# Fighting back epigenetic control: A story about the evolution and function of transposon-encoded anti-silencing systems

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**Abstract**

Epigenetic control of transposable elements (TEs) imposes strong selective constraints, engaging hosts and TEs in contested evolutionary arms races. An expected outcome of these arms races is the emergence of TE-encoded counteracting systems. However, the existence of such counteracting responses remains obscure. Here, we present the discovery and characterization of evolutionary unrelated anti-silencing systems encoded by distinct DNA transposons in plants. A shared characteristic of these independent systems is their remarkable sequence specificity, which relies on TE-encoded regulatory factors harboring DNA-binding domains of unknown origin, along with multimerization domains. These factors have the ability to bind target DNA sequences embedded in highly heterochromatic sequences, akin to bona fide pioneer transcription factors, and induce specific loss of DNA methylation and epigenetic activation of targeted TEs. Last, we also demonstrate that the activity of TE-encoded anti-silencing factors could account for the hitherto enigmatic Enhancer/Suppressor function described by Barbara McClintock more than 60 years ago. Our findings reveal how conflicts between TEs and hosts have driven the evolution of controlling systems.

**Keywords:** epigenetics, anti, silencing, arms race, plants, DNA transposons, DNA methylation

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