-Responsive Gene Expression

Histone acetylation is an important component of chromatin structure that affects gene transcription. Hyperacetylation of histones relaxes chromatin structure and is associated with transcriptional activation, whereas hypoacetylation of histones induces chromatin compaction and gene repression. Benhamed et al. present new information on the effects of histone acetylation of chromatin on light-regulated gene expression. This work firmly establishes the pivotal role of Arabidopsis GCN5 and HD1 in controlling histone acetylation levels over several light-responsive genes and makes an important contribution to our understanding of the role played by chromatin in regulating gene expression. It was previously found that the histone acetyltransferase TAF1 is required for light regulation of gene expression. In this work, the authors show that histone acetyltransferase GCN5 and histone deacetylase HD1 are also involved and play opposing roles that may help to fine-tune and balance light regulation of gene expression. Mutations of GCN5 resulted in a long hypocotyl phenotype and reduced light-induced gene expression, whereas mutations in HD1 had the opposite effect. The authors further characterize the extent and type of histone acetylation on target promoters and find that TAF1, GCN5, and HD1 have distinct and specific effects on histone acetylation required for light regulation of gene expression.

RNA Turnover Plays a Role in Ethylene Signaling

Recessive ethylene-insensitive mutants known as ein5/ain1 correspond to a gene whose identity has remained elusive for more than 10 years. Potuschak et al. confirm that EIN5 is allelic XRN4, which encodes a cytoplasmic exoribonuclease. The authors show that XRN4 is required for ethylene responses and likely acts between CTR1 and EBF1/2 in the ethylene signaling pathway. xrn4 mutants have increased levels of EBF1/2 mRNA, consistent with the function of XRN4 as an exoribonuclease involved in mRNA turnover. Ethylene insensitivity of the mutants is related to increased levels of EBF1/2 transcript, which encodes related F-box proteins involved in degradation of the EIN3 protein, a key transcriptional regulator in the ethylene response pathway that functions in the induction of primary target genes of the ethylene transcriptional cascade. Interestingly, XRN4 has been found to play a role in microRNA-directed mRNA degradation and RNA-induced gene silencing events. However, Potuschak et al. show that regulation of EBF1/2 mRNA turnover by XRN4 is independent of these processes. The identification of XRN4 as a key component in ethylene signaling adds RNA degradation as another post-transcriptional process that modulates perception of this plant hormone.

New model of the ethylene signaling cascade including XRN4/EIN5.
RNA Turnover Plays a Role in Ethylene Signaling
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