

What is the Difference between Near Infrared and Far Infrared Light Therapies?

: 6/25/2019

In order to begin our discussion about Near Infrared therapy let's make sure we are all on the same page about what infrared even means.

Infrared radiation (IR), or infrared light, is a type of energy that's invisible to the human eye but that can be felt as heat (1). IR is a type of electromagnetic radiation.

Electromagnetic radiation is a continuum of frequencies produced when atoms absorb and then release energy (1). From highest to lowest frequency, electromagnetic radiation includes gamma-rays, X-rays, ultraviolet radiation, visible light, infrared radiation, microwaves and radio waves (1). Together, these types of radiation make up the electromagnetic spectrum.

Within the electromagnetic spectrum, infrared waves occur at frequencies above those of microwaves and just below those of red visible light. Waves of infrared radiation are longer than those of visible light.

You might be thinking that radiation sounds bad for the body especially when you hear that microwaves are next on the spectrum.

However, there are two types of radiation:

1. Ionizing – can damage DNA (genes)
2. Non-ionizing – tends not to damage DNA

Infrared radiation is a non-ionizing form of radiation, which does not damage DNA (2). Ionizing radiation exposure can damage DNA. Ionizing forms are far ultraviolet radiation and x-rays.

Infrared radiation can be categorized into three groups according to wavelength, namely near infrared (NIR, 0.8–1.5 μm), middle infrared (MIR, 1.5–5.6 μm), and far infrared (FIR, 5.6–1000 μm) (3).

Infrared energy explains the concept of thermal imaging. Some infrared energy can be seen as heat. Some objects are so hot they emit visible light, such as fire (2). Other objects, such as humans, are not as hot and only emit infrared waves (2).

The human eye cannot see these infrared waves but instruments that can sense infrared energy, like night-vision goggles or infrared cameras, allow us to see the infrared waves emitting from humans and animals (2).

Everything in the universe emits some level of IR radiation (1). The two most obvious sources are the sun and fire. All living organisms benefit from the natural electromagnetic radiation of the sun.

Thermal radiation (or infrared) is a band of energy that has been used effectively for millennia to treat and ease certain maladies and discomforts (4). Heated saunas are one of the oldest methods of delivering radiation in a controlled environment and within a convenient treatment time (4).

What is Far InfraRed (we will talk about near infrared in a moment):

Far InfraRed Radiation or FIR relates to the longer wavelengths of radiation in the infrared spectrum, between 5.6 and 1000 micrometers (3). FIR wavelength cannot be perceived by the eyes, but its heat penetrates up to 1.5 inches (almost 4 cm) beneath the skin (4). FIR has been found to stimulate cells and tissue and is considered a promising treatment method for certain medical conditions (4).

There are new techniques for delivering FIR radiation to the human body. In fact, you may have heard of a far-infrared sauna. If not, you can Google the term and find lots of information and products.

Specialty lamps and saunas, delivering pure FIR radiation (eliminating completely the near and mid infrared bands), have become safe, effective, and widely used for the therapeutic benefits of FIR (4).

Clothing made with fibers containing FIR emitting ceramic nanoparticles, which is woven into the fabric, is being used to generate FIR radiation, and attain health benefits from its effects (4).

Benefits of FIR:

There are multiple medical applications of FIR that can improve health and reduce or even treat disease:

- Reduces pain and inflammation (4)
- Promotes cell repair post exposure to FIR (4)
- Enhances circulation in the skin (4)
- Protects against oxidative stress (4)
- Enhances weight loss (4)
- Stimulates cell proliferation, increases tissue regeneration (4)
- FIR sauna therapy has been used to improve cardiac and vascular function and reduce oxidative stress in patients with chronic heart failure (5).
- FIR saunas have a beneficial effect on quality of life in patients with type II diabetes. Physical health, general health, stress and fatigue all improved in the treatment group receiving FIR (6).
- A study of patients with rheumatoid arthritis and ankylosing spondylitis showed a reduction in pain, stiffness, and fatigue during far infrared sauna therapy (8).
- FIR has the effect of reducing the proliferation of some cancer cell lines (4). This suggests that FIR radiation may be used as an effective medical treatment for some cancer cells (4).
- FIR therapy reduced symptoms of exercise-induced muscle damage in highly-trained athletes after a trail running race (8).
- Modulates sleep: one study used a blanket containing FIR emitting ceramic discs and reported improved quality of sleep in the study subjects (9).
- Gloves have been made out of FIR emitting fabrics and these gloves can be used to treat arthritis of

the hands and Raynaud's syndrome (10).

- FIR therapy is effective in relieving pain in patients with chronic pain, chronic fatigue syndrome and fibromyalgia (3).
- FIR benefitted patients who experienced persistent and progressively increasing phantom limb pain after amputation (3).
- FIR stimulation alleviated depression in patients with insomnia by increasing serotonin (3).
- FIR can reduce the pain of wounds after standard medical wound treatments. Wounds exposed to FIR had lower healing times (11).

Risks:

FIR is generally quite safe compared to other medical interventions. However, there are risks of infrared radiation exposure to the skin and the eyes. A potential concern is an increase in photo-aging (skin aging due to light) (12).

Infrared radiation can also harm tattooed skin and cause skin inflammation (13). The lens of the eye is very sensitive to infrared radiation and long-term exposure can contribute to cataract formation (14).

How to access FIR:

There are three main ways to benefit from FIR radiation:

- FIR saunas
- FIR ray devices
- FIR emitting ceramics and fabrics (4)

FIR saunas are quite popular and there are many brands of FIR saunas that can be purchased for home use. In addition to saunas, there are also FIR lamps and clothing that can be purchased.

What is Near Infrared:

Near Infrared Radiation or NIR relates to the shorter wavelengths of radiation in the infrared spectrum; NIR, 0.8–1.5 μ m (3). NIR is used in the therapy called Photobiomodulation or PBM. We have just written an extensive article on Photobiomodulation, which you can find [here](#). It is a form of light therapy that uses near-infrared light over the brain, inside the nasal cavity, or over injuries or wounds (15).

The light is used to heal, improve tissue repair in wounds, bones and tendons, reduce pain and inflammation and restore and stimulate multiple physiological processes which repair damage caused by injury or disease (15). The healing occurs wherever the beam is applied. The light stimulates the cell's natural healing and pain relief processes.

Benefits of near infrared therapy:

Photobiomodulation is used for a huge variety of health issues as it has a significant anti-inflammatory effect. (Again, please refer to our article on [PBM](#) for the full details)

- The key applications of PBM for the future are in the areas of inflammation and autoimmunity (16).
- Cognitive performance or brain injury (16)
- Wound healing (16)
- Arthritis (16)
- Muscle healing (16)
- Inflammatory Pain (16)
- Lung inflammation and asthma (16)
- Abdominal fat, obesity and type 2 diabetes (16)
- Cancer (17)
- Achilles tendinopathy (16)
- Thyroiditis (16)
- Psoriasis (16)
- Hair loss (16)
- Cognitive performance, memory and mood (18)
- Cosmetic and aesthetic improvements (18)

Risks:

There are no known risks or side effects associated with PBM.

Which Type of Infrared Radiation – NIR or FIR – is Recommended to be Better for Health?

Based on multiple factors, we recommend NIR therapy over FIR therapy if you have to choose one. However in many cases we may suggest both!

This is because the sun emits 37% of its total energy in the near infrared range, and 3% in the far infrared range (19). Humans are biologically designed to use near infrared light, more so than far infrared light (19). It is now understood that the human body is partially photosynthetic and that we need sun light and near infrared for optimal health (19).

Near infrared is received at the cellular level in a way that far infrared is not. As we discussed in our article on [PBM](#), the effect of near infrared on the cells of the body is an increase in cellular energy production that can then be used to repair and rejuvenate at the cellular level. Far infrared does not have the same cellular effect on the mitochondria of the cells (19). Thus, Near Infrared can provide greater rejuvenating effects over FIR.

For people looking for overall health and mitochondrial support, NIR is our recommendation. For activating longevity genes without as much concern for mitochondrial support, FIR is probably fine.

Thus, we recommend Photobiomodulation therapy (using Near Infrared Radiation) in most cases as an effective means to treating specific conditions and improving health versus using Far Infrared therapy. That being said, there can be enormous value to the detoxification from sweating that can be stimulated through FIR sauna therapy. This is very beneficial in many cases, but can also be achieved with

standard saunas and does not require FIR technology in the sauna. For those purchasing a sauna, we do recommend the FIR technology to add some extra benefit.

References:

1. Live Science. 2019. What is Infrared? <https://www.livescience.com/50260-infrared-radiation.html>. Accessed June 11, 2019.
2. NASA Science. 2019. Tour of the Electromagnetic Spectrum. https://science.nasa.gov/ems/07_infraredwaves. Accessed June 11, 2019.
3. Shui S, Wang X, Chiang JY, Zheng L. 2015. Far infrared therapy for cardiovascular, autoimmune and other chronic health problems: A systematic review. *Exp Biol Med*. v.240(10); 2015 Oct.
4. Vatansever F, Hamblin 2012. Far infrared radiation (FIR): Its biological effects and medical applications. *Photonics Lasers Med*. doi: 10.1515/plm-2012-0034.
5. Fujita S, Ikeda Y, Miyata M, Shinsato T, Kubozono T, Kuwahata S, Hamada N, Miyauchi T, Yamaguchi T, Torii H, Hamasaki S, Tei C. Effect of Waon therapy on oxidative stress in chronic heart failure. *Circ J*. 2011;75(2):348–56.
6. Beever R. The effects of repeated thermal therapy on quality of life in patients with type II diabetes mellitus. *J Altern Complement Med*. 2010;16(6):677–81.
7. Oosterveld FG, Rasker JJ, Floors M, Landkroon R, van Rennes B, Zwijnenberg J, van de Laar MA, Koel GJ. Infrared sauna in patients with rheumatoid arthritis and ankylosing spondylitis. A pilot study showing good tolerance, short-term improvement of pain and stiffness, and a trend towards long-term beneficial effects. *Clin Rheumatol*. 2009;28(1):29–34.
8. Hauswirth C, Louis J, Bieuzen F, Pournot H, Fournier J, Filliard JR, Brisswalter J. Effects of whole-body cryotherapy vs. far-infrared vs. passive modalities on recovery from exercise-induced muscle damage in highly-trained runners. *PLoS One*. 2011;6(12):e27749.
9. Inoué S, Kabaya M. Biological activities caused by far-infrared radiation. *Int J Biometeorol*. 1989;33(3):145–50.
10. Ko GD, Berbrayer D. Effect of ceramic-impregnated “thermoflow” gloves on patients with Raynaud’s syndrome: randomized, placebo-controlled study. *Altern Med Rev*. 2002;7(4):328–35.
11. Lin YH, Li TS. 2017. The Application of far Infrared in the Treatment of Wound Healing: A Short-Evidence Based Analysis. *J Evid Based Complementary Altern Med*. 2017 Jan;22(1):186-188.
12. Holzer AM, Athar M, Elmets CA. 2010. The other end of the rainbow: infrared and skin. *J Invest Dermatol*. 2010 Jun;130(6):1496-9. doi: 10.1038/jid.2010.79.
13. Chiang C, Romero L. 2009. Cutaneous lymphoid hyperplasia (pseudolymphoma) in a tattoo after far infrared light. *Dermatol Surg*. 2009 Sep;35(9):1434-8. doi: 10.1111/j.1524-4725.2009.01254.x.
14. Aly EM, Mohamed ES. 2011. Effect of infrared radiation on the lens. *Indian J Ophthalmol*. 2011 Mar-Apr;59(2):97-101. doi: 10.4103/0301-4738.77010.
15. Joovv. 2019. Photobiomodulation and Cancer: What is the Truth? www.joovv.com/blogs/joovv-blog/photobiomodulation-cancer-truth. Accessed May 28 2019.
16. Hamblin MR. 2017. Mechanisms and applications of the anti-inflammatory effects of photobiomodulation. *AIMS Biophysics*, 2017, 4(3):337-361. doi: 3934/biophy.2017.3.337.
17. Hamblin MR, Nelson ST, Strahan JR. 2018. Photobiomodulation and Cancer: What is the Truth?

Photomed Laser Surg.2018 May;36(5):241-245. doi: 10.1089/pho.2017.4401.

18. Hamblin MR, de Sousa MVP, Agrawal T. 2017. Handbook of Low Level Laser Therapy. Singapore: Pan Stanford Publishing.
19. Lifestyle Integration. Near Vs. Far Infrared Benefits. <https://www.lifestyleintegration.com.au/learning-centre/articles/119-near-versus-far-infrared-benefits.html>. Accessed June 11, 2019.