2-A-04 Protective effects of astaxanthin and loading on muscle atrophy and capillary regression of disused muscle.

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Purpose: Disuse-induced muscle atrophy and capillary regression in skeletal muscle are related to over-expression of oxidative stress. The purpose of the present study was to identify effect of astaxanthin and/or loading on muscle atrophy and capillary regression of the soleus muscle induce hindlimb unloading.

Methods: Thirty-five adult male SD rats were randomly divided into five groups: 1) control (CON), 2) hindlimb unloading (HU), 3) hindlimb unloading with astaxanthin (HU+AX), 4) hindlimb unloading with loading (HU+Lo) and 5) hindlimb unloading with astaxanthin and loading (HU+AX+Lo) groups. Astaxanthin (Fuji chemical industry) was orally administered 50mg/kg body weight twice in a day. Rats were subjected to loading for one hour per day. After 14-days of hindlimb unloading, the soleus muscle was removed.

Results and Discussion: Muscle wet weight and fiber cross-sectional areas in the HU+Lo and HU+AX+Lo groups were significantly higher than those in the HU and HU+AX groups. Capillary-to-muscle fiber ratio, capillary volume and succinate dehydrogenase activity of the slow fiber in the HU+AX and HU+AX+Lo groups were significantly higher than those in the HU and HU+Lo groups. Astaxanthin is effective to attenuate oxidative stress and maintain the architecture of capillary network. The combination of astaxanthin and loading resulted in further effect in preventing capillary regression and muscle atrophy of disused muscle.

Key words: muscle atrophy, capillary, oxidative stress

2-A-05 Autolysis of calpain 1 and 2 during hindlimb unloading was attenuated by intermittent reloading with heat stress in rat soleus muscle.

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Purpose: To examine the effect of intermittent reloading with heat stress on autolysis of calpain 1 and 2 in atrophied rat soleus muscle.

Methods: Forty male Wistar rats (10wks of age, 261.7±1.17 g) were randomly divided into four groups: control (CON, n=10), hindlimb unloading (HU, n=10), hindlimb unloading with intermittent reloading (IR, n=10), hindlimb unloading with intermittent reloading and heat stress (IR+H, n=10). The HU, IR and IR+H group were unloaded for 7 days. IR and IR+H group were released from unweighting for 1h every second day. During this time, IR+H group was placed in a heat chamber for 30 min (41.5-42°C). After 7days unloading, soleus muscle were removed and analyzed.

Results and Discussions: Seven-days unloading resulted in a 31% reduction in the soleus muscle mass, but only IR+H significantly prevented the reduction (CON; 168.2±6.7, HU; 116.3±3.7, IR; 121.0±3.7, IR+H; 131.1±2.4 mg). Autolyzed form of calpain 2 (HU; 267, IR; 236 and IR+H; 105% of CON) and ubiquitinated protein (HU; 164, IR; 140 and IR+H; 112% of CON) in particulate fraction was significantly increased in HU, but also IR+H significantly prevented the increase. Calpain plays a role in a release of myofibrillar protein from the sarcomere, and the released proteins are degradated by ubiquitin-proteasome system. Therefore, these data indicate that inhibition of calpain autolysis by the intermittent reloading with heat stress could be effective to prevent the muscle atrophy.

Key Words: autolysis, hyperthermia, cysteine protease