



## **SUMMARY OF EUROPEAN CLINICAL STUDIES**

### **SINGLE USER CRYO CABIN**

#### **Effect of whole body cryotherapy on the levels of some hormones in professional athletes**

**INTRODUCTION:** The study was undertaken to determine blood serum concentrations of selected steroid hormones (estradiol--E(2), testosterone--T, dehydroepiandrosterone sulfate--DHEA-S) and luteinizing hormone (LH) in professional footballers subjected to whole body cryotherapy.

**MATERIAL AND METHODS:** Twenty-two clinically healthy males, mean age 26.7 years, were studied. The subjects underwent ten sessions of whole body cryotherapy in Wroclaw-type chamber, with kinesitherapy following each session. Blood samples were collected before and two days after the treatment and the results were analyzed statistically.

**RESULTS:** After the treatment there was a significant decrease in the concentrations of T (6.01 vs. 4.80 ng/mL,  $p < 0.01$ ) and E(2) (102.3 vs. 47.5 pg/mL,  $p < 0.00001$ ), but no DHEA-S and LH. The T/E(2) ratio showed a significant increase from 72.2 to 136.5 ( $p < 0.01$ ). **CONCLUSIONS:** Whole body cryotherapy leads to a significant decrease in serum T and E(2), with no effect on LH and DHEAS levels. As a result of cryotherapy, the T/E(2) ratio was significantly increased. The changes observed are probably due to cryotherapy-induced alternation in the blood supply to the skin and subcutaneous tissue, as well as to modulation of the activity of aromatase which is responsible for conversion of testosterone and androstenedione to estrogens.

#### **The influence of whole body cryotherapy on mental health**

The paper presents a little known issue about the influence of wholebody cryotherapy on mental health. Observations of patients' behaviour after passing the cryogenic chamber leads to an interesting hypothesis. Short exposition to extreme cold has doubtless a profitable influence on man's frame of mind. Immediately after passing the cryogenic chamber, apart from the well known analgetic effect, we detect changes in patients' mental state such as improvement of mood, deep relaxation, freshening up, consolation, euphoria. This unusual state lasts for a long time after ending the cycle of cryotherapy. Different mechanisms of this effect are considered. New possibilities of this method have been presented.

## **BENEFICIAL EFFECTS OF THE WHOLE-BODY CRYOTHERAPY ON SPORT HAEMOLYSIS**

Authors: Banfi Giuseppe, Melegati Gianluca, Barassi Alessandra, Gianvico Melzi d'Eril

**Background.** Sport's anemia is a common risk for athletes. The principal source of an accelerated turnover of the erythrocytes in sportsmen is the intravascular hemolysis. This phenomenon is induced by mechanical breakage for impact of feet and muscular contractions, but also by osmotic changes causing membrane fragility, typically evident after exercise, when free radicals are increased. Whole-body cryotherapy (WBC) covers a wide range of therapeutic applications and consists of briefly exposing the body to extremely cold air. In sports medicine, WBC is used to improve recovery from muscle injury; however, empirical studies on its application to this area are lacking.

**Design and Methods.** We recruited ten rugby players of the Italian National Team. In these athletes we measured hematological parameters, before including mean spheroid cell volume (MSCV) by means of Coulter LH750, besides of haptoglobin, and after WBC. The subjects underwent five sessions on alternate days once daily for one week. During the study period, the training workload was the same as that of the previous weeks. **Results.** We observed in the athletes increase of haptoglobin and an increase of MSCV after the treatment period.

**Conclusions.** WBC reduces sports haemolysis, as judged from MSCV and haptoglobin data, supported from other haematological values, as well as the absence of mean corpuscular volume and reticulocytes increase. The treatment is useful to prevent the physiological impairments derived from sport haemolysis.

### **Whole-body cryotherapy in patients with inflammatory rheumatic disease. A prospective study**

Authors: Kay-P Braun, Sabine Brookman-Amisshah, Katrin Geissler, Doris Ast, Matthias May, Helmut Ernst

**BACKGROUND:** As yet, whole-body cryotherapy is especially used for the therapy of chronic inflammatory arthritis. An analgetic effect has been described in several studies. However, only few data exist concerning the long-term effects of this therapy.

**PATIENTS AND METHODS:** : A total of 60 patients with rheumatoid arthritis (n = 48), and ankylosing spondylitis (n = 12) was analyzed. Patients underwent treatment with whole-body cryotherapy twice a day. The average age was 55.7 +/- 10.33. The study group consisted of 48 female and twelve male patients. The average number of therapeutic treatments with cryotherapy was 15.8 +/- 8.37, the average follow-up 63.4 +/- 63.48 days.

**RESULTS:** : 13 patients (21.7%) discontinued treatment because of adverse effects. For patients with rheumatoid arthritis, DAS28 (Disease Activity Score) and VAS (visual analog scale) were determined. A significant reduction of both parameters was found (DAS 3.9 +/- 1.22 vs. 3.4 +/- 1.08; p < 0.01; VAS 51.4 +/- 16.62 vs. 37.9 +/- 19.13; p < 0.01). BASDAI (Bath Ankylosing Spondylitis Disease Activity Index) was analyzed for patients with ankylosing spondylitis, and also showed a significant reduction (4.4 +/- 1.91 vs. 3.1 +/- 1.34; p = 0.01).

**CONCLUSION:** : Thus, whole- body cryotherapy is an effective option in the concept of treatment of inflammatory rheumatic diseases. The relief of pain allows an intensification of physiotherapy. A significant reduction of pain over a period of 2 months could be shown.

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### **Whole-body cryotherapy in rehabilitation of patients with rheumatoid diseases - pilot study**

Authors: D Metzger, C Zwingmann, W Protz, W H Jäckel

Cryotherapy as a whole-body cold therapy (with cold air cooled by addition of nitrogen blown on the patients in an open cabin) for treatment of inflammatory rheumatic diseases already started in Bad Säckingen in 1986. In 1996, a new cold chamber (this time a closed chamber without any addition of nitrogen) based on compressor technology was introduced. The aim of our study was to test whether significant pain relief could be achieved by means of this cold therapy. Furthermore, we were interested in the practicability and acceptance of this new technique. Wellbeing during the treatment application and pain level were assessed using verbal and numerical rating scales. The sample consisted of 120 consecutive patients (75% women, age: 30-67 yrs, M = 52.6 yrs). These patients were suffering from primary fibromyalgia (40.7%), rheumatoid arthritis (17.3%), chronic low back pain (16.4%), ankylosing spondylitis (10.9%), osteoarthritis (9.1%), secondary fibromyalgia (3.6%) and other autoimmune diseases (1.8%) (mean duration of symptoms: 4 yrs). The patients were treated 2.5 minutes on average in the main chamber (mean temperature: -105 degrees C). The patients' statements concerning their pain level were analyzed by means of analyses of variance with repeated measures and paired-sample t-tests.

**RESULTS:** The pain level after application of the cold therapy decreases significantly. The pain reduction lasts about 90 minutes. The initial pain level decreases during the whole time of treatment, no significant improvement, though, can be shown from the middle to the end of the four-weeks treatment. According to the results of our study, there is evidence that the whole-body cold therapy generates important short-term effects and somewhat weaker effects over the treatment period as a whole. Short-term pain reduction facilitates intensive application of physiotherapy and Occupational Therapy. The treatment procedure is practicable, and all in all well tolerated. From the patients' point of view, whole-body cold therapy is an essential part of the rehabilitation programme.

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### **Whole-body cryotherapy as adjunct treatment of depressive and anxiety disorders**

Authors: Joanna Rymaszewska, David Ramsey, Sylwia Chłodzińska-Kiejna

**INTRODUCTION:** Rheumatism has been treated using whole-body cryotherapy (WBCT) since the 1970s. The aim of this study was to assess the efficacy of WBCT as an experimental, adjunctive method of treating depressive and anxiety disorders.

**MATERIALS AND METHODS:** A control (n=34) and a study group (n=26), both consisting of outpatients 18-65 years old with depressive and anxiety disorders (ICD-10), received standard psychopharmacotherapy. The study group was additionally treated with a series of 15 daily visits to a

cryogenic chamber (2-3 min, from -160 degrees C to -110 degrees C). The Hamilton's depression rating scale (HDRS) and Hamilton's anxiety rating scale (HARS) were used as the outcome measures.

**RESULTS:** After three weeks, a decrease of at least 50% from the baseline HDRS-17 scores in 34.6% of the study group and 2.9% of the control group and a decrease of at least 50% from the baseline HARS score in 46.2% of the study group and in none of the control group were noted.

**CONCLUSIONS:** These findings, despite such limitations as a small sample size, suggest a possible role for WBCT as a short-term adjuvant treatment for mood and anxiety disorders.

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### **Evaluation of effectiveness of whole-body cryotherapy in patients with tinnitus**

Authors: Agnieszka Kamińska-Staruch, Jurek Olszewski

**INTRODUCTION:** The aim of the study was evaluation of effectiveness of whole-body cryotherapy in patients with tinnitus.

**MATERIALS AND METHODS:** The research was carried out in 120 patients (aged 20-68) with tinnitus, divided into two groups: I - 80 patients treated by cryotherapy and II - 40 patients non treated. There were: 73 women and 47 men. Among patients of I group: 39 reported bilateral tinnitus, 20 reported right tinnitus, 15 reported left tinnitus and 6 reported tinnitus in head. Duration of the ailment took from 1 month to 23 years. The methods included: taking a history, otolaryngological physical examination, audiometry establishing level of tinnitus, medical consultation, X-ray examination of chest and cervical spine and CT of head. After examinations and additional consultations the patients were qualified for cryotherapy unless there were some contraindications. The patients underwent 10 procedures in two cycles with the weekend break. They were in cryochamber in temperature of -110 degrees C for 3 minutes. After cryotherapy they used kinesitherapy for 45 minutes. Intensity and troublesomeness of tinnitus was evaluated using self-assessment chart (point scale 0-100) and audiometry establishing level of tinnitus before and after treatment.

**RESULTS:** The results indicates complete elimination of tinnitus in 4 patients, decrease in their intensity in 47 patients, maintenance of the ailment on the same level in 13 people and slightly increase of tinnitus in 16 patients. In audiometry we could observe in I group changes in frequency of tinnitus in 138 ears and changes in intensity of tinnitus in 91 ears. After treatment decrease of average hearing loss and average hearing damage were observed.

**CONCLUSIONS:** Treatment of tinnitus may be effective by using whole-body cryotherapy.

### **The impact of whole-body cryotherapy on parameters of spinal mobility in patients with ankylosing spondylitis**

Authors: Agata Stanek, Aleksander Sieroń, Grzegorz Cieślak, Beata Matyszkiewicz, Irena Rozmus-Kuczia

**BACKGROUND.** The aim of our study was to assess the impact of whole-body cryotherapy with subsequent kinesitherapy on spinal mobility parameters in patients with ankylosing spondylitis.

**MATERIAL AND METHODS.** We enrolled 32 men with ankylosing spondylitis in a clinical trial. The subjects were randomly divided into 2 groups consisting of 16 persons, with no significant differences in age, duration, or stage of disease, treated with a cycle of 10 whole-body cryotherapy procedures with subsequent kinesitherapy or kinesitherapy alone, respectively. Routine spinal mobility parameters were determined for all patients before and after the end of the therapeutic cycle.

**RESULTS.** Significant improvement of spinal mobility was observed in both groups of patients, but in patients exposed to whole-body cryotherapy with subsequent kinesitherapy the percentage changes in the values of particular parameters were more distinct as compared to patients in whom kinesitherapy alone was used, mainly in respect to lumbar and thoracic spinal mobility.

**CONCLUSION.** The use of whole-body cryotherapy as a component of comprehensive therapy in patients with ankylosing spondylitis produces significant improvements in spinal mobility parameters as compared to patients in whom kinesitherapy alone is used.

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### **The assessment of pelvic statics in patients with spinal overload syndrome treated in whole- body cryotherapy**

Authors: Zbigniew Sliwiński, Wojciech Kufel, Beata Michalak, Bartłomiej Halat, Wojciech Kiebzak, Magdalena Wilk, Robert Jonak

**BACKGROUND.** In pain syndromes involving the lumbo-sacral region, the pelvis, and the lower extremities, the mobility of the hip joint is disrupted by structural and functional changes in tissues, which also cause irritation of the ligaments and muscles of the pelvis. Dislocation of the pelvis with incorrect alignment of the sacroiliac bone leads to an oblique load on the lumbar vertebrae and muscle tension. In recent years whole- body cryotherapy has come to be more and more often applied in the comprehensive treatment of spinal overload syndrome, to reduce pain, relax skeletal muscles, and increase joint mobility.

**MATERIAL AND METHOD.** The research was conducted in the SP ZOZ outpatient rehabilitation clinic in Zgorzelec, Poland, from December 2004 to March 2005. The study group consisted of 20 persons, 13 women (65%) and 7 men (35%), ranging in age from 23 to 77 years (mean age 47). Each of the subjects received whole-body cryotherapy in a 20-day cycle, once a day for 3 minutes at a temperature of -130 degrees C. The length of the pelvic muscles implicated in overload syndrome, the pain pressure of the pelvic ligaments, the Pidelou test, and Patrick's symptom were assessed before therapy was commenced and after its completion. Immediately after each session the patients received kinesitherapy under supervision of a physiotherapist, Magine exercises, post-isometric relaxation using Mitchel's method for the muscles and the intraspinal, lumbo-sacral and ilio-lumbar ligaments, active of the lumbar spine in the non-painful direction, and neuromobilization using Butler's method. This was supplemented by exercises on the ergometer in horizontal position.

**RESULTS.** Whole-body cryotherapy applied together with kinesitherapy was effective in reducing pressure pain in the ligaments (average 20%) and tension in significant pelvic muscles (average 30%).

**CONCLUSIONS.** The cryotherapy and kinesitherapy combination applied to the treatment of spinal overload syndrome gives satisfactory clinical outcome.

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### **Cryotherapy in osteoporosis**

Authors: K Ksiezopolska-Pietrzak

Cryotherapy is use of temperature lower than -100 degrees C onto body surface, for 2-3 minutes, in aim to cause physiological reactions for cold and to use such adapting reactions. Organism's positive response to cryotherapy supports treatment of basic disease and facilitates kinesitherapy. Low temperature may be obtained by use of air flow cooled with liquid nitrogen; this could be applied either locally, over chosen part of the body, or generally, over the whole body, in cryosauna or in cryochamber. The most efficiently is applying cryotherapy twice a day, with at least 3 hours interval. Kinesitherapy is necessarily used after each cryotherapy session. Whole treatment takes 2 to 6 weeks, depending on patient's needs. Cryotherapy reduces pain and swellings, causes skeletal muscles relaxation and increase of their force, also, motion range in treated joints increases. Thus, cryotherapy seems to fulfill all necessary conditions for rehabilitation in osteoporosis. Cryotherapy represents numerous advantages: it takes short time for applying, being well tolerated by patient, also patient's status improves quickly. In addition, contraindications against cryotherapy are rare. All this makes cryotherapy a method for a broad use in prophylactics and treatment of osteoporosis.

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Clinical and experimental rheumatology. 24(3):295-301. ISSN: 0392-856X

### **Can short-term exposure to extremely low temperatures be used as an adjuvant therapy in the treatment of affective and anxiety disorders?**

Authors: Joanna Rymaszewska, David Ramsey, Sylwia Chłodzińska-Kiejna, Andrzej Kiejna

**AIM:** The aim of the research was to assess the effect of whole-body cryotherapy (WBCT) on the symptoms observed in a group of patients suffering from affective and anxiety disorders and their own subjective assessment of life satisfaction.

**METHOD:** The study group was given short-term exposure (120-180 sec.) to temperatures between -110 degrees C and -160 degrees C on each working day for a period of 3 weeks (a total of 15 treatments). Both the study group (n=26) and control group (n=34) were observed at the beginning and the end of this 3 week interval. Standard psychopharmacological treatment was carried out in both groups, independently of whether cryotherapy was used or not. Hamilton's scales of depression and anxiety were used, together with the life satisfaction scale.

RESULTS: A statistically significant larger improvement, together with a better mean state after 3 weeks, was observed with respect to 11 of the 14 components of the anxiety scale in the study group compared to the control group (except symptoms associated with the gastrointestinal and genitourinary symptoms and behaviour at interview). A larger improvement, together with a better mean state after 3 weeks, was observed with respect to 12 of the 16 components of the depression scale (except digestive, sexual life hypochondria, body weight and criticism) and 6 of the 11 components of the life satisfaction scale (physical well-being, physical condition, domestic activity, professional activity, personal interests and general satisfaction from life) in the study group.

CONCLUSIONS: Cyclic short-term whole-body exposition to extremely low temperatures significantly reduced the severity of depressive and anxiety symptoms and increased the life satisfaction.



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