ZUCKER OBESE RATS ARE SENSITIVE TO WEIGHT-REDUCING EFFECT AND INSENSITIVE TO OREXIGENIC EFFECT BY COLD EXPOSURE

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Male Wister, male Zucker lean rats and male Zucker obese rats at 7 weeks were allotted into 2 groups. All rats in W group were kept at 25±1°C for 11 weeks. All rats in C group were kept at 10±1°C for 9 weeks. The rats in C group were allotted into following groups so that both groups had similar body mass: a cold acclimated group (C group) and deacclimated group (D group). All rats in C group were maintained at 10±1°C for a further 2 weeks, and all rats in D group were transferred to a 25±1°C environment and maintained for 2 weeks. Each rat was dissected at the end of experiments. Each rat was weighed, anesthetized with ether. Inter scapular brown adipose tissue and adrenal glands were dissected. Increase in body masses at each age was smaller in C group than in W group. In C groups, rate of increase in body masses was less in obese rats than in lean rats. After 2 weeks of deacclimation, body masses in D group in Wistar and lean rats reached closer to those in C groups while those in obese rats were lighter in D group than in W group. The ratio of masses of brown adipose tissue per body masses were greater in obese rats than in Wistar and lean rats. While ratios of masses of adrenal glands to body masses were smaller in obese rats than in Wistar and lean rats. In Wistar and lean rats, food intake increased markedly by cold exposure while food intake in obese rats increased slightly. Oxygen intake per body mass was smaller in obese rats than Wistar and lean rats. Weight-reducing effect of cold exposure resulted from more increase in energy expenditure due to enhanced thermoregulatory thermogenesis than in energy intake. Less increase in food intake by cold acclimation in obese rats indicates they could not increase food intake in spite of enhanced thermoregulatory thermogenesis during cold exposure, because they already had maximum volume of food intake that they could eat in warm environment. Greater ratio of mass of brown adipose tissue to body mass in obese rats compared to Wistar and lean rats might be caused by hereditary nature of tendency to obesity. Smaller increase in body mass during deacclimation might be resulting from greater ratio of mass of brown adipose tissue to body mass during cold acclimation. In conclusion, marked weight-reducing effect of cold exposure observed in Zucker obese rats was caused by defect of orexigenic effect of cold exposure due to lack of leptin receptor in hypothalamus.

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