Retrovirology

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Invited speaker presentation

Silencing of retroviruses by small RNAs in *Drosophila*

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Retroviruses propagate also in invertebrates. The *Drosophila* genome contains many proviruses belonging to several families of endogenous retroviruses. These proviruses are usually repressed, but the mechanisms involved in their repression have been a mystery for a long time.

Gypsy is a *Drosophila* endogenous retrovirus that is also infectious. Therefore it can propagate both horizontally as infectious retroviruses and vertically as endogenous retroviruses. It can transpose as well as retrotransposons. One of the principal ways of propagation of gypsy involves infection of the female germline by particles produced by somatic cells of the ovaries. This process is normally repressed by the host locus *flamenco* (*flam*). Restrictive *flam* alleles repress gypsy in these somatic cells. We have shown that the repression correlates with the amount of complementary 24-29 nucleotide long piRNAs (Piwi interacting RNAs). These small RNAs are responsible for the control of transposable elements. The silencing mechanisms associated with them are different from the mechanisms associated with siRNAs and miRNAs and have still to be elucidated.

The amount of gypsy piRNAs is determined by the *flam* locus in a provirus copy number-independent manner and their production is triggered by pericentromeric defective proviruses located in the locus. *flam* also controls other retroelements. The *flam* region is very rich in defective copies of retrotransposons and endogenous retroviruses, including gypsy.

Our results indicate that the piRNA silencing pathway may be considered as a sort of immunity system using the defective proviruses (or transposable elements) located in heterochromatin as a repertory directing the silencing machinery toward the transcripts of the corresponding functional retroviruses (or transposable elements).