

MiCEE is a ncRNA-protein complex that mediates epigenetic silencing and nucleolar organization

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Abstract

© 2018 The Author(s). The majority of the eukaryotic genome is transcribed into noncoding RNAs (ncRNAs), which are important regulators of different nuclear processes by controlling chromatin structure. However, the full extent of ncRNA function has remained elusive. Here we deciphered the function of the microRNA Mirlet7d as a key regulator of bidirectionally transcribed genes. We found that nuclear Mirlet7d binds ncRNAs expressed from these genes. Mirlet7d-ncRNA duplexes are further bound by C1D, which in turn targets the RNA exosome complex and the polycomb repressive complex 2 (PRC2) to the bidirectionally active loci. The exosome degrades the ncRNAs, whereas PRC2 induces heterochromatin and transcriptional silencing through EZH2. Moreover, this multicomponent RNA-protein complex, which we named MiCEE, tethers the regulated genes to the perinucleolar region and thus is required for proper nucleolar organization. Our study demonstrates that the MiCEE complex mediates epigenetic silencing of bidirectionally expressed genes and global genome organization.

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