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19.12.18 Transcription complex proteins gain novel function to drive genome defence against transposons

last modified Dec 20, 2018 05:17 PM

In this Genes & Development article, the Miska and Ahringer labs with colleagues in China and Germany show how four proteins with ancestral functions combine in a complex that is essential for production of piRNAs

The USTC complex co-opts an ancient machinery to drive piRNA transcription in *C. elegans*

Weng C *et al.* (2018) Genes & Development (http://genesdev.cshlp.org/content/early/2018/12/19/gad.319293.118) , Online advance publication on 19 December 2018, doi: 10.1101/gad.319293.118

Abstract from the paper

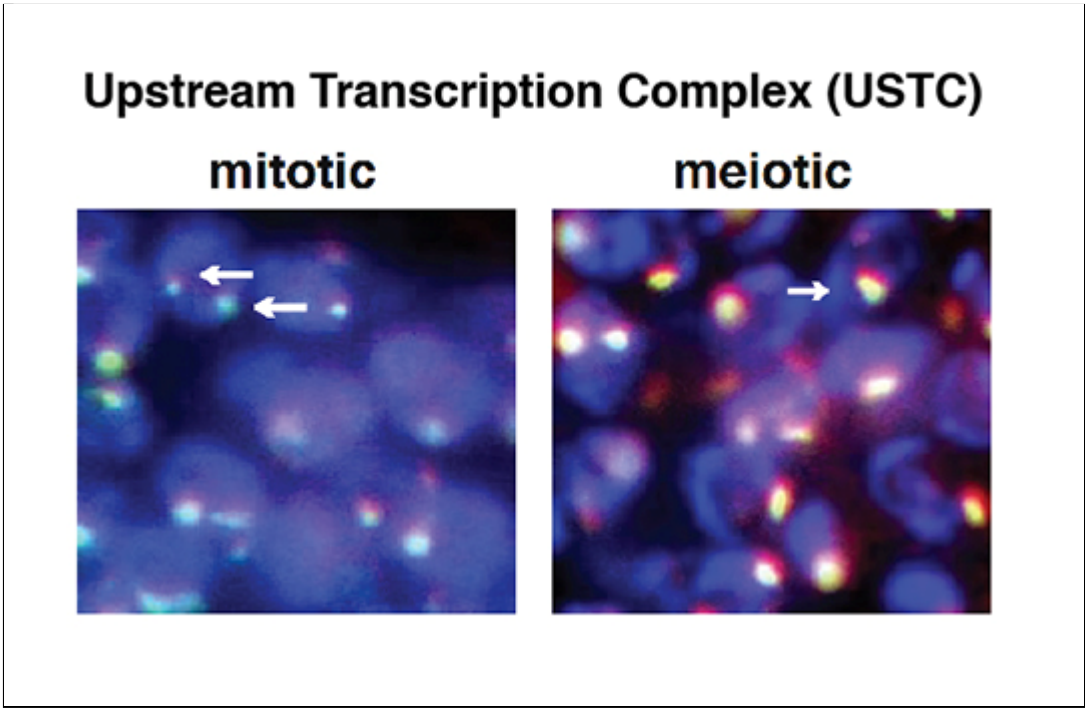
Piwi-interacting RNAs (piRNAs) engage Piwi proteins to suppress transposons and nonself nucleic acids and maintain genome integrity and are essential for fertility in a variety of organisms. In Caenorhabditis elegans, most piRNA precursors are transcribed from two genomic clusters that contain thousands of individual piRNA transcription units. While a few genes have been shown to be required for piRNA biogenesis, the mechanism of piRNA transcription remains elusive.

Here we used functional proteomics approaches to identify an upstream sequence transcription complex (USTC) that is essential for piRNA biogenesis. The USTC contains piRNA silencing-defective 1 (PRDE-1), SNPC-4, twenty-one-U fouled-up 4 (TOFU-4), and TOFU-5. The USTC forms unique piRNA foci in germline nuclei and coats the piRNA

cluster genomic loci. USTC factors associate with the Ruby motif just upstream of type I piRNA genes. USTC factors are also mutually dependent for binding to the piRNA clusters and forming the piRNA foci. Interestingly, USTC components bind differentially to piRNAs in the clusters and other noncoding RNA genes.

These results reveal the USTC as a striking example of the repurposing of a general transcription factor complex to aid in genome defense against transposons.

Figure shows the unique foci formed by USTC in the C. elegans *germline*



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Read more about research in the Miska (https://www.gurdon.cam.ac.uk/research/miska) and Ahringer (https://www.gurdon.cam.ac.uk/research/ahringer)labs.

Watch Eric Miska (https://www.youtube.com/watch?v=jXmM8Or62h8) and Julie Ahringer (https://www.youtube.com/watch?v=ewWq35VbSsI) describe their research in these short videos.