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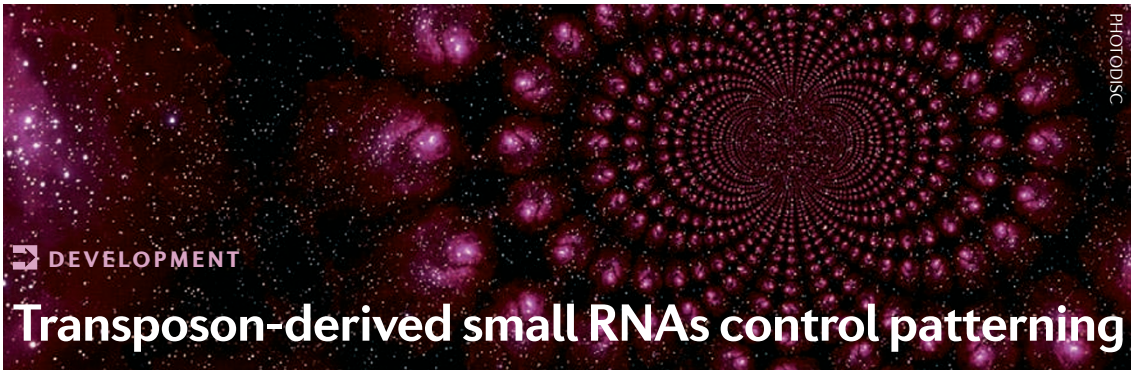

DEVELOPMENT

Transposon-derived small RNAs control patterning

Early embryogenesis requires the precise orchestration of repression and degradation of maternal transcripts with activation of the embryo's genome. A new paper reveals that retrotransposon-derived Piwi-interacting RNAs (piRNAs) are involved in this switch in *Drosophila melanogaster*. Intriguingly, this suggests a direct role for transposable elements in development.

piRNAs are small RNAs that have essential roles in maintaining genomic integrity in the germ line by repressing transposable elements. They are also maternally deposited in the early embryo, and Rouget and colleagues used *D. melanogaster* mutants that are defective in the piRNA pathway to explore whether this pathway affects maternal RNAs in early embryos. Maternal *nanos* (*nos*) mRNA is normally translationally repressed and degraded in the bulk of the embryo but remains at the posterior pole, thus giving rise to a NOS gradient that is required for anteroposterior patterning. The authors found that the mutant embryos failed to deadenylate *nos* mRNA, which led to ectopic NOS expression and defects in head development.

nos mRNA deadenylation requires recruitment of the deadenylase protein CCR4 to the transcript by Smaug (SMG), so the authors investigated the relationship between the piRNA pathway and these proteins. They found that two Argonaute proteins that are specifically involved in the piRNA pathway associate with CCR4 and SMG and that defects in the piRNA pathway disrupted the distribution of CCR4 and SMG in the embryo. They also identified piRNAs that are complementary to the *nos* 3′ UTR and showed that blocking these piRNAs or deleting their binding sites in *nos* results in head developmental defects or altered *nos* mRNA deadenylation, respectively. Together, these experiments support a direct role for piRNAs in the regulation of the maternal *nos* transcript.

This new function for piRNAs is likely to be widespread, as the authors found that the deadenylation of other maternal mRNAs is affected in piRNA pathway mutants. Importantly, because these regulatory piRNAs originate from transposable elements, this work suggests that the host genome has co-opted these genomic 'parasites' for a mechanism of developmental control.

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ORIGINAL RESEARCH PAPER Rouget, C. *et al.* Maternal mRNA deadenylation and decay by the piRNA pathway in the early *Drosophila* embryo. *Nature* 17 Oct 2010 (doi:10.1038/nature09465)
FURTHER READING Ghildiyal, M. & Zamore, P. D. Small silencing RNAs: an expanding universe. *Nature Rev. Genet.* **10**, 94–108 (2009)