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## Far Infrared Therapy (FIRT)

### What is Infrared Heat?

Radiant heat is simply a form of energy that heats objects directly, without having to heat the surrounding air. Radiant heat is also called infrared energy or IR. The electromagnetic spectrum is divided into three segments by wavelength, measured in microns or micrometers (a micron = 1/1,000,000 of a meter): 0.076 to 1.5 microns = near or close, 1.5 to 5.6 = middle or intermediate, 5.6 to 1000 = far or long wave infrared. The far infrared segment of the electromagnetic spectrum occurs just below, or "infra" to, red light as the next lowest energy band. This band of light is not visible to human eyes but can be seen by special cameras that translate infrared into visible colors. We can, however, feel this type of light, which we perceive as heat. The sun produces most of its energy in the infrared segment of the spectrum. Our atmosphere has a "window" in it that allows infrared rays-in the 7 to 14 micron ranges-to safely reach the earth's surface. When warmed, the earth radiates infrared rays in the 7 to 14 micron bands, with peak output at 10 microns.



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Our tissues normally produce infrared energy for warmth and tissue repair. Tissue production of infrared energy is associated with a variety of healing responses. At times, the infrared energy in our tissues may require a boost to a higher level to ensure the fullest healing possible for tissue repair. Body tissues that need an infrared boost selectively absorb infrared rays; after boosting a tissue's infrared energy, the remaining rays pass onward harmlessly. This phenomenon is called "resonant absorption." Our bodies radiate infrared energy through the skin at 3 to 50 microns, with most output at 9.4 microns. Our palms emit infrared energy too, from 8 to 14 microns. Palm healing, an ancient tradition in China, has used the healing properties of infrared rays for 3,000 years. Yogis in India also employ palm healing and recommend it especially for

relieving eyestrain.

## Far Infrared Therapy and Electromagnetic Fields

Recently there have been reports detailing the hazards of exposure to certain kinds of electromagnetic fields, such as those from high-tension power lines, cell phones, or from computer display terminals. Infrared heating systems have been tested in Japan and found free of toxic electromagnetic fields. The Swedish National Institute of Radiation Protection has also concluded that infrared heaters are not dangerous. Instead, Japanese researchers have reported that infrared radiant heat antidotes the negative effects of toxic electromagnetic sources.

Infrared energy penetrates tissues to a depth of over one inch. Its energy output is tuned to correspond closely to the body's own radiant energy so that body tissues absorb close to 93 percent of the infrared waves that reach the skin. A conventional sauna, in comparison, must rely on an indirect means of heat to produce its heating effect on the body (convection - air currents, and conduction - direct skin contact with hot air). An infrared heater heats only 20 percent of the air, leaving over 80 percent of the heat available to directly heat the body. Thus, an infrared heated sauna can warm its users to a greater depth and with more efficiency than a conventional sauna.

Infrared heater output creates penetrating heat and mildly warm air (which only heats the skin superficially). This crucial difference between it and traditional saunas explains the many unprecedented benefits that come from its use that are not attainable in conventional saunas.

Another difference lies in the process of sweating. Infrared energy created in the sauna may induce up to two to three times the volume of sweat produced in a traditional sauna, while operating at significantly cooler temperatures (100-130 degrees Fahrenheit - 37-55 degrees Celsius, compared to 180-235 degrees Fahrenheit). The lower heat is safer for those concerned with cardiovascular risk factors that might be adversely affected by high temperatures encountered in more traditional saunas. In fact, German researchers have reported beneficial effects from hour-long whole-body infrared exposure in two groups of hypertensive patients studied in 1989, including a 24-hour long increase in peripheral blood flow and decrease in high blood pressure. One issue for traditional sauna users has been breathing exceptionally hot air. Unlike traditional saunas, which require a closed atmosphere to maintain the levels of heat required for therapeutic results, Infrared saunas can be used with the door or window fully open if the only desired effect is infrared penetration. It is distinctly more pleasant to breathe air that is 50-125 degrees Fahrenheit (10-60 degrees Celsius); in an infrared sauna, patients breathe cooler air while maintaining a feeling of warmth.

## Therapeutic Effects of Far Infrared Therapy

### Increases extensibility of collagen tissues

Tissues heated to 45 degrees Celsius and then stretched exhibit a non-elastic residual elongation of about 0.5 to 0.9 percent that persists after the stretch is removed. This effect does not occur in these same tissues when stretched at normal tissue temperatures. Therefore, 20 stretching sessions can produce a 10-18% 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 synovium that have become scarred, thickened, or contracted. Such stretching at 45 degrees Celsius causes much less weakening in stretched tissues for a given elongation than a similar elongation produces at normal tissue temperatures.

Experiments have clearly shown that low-force stretching could produce significant residual elongation when heat is applied together with stretching or range-of-motion exercises, which is much safer than stretching tissues at normal tissue temperatures.

### **Decreases joint stiffness**

There is a 20% decrease in rheumatoid finger joint stiffness at 45 degrees Celsius (112 degrees Fahrenheit) as compared to 33 degrees Celsius (92 degrees Fahrenheit), which correlates 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.

### **Relieves muscle spasm**

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. Results produced demonstrate their peak effect within the therapeutic temperature range obtainable with radiant heat.

### **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 2-25 micron waveband is used for the treatment and relief of pain by over 40 reputable Chinese medical institutes.

### **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 contralateral 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. Axonal reflexes that change vasomotor balance also produce vasodilatation.

### **Assists in resolution of inflammatory infiltrates, edema, and exudates**

Increased peripheral circulation provides the transport needed to help evacuate edema, which can help inflammation, decrease pain, and help speed healing.

### **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 favor careful monitoring of the tumor temperature; whereas, the successes reported in Japan make no mention of such precaution.

### **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.

## **Therapeutic Applications of Far Infrared Therapy**

### **Cardiovascular Conditioning and Weight Loss**

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, 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.

In it's *Wellness Letter*, October 1990, the University of California Berkeley reported, "the 1980's was 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 "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 an infrared 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 up to 250% by burning 900-2400 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.

Far Infrared Therapy can, therefore, play a pivotal role in both weight control and cardiovascular conditioning. It is valuable for those who do not or cannot exercise, but who want an effective weight control and fitness maintenance program.

### **Coronary Artery Disease, Arteriosclerosis, and Hypertension**

Finnish researchers, reporting the regular use of conventional saunas, state that "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.

In 1989, German medical researchers reported that a single whole-body session of infrared-induced hyperthermia lasting over one hour had only beneficial effects on subjects with Stage 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 cite 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.

## Environmental Toxin Overload

Each day, we are exposed to numerous chemicals and toxins from the environment, which deposit in our tissues and cells. They come from the air around us, the water we use to drink and bathe, the food we eat, the soil in which our food is grown, and the household products we use. Toxic overload has been implicated in many health conditions, from Fibrocystic Breast Disease (FBD) in women to Attention Deficit Hyperactivity Disorder (ADHD) in children. Physical symptoms of overload include: fatigue, headache, joint or muscle pain, frequent colds and flus, allergies, hormonal imbalance, chemical sensitivity, sinus congestion, psoriasis and other skin conditions, loss of dexterity, insomnia, and more. Psychological symptoms include poor concentration, memory loss, mood changes, mental confusion, and changes in behavior.

Heavy metals impair the immune system and neurological function. Organic solvents and pesticides increase our risk of certain cancers. Carbon monoxide pollution is increasing with more vehicles on the road, affecting our nervous, immune, and respiratory systems. Numerous other chemicals have also been shown to injure our bodies, building up in our tissues and causing organ dysfunction. Treating the damage alone cannot stop the process; we must also address the cause, specifically this toxic residue in our tissues.

It is to this end that Far Infrared Therapy is effective. By its direct heating effects on the tissues, Far Infrared Therapy mobilizes toxins from fat cells and increases circulation, thus aiding in elimination of these toxins through perspiration. 30-50% of the population does not adequately or effectively mobilize and eliminate the toxins in their bodies that they are exposed to each day. Normal sweat is 97-99% water; sweat induced by Far Infrared Therapy is only 80-85% water. The rest is composed of environmental toxins that are being mobilized, some heavy metals, urea, cholesterol, and lactic acid. Removal of such toxic residues from the body provides increased and improved cellular function, thus enhancing overall health and well-being.



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