Circannual rhythm in a beetle and its relationship to the circadian clock

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The varied carpet beetle *Anthrenus verbasci* shows a circannual pupation rhythm. This rhythm has self-sustaining oscillation, temperature compensation and entrainability to photoperiodic changes. Moreover, the phase response curve to long-day pulses against the background of constant short days closely resembles a curve for light pulses in circadian rhythms.

In the present study, we examined the relationship of this rhythm to the circadian clock. (1) There was no correlation between the free-running period of the circadian activity rhythm in adults and the larval duration under constant conditions; the latter should be positively correlated to the circannual period. (2) When larvae were subjected to light–dark cycles with a short photophase followed by a variable scotophase (the Nanda–Hamner protocol), short-day effects were clearer under cycles of which the length was a multiple of 24 h.

From these results, we conclude that oscillation of the circannual rhythm in *A. verbasci* is produced by a circannual clock independent of the circadian clock but a circadian clock is involved in photoperiodic entrainment of the circannual clock.