EFFECT OF SELECTIVE AND NON-SELECTIVE OPIOIDS ON BODY TEMPERATURE IN WARM- AND COLD-ACCLIMATED RATS

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Exposure to ambient temperatures outside the thermoneutral zone modifies energy balance in mammals. Cold ambient temperature increases the expenditure of energy, loss of heat and intake of food. In non-hibernating mammals exposed to cold for extended periods of time, defense of body temperature (Tb) occurs through the adjustment of physiological processes. Chronic exposure to ambient temperatures above the thermonuetral zone requires multiple adjustments to maintain heat balance and compensate for water loss. Since the endogenous opioid system is involved in thermoregulatory controls, this study was designed to examine the response of acclimated animals to the administration of selective and non-selective opioid agonists and antagonists. Tb was measured for 4 hrs post-injection in unrestrained, male S-D rats, previously exposed to a 12 hr L/12 hr D cycle and an ambient temperature of 5° ± 1°C or 32° ± 1° C for 14-17 days. Seven days prior to testing, a polyethylene cannula was implanted in the right lateral ventricle under ketamine anesthesia (75-125 mg/kg, ip). Tb was monitored at the acclimation temperature during the post-injection period. Saline icv (6 µl) or sc (1 ml/kg) had no significant effect on Tb in either the cold- or warm-acclimated animals. In animals acclimated to 5°C, naloxone (NLX, 1 mg/kg, sc) induced a statistically significant decrease in Tb, ranging from -1.11 to -1.86°C over the 4 hr post-injection period. Morphine (MS, 10 µg/3 µl, icv) caused hypothermia during the first 45 minutes post-injection (max decrease -1.71°C) in cold-acclimated animals. Tb increased during the remainder of the post-injection period. NLX pretreatment, followed by MS, enhanced the initial hypothermia, though the effect was subadditive to that of NLX alone, and blocked the late phase hyperthermia seen with MS. PL-017 (1 µg/3 µl, icv), a mu-selective agonist, induced statistically significant hyperthemia (max ΔTb 1.13°C) in cold-acclimated rats. CTAP (1 µg/3 µl, icv) a cyclic somatostatin analog and mu receptor antagonist, had no effect of its own and in combination with PL-017, blocked the elevation in Tb. In warm-acclimated rats, NLX had no effect on Tb. MS elevated Tb (2°C) with increases seen in both the duration and magnitude of the effect when compared to animals conditioned to 20° C. Administration of PL-017 to warm-acclimated rats caused an increase in time-independent changes in Tb. The duration of the effect was also altered in a statistically significant manner. CTAP had no effect on Tb alone and in combination with PL-017 blocked hyperthermia. The data suggest that acclimation modifies the response of the animals to administration of exogenous opioids.

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