The effect of whole-body cryostimulation on lysosomal enzyme activity in kayakers during training

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Accepted: 18 January 2007 / Published online: 16 February 2007 © Springer-Verlag 2007

Abstract Effects of whole-body cryostimulation on lysosomal enzyme activity: acid phosphatase (AcP), arylsulphatase (ASA) and cathepsin D (CTS D), as well as on the creatine kinase (CK), and the cortisol concentration in the serum of kayakers during training were studied. Additionally, the effect of a single cryostimulation treatment in untrained men was evaluated. The kayakers were subjected to a ten-day training cycle, in which training sessions were preceded by whole-body cryostimulation at a temperature ranging from −120 to −140°C, and to a control training without cryostimulation. Blood samples were taken from the kayakers before the training and after the sixth and tenth day of training and from untrained men before and after cryostimulation. The single cryostimulation caused a 30% (P < 0.05) decrease in the CK activity in untrained men. After the sixth day of training with cryostimulation, the activity of ASA was 46% (P < 0.001), AcP 32% (P < 0.05) and CK 34% lower (P < 0.05) than after the sixth day of training without cryostimulation. The results support that preceding training with whole-body cryostimulation alleviates exertion stress by a stabilisation of lysosomal membranes.

Keywords Sport · Cold · Cryo-chamber · Lysosomal hydrolase

Introduction

Intense exercise or training injures skeletal muscles (Steinacker et al. 2004; Howatson et al. 2005; Weerapong et al. 2005). Injury to the cell and sarcoplasmic membranes leads to accumulation of intracellular calcium, impairment of muscle force generation and provides myofibrilar disruption (Kędziora 1998). Structural changes in muscle fibres are accompanied by the increased release of certain intracellular enzymes, including lysosomal hydrolases (McCully 1986).

Cryostimulation involves exposing the surface of the body to temperatures below −100°C for 2–3 min (Yamauchi et al. 1981). Whole-body cryostimulation has applications in treating injuries in athletes, particularly the overuse syndrome. Low temperatures support rehabilitation and limit secondary damage to tissues (Swenson et al. 1996; Myrer et al. 2001). Cryostimulation is also used for renewal and preventive treatment before training. Cryostimulation benefits the time it takes for the athlete to return to full fitness and may avoid surgery. Extremely low temperatures reduce pain, which curtails the efficacy of exercises (Long et al. 2005). Delayed tiredness or greater muscle performance in athletes during training is reported by cryostimulation (Wozniak et al. 2001).