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Variation in behaviour plasticity by distinct regulation of the brain methylome

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Studies in several social insect species reveal a potential involvement of epigenetic mechanisms, especially DNA methylation, in caste determination. However, few studies have investigated primitively Eusocial insects which have caste determination later in development and show greater behaviour plasticity at adult stage. To understand the underlying epigenetic mechanisms we determined the adult brain methylome dynamics and associated transcriptomes of various individuals of two primitively social species: the paper wasp *Polistes canadensis* and the dinosaur ant *Dinoponera quadriceps*. DNA methylation in gene bodies, particularly at their 5' end, was positively associated with expression of housekeeping genes, a conserved feature in all insect species suggesting an ancestral role of methylation in constitutive gene expression. Notably, DNA methylation was not associated with caste specific gene expression. Key components of the methylation and demethylation machinery including a TET hydroxylase are conserved in primitively eusocial insects, but *Polistes canadensis* lacks DNMT3, which may account for its strikingly unpatterned methylome. Given the flexibility of adult *Polistes* to change caste, we manipulate the social structure of the nest to understand if unpatterned epigenomes reflect greater reprogramming potency.