



Epigenetic regulation of circadian rhythm in ants

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The circadian rhythm of organisms as diverse as mammals and plants is controlled by modifications of histone proteins that allow a fine regulation of gene expression by changing the chromatin structure. Although epigenetic mechanisms have been suggested to influence key aspects of insect societies, the role of histone modifications in regulating their circadian rhythm has never been studied. Here we ask whether histone acetylation plays a role in adjusting the circadian rhythm in colonies of the ant *Temnothorax longispinosus*. We first characterized the circadian activity of 20 colonies by recording the proportion of active ants every hour over 4 days under a 12h:12h light:dark regime. Fitting a cosine function to the data collected in each colony revealed that *T. longispinosus* ants are diurnal and show a peak in activity around the 6-hour time point, which corresponds to the middle of the light period. We repeated the experiment right after shifting the light regime 6 hours forward to find that the peak activity also moved 6 hours forward (around the 12-hour time point), thus showing that colonies rapidly adjust to the change in light input. To investigate whether histone acetylation regulates this adjustment, we fed colonies with a chemical inhibitor of histone acetyltransferase (C646). Treated colonies had their peak activity around the 6-hour time point, thus showing that they did not adjust to the new light regime. Interestingly, neither the average activity nor the amplitude of the circadian rhythm were affected by the treatment. These findings suggest a role for histone acetylation in regulating a specific feature of the circadian rhythm in *T. longispinosus*, namely the synchronization of the periodic activity with the light regime. Further studies should assess the location and extent of histone modifications, and identify associated changes in gene expression to better understand how epigenetic mechanisms regulate the circadian rhythm of insect societies.