K(Ch)romatin-Associated Nuclear Guide RNA Functions as a Sequence-Specific Transcription Activator

A distinct class of RNAs, termed K(Ch)romatin-Associated Nuclear Guide (KANG) RNAs, comprises 31-nucleotide 5′-tRNA-derived fragments that rapidly accumulate in the nucleus of plants in response to pathogen challenge. Interestingly, expression of these KANG RNAs alone is sufficient to activate defense gene expression and confer resistance to both pathogens and pests. KANG RNAs associate with chromatin through a specific 5′-end sequence, which can be customized to target desired genomic loci. These RNAs also exhibit intercellular mobility that is enhanced upon pathogen infection in a manner dependent on components of systemic acquired resistance (SAR). Importantly, overexpression of KANG RNAs leads to increased disease resistance with minimal impact on plant growth. The broad applications of KANG RNAs in biotechnology will be discussed.