

OR344*The organisation of a queenless honeybee colony***Marianne Peso**, Naïla Even, Nicholas Naeger, Gene Robinson, Andrew Barron

In queenless colonies honeybee workers activate their ovaries and begin to reproduce. Kin selection theory predicts that because of the altered relatedness structure of a queenless honeybee colony compared to a queenright colony the level of altruism displayed by workers is expected to decrease while reproductive conflict should increase. A common assumption is that reproductive workers focus on personal reproduction over colony tasks. In a study of the behaviour and physiology of workers raised in hopelessly queenless honeybee colonies, we found that reproductive workers foraged (early), had developed brood-food producing glands, had wax scales, and defended the hive. In other words, they were simultaneously reproductive while nursing, maintaining and defending the hive, and foraging. In a hopelessly queenless colony, most colony functions were maintained but both the reproductive division of labour and task specialisation that exemplify queenright colonies had broken down. Reproductive queenless workers are task generalists. To examine the physiology of this novel bee behavioural state we examined their brain biogenic amine levels. Biogenic amines are strongly associated with temporal polyethism (age, and task speciality) in queenright colonies. However, queenless bees did not display the biogenic amine profiles typical of queenright bees, and did not show the changes in amine levels typically associated with age and foraging status in queenright colonies. In queenless colonies brain amine levels correspond most strongly with degree of ovary activation. We showed that in hopelessly queenless colonies, individuals, while reproductive, lose their behavioural specialisation, which was reflected in their brain neurochemistry. The generalist behaviour of queenless workers results in a social structure that may reveal an atavistic state, as it resembles the behaviour of primitively eusocial bees, in which individuals cooperate to maintain and defend a nest, while also engaging in personal reproduction.