BRAIN LOCI RELATING TO THE BODY WARM UP DURING AROUSAL FROM TORPOR IN THE HIBERNATING GOLDEN HAMSTER

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Brown adipose tissue (BAT) thermogenesis provides basal increase in body temperature during arousal from hibernation. Several brain loci relating to the regulation of BAT thermogenesis have been investigated mostly in rats, non-hibernator. Among them, in and around the retrorubral field in the rat midbrain constitutes a tonic inhibition mechanism for BAT thermogenesis (Shibata *et al.*, 1999). The similar inhibitory mechanism on BAT thermogenesis also exists in the hamster midbrain (Hashimoto *et al*., 1999). In the present study, we investigated 1) whether this inhibitory mechanism is involved in the body temperature change of wide range during hibernation, and 2) which brain loci are involved in the facilitation of BAT thermogenesis during arousal. Experiments were performed in accordance with the guidelines of the Ethics Committee for Animal Experiments, Asahikawa Medical University. Hibernating male golden hamster (*Mesocricetus auratus*) in the cold room (5°C, constant dark) were moved to recording room (10 - 12°C), and mounted in a brain stereotaxic apparatus for small rodents according to the rat brain atlas of Paxinos and Watson with a small modification (Hashimoto *et al*., 1999). Under local anesthesia (4% Lidocaine), head and back skin were incised along to the midline and the skull was bored for cannula insertion. Temperatures of the rectum (T_{REC}) and interscapular BAT (T_{BAT}) were measured with 2 thermocouples by inserting the probe 3-4 cm beyond the anus and T_{BAT} by inserting the probe between 2 BAT pads through the skin incision, and recorded every minute with computer system. These handling procedures aroused the animals from torpid state and increased their body temperature. Initial T_{BAT} and T_{REC} were 6.5 - 10.5°C and 6.0 - 9.3°C, respectively. Experiments were terminated by over-dose urethane injection when T_{REC} reached around 15°C, since most hibernating animals started slightly moving at around this body temperature under the present experimental conditions. Bilateral microinjection of control saline, 10 % procaine hydrochloride or 0.1 M sodium glutamate (800 nl each side) into the midbrain region were carried out while T_{BAT} and T_{REC} were measured. Stereotaxic coordinates were 1mm lateral to the midline, 2.5 mm rostral to the vertical interaural zero plane (IA0) and 1.5 - 4.0 mm dorsal to the horizontal IA0. Saline microinjections affected time courses of the increase in neither T_{BAT} nor T_{REC} at any loci of the midbrain. Mean time spent for 5°C increase of T_{BAT} around 10°C were 29.1 - 38.8 min (mean ± SEM: 30.9 ± 0.17 min, n=6). During this increase of T_{BAT}, T_{REC} was increased by 1.6-1.9°C (1.7 ± 0.0°C). The microinjection of glutamete in and around the retrorubral field (co-ordinates: 1.5 - 2.5 mm dorsal to IA0), or procaine around periacuaductal gray matter (3.5 - 4 mm), delayed both T_{BAT} and Trec increases. Results suggest that these midbrain loci are involved in the mechanism of arousal from hibernation.

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