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Constitutive protection, mismatch, and the role of small RNA in transgenerational immune memory in the bumblebee Bombus terrestris

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A number of invertebrates show evidence of immune memory or priming. Individuals given cues of a parasite either as a clearable dose or an inactivated inoculum are better able to resist a subsequent exposure than naive individuals or those given a different priming immune exposure. This immune history can also be transferred across generations with offspring having increased resistance to parasites that their parents were exposed to. Since invertebrates lack the antibodies and T-cells of the adaptive immune system, the mechanisms behind such memory remain mysterious. Here we describe the full transcriptome expression profile of transgenerational immune memory in the European bumblebee *Bombus terrestris*. We found that daughters of mothers exposed to an inactivated inoculum of the Gram-positive bacterium *Arthrobacter globiformis* constitutively express all known antimicrobial peptides at much higher quantities than daughters that have no immune history. We also describe how a mismatch between immune history and exposure results in a fundamentally different expression pattern. Finally, we explore the role of small RNA in moderating these expression patterns.