



Vitellogenin's gene regulatory role in honey bee division of labor.

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Vitellogenin (Vg) is an ancient egg-yolk precursor protein common to nearly all oviparous animals. It has evolved many non-reproductive functions, and in honey bees it plays an integral role in the behavioral development of the sterile worker caste. Workers transition from in-hive tasks, such as nursing larvae, to out-hive tasks, such as foraging for nectar and pollen, and this transition is dictated by Vg concentrations in the workers' haemolymph. However, the molecular mechanism by which Vg affects such behavioral changes has been unclear. Here, we show a novel function of Vg; that is acts as a transcription factor in worker bees to regulate gene expression, including many genes related to behavior. Through a combination of chromatin immunoprecipitation followed by high-throughput sequencing (ChIP-seq) and RNA-seq, our results show that Vg binds to DNA and alters gene expression at those loci. Moreover, the profile of Vg-DNA binding sites changes with worker age as they transition between behavioral tasks, which can provide a molecular explanation for worker age polyethism. These data suggest Vg is a transcription factor, a hitherto unknown function of Vg and one that opens future research on Vg's gene regulatory role in other organisms.