

Effect of vibrostimulation of foot and supporting afferentation on functional state of shin muscles in rats during hindlimb unloading

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Abstract

© 2014, Pleiades Publishing, Inc. The goal of this work was to study the influence of daily 3-hr vibrostimulation of the supporting zones of the foot and 3-hr of usual locomotion on the functional state of the soleus, gastrocnemius, and tibial anterior muscles in rats after 7 and 14 days of hindlimb unloading. After 7 days of unloading the soleus weight decreased, while the weight of gastrocnemius and tibial anterior remained unchanged. After 14 days of hindlimb unloading a weight reduction was observed in all studied muscles. Vibrostimulation of the foot and supporting afferentation prevented the loss of weight in gastrocnemius and tibial anterior during the first week of unloading and reduced the negative effect of hindlimb unloading in 14 days. Our results demonstrate that the amplitude of the M-response after 7 days of hindlimb unloading was decreased predominantly in soleus as compared to gastrocnemius and tibial anterior. By the 14 day we observed restoration of the amplitude of the M-response in gastrocnemius and tibial anterior, and the increased amplitude of the M-response in soleus. Different techniques for foot stimulation in rats during hindlimb unloading demonstrated the positive effect in regard to M-response restoration — the amplitude of the M-response was increased in all studied muscles. Thus, our results demonstrate that foot vibrostimulation or supporting afferentation can completely prevent atrophy caused by hindlimb unloading in gastrocnemius and tibial anterior and decrease atrophy in soleus in rats.

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Keywords

hindlimb unloading, M-response, muscle atrophy, supporting afferentation, vibrostimulation