

## 1. Vascular (blood vessel) Inflammation

Arterioscler Thromb Vasc Biol. 2008 Jan 17

### **Far Infrared Therapy Inhibits Vascular Endothelial Inflammation via the Induction of Heme Oxygenase-1.**

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**OBJECTIVE:** Survival of arteriovenous fistulas (AVFs) in hemodialysis patients is associated with both far infrared (FIR) therapy and length polymorphisms of the heme oxygenase-1 (HO-1) promoter. In this study, we evaluated whether there is an interaction between FIR radiation and HO-1 in regulating vascular inflammation.

**METHODS AND RESULTS:** Treatment of cultured human umbilical vein endothelial cells (ECs) with FIR radiation stimulated HO-1 protein, mRNA, and promoter activity. HO-1 induction was dependent on the activation of the antioxidant responsive element/NF-E2-related factor-2 complex, and was likely a consequence of heat stress. FIR radiation also inhibited tumor necrosis factor (TNF)-alpha-mediated expression of E-selectin, vascular cell adhesion molecule-1, intercellular cell adhesion molecule-1, monocyte chemoattractant protein-1, interleukin-8, and the cytokine-mediated adhesion of monocytes to ECs. The antiinflammatory action of FIR was mimicked by bilirubin, and was reversed by the HO inhibitor, tin protoporphyrin-IX, or by the selective knockdown of HO-1. Finally, the antiinflammatory effect of FIR was also observed in patients undergoing hemodialysis.

**CONCLUSIONS:** These results demonstrate that FIR therapy exerts a potent antiinflammatory effect via the induction of HO-1. The ability of FIR therapy to inhibit inflammation may play a critical role in preserving blood flow and patency of AVFs in hemodialysis patients.

## 2. Allergic Rhinitis

is a medical term describing irritation and inflammation of some internal areas of the nose.

**Conf Proc IEEE Eng Med Biol Soc. 2007;1:1479-82**

**Clinical effects of far-infrared therapy in patients with allergic rhinitis.**Hu KH, Li WT.

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[drhook@ms68.hinet.net](mailto:drhook@ms68.hinet.net). Allergic rhinitis (AR) is the sixth most common chronic illness worldwide,

which has a significant impact on patients' quality of life. The actual cost of AR is staggering, approximately \$5.6 billion being spent annually in direct medical costs and other indirect costs.

Therefore, it should be taken seriously upon its evaluation and treatment. AR is an IgE-mediated inflammation, which symptoms are likely due to increased vascular permeability. Current therapeutic options such as avoidance of allergen, medication and immunotherapy are unsatisfactory.

Far-infrared (FIR) is an invisible electromagnetic wave with a wavelength longer than that of visible light. It has been used to treat vascular diseases as a result of an increase in blood flow.

The **objective** of this study was to evaluate the clinical effects of FIR therapy in patients with AR. Thirty-one patients with AR were enrolled in this study.

**Method:** A WS TY101 FIR emitter was placed to face the patient's nasal region at a distance of 30 cm. The treatment was performed for 40 min every morning for 7 days. Every day, patients recorded their symptoms in a diary before and during treatment. Each symptom of rhinitis was rated on a 4-point scale (0-3) according to severity.

**Results:** During the period of FIR therapy, the symptoms of eye itching, nasal itching, nasal stuffiness, rhinorrhea and sneezing were all significantly improved. Smell impairment was not improved until after the last treatment. No obvious adverse effect was observed in the patients during treatment and follow-up.

### **3. Appetite Loss and Mild Depression**

Psychosom Med. 2005 Jul-Aug;67(4):643-7

**Repeated thermal therapy diminishes appetite loss and subjective complaints in mildly depressed patients.**

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**OBJECTIVE:** We observed that repeated thermal therapy improved appetite loss and general well-being in patients with chronic heart failure. The purpose of this study is to clarify the effects of repeated thermal therapy in mildly depressed patients with appetite loss and subjective complaints.

**METHODS:** Twenty-eight mildly depressed inpatients with general fatigue, appetite loss, and somatic and mental complaints were randomly assigned to thermal therapy group (n = 14) or nonthermal therapy group (n = 14). Patients in the thermal therapy group were treated with 60 degrees C far-infrared ray dry sauna for 15 minutes and were then kept at bed rest with a blanket for 30 minutes once a day, 5 days a week for a total of 20 sessions in 4 weeks.

**RESULTS:** Four weeks after admission, somatic complaints, hunger, and relaxation scores significantly improved (p < .001, p < .0001, p < .0001, respectively) and mental complaints slightly improved (p = .054) in the thermal therapy group compared with the nonthermal therapy group. Furthermore, the plasma ghrelin concentrations and daily caloric intake in the thermal therapy group significantly increased compared with the nonthermal therapy group (p < .05).

**CONCLUSIONS:** These findings suggest that repeated thermal therapy may be useful for mildly depressed patients with appetite loss and subjective complaints.

#### **4. Chronic Pain**

**Psychother Psychosom. 2005;74(5):288-94**

**The effects of repeated thermal therapy for patients with chronic pain.**

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**BACKGROUND:** It has been reported that local thermal therapy with a hot pack or paraffin relieves pain. We hypothesized that systemic warming may decrease pain and improve the outcomes in patients with chronic pain. The purpose of this study was to clarify the effects of systemic thermal therapy in patients with chronic pain.

**METHODS:** Group A (n = 24) patients with chronic pain were treated by a multidisciplinary treatment including cognitive behavioral therapy, rehabilitation, and exercise therapy, whereas group B (n = 22) patients were treated by a combination of multidisciplinary treatment and repeated thermal therapy. A far-infrared ray dry sauna therapy and post-sauna warming were performed once a day for 4 weeks during hospitalization. We investigated the improvements in subjective symptoms, the number of pain behavior after treatment and outcomes 2 years after discharge.

**RESULTS:** The visual analog pain score, number of pain behavior, self-rating depression scale, and anger score significantly decreased after treatment in both groups. After treatment, the number of pain behavior was slightly smaller (p = 0.07) and anger score was significantly lower in group B than those in group A (p = 0.05). Two years after treatment, 17 patients (77%) in group B returned to work compared with 12 patients (50%) in group A (p < 0.05).

**CONCLUSION:** These results suggest that a combination of multidisciplinary treatment and repeated thermal therapy may be a promising method for treatment of chronic pain. Copyright 2005 S. Karger AG, Basel.

#### **5. Chronic Fatigue Syndrome**

**J Psychosom Res. 2005 Apr;58(4):383-7**

**The effects of repeated thermal therapy for two patients with chronic fatigue syndrome.**

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**OBJECTIVE:** This paper describes the successful treatment of two patients with chronic fatigue syndrome (CFS) using repeated thermal therapy.

**METHODS:** Two patients with CFS underwent treatment with prednisolone (PSL), with no satisfactory effect. They were subjected to thermal therapy that consisted of a far-infrared ray dry sauna at 60 degrees C and postsauna warming. The therapy was performed once a day, for a total of 35 sessions. After discharge, these subjects continued the therapy once or twice a week on an outpatient basis for 1 year.

**RESULTS:** Symptoms such as fatigue, pain, sleep disturbance, and low-grade fever were dramatically improved after 15 to 25 sessions of thermal therapy. Although PSL administration was discontinued, the subjects showed no relapse or exacerbation of symptoms during the first year after discharge. The patients became socially rehabilitated 6 months after discharge.

**CONCLUSIONS:** These results suggest that repeated thermal therapy might be a promising method for the treatment of CFS.

## 6. Wound Healing

Exp Biol Med (Maywood). 2003 Jun;228(6):724-9

**Promotive effects of far-infrared ray on full-thickness skin wound healing in rats.**

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The biological effects of far-infrared ray (FIR) on whole organisms remain poorly understood. The aim of our study was to investigate not only the hyperthermic effect of the FIR irradiation, but also the biological effects of FIR on wound healing. To evaluate the effect of FIR on a skin wound site, the speed of full-thickness skin wound healing was compared among groups with and without FIR using a rat model. We measured the skin wound area, skin blood flow, and skin temperature before and during FIR irradiation, and we performed histological inspection.

**Wound healing was significantly more rapid with than without FIR. Skin blood flow and skin temperature did not change significantly before or during FIR irradiation. Histological findings revealed greater collagen regeneration and infiltration of fibroblasts that expressed transforming growth factor-beta1 (TGF-beta1) in wounds in the FIR group than in the group without FIR.**

Stimulation of the secretion of TGF-beta1 or the activation of fibroblasts may be considered as a possible mechanisms for the promotive effect of FIR on wound healing independent of skin blood flow and skin temperature.