1. **Leg heating** using far infra-red radiation in patients with chronic heart failure acutely improves the hemodynamics, vascular endothelial function, and oxidative stress.


**Source:** Department of Cardiovascular Medicine, Kyushu University Hospital, Japan.

**Abstract**

**BACKGROUND:** Systemic thermal therapy (STT) has been associated with beneficial effects in patients with chronic heart failure (CHF). The fact, however, that it requires a dedicated as well as spacious facility and trained personnel makes it difficult to practice in the daily care of patients with CHF.

**OBJECTIVE:** The aim of this study was to determine whether the leg thermal therapy (LTT) has a positive impact similar to that of STT in patients with CHF.

**Methods and Results** Twenty patients with CHF (57 ± 17 years old, left ventricular ejection fraction=30 ± 10%) received LTT (45°C) for 20 minutes. Immediately after the treatment, the core temperature had increased (+0.3 ± 0.3°C) (p<0.01). While the LTT had no significant effects on the heart rate, systolic arterial pressure, and diastolic blood pressure, it increased the cardiac output (mixed venous oxygen saturation; +2 ± 3%) and decrease the pulmonary capillary wedge pressure (-2 ± 2 mmHg). The LTT significantly improved the flow-mediated vasodilatation (FMD) from 4.8 ± 2.6 to 7.1 ± 3.6%, the antioxidative markers, thiol from 4.0 ± 0.7 to 4.5 ± 0.9 μmoL/g, and the marker of oxidative deoxyribonucleic acid (DNA) damage, urine 8-hydroxy-2'deoxyguanosine (8OHdG) from 100 to 82 ± 3%, respectively (p<0.05). No patient had any adverse effects associated with LTT.

**Conclusion:** Leg thermal therapy (LTT) acutely improved flow-mediated vasodilatation (FMD), and oxidative stress in patients with chronic heart failure (CHF). Although the long-term effect of leg thermal therapy (LTT) remains to be investigated, its practicality which is comparable to that of Systemic thermal therapy (STT) would make it an attractive therapeutic strategy for patients with chronic heart failure (CHF).

2. **Effect of Waon (Far Infrared) therapy on oxidative stress in chronic heart failure.**


**Source:** Department of Cardiovascular, Respiratory and Metabolic Medicine, Graduate School of Medicine, Kagoshima University, Kagoshima, Japan.

**Abstract**

**BACKGROUND:** A previous report by our team showed that Waon (Far Infrared) therapy, using a far infrared-ray dry sauna at 60°C, improves cardiac and vascular function in patients with chronic heart failure (CHF). The purpose of the present study was to clarify the effect of Waon (Far Infrared) therapy on oxidative stress in CHF patients and investigate its mechanism by animal experiments.

**METHODS AND RESULTS:** Forty patients with CHF were divided into control (n=20) and Waon therapy (n=20) groups. All patients received standard optimal medications for CHF. Waon therapy group was treated with Waon therapy daily for 4 weeks. After 4 weeks of Waon (Far Infrared) therapy, concentrations of hydroperoxide and brain natriuretic peptide (BNP) decreased significantly (hydroperoxide, 422±116 to 327±88U.CARR, P<0.001; BNP, 402±221 to 225±137pg/ml, P<0.001), and the nitric oxide metabolites increased (71.2±35.4 to 92.0±40.5mmol/L, P<0.05). In contrast, none of these variables changed over the 4-week interval in the control group. Furthermore, animal experiments were performed using TO-2 cardiomyopathic hamsters. On immunohistochemistry, cardiac expression of 4-hydroxy-2-nonenal, a marker of oxidative stress, was decreased in the 4-week Waon therapy compared to untreated hamsters. On Western blotting, cardiac expressions of heat shock protein (HSP) 27, manganese superoxide dismutase and HSP32, which reduce oxidative stress, were significantly upregulated in the 4-week Waon therapy compared to untreated hamsters.

**CONCLUSIONS:** Waon (Far Infrared) therapy decreases oxidative stress in patients and hamsters with heart failure.

3. **Repeated (Far Infrared) sauna therapy reduces urinary 8-epi-prostaglandin F(2alpha)**

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Abstract
We have reported that repeated (Far Infrared) sauna therapy improves impaired vascular endothelial function in a patient with coronary risk factors. We hypothesized that sauna therapy decreases urinary 8-epi-prostaglandin F(2alpha) (PGF(2alpha)) levels as a marker of oxidative stress and conducted a randomized, controlled study. Twenty-eight patients with at least one coronary risk factor were divided into a sauna group (n = 14) and non-sauna group (n = 14). Sauna (Far Infrared) therapy was performed with a 60 degrees C far infrared-ray dry sauna for 15 minutes and then bed rest with a blanket for 30 minutes once a day for two weeks. Systolic blood pressure and increased urinary 8-epi-PGF(2alpha) levels in the sauna group were significantly lower than those in the non-sauna group at two weeks after admission (110 +/- 15 mmHg vs 122 +/- 13 mmHg, P < 0.05, 230 +/- 67 pg/mg x creatinine vs 380 +/- 101 pg/mg x creatinine, P < 0.0001, respectively).

These results suggest that repeated (Far Infrared)sauna therapy may protect against oxidative stress, which leads to the prevention of atherosclerosis.