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Modulation of Cardiac Vascular Endothelial Growth Factor and PGC-1α Protein and Gene Expression with Regular Post-Exercise Cold Water Immersion of Rats

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We aimed to examine the oxidative and protective biomarkers responses in cardiac muscles to regular post-exercise cooling. Thirty-five male Spargue-Dawley rats were assigned into post-exercise cold-water immersion (CWI; n = 13), exercise only (Ex; n = 12), and untreated control group (Con; n = 10). CWI and Ex were trained on treadmill 5 sessions/week, 30-60 min/session, for 10 weeks. Following each session, CWI rats were immersed in cold water (10 °C) for 15 min. Left ventricle protein content of PGC-1α and VEGF was determined by western blotting, while HSP70 was assessed by the enzyme-linked immunosorbent assay. Superoxide dismutase (SOD) activity was measured using colorimetric method. Gene expression was determined by real-time quantitative PCR. PGC-1α and SOD mRNA were not changed in CWI or Ex relative to CON ($P = 0.28$). VEGF mRNA was markedly increased in CWI compared to Ex and CON ($P < 0.001$), and was similar between CON and Ex ($P = 0.9$). HSP70 mRNA increased in Ex compared to CON (P 0.002) and CWI ($P = 0.02$), but was not different between CWI and CON ($P = 0.3$). Ex and CWI induced higher PGC-1α protein content compared to CON ($P < 0.001$), and was higher in CWI than Ex ($P = 0.01$).VEGF protein was elevated in CWI relative to CON ($P < 0.001$), and Ex ($P = 0.008$). No VEGF changes were observed in Ex compared to CON. HSP70 protein was increased in CWI and Ex compared to CON ($P = 0.02$), and was similar in CWI and Ex ($P = 0.3$). SOD activity and mRNA expression were similar among all groups. These results suggest post-exercise CWI may further enhance cardiac oxidative capacity through increasing the regulating factors of mitochondrial biogenesis and angiogenesis, PGC-1α and VEGF. In addition, CWI does not seem to worsen the exercise-induced cardio protection and oxidative stress.

Biography:

Dr. Ramzi A Al-horani earned his PhD degree in exercise physiology from the University of Alabama in 2015. His research area has been focusing on the environmental effects on cardiovascular responses and cardiac molecular adaptation. He has been involved in swimming coaching and personal training for over than 12 years. He has taught several courses in kinesiology such as exercise physiology, functional anatomy, and athletic training. Also, he has a trend in the public health, where he gives lectures, courses, and presentations in the topics of obesity and cardiovascular diseases in association with exercise.