

Original Article

# Physical inactivity- and energy restriction-induced muscle atrophy in rats: A preliminary study on the effects of energy restriction during hospitalization

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## ABSTRACT

### **【Aim】**

During hospitalization, injured athletes are frequently exposed to energy restrictions as well as physical inactivity, which may induce substantial muscle atrophy. To obtain preliminary data on muscle atrophy induced by energy restriction and its combination with physical inactivity during hospitalization, we evaluated the skeletal muscle weights in rats subjected to energy restriction with/without denervation-induced physical inactivity.

### **【Methods】**

Twenty-week-old male Fischer rats were divided into the following 3 groups: fed ad libitum (Con); subjected to 33% energy restriction (ER); or unilateral denervation in combination with the 33% energy restriction (Den-ER). After a 2-week intervention, the slow-twitch soleus and fast-twitch plantaris muscles were dissected and the muscle weights were measured.

### **【Results】**

The soleus and plantaris muscle weights in the Den-ER group were 40% and 48% lower than those in the Con group, respectively. While no significant difference in the soleus muscle weight was observed between the ER and Con groups, the plantaris muscle weight was 7% lower in the ER group than in the Con group.

### **【Conclusion】**

Our results suggest that simultaneous physical inactivity and energy restriction, such as during hospitalization, can induce substantial atrophy in both slow- and fast-twitch muscles. They also suggest that energy restriction alone might exert atrophic effects only in fast-twitch muscle, accounting for 15% of the muscle atrophy during hospitalization.

**Keywords:** physical inactivity, energy restriction, muscle atrophy, autophagy, ubiquitin-proteasome