Research on Far Infrared Rays by Dr. Aaron M. Flickstein

"Regular use of a sauna may impact a similar stress on the cardiovascular system as running, and its regular use may be as effective [at] burning calories."
Journal of the American Medical Association

The Use of Infrared Heat to Produce Cardiovascular Conditioning

The August 7, 1981 issue of the Journal of the American Medical Association (JAMA) reported what is common knowledge today: Many people who run do so to place a demand on their cardiovascular system as well as to build muscle. What isn't well known is that it also reported the "regular use of a sauna may impart a similar stress on the cardiovascular system, and its regular use may be as effective as a means of cardiovascular conditioning and burning of calories as regular exercise."

It has been found that the infrared sauna makes it possible for people in wheelchairs, those who are otherwise unable to exert themselves, and those who won't follow an exercising/conditioning program to achieve a cardiovascular training effect. It also allows for more variety in any ongoing training program.

Blood flow during whole-body hyperthermia is reported to rise from a normal five to seven quarts a minute to as many as 13 quarts a minute.

Due to the deep penetration of infrared rays (over one and a half inches into body tissue), there is a deep heating effect in the muscle tissue and internal organs. The body responds to this heat with a hypothalamic-induced increase in both heart volume and rate. Beneficial heart stress leads to a sought-after cardiovascular training and conditioning effect. Medical research confirms the use of a sauna provides cardiovascular conditioning as the body works to cool itself and involves substantial increases in heart rate, cardiac output, and metabolic rate. As a confirmation of the validity of this form of cardiovascular conditioning, extensive research by NASA in the early 1980's led to the conclusion that infrared stimulation of cardiovascular function would be the ideal way to maintain cardiovascular conditioning in American astronauts during long space flights.

Infrared Heat, Caloric Consumption, and Weight Control In its Wellness Letter, October 1990, the University of California Berkeley reported that "the 1980's were the decade of high-impact aerobics classes and high-mileage training. Yet there was something elitist about the way exercise was prescribed: only strenuous workouts would do, you had to raise your heart rate to between X and Y, and the only way to go was to "go for the burn." Such strictures insured that most 'real' exercisers were relatively young and in good shape to begin with. Many Americans got caught up in the fitness boom, but probably just as many fell by the wayside. As we've reported, recent research shows that you don't have to run marathons to become fit - that burning just 1,000 calories a week...is enough. Anything goes, as long as it burns these calories."

Guyton's Textbook of Medical Physiology reports that producing one gram of sweat requires 0.586 kcal. The JAMA citation above goes on to state that "A moderately conditioned person can easily sweat off 500 grams in a sauna, consuming nearly 300 kcal - the equivalent of running two to three miles. A heat-conditioned person can easily sweat off 600 to 800 kcal with no adverse effect. While the weight of water loss can be regained by rehydration, the calories consumed will not be." Since a sauna helps generate two to three times the sweat produced in a conventional hot-air sauna, the implications for increased caloric consumption are quite impressive.

Assuming one takes a sauna for 30 minutes, some interesting comparisons can be drawn. Two of the highest calorie output exercises are rowing and running marathons. Peak output on a rowing machine or during a marathon burns about 600 calories in 30 minutes. An infrared sauna may better this from "just slightly" up to 250 percent by burning 900 to 2400 calories in the same period of time. It might in a single session simulate the consumption of energy equal to that expended in a six- to nine-mile run.

The infrared sauna can therefore, play a pivotal role in both weight control and cardiovascular conditioning. It is valuable for those who don't exercise and those who can't exercise and want an effective weight control and fitness maintenance program, and the benefits regular exercise contribute to such a program.

History of the Sauna and Development of Infrared Technology

The Finns popularised sauna use. Their ancient religious ceremonies used it for mental, spiritual, and physical cleansing. Use of the sauna in their religion stayed with them when they migrated between 5,000 and 3,000 BC from an area northwest of Tibet to their present location in Finland. Native American Indians used sweat lodges for cleansing and purifying, recognizing the health benefits of a sweat as well.

Dr. Tadashi Ishikawa, a member of the Research and Development Department of Fuji Medical, received a patent in 1965 for a zirconia ceramic infrared heater used in the first healing infrared thermal systems. Medical practitioners in Japan were the only ones using infrared thermal systems for 14 years. In 1979, they were finally released for public use. The technique has been further refined into infrared thermal systems that have been sold in the United States since 1981. One use of infrared heat in the United States has been in the form of panels used in hospital nurseries to warm newborns.

World-Wide Reports on Infrared Sauna Use

Over the last 25 years, Japanese and Chinese researchers and clinicians have completed extensive research on infrared treatments and report many provocative findings. In Japan, there is an "infrared society" composed of medical doctors and physical therapists dedicated to further infrared research. Their findings support the health benefits of infrared therapy as a method of healing.

There have been over 700,000 infrared thermal systems sold in the Orient for whole-body treatments. An additional 30 million people have received localized infrared treatment in the Orient, Europe, and Australia with lamps, which emit the same 2 to 25 micron wave bands as employed in a whole-body system. In Germany, physicians in an independently developed form have used whole-body infrared therapy for over 80 years.

Musculoskeletal Improvements with Infrared Heat

Success has been reported from infrared treatments by Japanese researchers for the following musculoskeletal conditions:

Effects of Infrared Heat on Rheumatoid Arthritis

A case study reported in Sweden worked with a 70-year-old man who had rheumatoid arthritis secondary to acute rheumatic fever. He had reached his toxic limit of gold injections and his Erythrocyte Sedimentation Rate (ESR) was still 125. After using an infrared heat system for less than five months, his ESR was down to 11.

The rheumatologist worked with a 14-year-old Swedish girl who had difficulty walking downstairs due to knee pain from the age of eight. This therapist told her mother the girl would be in a wheelchair within two years if she didn't begin gold corticosteroid therapy. After three infrared sauna treatments, she began to become more agile and subsequently took up folk dancing without the aid of conventional approaches in her recovery.

A clinical trial in Japan reported a successful solution for seven out of seven cases of rheumatoid arthritis treated with whole-body infrared therapy.

These case studies and clinical trials indicate that further study is warranted for the use of whole-body infrared therapy in the care of patients with rheumatoid arthritis.

Other Therapeutic Effects of Infrared Heat

The following information has been summarized from Chapter 9 of Therapeutic Heat and Cold, Fourth Edition, Editors Justus F. Lehmann, M.D., Williams, and Wilkin, or concluded from data gathered there.

Generally it is accepted that heat produces the following desirable therapeutic effects:

1. Infrared heat increases the extensibility of collagen tissues.

Tissues heated to 45 degrees Celsius and then stretched exhibit a nonelastic residual elongation of about 0.5 to 0.9 percent that persists after the stretch is removed. This does not occur in these same tissues when stretched at normal tissue temperatures. Therefore 20stretching sessions can produce a 10 to 18 percentage increase in length of tissues heated and stretched.

Stretching of tissue in the presence of heat would be especially valuable in working with ligaments, joint capsules, tendons, fasciae, and synoviurn that have become scarred, thickened, or contracted. Such

stretching at 45 degrees Celsius caused much less weakening in stretched tissues for a given elongation than a similar elongation produced at normal tissue temperatures.

Experiments cited clearly showed low-force stretching could produce significant residual elongation when heat is applied together with stretching or range-of-motion exercises. This is safer than stretching tissues at normal tissue temperatures.

2. Infrared heat decreases joint stiffness.
There was a 20 percent decrease in rheumatoid finger joint stiffness at 45 degrees Celsius (112 degrees Fahrenheit) as compared with 33 degrees Celsius (92 degrees Fahrenheit), which correlated perfectly to both subjective and objective observation of stiffness. Speculation has it that any stiffened joint and thickened connective tissues may respond in a similar fashion.

3. Infrared heat relieves muscle spasms.
Muscle spasms have long been observed to be reduced through the use of heat, be they secondary to underlying skeletal, joint, or neuropathological conditions. This result is possibly produced by the combined effect of heat on both primary and secondary afferent nerves from spindle cells and from its effects on Golgi tendon organs. The results produced demonstrated their peak effect within the therapeutic temperature range obtainable with radiant heat.

4. Infrared heat treatment leads to pain relief.
Pain may be relieved via the reduction of attendant or secondary spasms. Pain is also at times related to ischemia (lack of blood supply) due to tension or spasm that can be improved by the hyperemia that heat-induced vasodilatation produces, thus breaking the feedback loop in which the ischemia leads to further spasm and then more pain.

Heat has been shown to reduce pain sensation by direct action on both free-nerve endings in tissues and on peripheral nerves. In one dental study, repeated heat applications led finally to abolishment of the whole nerve response responsible for pain arising from dental pulp.

Heat may lead to both increased endorphin production and a shutting down of the so called "spinal gate" of Melzack and Wall, each of which can reduce pain.

Localized infrared therapy using lamps tuned to the 2 to 25 micron waveband is used for the treatment and relief of pain by over 40 reputable Chinese medical institutes.

5. Infrared heat increases blood flow.
Heating one area of the body produces reflex-modulated vasodilators in distant-body areas, even in the absence of a change in core body temperature. Heat one extremity and the contra lateral extremity also dilates; heat a forearm and both lower extremities dilate; heat the front of the trunk and the hand dilates.

Heating muscles produces an increased blood flow level similar to that seen during exercise. Temperature elevation also produces an increased blood flow and dilation directly in capillaries, arterioles, and venules, probably through direct action on their smooth muscles. The release of bradykinin, released as a consequence of sweat-gland activity, also produces increased blood flow and vasodilatation.

Whole-body hyperthermia, with a consequent core temperature elevation, further induces vasodilatation via a hypothalamic-induced decrease in sympathetic tone on the arteriovenous anastomoses. Vasodilatation is also produced by axonal reflexes that change vasomotor balance.

6. Infrared heat assists in resolution of inflammatory infiltrates, oedema, and exudates.
Increased peripheral circulation provides the transport needed to help evacuate oedema, which can help inflammation, decrease pain, and help speed healing.

7. Infrared heat introduced in cancer therapy.
More recently, infrared heat has been used in cancer therapy. This is a new experimental procedure that shows great promise in some cases when used properly. American researchers favour careful monitoring of the tumour temperature; whereas, the successes reported in Japan make no mention of such precaution.

8. Infrared heat affects soft tissue injury.
Infrared healing is now becoming a leading edge care for soft tissue injuries to promote both relief in chronic or intractable "permanent" cases, and accelerated healing in newer injuries.

Chinese Studies Report Positive Effects of Infrared Heat

Researchers report over 90 percent success in a summary of Chinese studies that assessed the effects of infrared heat therapy on:

- Soft tissue injury
- Lumbar strain
- Periarthritis of the shoulder
- Sciatica
- Pain during menstruation
- Neurodermatitis
- Eczema with infection
- Post-surgical infections
- Facial paralysis (Bell's Palsy)
- Diarrhoea
- Cholecystitis
- Neurasthenia
- Pelvic infection
- Paediatric pneumonia
- Tinea
- Frostbite with inflammation

Japanese Studies on the Positive Effects of Infrared Heat

- As reported in Infrared Therapy by Dr. Yamajaki, Japanese researchers have produced the following provocative results with whole-body infrared heat:
- Burns (relieves pain and decreases healing time with less scarring) High blood pressure (safe in 40 to 50 degrees Celsius, 104 to 122 degrees Fahrenheit, regular use helps lower pressure)
- Low blood pressure (sauna trains the body to raise the pressure)
- Brain damage (accelerated repair in brain contusions) Short-term memory loss (improved)
- Cancer of the tongue (improved)
- Toxic electromagnetic fields (effects neutralized)
- Cerebral haemorrhage (speeds and significantly enhances recovery)
- Arthritis, acute and chronic (greatly relieved)
- Gouty arthritis (relieved)
- Rheumatoid Arthritis (relieved)
- Menopausal symptoms (relieved chills, nervousness, depression, dizziness, head- and stomach-aches)

- Weight loss (produced through sweating, the energy expended to produce sweating, and through direct excretion of fat)
- Auto accident-related soft tissue injury (daily sessions used until best healing attained, then used to deal with permanent residuals; pain control for chronic residuals lasted three days before another treatment was necessary)

Speculation about Infrared Heat Effects on Blood Circulation

All of the following ailments may be associated to some degree with poor circulation and, thus, may respond well to increased peripheral dilation associated with infrared treatment:

- Arthritis
- Sciatica
- Backache
- Haemorrhoids
- Nervous tension
- Diabetes
- Children's overtired muscles
- Varicose veins
- Neuritis
- Bursitis
- Rheumatism
- Strained muscles
- Fatigue
- Stretch marks
- Menstrual cramps
- Upset stomach
- Leg and decubitus ulcers (that fail to heal using conventional approaches)
- Post-operative oedema (treatment has proven so effective hospital stays were reduced by 25 percent)
- Peripheral occlusive disease ("The goal is to maintain an optimal blood flow rate to the affected part...In general the temperature should be maintained at the highest level, which does not increase the circulatory discrepancy as shown by cyanosis and pain." Therapeutic Heat and Cold, pp.456-457.)

Infrared Heat and Coronary Artery Disease, Arteriosclerosis, and Hypertension

Finnish researchers, reporting the regular use of conventional saunas state "there is abundant evidence to suggest that blood vessels of regular sauna-goers remain elastic and pliable longer due to the regular dilation and contraction" of blood vessels induced by sauna use, such as the Physiotherm Far Infrared Sauna.

In 1989, German medical researchers reported in "Dermatol Monatsschrift" a single whole-body session of infrared-induced hyperthermia lasting over one hour had only beneficial effects on subjects with State I and II essential hypertension. Each subject experienced a rise in core body temperature to a maximum level of 35.5 degrees Celsius (100.5 Fahrenheit). All of the subjects in one experiment had significant decreases in arterial, venous, and mean blood pressure that lasted for at least 24 hours and linked, according to researchers, to a persistent peripheral dilation effect. An improvement in plasma viscosity was also noted.

Another group of similar hypertensive patients was also studied under the same conditions of hyperthermia, with an eye toward more carefully evaluating the circulatory system effects induced by this type of whole-body heating. During each infrared session, there was a significant decrease of blood pressure, cardiac ejection resistance, and total peripheral resistance in every subject. There was also a significant increase of the subjects' heart rates, stroke volumes, cardiac outputs, and ejection fractions. The researchers site these last three effects as evidence that the stimulation of the heart during infrared-induced hyperthermia is well compensated, while the prior list of effects show clear detail of the microcirculatory changes leading to the desired result of a lowering blood pressure.

Aging and Infrared Heat Therapy

Problems often accompanying aging have been reported in Japan to be alleviated or reduced by the use of infrared therapy:

- Menopause
- Cold hands and feet (a physical therapist found 20 to 50 percent improvement was maintained).
- High blood pressure (in the case of a diabetic a systolic decrease from 180 to 125 and a concurrent 10 pound weigh loss) Rheumatoid arthritis (seven out of seven cases resolved in one clinical trial)
- Radiation sickness (relieved signs and symptoms)
- Cancer pain (greatly relived pain in later stages)
- Sequelae of strokes (Herniparesis relieved over time)
- Benign prostatic hypertrophy (reduced)
- Duodenal ulcers (eliminated)
- Pain preventing sleep or limiting sleeping position (relieved)
- Compression fracture pain (pain gone for three days after each treatment in osteoporotic compression fractures) Haemorrhoids (reduced)
- Cystitis (gone)
- Cirrhosis of the liver (reversed)
- Gastritis (relieved)
- Hepatitis (gone)
- Asthma, bronchitis (cleared up)
- Chron's Disease (gone)
- Post-surgical adhesions (reduced)
- Leg ulcers (healed when previously static and resistant to other care)
- Keloids (significantly softened and, in some cases, completely gone)

Ear, Nose, and Throat Conditions Relieved with Infrared Heat

In Japan, ear, nose, and throat conditions were relieved with infrared heat treatments:

- Chronic middle-ear inflammation or infection (in one study of chronic serous otitis media no pathogenic bacteria were isolated in 70 percent of the subjects studied after the use of heat)
- Sore throats
- Tinnitus (chronic severe case cleared with 10 infrared treatments)
- Nose bleeding (reduced)
- Infrared Heat Improved Skin Conditions
- Infrared therapy is used routinely in burn units throughout Asia.
- Skin conditions improved in Japan and China with the use of infrared heat application
- Nettle rash
- Clogged pores (unplugged of cosmetics, unexcelled skin texture and tone)
- Poor skin tone (restored to a more youthful level)
- Scars and pain from burns or wounds (decreased in severity and extent)

- Lacerations (healed quicker with less pain and scarring) Acne (three to four treatments may open pores that have been non-functioning for years, forcing out clogging cosmetics, and loosening dry outer skin)
- Teenage skin problems (clearing acne and blackheads) Body odour (improved functioning of the skin especially body odour induced by occupational exposure to odorous chemicals) Eczema and Psoriasis (respond well)
- Sunburn (According to the Clayton's Electrotherapy, 9th Edition, "infrared radiations are the only antidote to excessive ultraviolet radiations.")
- Ketoids (form at a reduced rate in those prone to their formation and may be softened by infrared heat if they have formed) Dandruff (increased blood flow through the scalp)

Mikkel Aaland's book Sweat (Capra Press, 1978) quotes a Finnish doctor:

"The best dressed foreigner can come into a doctor's office, and when his skin is examined, it is found to be rough as bark. On the other hand, as a result of the sauna, the skin of any Finnish worker is supple and healthy."

Contraindications

As you can see, the segment of the infrared spectrum emitted by an infrared sauna, such as Physiotherm Far Infrared Sauna is reputed to offer an astounding range of possible therapeutic benefits and effects in research conducted around the world.

However, the data presented in this article is offered for reference purposes only and to stimulate further observation. No implication of Physiotherm Far Infrared Sauna creating a cure for or treating any disease is implied nor should it be inferred. If you have a disease, be sure to consult with a primary-care physician concerning it.

Prescription Drugs: If you are using prescription drugs, check with your physician or pharmacist for possible changes in the drug's effect due to an interaction with infrared energy.

Certain Ailments: According to some authorities, it is considered inadvisable to raise the core temperature of someone with adrenal suppression, systemic lupus erythematosus, or multiple sclerosis.

Joint Problems: If a person has a recent (acute) joint injury, it should not be heated for the first 48 hours or until the hot and swollen symptoms subside. Joints that are chronically hot and swollen may respond poorly to vigorous heating of any kind. Vigorous heating is strictly contraindicated in cases of enclosed infections be they dental, in joints, or in any other tissues.

Pregnancy: In pregnancy or the suspicion of pregnancy, discontinuation of sauna use is recommended. Finnish women use traditional saunas that don't heat the body as deeply as an infrared sauna for only six to twelve minutes and reportedly leave at that time due to perceived discomfort. Their usage of traditional saunas at this low level of intensity is not linked to birth defects. Infrared sauna use may be two to three times more intense due to deep tissue penetration, and comparatively shorter two to six minute sessions hardly seem worth any minimal risk they may present.

Surgical Implants: Metal pins, rods, artificial joints, or any other surgical implants generally reflect infrared rays and are not heated by an infrared heat system. Nevertheless, a person should consult his or her surgeon before receiving such therapy. Certainly infrared therapy must be discontinued if a person experiences pain near any implants.

Silicone: Silicone does absorb infrared energy. Implanted silicone or silicone prostheses for nose or ear replacement may be warmed by infrared rays. Since silicone melts at over 200 degrees Celsius, it should

not be adversely affected by an infrared heat system, however. It is still advised that a person checks with his or her surgeon, and possibly are presentative of the product manufacturer, to be certain.

Menstruation: Heating of the low-back area of women during the menstrual period may temporarily increase menstrual flow. Once a woman is aware that this is occurring, she can choose to allow herself to experience this short-term effect without worry. Or she may simply avoid using an infrared heat source at that time in her cycle.

Haemorrhage: Haemophiliacs and anyone predisposed to haemorrhage should avoid infrared usage or any type of heating that would induce vasodilatation that can lead to the tendency to bleed.

Worsened Condition: Should any condition worsen with the use of an infrared heat system, the use of the system should be discontinued.

Pain: Pain should not be experienced when using an infrared heat system. If one does, the use of radiant heat is clearly inappropriate for the person at that time.

Do not attempt to self-treat any disease with a Physiotherm Far Infrared Sauna without direct supervision of a physician.