

Sex Peptide Evolution and the Impact of Selfish Genetic Elements

Submitted by Damian Thomas Smith, to the University of Exeter as a thesis for the degree of Doctor of Philosophy in Biological Science, July 2010.

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Signed: Damian Thomas Smith

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Abstract

Sexual conflict can occur when a trait is expressed in both sexes but has different optima in each (intralocus conflict) or when a beneficial trait expressed exclusively in one sex is detrimental to the other (interlocus conflict). The *Drosophila melanogaster* accessory gland protein (Acps) “sex peptide” (SP) has been implicated in interlocus conflict as it benefits males while being costly to females. Selfish genetic elements (SGEs) such as the endosymbiont *Wolbachia* and transposable elements (TEs) also influence fitness. DDT resistance is caused by a TE and is beneficial to females in the absence of DDT. Although the DDT resistance TE was present in populations before DDT use, it did not spread in populations, suggesting a hidden cost when expressed in males, making it potentially a sexually antagonistic allele.

This thesis aims to investigate the natural variation of male SP expression levels and the fitness consequences for males of this variation. I examine if *Wolbachia* infection influenced the expression levels or fitness consequences of SP variation. Additionally, I attempt to measure the fitness consequences of DDT resistance in males to test if intralocus conflict may potentially explain why DDT resistance did not spread before the use of DDT.

I found high levels of genetic variation in male SP expression levels, and this variation had fitness consequences for males via its effect on female refractory periods. I also found pre-copulatory costs to DDT resistance in males. However, these costs were not consistent when tested across different genetic backgrounds or when many individuals were present and incorporating larval competition, implying that additional costs and benefits to DDT resistance exist, which may explain why it did not spread before the use of DDT.

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