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Citation	Japanese Journal of Veterinary Research, 40(1), 46-46
Issue Date	1992-05-29
Doc URL	https://hdl.handle.net/2115/2379
Type	departmental bulletin paper
File Information	KJ00002377571.pdf

EFFECTS OF COLD EXPOSURE ON GLUCOSE UTILIZATION AND GLUCOSE TRANSPORTER IN BROWN ADIPOSE TISSUE IN RATS

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Brown adipose tissue (BAT) is the major site of non-shivering heat production during cold acclimation or arousal from hibernation. In this study, the effects of cold acclimation on glucose metabolism in BAT, particularly the expression of glucose transporter (GLUT), were assessed in rats.

After rats were exposed to cold, glucose uptake *in vivo* was found to increase specifically in BAT, but not in other insulin-sensitive organs such as white adipose tissue, skeletal muscle and heart. Thus, the increase in glucose utilization in BAT could be associated with heat production during cold acclimation in this organ.

A rate-limiting step in cellular glucose utilization is its uptake by GLUTs across the plasma membrane. GLUT4, an isoform of GLUTs, is distributed in insulin-sensitive organs including BAT. During cold exposure, the amounts of GLUT4 protein and mRNA were found to increase in BAT, but not in other organs. However, an apparent difference was noted between short (4h) and long (10d) exposures. Despite a 2-fold increase in glucose uptake in short cold exposure, neither GLUT4 protein nor mRNA levels increased. In long cold exposure, glucose uptake increased in parallel with the increase in GLUT4 protein and mRNA. These results suggest that in cold exposure the increase in glucose uptake in BAT is based on two different mechanisms: one is the increase of GLUT4 protein by its *de novo* synthesis and the other is the activation of GLUT4.