Spatiotemporal dynamics of sperm storage in the black soldier fly (Hermetia illucens), implications for post-copulatory sexual selection

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Résumé

When it comes to describing reproduction in internally fertilized species, understanding the dynamics of sperm storage - from sperm transfer to its use for fertilization - is crucial to unravel the complexities of post-copulatory selection processes. In this framework, we investigated the spatiotemporal dynamics of sperm storage in a species of great economic interest, the black soldier fly (BSF) which is used worldwide to convert agrowastes in valuable proteins. In females, spermathecae are compartmentalized, suggesting a control of sperm after copulation. Under controlled conditions, we counted sperm in the different parts of the female tract during and after mating, as well as after egg-laying. We also analysed spermathecae ultrastructure with transmission electronic microscopy to better describe their functioning. Our experiment revealed a two-step copulation process in BSF: the male initially transfers seminal fluid to the female during at least the first fifteen minutes, then he transfers a mass of spermatozoa that potentially acts as a sperm plug for one to two days during which only some spermatozoa enter the reservoirs. In a context of single mating, we found BSF females are able to lay up to three clutches and that spermatozoa stored after one mating are not limiting for laying. This description strongly suggests the evolutionnary pressure of a complex sexual selection and potential sexual conflicts processes involved in BSF reproduction.

Mots-Clés: male sperm precedence, spermathecae, female reproductive behavior, successive egg, laying, sperm plug, Black soldier fly

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