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Title: REDUCTION OF SATELLITE DNA TRANSCRIPTION ENHANCES DRIVE IN SEGREGATION DISTORTION

Abstract: Meiotic drivers are selfish genetic elements that bias their transmission during gametogenesis. One of the well-known examples is Segregation Distorter (SD) in *Drosophila melanogaster*. SD heterozygous male flies transmit the SD chromosome to nearly all of their progeny (>95%). Two key components have been identified in the SD system: the driver, Segregation distorter (Sd), and its target, Responder (Rsp). Sd encodes a truncated duplication of the gene RanGAP, and Rsp corresponds to tandem satellite DNA (satDNA) repeats. Besides these two key components, there are different modifiers of SD in the genome that are also critical for the strength of drive. Different SD haplotypes exist in natural populations, and while all SD chromosomes have Sd-RanGAP, they may differ in their modifiers. SD targets Rsp-bearing sperm for destruction, however, the role of Rsp in this process and how is it targeted by SD remain unknown. To test if Rsp transcripts play roles in SD drive, we performed RNA-seq to detect the expression level of Rsp in testes with or without SD. We found that the Rsp piRNA population is reduced in SD heterozygotes. This reduction is specific to one SD chromosome (SD-Mad), and not another SD chromosome (SD-5). These SD chromosomes differ in their chromosomal inversions and may differ in their modifiers. Our data suggest that the disruption of Rsp piRNA production may be due to potential modifiers of SD on the SD-Mad chromosome. We show that the Rsp piRNA level is recovered when Sd-RanGAP is deleted, and that overexpression of Rsp piRNAs partially rescues the segregation distortion of SD-Mad, demonstrating a correlation between the Rsp piRNA level and the drive strength of SD-Mad. Taken together, our results indicate that some modifiers of SD may facilitate drive by disrupting piRNA production from Rsp, which may play a role in regulating the chromatin state during spermatogenesis.