CLOCK GENE PLAYS AN IMPORTANT ROLE IN CIRCADIAN CHANGES IN THERMOREGULATION DURING FASTING IN MICE

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\textbf{Background} Food deprivation decreases body core temperature ($T_b$) in mice, which shows time-dependency: greater in the inactive (light) phase and smaller in the active (dark) phase. The purpose of the present study was to clarify the mechanism involved in the change of $T_b$ rhythm during fasting. \textbf{Procedure} Male ICR wild-type (WT) and Clock mutant (CM) mice, housed at 27°C in a 12:12-h light-dark cycle were exposed to the cold at 20°C after 48-h fasting, corresponding to either at ZT1-4 (early light phase) or ZT13-16 (early dark phase). $T_b$ (telemetry), oxygen consumption (indirect calorimetry), UCP1 mRNA level in the brown adipose tissues (RT-PCR), and cFos-immunoreactive (ir) cells in the hypothalamus (immunohistochemistry) were assessed. \textbf{Results} $T_b$ decreased in the cold in all the groups. In WT, the reduction was greater in the light phase than in the dark phase; however, the reduction was similar in both the phases in CM. Oxygen consumption and UCP1 mRNA increased in the cold in the dark phase in WT and both the phases in CM, whereas remained unchanged in the light phase in WT. After the cold exposure, counts of cFos-ir cells in the medial preoptic area and paraventricular nucleus increased in all the groups: greater in the dark phase in WT and both phases of CM than in the light phase in WT. In the suprachiasmatic nucleus, counts of cFos-ir cells increased after fasting and the cold exposure had additive effect of the cFos expression in the light phase of WT. \textbf{Conclusions} These results indicate that fasting attenuates thermoregulatory responses to the cold, depending on time of the day. Neuronal activities in the medial preoptic area and paraventricular nucleus may be linked with the time-dependent thermoregulatory response in WT. In addition, the time-dependency of the thermoregulation and neuronal response in the two hypothalamic areas would be abolished in CM.