Social and molecular regulation of size-related division of labor in the bumblebee Bombus terrestirs

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We combined sociobiological, physiological, and molecular approaches to study division of labor in the model bumblebee *Bombus terrestris*. Given that division of labor in bumblebees strongly relates to body size, we investigated the social factors influencing larva development. We identified a critical period shortly after larval hatching during which direct contact with the queen shortens larval developmental duration. Ultimate body size is thus determined by interplay between a negative effect of contact with the queen and a positive effect of the total number of brood caring bees. RNA sequencing analyses further showed that many brain transcripts are differentially expressed in worker bees specializing in foraging or brood care activities; some of these transcripts were shown to be differentially expressed in “nurses” and “foragers”, even when we controlled for genetic variation, age, and body size. There was very little overlap between the list of genes associated with task performance and those regulated by JH. This later finding lends credence to the hypothesis that by contrast to honeybees, in bumblebees JH does not regulate the division of labor. Adenosine Deaminase Acting on RNA (ADAR) mediated RNA editing (“A-to-I RNA editing”) was ubiquitous in the bumblebee brain, including recoding of ion channels, transporters, and receptors that are predicted to affect brain function and behavior. Editing levels were influenced by task performance, but not by dominance or JH. Taken together our results show that the social environment during larva development determines its ultimate body size and the propensity to perform brood care or foraging activities. Despite the flexibility in task performance, division of labor in *B. terrestris* is associated with differential gene expression and RNA editing. I will discuss specific genes and molecular processes that are associated with task performance.