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Parent-of-origin effects on gene expression in honeybees.

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In mammals and plants, genomic imprints silence parental alleles through methylation of intergenic CpG islands or histone modifications. In theory, parent-of-origin effects (POEs) on gene expression are the result of intragenomic conflict. The kin-conflict theory of genomic imprinting predicts more pronounced selective pressure in a highly polyandrous, haplodiploid insect society and some POEs that influence adult worker behaviors. To our knowledge the only invertebrate examples of genomic imprinting involve heterochromatization of entire parental genomes or position effects caused by chromosomal abberations (e.g., in *Drosophila*). These considerations and the prior discovery of a phenotypic paternal effect on stinging behavior in honeybees motivated us to look for POEs on transcription. We sequenced RNA transcripts from reciprocal hybrid workers derived from crosses between one European and one Africanized honeybee colony, as well as genomic DNA from the parents. We identified single-nucleotide polymorphisms (SNPs) within transcripts in each family and used read counts of alternative alleles to determine whether either the maternal allele or paternal allele was overexpressed in the heterozygous F_1 workers. About 1,000 to 2,400 transcripts contained informative SNPs in larvae, adults or individual brains. Our results and validation tests suggest that parental effects on expression are at least as abundant in honeybees as they are in mammals and higher plants. Results also are in accordance with the kinship theory because (in contrast to mammals and plants) parental effects were just as frequent in whole adults and individual brain samples as they were in first instar larvae, and overlap between lifestages and tissues was much higher than expected by chance. In agreement with theory, several transcripts in larval stages with maternal expression bias are involved in IIS signaling and may be negative regulators of growth, including neural lazarillo.