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Effects of mild aerobic exercise training on the diaphragm in mdx mice

Monica Frinchi¹, G. Morici^{1,2}, A. Pitruzzella¹, R. Barone¹, V. Di Liberto¹, A. Pace³, V. Perciavalle⁵, N. Belluardo¹, F. Cappello¹, G. Muddò¹, M.R. Bonsignore^{2,4}

¹Dept of Experimental Biomedicine and Clinical Neuroscience (BioNeC), Univ. of Palermo, Palermo, Italy

²Inst. of Biomedicine and Molecular Immunology (IBIM), Consiglio Nazionale delle Ricerche (CNR), Palermo, Italy

³Dept of Science and Molecular and Biomolecular Technology (STEMBIO) - Univ. of Palermo, Palermo, Italy

⁴Biomedical Dept. of Internal and Specialistic Medicine (DiBiMIS), Univ. of Palermo, Palermo, Italy

⁵Dept of Biomedical and Biotechnological Sciences, Section of Physiology, Univ. of Catania, Catania, Italy

Mild endurance exercise training positively affects limb skeletal muscle in the mdx mice model of Duchenne Muscular Dystrophy (DMD). However, few and controversial data are available on the effects of mild exercise training on the diaphragm of mdx mice. The diaphragm was examined in mdx and wild type mice either under sedentary conditions (mdx-SD, WT-SD) or during mild exercise training (mdx-EX, WT-EX). At baseline, and after 30 and 45 days of training (5 d/wk for 6 weeks), diaphragm muscle morphology and Cx39 protein were assessed. In addition, tissue levels of the chaperonin Hsp60 were measured at the same time points in gastrocnemius, quadriceps and diaphragm in each experimental group. Although morphological analysis showed unchanged total area of necrosis/regeneration in the diaphragm after training, there was a trend for regeneration areas to be larger than necrosis areas. However, the levels of Cx39 protein, a marker associated with active degeneration-regeneration process in damaged muscle were similar in the diaphragm of mdx-EX and mdx-SD mice. The diaphragm, but not limb muscles, of both trained and sedentary mdx mice showed decreased Hsp60 expression at 45 days, suggesting exhaustion of potentially protective mechanisms in the diaphragm similar to previous findings in lung epithelium. Compared to the positive effects of exercise training previously observed in limb skeletal muscles, the diaphragm showed little change after training.