

Whole-Body Cryotherapy in Athletes

Authors:

Banfi G, Lombardi G, Colombini A, Melegati G.

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Abstract

Cold therapy is commonly used as a procedure to relieve pain symptoms, particularly in inflammatory diseases, injuries and overuse symptoms. A peculiar form of cold therapy (or stimulation) was proposed 30 years ago for the treatment of rheumatic diseases. The therapy, called whole-body cryotherapy (WBC), consists of exposure to very cold air that is maintained at -110°C to -140°C in special temperature-controlled cryochambers, generally for 2 minutes. WBC is used to relieve pain and inflammatory symptoms caused by numerous disorders, particularly those associated with rheumatic conditions, and is recommended for the treatment of arthritis, fibromyalgia and ankylosing spondylitis. In sports medicine, WBC has gained wider acceptance as a method to improve recovery from muscle injury. Unfortunately, there are few papers concerning the application of the treatment on athletes. The study of possible enhancement of recovery from injuries and possible modification of physiological parameters, taking into consideration the limits imposed by antidoping rules, is crucial for athletes and sports physicians for judging the real benefits and/or limits of WBC.

According to the available literature, WBC is not harmful or detrimental in healthy subjects. The treatment does not enhance bone marrow production and could reduce the sport-induced haemolysis. WBC induces oxidative stress, but at a low level. Repeated treatments are apparently not able to induce cumulative effects; on the contrary, adaptive changes on antioxidant status are elicited — the adaptation is evident where WBC precedes or accompanies intense training. WBC is not characterized by modifications of immunological markers and leukocytes, and it seems to not be harmful to the immunological system. The WBC effect is probably linked to the modifications of immunological molecules having paracrine effects, and not to systemic immunological functions. In fact, there is an increase in antiinflammatory cytokine interleukin (IL)-10, and a decrease in proinflammatory cytokine IL-2 and chemokine IL-8. Moreover, the decrease in intercellular adhesion molecule-1 supported the anti-inflammatory response. Lysosomal membranes are stabilized by WBC, reducing potential negative effects on proteins of lysosomal enzymes. The cold stimulation shows positive effects on the muscular enzymes creatine kinase and lactate dehydrogenase, and it should be considered a procedure that facilitates athletes' recovery. Cardiac markers troponin I and high-sensitivity C-reactive protein, parameters linked to damage and necrosis of cardiac muscular tissue, but also to tissue repair, were unchanged, demonstrating that there was no damage, even minimal, in the heart during the treatment. N-Terminal pro B-type natriuretic peptide (NT-proBNP), a parameter linked to heart failure and ventricular power decrease, showed an increase, due to cold stress. However, the NT-proBNP concentrations observed after WBC were lower than those measured after a heavy training session, suggesting that the treatment limits the increase of the parameter that is typical of physical exercise. WBC did not stimulate the pituitary-adrenal cortex axis: the hormonal

modifications are linked mainly to the body's adaptation to the stress, shown by an increase of noradrenaline (norepinephrine).

We conclude that WBC is not harmful and does not induce general or specific negative effects in athletes. The treatment does not induce modifications of biochemical and haematological parameters, which could be suspected in athletes who may be cheating. The published data are generally not controversial, but further studies are necessary to confirm the present observations.

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