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The evolutionary genetic basis of social regulation of caste development

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Increasingly, researchers have used transcriptomic approaches to identify genes and gene networks affecting the caste developmental trajectory of social insect larvae. These results have largely been interpreted as supporting evolutionary genetic scenarios (e.g., the reproductive groundplan and gene toolkit hypotheses) whereby highly conserved gene networks found in solitary ancestors are rearranged and decoupled to produce the alternative reproductive castes that form the basis of insect societies. Intuitively, these conserved gene networks must play important roles in the expression of phenotypic plasticity for reproductive traits. However, these scenarios do not help to explain how development is increasingly socially controlled in derived insect societies. Because of strict social regulation of development and caste expression, the social insect developmental program includes genes expressed in social partners, as well as genes expressed in developing larvae. I will discuss recent results from honeybees and ants highlighting how socially acting genes affect the genetic basis and evolution of social insect caste.