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The effects of whole-body cryotherapy on oxidative stress in multiple sclerosis patients

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Abstract

There is strong evidence that multiple sclerosis (MS) is characterized not only by immune mediated inflammatory reactions but also by neurodegenerative processes. Accumulated data indicate that oxidative stress (OS) plays a major role in this process. Generated in excess, reactive oxygen species (ROS) lead to oxidative stress and are involved in demyelination and axonal damage in MS. ROS generation may be inhibited partly by hypothermia, which is known as a potent putative neuroprotectant and may inhibit generating free radicals and oxidative stress. Whole-body cryotherapy (WBCT) treatment may improve both survival and neurological outcome in MS patients.

The aim of the study was to determine the effects of WBCT on oxidative stress by the level of total antioxidative status (TAS) in plasma and the activity of antioxidative enzymes: superoxide dismutase (SOD) and catalase (CAT) in the erythrocytes from MS patients. Moreover, we measured the combined effects of WBCT and melatonin on TAS and activity of antioxidative enzymes in MS patients. Sixteen MS patients were treated with 3 cycles of 10 exposures in a cryogenic chamber. The last cycle was accompanied by a 14-day-long supplementation of melatonin (10 mg daily). Healthy subjects as a control group had 1 cycle of WBCT.

Our preliminary results for the first time showed that WBCT treatment of MS patients resulted in the increase of TAS but had no effects on activity of antioxidative enzymes: SOD and CAT. Supplementation of melatonin and the treatment along with WBCT significantly increased the activity of SOD and CAT in erythrocytes of MS patients.

Keywords

- Whole-body cryotherapy;

- Oxidative stress;
- Multiple sclerosis

Figures and tables from this article:

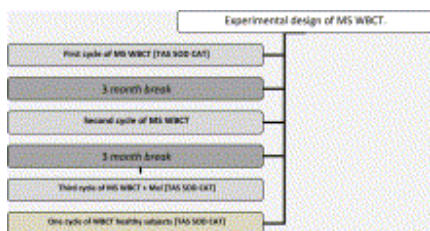


Fig. 1. Illustration of the study design.

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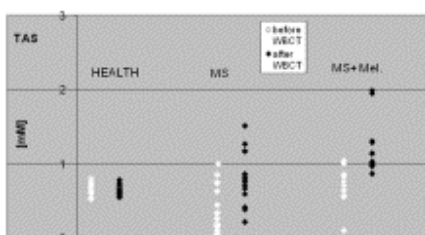


Fig. 2. Total antioxidative status (TAS) level in plasma before and after 10 exposures of whole-body cryotherapy (WBCT) in 3 groups: healthy subjects; multiple sclerosis patients non-supplemented (MS) and multiple sclerosis patients supplemented with melatonin (MS+MEL).

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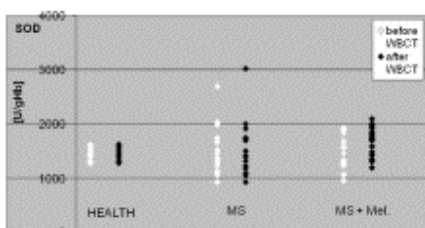


Fig. 3. Superoxide dismutase (CuZnSOD) activity in erythrocytes before and after 10 exposures of whole-body cryotherapy (WBCT) in 3 groups: healthy subjects; multiple sclerosis patients non-supplemented (MS) and multiple sclerosis patients supplemented with melatonin (MS+MEL).

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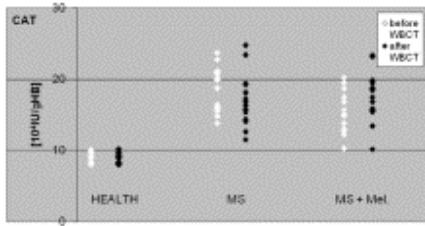


Fig. 4. Catalase (CAT) activity in erythrocytes before and after 10 exposures of whole-body cryotherapy (WBCT) in 3 groups: healthy subjects; multiple sclerosis patients non-supplemented (MS) and multiple sclerosis patients supplemented with melatonin (MS+MEL).

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