Chocolate's Theobromine, and Not Caffeine, Significantly Reduces Sleep in Drosophila

Radulovacki, Reid

Chocolate and caffeine are well-known to affect the quality of sleep. Chocolate, however,contains only minimal traces of caffeine but larger amounts of theobromine, a related alkaloid stimulant, whose effect on sleep has not been documented. Studying the effect of theobromine on the sleep/wake cycle of Drosophila melanogaster, whose circadian cycles are the same as humans, may allow us to better understand its impact on human sleep. This research investigates whether theobromine increases wakefulness and reduces sleep for D. melanogaster, relative to caffeine, a known stimulant. Theobromine and caffeine were separately administered to the Sucrose/Agar food supply of white-eyed adult D. melanogaster at relative concentrations of 8:1 (respectively) typically found in chocolate. For each alkaloid added, the Circadian sleep pattern (24-hour fly activity) for single test subjects was monitored for five days using a Trikinetics Sleep Chamber and Drosophila Activity Monitor (DAM). Sleep and wake times were collected, and later processed using pySolo. Analysis of circadian sleep cycle data in D. melanogaster, for relative amounts of theobromine to caffeine (8:1 ratio) found in chocolate, suggests that theobromine disrupts sleep, while caffeine plays only a limited role. Theobromine-fed flies register 30% less total sleep at night versus the control group, while for caffeine-fed flies, only a 4% reduction in sleep is observed. Moreover, theobromine-fed flies demonstrate a 90% increase in activity during the daytime vs. both caffeine-fed and control flies. These results suggest that theobromine, and not caffeine, may be the dominant chemical in chocolate that affects the human sleep/wake cycle.

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