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Caste-dependent sleep of worker honey bees

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Understanding caste-dependent sleep patterns within a society is the starting point for an analysis of societally-based function(s) of sleep, and sleep's impact on the behavior and ecology of societies. Sleep has been documented in several invertebrates, including both solitary and social insects (Shaw et al. 2003). *Apis mellifera* foragers exhibit diagnostic characters of sleep (Sauer et al. 2004), but no one has explicitly documented sleep dynamics of non-foraging workers within the colony (cell-cleaners, nurse bees, and food-storers), leaving gaps in our understanding of sleep's role across members of a colony. I examined workers within a honey bee colony for caste-dependent sleep signs.

Methods: Frequency of sleep (proxy: antennal and body immobility while in relaxed posture) exhibited by individually marked honey bee workers from different functional castes, were recorded for 72h (3sec/h x 40 bees) and for 24h periods (30min/h x 1 bee of each worker caste). Behavioral sleep states were also recorded throughout individual bees' lifetimes (15min x 2 bees/h x 48h/week).

Results:
72h survey: Workers were immobile in a relaxed posture a greater proportion of time with each sequential caste (3.9 ± .5%, 4.8 ± .6%, 8.3 ± .7%, 19.2 ± 2.0% SEM), although not significantly so between the youngest two castes. Cell-cleaners and nurse bees also showed no circadian rhythmicity between mobility and immobility (P=.92, .96), but food-storers (P=.025), and foragers (P<.0001) did. These patterns held up in the 48h surveys spanning bees' lifetimes.
24h survey: Same patterns as above, except the food-storer spent proportionally less time in a sleep state than did the nurse bee.

Conclusion: Honey bee workers exhibit behaviors suggestive of sleep for longer periods and with greater rhythmicity as they increase in age and change tasks.

Sauer S. et al. 2004. *J. Sleep Res.* 13:145-152
Shaw P. 2003. *J. Biol. Rhythms.* 18:4-11

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