EFFECT OF RELOADING IN IMMOBILIZED MICE SOLEUS MUSCLE
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Introduction
Skeletal muscle shows high plasticity in response to external conditions, which leads to hypertrophy or atrophy depending on the differences in stimulation levels. However, skeletal muscle which occurs with atrophy exhibits not only recovery, but also damage by reloading following hindlimb suspension or cast immobilization (1), because it might be susceptible to external stress. The present study aimed to explore the recovery of mouse soleus muscles following immobilization in the shortened position.

Methods
The soleus muscles of 7-week-old female ICR mice were used in this study. Under anesthesia, the left hind limb was immobilized at the ankle joint in maximum planter flexion for 10 days. Following immobilization, the cast was removed and the animals were allowed to reload freely in their cages. Left soleus muscles were removed immediately after immobilization (day 0, prior to reloading), 2, 5, 7 and 10 days after reloading. Age-matched mice were used as controls in each reloading period. The soleus muscle was evaluated by muscle wet mass, cross-sectional area (CSA) and frequency of central nucleated fibers (i.e. regenerating muscle fibers). As for detection of the loss of sarcolemmal integrity, Evans blue dye (EBD) positive fibers were searched (2). Results were analyzed using 1-way analysis of variance. If statistical significance was achieved (P<0.05), pairwise comparisons were performed using Scheffe’s method.

Results
1. Muscle wet mass
Muscle wet mass was significantly decreased compared with the age-matched control group (P<0.01) at 0 day reloading. At 5 days and 10 days reloading, there was no significant difference in muscle wet weight compared with each age-matched control group.

2. Fiber cross-sectional area
CSA of the 0 day reloading group was significantly smaller compared with the age-matched control (P<0.01). CSA was recovered with time; there was no significant difference between the 10 days reloading group and the age-matched control group.

3. Frequency of central nucleated fibers
Regarding the mean frequency of central nucleated fibers, there was no significant difference among all experimental groups. The mean frequency of central nucleated fibers was less than 3%, which is considered within the normal limit.

4. Frequency of EBD positive fibers
EBD positive fibers were not observed in all experimental groups.

Discussion/Conclusion
In this experiment, remarkable muscle damage, such as sarcolemmal disruption was not observed by reloading following immobilization. After 5 days reloading, there was no difference in muscle wet weight, whereas CSA was significantly smaller compared with the controls. Thus, it seems likely that muscle edema occurred in the early stage after reloading.

References

Keywords: Recovery, Skeletal Muscle, Rehabilitation