ABSTRACT

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Haplotypic independence and evolutionary innovation in the absence of sex: insights from mites and stick insects

Sex strongly impacts genome evolution via recombination and segregation. In the absence of these processes, haplotypes within lineages of diploid organisms are predicted to accumulate mutations independently of each other and diverge over time. Such haplotypic independence might lead to non-canonical routes of evolvability, helping some species to adapt, diversify and persist for millions of years alleviating the predicted negative consequences of asexuality. Here, I present genomic and transcriptomic data indicating divergence and disparate evolutionary trajectories between haplotypic blocks for millions of years in parthenogenetic oribatid mites. Evolutionary independence between haplotypes can also provide the opportunity to generate insight into how parthenogenesis originated in the first place. Using separate maternal and paternal haplotype trees in hybrid *Bacillus* stick insects with different alternative reproductive strategies, I show that the fully clonal transmission of both parental haplotypes in parthenogenetic *Bacillus* lineages evolved from hybridogenesis where only the maternal haplotypes are transmitted clonally; the paternal genome is eliminated from the germline each generation and replaced by mating with the paternal species. This indicates that a loss of sex *per se* may drive evolutionary innovation in the form of different alternative reproductive strategies. Studying interaction and conflict between diverged haplotypes in hybrid and non-hybrid asexual organisms promises novel insights into how alternative reproductive strategies can originate and succeed.