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Room: Seminar Room

Interaction between genetic effects and experimentally manipulated pre-hatching hormonal conditions

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Maternal effects shape phenotypic traits in many organisms providing them with effective means of responding to environmental heterogeneity experienced by their mothers. Maternal effects are mediated through a wide array of mechanisms, and hormonal mediators are important examples thereof. Bird mothers deposit various hormones in their eggs' yolks to influence the traits of their offspring. Since maternal effects were repeatedly demonstrated to interact with additive genetic effects, maternal effects may provide one of possible mechanisms of genotype-by-environment interactions. Here, we experimentally test this possibility by manipulating yolk levels of two important hormones (testosterone and corticosterone) in developing embryos of the blue tit inhabiting a long-term monitored wild population. Hormones levels were manipulated by injecting eggs with three types of solutions (sham injection; testosterone solution; corticosterone solution). Subsequently, the eggs were cross-fostered between nests arranged in triplets and chicks were assigned to their eggs by hatching them in an incubator. Offspring traits were analysed using an animal model. Our results show that the expression of additive genetic effects in morphological and condition-dependent traits in this species depends on the elevated levels of yolk steroid hormones: steroids affected both the amount of observed genetic variance in traits and genetic correlations within traits between experimental groups. It indicates that maternal hormones may significantly contribute to generating and maintaining genotype-by-environment interactions, which in turn contribute to the maintenance of genetic variance in naturally selected traits.