Section: BASIC EXPERIMENTAL
Abstract: BAS-04

Climbing exercise training improves redox balance, inflammation, and mitochondrial dynamics in skeletal muscles of aged rats with arterial insufficiency

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Walking is the main clinical treatment for arterial insufficiency (AI). This study investigated the histological changes and gene expression of oxidative stress, inflammation, and mitochondrial dynamics markers in the limb muscles of rats with AI submitted to climbing exercise training (CET). Male Wistar rats (n=24, 10 months-old, CEUA#07/2024) underwent right femoral artery ligation or sham surgery. After 5 wks, rats were assigned to CET (no load, 3×/wk, alternate days, +1 climb/week for 10 wks) or maintained sedentary (SED). Animals were euthanized 24 h after the last session, and soleus (SM) and gastrocnemius muscles (GM) were collected for histology and RT-qPCR. CET reduced inflammatory infiltrate in SM vs AI-SED. Muscle fiber splitting was observed, suggesting satellite cell activation. In AI-SED rats, GM showed increased SOD (1.52±0.17) vs SED-SHAM (1.03±0.10, p=0.0180), CET-SHAM (0.66±0.05, p=0.0003), and CET-AI (0.85±0.06, p=0.0023), and COX-2 (1.50±0.13) vs SED-SHAM (1.01±0.13, p=0.0026), CET-SHAM (0.74±0.03, p<0.0001), and CET-AI (0.80±0.10, p<0.0001), with no changes in other pro-inflammatory genes. In SM, AI-SED rats showed greater SOD (2.12±0.15) than SED-SHAM (1.04±0.13, p<0.0001) or CET-SHAM (0.60±0.06, p<0.0001) or CET-AI (0.73±0.11, p<0.0001); catalase (1.64±0.23) than SED-SHAM (1.03±0.12, p=0.0441) or CET-SHAM (0.93±0.12, p=0.0226); TNF-α (1.41±0.20) than CET-SHAM (0.75±0.12, p=0.0205) or CET-AI (0.79±0.10, p=0.0223); IL-6 (1.60±0.13) than SED-SHAM (1.04±0.14, p=0.02349) or CET-SHAM (0.93±0.15, p=0.0097) or CET-AI (0.85±0.08, p=0.0024); and IL-1β (1.60±0.17) than SED-SHAM (1.01±0.07, p=0.0226) or CET-SHAM (0.76±0.10, p=0.0019) or CET-AI (0.84±0.16, p=0.0029). Fis1 expression increased in SM of trained animals. CET also increased mitochondrial fusion genes (MFN1, MFN2) in GM. Therefore, CET exerts modulatory and protective effects in AI rats, improving redox balance, reducing inflammation, and regulating mitochondrial dynamics in SM and GM. Supported by CNPq, FAPESP and Centro Universitário FMABC.

KEYWORDS: Arterial insufficiency; Femoral artery; Soleus muscle, Gastrocnemius muscle; Physical training.

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