

## **Complex evolutionary trade-offs between ageing, immune response and sexual attractiveness in mealworm beetle *Tenebrio molitor***

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Age-related decline in immune activity is referred to as immunosenescence and has been observed for both the adaptive immune response of vertebrates and the innate immune system of invertebrates. Invertebrates do not possess lymphocyte or antibody-based humoral immune systems. Recent evidence shows that many invertebrates possess ‘trans-generational priming’, which means that either immune-challenged mothers (Moret, 2006) or fathers (Roth et al., 2010) can transfer their protective effects to their offspring (Schmid-Hempel, 2011). However, they have developed other efficient ways of immune defence. Because maintaining a basic level of immune defence and mounting an immune response is costly, optimal investment in immune function should vary over a wide range of individual states such as the individual’s age. In this study, we tested whether the immune response and immunological priming within individuals become less efficient with age using mealworm beetles, *Tenebrio molitor*, as a model organism. We also tested whether ageing and immunological priming affected the odours produced by males.

We found a significant increase in the encapsulation response against the nylon monofilament between the first and the second implantations of double challenged males of the young male group. We found that young males of *T. molitor* were capable of mounting an immune response a sterile nylon monofilament implant with the potential to exhibit a simple form of immune memory through mechanisms of immune priming. This was demonstrated by greater values of encapsulation in the second implant of treatment males of the young male group compared with control males of the young male group. Our results show that optimal investment in the immune system may vary over a range of individual states. We found that young beetles can afford both within individual immune priming of their encapsulation response and increased sexual attractiveness and longer life span, whereas the implantation had a more negative impact on older beetles. The immune system of older males in *T. molitor* is less effective, suggesting complex evolutionary trade-offs between ageing, immune response and sexual attractiveness.

### **References:**

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