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Panoramix: The missing link between the piRNA pathway and the general silencing machinery

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The piwi-interacting RNA (piRNA) pathway is a small RNA-based innate immune system that defends germ cell genomes against parasitic transposons. In Drosophila ovaries, the nuclear piwi protein is required for transcriptional silencing of transposons, though the precise mechanisms by which this occurs are unknown. Through mining the data from several independent genome-wide RNAi screens for factors required for transposon silencing, we identified an ovary specific nuclear protein (CG9754/Panoramix) that can influence global transposon transcription similarly as piwi when eliminated. The effect is not due to the defects of piRNA biogenesis since levels of piRNAs remained unchanged and piwi proteins stayed bound with piRNAs in nucleus. Strikingly, enforced tethering of this protein to nascent mRNA transcripts, causes co-transcriptional silencing of the source locus (~1000-fold repression) and the deposition of repressive chromatin marks. Interestingly, this protein is a component of piwi complexes that functions downstream of piwi and its binding partner, Asterix. We have named this gene Panoramix, the mentor who empowers Asterix to perform his feats of strength. Importantly, we found that both Eggless/dSetDB1 (H3K9 methyltransferase) and dLSD1 (H3K4me2 demethylase) are required for Panoramix-mediated silencing. Therefore, we propose that Panoramix forms one of the missing links between the piRNA pathway and the general silencing machinery that it recruits to enforce transcriptional repression to protect germline from transposons.

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