ADAPTIVE CHANGES IN BROWN ADIPOSE TISSUE IN WISTAR RATS, ZUCKER LEAN AND OBESE RATS

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Male Wistar rats, male Zucker lean and Zucker obese rats were used. All rats in each strain were allotted into three groups so that all groups contained a similar mean value of body mass; warm acclimated(W), cold acclimated(C) and deacclimated(D) group. All rats in W groups were housed in the room at 25±1°C for 11 weeks, all rats in C group were housed in the room at 10±1°C for 11 weeks and all rats in D group were housed in the room at 25±1°C for 2 weeks after housing at 10±1°C for 9 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. In C groups, obese rats showed smaller rate of increase in body mass than lean rats. Increase in body mass for 2 weeks of deacclimation in obese rats was smaller than that in lean rats. Masses of brown adipose tissue per body masses were greater in obese rats than Wistar and lean rats while masses of adrenal glands per body masses were smaller in obese rats than Wistar and lean rats. In all strains, masses of brown adipose tissue and adrenal gland per body masses were greater in C groups than in W groups. Masses of brown adipose tissue per body masses were slightly smaller in D groups than in C groups while masses of adrenal glands per body masses were considerably smaller in D groups than in C groups. Lipid droplet in brown adipocyte decreased in number and lipid droplets became small lobulettes by cold acclimation. These characteristics of lipid droplets were maintained after deacclimation though fusion of lipid droplets was observed. Density of lipid in brown adipocyte was greater in obese rats than those in other strains and that in lean rats was the smallest. However, morphological changes of Zucker lean and obese rats by cold acclimation and deacclimation were essentially the same as those observed in Wistar rats. During cold acclimation, a large proliferation of mitochondria accompanied by the increase in size was observed. After deacclimation, number of mitochondria decreased and lipid droplets became slightly small in number and increased in size. However size of droplet in D group was considerably smaller than that in W group. Marked weight-reducing effect in Zucker obese rats observed during cold acclimation is partly caused by greater ratio of masses of brown adipose tissue to body masses as well as proliferation of mitochondria accompanied by the increase in size in brown adipose tissue induced by cold exposure.

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