The Effects of Hot Bathing on Muscle Damages in Rats Subjected to Moderate Intensity Running

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I. Background

Recent reports have suggested that the heating of skeletal muscles may be a useful method to gain the muscular skeletal mass and to decrease muscle damage in patients receiving therapeutic exercise. In the future, heat stimuli will be use before standard therapeutic exercise for recovery from muscular atrophy and damage (Fig.1).

Fig.1 Hypothesis that heat stress facilitates muscular hypertrophy

II. Purpose

The purpose of this study was to clarify the effects of heat treatment on muscles before moderate intensity running from the viewpoint of histology.

III. Method

Ten male Wistar rats, 12-14-month-old and 250-330 g body weight, were used. The rats were randomly classified into three groups: (1) control group (C, n=2), (2) moderate intensity running without hot bathing (NHB, n=3) and (3) hot bathing before moderate intensity running (HB, n=5). The moderate exercise consisted of running with the treadmill on a 0% gradient and 20 m/min, and for 45 min and continued 5 days per week. Everyday for 5 days the left hindlimbs of the rats were immersed once a day in hot water at 42 degree C for 60 min before the exercise (Fig.2). Histological analyses were carried out on the bilateral gastrocnemius, soleus and plantaris ms. for each group of rats. In all frozen muscle samples, ten-micrometer-thick sections were cut using a Cryostat, sections were treated with combination acid myofibrillar ATPase staining.

IV. Results

The muscle samples chosen intentionally exhibited varying amounts of the two fiber types. In HB, the diameters of type 1 and 2 muscle fibers in the left side were greater on the left side than on the right side. In the other two groups, the sizes of these two types of fibers and the ratios of the number of each type of muscle fibers to the total fibers in the three muscles showed no differences between right and left side in each group (Table).

Table Sectional area and ratios of two types of muscle fiber by ATPase stain in three muscles of rats

Fig.2 Muscle temperature changes in rat gastrocnemius and soleus during hot bathing
### V. Conclusion

These results suggest that heat stress before moderate running could promote the muscle hypertrophy and changing myosin composition of skeletal muscles.

### VI. References
