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The effect of reduced chromatin gene expression on an epigenetically regulated maize gene

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In virtually all eukaryotic organisms, not just plants, genes are regulated at the level of chromatin. In a genomics approach to understand how expression of a gene can be regulated by its chromatin configuration, a series of maize mutants in which chromatin gene expression has been knocked down by RNA interference are being analyzed.

Mutants of three different types of chromatin genes, which all are thought to have normal roles in gene silencing, were examined. The maize gene *chr101* is orthologous to the Arabidopsis gene *DDM1*, which codes for an ATPase-dependent chromatin remodeling protein responsible for maintaining DNA methylation and gene silencing patterns. The maize genes *dmt101*, *dmt102*, and *dmt106* show sequence homology to the Arabodopsis genes *MET1*, *CMT1*, and *DRM3*, respectively, all of which code for DNA methyltransferases. The maize *mbd* genes show sequence homology to the Arabodopsis AtMBD genes, which code for methyl-CpG-binding domain proteins responsible for binding specifically to methylated DNA and recruiting histone deacetylases, which aid in tightening chromatin structure.

To look at the effect of reduced chromatin gene expression, plants carrying transgenes targeting *chr, dmt,* or *mbd* genes were crossed to a line carrying a gene that acts as a reporter for chromatin-level regulation. The reporter, *Pl-Blotched*, activates synthesis of purple anthocyanin pigments to produce a variegated phenotype that is correlated with closed chromatin and a distinct pattern of DNA methylation. Mutations in genes that are necessary for maintaining a closed chromatin configuration--like *chr*, *dmt,* and *mbd* genes--may lead to increased *Pl-Blotched* expression, which should be evident phenotypically as higher anthocyanin levels. To test this idea, I measured pigment levels in plants carrying chromatin-gene mutations. Increased pigmentation in the transgenic plants will provide evidence that the targeted genes play a role in regulating *Pl-Blotched*.