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# Repairs DNA and Rejuvenates Your Cells While You Relax

Analysis by Dr. Joseph Mercola ✔ Fact Checked | February 26, 2023

## STORY AT-A-GLANCE

- The typical infrared sauna sold in the U.S. is far-infrared. These low-energy wavelengths provide virtually no photobiomodulation health benefits; they only heat your body superficially
- The near-infrared wavelengths can penetrate up to 4 inches into your body's tissues. The incandescent light bulb is the most efficient way to heat tissue because it is mostly near-infrared
- Only a few percent of solar radiation are far-infrared. About 40% of the sunlight spectrum is near-infrared
- Sunlight and incandescent light interacts with light receptor proteins called chromophores in your body. When light hits the chromophores, they activate a variety of biological processes. Near-infrared also activates the mitochondrial chelating systems in the cells
- Near-infrared light therapy stimulates your mitochondria to release nitric oxide and boost ATP production which, together, promote healing effects such as DNA repair and cellular regeneration

**I am of the belief, as are many other experts, that near-infrared sauna is an integral component of successful detoxification. Near infrared light also has many other biological benefits.**

Here, I interview Brian Richards, founder of SaunaSpace,[1] who is equally passionate about this modality, and has developed a near-infrared sauna using high-powered incandescent light bulbs. While he does not have any formal health training, he's quite knowledgeable and can provide information I think many could benefit from.

## The Differences Between Near- and Far-Infrared

The vast majority of infrared saunas are far-infrared. While these certainly have many benefits, there are some downsides. As explained by Richards, the difference between far- and near-infrared is the wavelength of the light. Near-infrared is higher energy. It's referred to as near-infrared due to the fact that the wavelengths are closer to the red wavelength.

> *"[Near-infrared] is what an incandescent sauna is,"* Richard says. *"But that's not what the typical infrared sauna is. The typical infrared sauna is far-infrared, which are the very low-energy infrared wavelengths. They start out at 3,000 nanometers (nm) and go up from there.*
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> *There's virtually no photobiomodulation (PBM) from these wavelengths. They're only heating the body. It's a very small portion of the sunlight's spectrum. Actually, only a few percent of the solar radiation are far-infrared. The biggest portion of infrared (about 40%) in the sunlight spectrum that reaches the Earth is near-infrared ...*
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> *So, a huge part of our evolutionary context is getting so much of our light as a near-infrared wavelength every day ... If we're comparing near-infrared to far-infrared, one of the big differences has to do with penetration into biological tissue. We have this concept of water absorption. Water absorbs different wavelengths to different degrees.*
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> *The water absorption spectrum actually starts at about 980 nm — the 'first overtone of water' it's called. Right when we get in the middle of near-infrared, it's only then that water begins absorbing wavelengths of light. But it's a*

*continuum, so once you get out of near-infrared, at about 1,400 or 1,500 nm, the water is almost entirely absorbing all of the wavelengths.*

*Once you get out to mid-infrared, and certainly when you get to far-infrared wavelengths, they're 100% absorbed by water. Many people are unaware of this, but far-infrared wavelengths, for that reason, do not penetrate biological tissue very deeply. Saunas using far-infrared wavelengths are essentially surface heating you, and heating you in a conductive fashion.*

*The near-infrared wavelengths, because they're at the beginning of water's absorption spectrum, have been shown to penetrate up to 100 millimeters (mm) [3.9 inches] ... With near-infrared wavelengths, we get radiant heat ... penetrating heat. This is a much more efficient way to heat biological tissues ...*

*The incandescent [light] bulb ... is the most efficient way to heat tissue because it is substantially near-infrared ... The sun is about 5,500 kelvin (K) ... The incandescent bulb is between 2,400 and 2,800 K, so about half the temperature of the sun. Its peak is actually in the near-infrared. It's a little bit shorter ... But essentially, it's the same form of light."*

## Far-Infrared Saunas Often Advertise Near-Infrared Benefits

There's a great deal of confusion on this issue, and many sauna makers take advantage of that confusion. Many of the far-infrared saunas promote their sauna as doing exactly what Richards just explained, but far-infrared saunas are NOT radiant.

They heat your body, yes, but it's very superficial, reaching only a few mm into your body. So, much of the far-infrared sauna advertising you see is really referring to the benefits associated with near-infrared, which is only a very small portion of the light emitted by those types of saunas.

It's the ability of near-infrared to penetrate so deeply into tissues[2] that makes it so effective for detoxification and physical healing. On the other hand, unnatural light

sources such as LEDs have a converse effect — they can cause a great deal of harm to your health.

Richards discusses this influence as well, so for more information please listen to the interview or read through the transcript. This issue has also been covered at great depth by Dr. Alexander Wunsch, a world class expert on photobiology, in "How LED Lighting May Compromise Your Health."

## Beware of 'Full-Spectrum' Sauna Claims

Two other common problems with far-infrared saunas is that a) they claim to be "full-spectrum," when in fact they emit virtually no near-infrared, and b) they emit high levels of electromagnetic fields (EMFs), even if claiming to be low- or no-EMF emitting.

I've measured some of these low-EMF saunas, and while there were no magnetic fields (the "M" in EMF), they emitted high amounts of electric fields (the "E" in EMF).

The problem is electrical fields are very difficult to measure without an expensive meter and proper training, and are another source of massive confusion, even within the Building Biology committee (a group of public and working professionals dedicated to creating safe havens in a toxic, electromagnetic world). Richards adds:

> *"You've got to be careful because there are so-called full-spectrum infrared saunas now where they have far-infrared emitters for heat, but they've added in near-infrared emitters in one of two ways. One way is to use LEDs. You can make LEDs now that emit only one monochromatic near-infrared wavelength.*
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> *They'll add a few of those to be able to claim that there's near-infrared, therefore it's full-spectrum, when it's not. It's really two technologies that they're trying to bring together and create a composite full-spectrum. But it still doesn't have the same natural [spectral power curve] shape as an incandescent bulb, as the sunlight ...*

*There are also some saunas that use low-irradiance, near-infrared emitters that are basically heating elements that are hotter than the far-infrareds. They do emit a small amount of near-infrared, but it's at a very low power level, what we call in light-therapy: irradiance."*

## What Is 'Irradiance'?

For clarification, the term "irradiance" refers to the power density, which is measured in watts per meter-squared or milliwatts per centimeter-squared ($mW/cm^2$). Watts refers to the power. An incandescent sauna bulb is typically 250 watts, so it's high-powered. Watts per meter squared is the amount of power received across an area in space.

*"That's what power density is. It's the power that's received across a surface area in space,"* Richards explains. *"When we look at light sources in terms of 'How much light therapy are you getting? What dose are you getting?' you measure it by measuring irradiance.*

*If we know the irradiance, and we know how far away we are from [the light source], then we know exactly how many joules we get, how much energy we get dosed with per second.*

*If we sit a certain amount of time at a certain distance from a light source of known irradiance, we can figure out exactly how much energy we receive per unit time. In the scientific world, they use this term irradiance, but it's basically power over an area. It varies widely with different light technologies of course."*

There are inexpensive meters that can objectively measure irradiance, called irradiance meters. Solar panel installers use them to measure the irradiance received by the solar panel, for example. The typical consumer meter will measure irradiance between 400 and 1,100 nm. In essence, they measure visible light — including the PBM section of near-infrared.

Using a consumer irradiance meter, anyone can confirm that the incandescent near-infrared sauna user, at 24 inches from the four 250W specialty lamps, receives about 30

mW/cm$^2$ near infrared irradiance. A single 250W specialty incandescent lamp, typically used at 12 to 18 inches from the exposed body part, delivers 15-34 mW/cm$^2$.

## Near-Infrared Activates Your Body's Innate Healing Capacity

Traditionally, the benefit of sun exposure is thought to be almost universally due to the benefit of ultraviolet-B (UVB) radiation, which stimulates vitamin D production in your body. What most overlook is the effect of near-infrared and its impact on PBM. This is important as 40% of sunlight is in the near-infrared spectrum, which strongly supports the idea that this is an important frequency to be exposed to.

As explained by Richards, PBM refers to the process of light activating biological systems. In a nutshell, light interacts with light receptor proteins, called chromophores, in your body. When light hits the chromophores, they activate a variety of biological processes.

Importantly, certain proteins in the electron transport chain in your mitochondria contain the light-receptor protein cytochrome C oxidase (CO), which plays an important role in cellular respiration. CO has absorption bands for near-infrared light and visible red light.

This narrow bandwidth of the sunlight is not just heating your body or, in terms of UV, promoting vitamin D production. It activates an entirely different healing system. "Since we have mitochondria in every cell of our body, with the exception of red blood cells, it's a core restorative healing system," Richards says.

One of my recent passions is mitochondrial function, the electronic transport chain specifically, and how to improve and upregulate its function in order to decrease electron leakage, reactive oxygen species (ROS) production and oxidative stresses.

I've delved deep into the molecular biological literature, and it's exceptionally rare to find research that addresses the near-infrared component of mitochondrial function. Yet it's a really important component of mitochondrial health. Richards explains, "Near-infrared [light] activates the mitochondrial healing systems in the cells, but it does a lot more than that too."

## The Benefits of Incandescent Heating

While the incandescent light bulb uses far more energy than LED bulbs, the heating they provide actually has therapeutic benefits. Farmers have long used incandescent light bulbs to incubate animal life and keep livestock warm, for example. Incandescent light bulbs can also be used for incandescent sauna therapy. For this, Richards recommends using a 250-watt, red-filtered incandescent bulb.

> *"All of the wavelengths emitted that the energy-efficient folks call nonefficient and wasteful are the healing wavelengths,"* he says. *"You want the 250-watt in an incandescent sauna therapy because you want a lot of the irradiance. You want a lot of this big portion of the healing wavelengths of near-infrared ...*
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> *When we've gone to LEDs and fluorescents, we've removed the healing component for the sake of energy efficiency, but with very detrimental consequences to our health ... From sauna therapy, we know all the benefits of heating the body.*
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> *It's not just about detox. It's the vasodilation, the blood circulation and the structuring of water. There are so many aspects that are beneficial to us. We remove almost all of those in our attempt to become 100% energy efficient."*

While it can be quite difficult to find incandescent light bulbs these days, and they cost more than LEDs, you can still find the 250-watt specialty bulbs Richards uses in his incandescent sauna therapy.

## Therapeutic Dosing

As mentioned earlier, you can determine whether you're actually getting a therapeutic dose by using an irradiance meter. With far-infrared saunas using near-infrared LEDs, you'll find they provide nowhere near the required irradiance. Above 100 mW per $cm^2$, the energy starts getting excessive, which can be counterproductive. As noted by Richards:

*"Even with light therapy, we don't want an unlimited amount. Just like you can't be in the sun for an unlimited amount, you don't want to be in the sauna for eight hours. With the sauna, you're going to heat shock the body. Raise cell temperature a few degrees and you get all these detox and other cellular responses due to the heat shock.*

*The same thing with the light. You want to get a certain kind of natural level of irradiance. You know, 20, 30 or 40 mW per cm squared for a certain amount of time. That activates the healing systems in the cells in the body, and then let the body do its work.*

*If you look at the literature, the reason it's called low-level light therapy (LLLT) is because it's also referred to as low-level laser therapy. The original light therapy studies were done with lasers, which are high-powered sources, where the irradiance is incredibly high. What was found was that ... it's too much energy for the system. You can damage it.*

*If you see studies where near-infrared wavelengths have been shown to be damaging to the cells, you have to look at the irradiance levels that they use in the studies. You'll see that they're incredibly high. Just like if you get too much near-infrared or too much infrared, you can burn yourself."*

It's really all about getting a natural dosage level of near-infrared wavelengths, but what is that? In the paper, "Infrared and Skin: Friend or Foe,"[3] co-author Michael Hamblin, Ph.D., notes that "solar IR-A average irradiance is around 20 mW/cm$^2$ during the day with a peak irradiance reaching 40 mW/cm$^2$."

Interestingly, the irradiance received in an incandescent near-infrared sauna at 24 inches from the four 250W lamps is about 30 mW/cm$^2$, closely mimicking the near-infrared irradiance we get from sunlight.

Thirty mW/cm$^2$ is equivalent to 1.8 joules per centimeter-squared (J/cm$^2$) per minute, so a 20- to 30-minute near-infrared sauna session delivers around 36 to 54 J, which is right

within the recommended photobiomodulation range discussed in-depth with Hamblin in my article, "Healing the Body With Photobiomodulation."

Essentially, what you're doing with near-infrared-based LLLT is stimulating your mitochondria to release nitric oxide (NO) and boosting adenosine triphosphate (ATP) production. Together, your mitochondria, NO and ATP work in concert to promote healing effects, such as DNA repair and cellular regeneration.

## Incandescent Light Therapy Benefits

Richards started using an incandescent sauna to address his own health problems. He struggled with insomnia, adrenal fatigue, body acne, pessimism, low energy, and overall didn't feel very well.

> *"Through my [online] research, as people do nowadays to get information and take action, I came across this [incandescent light therapy] concept,"* Richards says. *"It dates back to Dr. Kellogg, actually, of the early 20th century. I subsequently learned of and watched Alexander Wunsch's videos, and many others.*
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> *Incandescent light therapy dates back 100 years. A long time ago, they were using it to heal lupus vulgaris and all these other things. Before we had this word 'photobiomodulation,' before we could look at the microscopic level and see the mitochondria, we had an understanding that this light was healing.*
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> *I found an old manual by Dr. Lawrence Wilson, '**Sauna Therapy for Detoxification and Healing**,'[4] which provides instructions on how to build your own incandescent lamp sauna. I built my own and had this amazing healing experience. It completely resolved all of my problems ... It really blew me away. That's what got me into all of this.*
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> *Since then, I've tried other saunas ... It's striking how poorly the far-infrared sauna heats you. You sit in there for 20 minutes and you're just waiting [to start to sweat] ... In an incandescent sauna, it's immediate. You start sweating. You*

*can feel the heat. The heat is very brisk and vital. It's getting in there. But you know what? It feels good, because it's mitochondrial stimulation.*

*It's natural full-spectrum light in the natural shape and form of light as we're designed to get it. It's a feel-good heat and a great sweat. We know now too that it comes with all of these benefits of PBM. There are other kind of synergistic benefits that you can't just attribute to the detox and the mitochondrial stimulation of the light."*

These benefits include structuring the water in your body — a topic discussed in depth in my interview with Gerald Pollack, Ph.D., author of "The Fourth Phase of Water." Pollack calls this structured water exclusion zone or EZ water. Wunsch also discusses how water nutrient delivery is improved when near-infrared light hits the water in and around your cells.

As noted by Richards, the inside of your mitochondria has been shown to consist nearly entirely of structured water. Scientists have also demonstrated that structured water acts as a type of chromophore. Structured water also acts as a vehicle to activate, improve and optimize biological systems. All of this suggests that the human body really needs light in its natural form, as the sun's wavelengths to:

1. Structure water
2. Provide benefits associated with heating
3. Activate biological processes via chromophores

## Considerations When Building Your Own Incandescent Sauna

As mentioned, the instructions Richards used to build his own incandescent sauna can be found in Wilson's book, "**Sauna Therapy for Detoxification and Healing**,"[5] available on Amazon. This type of sauna was used in Kellogg's sanitariums and spas in the early 1900s.

I discuss the history of Kellogg and the early days of light therapy in "How Therapeutic Use of Full-Spectrum Light Can Improve Your Health." Many chiropractic schools used to teach single lamp therapy, but light therapy as a whole was more or less abandoned by the 1970s.

The incandescent sauna Richards built, based on Wilson's instructions, basically consists of four 250-watt incandescent light bulbs in a diamond configuration placed close to the body for targeted, localized relief.

> *"I built mine based on his plans. It was a very bricolage product. He, for example, recommends using PVC plumbing pipe to construct the framework of the sauna and just use painters' cloth from the hardware store and hardware cloth or what farmers call chicken wire for the bulbs. That's what I made. It did work. It worked incredibly well for me, but it does have some serious disadvantages.*
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> *First of all, you want it to be hypoallergenic. You want natural materials, not a bunch of off-gassing plastics. That's a big issue. Secondly, these bulbs are hot, so you need to protect yourself from the bulbs. Just a hardware cloth or some flexible wire is not sufficient.*
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> *You don't want to touch the surface of an incandescent bulb. You can burn yourself. You need professional protection from that. Something that's not negligently designed. Those are some basic product design issues that I've addressed in my saunas.*
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> *But more interestingly, and harder to address, is the electric field and magnetic field mitigation. EMFs stress us out. They're nervous system stressors. We need to address both of them. They're actually addressed in totally different ways. This is a big misnomer that you touched on earlier — these so-called far-infrared saunas that are described as low-EMF.*
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> *When they say they're low-EMF, they're only talking about magnetic fields. They're only talking about one-half of the picture. Both magnetic fields and*

*electric fields are nervous system stressors. We don't want either of them from our electrical device.*

*They interact with our bodies in different ways, certainly, but they also are different in nature. Magnetic fields are hard to mitigate. They're really hard to shield ... You have to just kind of deflect it."*

## The Challenge of EMF Mitigation

Magnetic fields are measured in nanotesla, while electric fields are measured in volts per meter. This requires two different kinds of metering devices, as a device measuring electric fields will tell you nothing about the magnetic field and vice versa. When building (or buying) a sauna, you'll want to measure both, to make sure neither field is present or very high.

Now, some of these meters can be very expensive. Since the important part is the effect these fields have on your body, you can use a body voltage meter instead, which measures the voltage reading of your actual body. (Keep in mind that your body voltage meter must be grounded in order to provide you with an accurate reading.)

*"When you use a proper grounded body voltage meter, and you're measuring body voltage instead of just the voltage around the sauna, you find that when you sit inside a far-infrared sauna with a body voltage meter, you'll get thousands of volts per meter, thousands of millivolts, depending on the meter you're using. Very high,"* Richards says.

*"Our natural body voltage is only a few millivolts or less even. It's almost zero. It fluctuates, but it's never above 10 mV, ever ancestrally. Pre-1888, we never had this [level of electric field exposure] in our life. We never had any of this man-made electric field stress.*

*We have it now 24 hours a day, from dirty electricity, from our computers ... [In] the incandescent saunas that I've been making and dealing with for many years ... we use grounding and shielding principles to ground out, block out and shield*

*out all the electric fields so they don't get to the user, so they don't increase the body voltage.*

*You see that in my sauna. You measure it with a body voltage meter, either measuring radio frequency (RF) or measuring dirty electricity, the low frequency, you'll see that it's almost zero ... There's no sauna on Earth that's ever done that before."*

## How to Use Your Incandescent Sauna

While I believe Richards has built the ultimate zero-EMF near-infrared sauna, it is a significant investment, and may be out of reach for some. If that's the case, you can still benefit from this technology by building your own starter sauna that will provide benefits, but will not protect you from EMFs. The core of the sauna are four **250-watt Philip incandescent bulbs**, which can be purchased for less than $40.

To that, you need a safe light fixture. Wilson's sauna can be built for a few hundred dollars. But you could actually forgo the tent, especially if you're not addressing the electric fields.

The heating you want occurs as a result of the light shining onto your body, so you don't really need a sauna tent. As noted by Richards, "All you really need is the air around you to be above body temperature; above 100 degrees Fahrenheit."

So just about any small enclosed space, like a spare closet, could serve this purpose, but if surrounding materials like paint or finished wood or carpet have petrochemicals in them, undesirable toxic off-gassing can occur. Also, since the heating is directional, remember to rotate your body so that different parts are exposed, unless you're only working on a single area with one lamp.

*"The core of our sauna are these four 250-watt lights on our shielded device, with all the lifetime warranty and the quality that we manufacture. We sell just that as well, because you can use it in a closet. You can use it in a shower.*

*We have a lot of folks who have far-infrared cabinet saunas. They're purchasing just that [four-lamp assembly]. They have buyer remorse and they want to upgrade to near-infrared and to full-spectrum and to be shielded. You can put one of our [near-infrared bulb assemblies] into a far-infrared sauna very affordably and not have to deal with any of the EMF stress at all from the product.*

*You just don't have to turn [the far-infrared sauna on. You just use the four walls and ceiling. The same goes with the shower or other innovative enclosures that people can think of.*

*For folks who are skeptical of the concept, the proof's in the pudding. You can start out with one bulb. You can start out with what's called this targeted therapy, so single lamp incandescent therapy. And just use that for a localized issue.*

*Folks are using it for everything, from headaches to cramps, to skin issues, to neuropathies in the limbs, to just aches and pains from old injuries. That's something that anybody can start out with and get a feel for this concept.*

*For the full body and the real detoxification, you do need to sweat passively. To sweat passively, we need air around us to be of 100 degrees F. Typically, it's nice to have an enclosure to do that for convenience. But depending on the environment, the sauna room could be the size of a football stadium. If it's above 100 degrees, you could just sit in front of your four 250-watt, red-filtered, incandescent lamps."*

## The Importance of Passive Sweating for Detoxification

While there are a number of different ways to get a sweat on, if you're working on detoxifying heavy metals and other pernicious toxins from your body, passive sweating is more effective than active sweating. Active sweating is caused by physical exertion

such as during exercise. Research has shown the toxin concentration in sweat during exercise is actually quite low.

Sweat samples taken during sauna bathing, on the other hand — i.e., during passive sweating — reveal high amounts of toxins are being released in the sweat. The reason for this, Richards explains, has to do with sympathetic versus parasympathetic nervous system activation. Your autonomic nervous system has two states, commonly referred to as "fight or flight" and "rest and digest."

When you're exercising vigorously enough to start sweating, your body is allocating energy toward your muscles, lungs and heart. "There's no cellular reserves or hormonal gearing for detoxification or cellular repair or anything like that," Richards says.

During passive sweating, however, your body is heated, which helps release toxins through the sweat, and since you're not exerting yourself in any way, your body is able to use the energy from the incandescent lights to heal and repair itself. This is also why EMF mitigation is so important, as EMFs will activate your sympathetic nervous system. Again, EMFs are a nervous system stressor, which will hamper your detox efforts.

## More Information

Overall, near-infrared therapy is something that can benefit just about everyone, seeing how most people experience mitochondrial stress and are exposed to toxins on a daily basis.

Like me, Richards is passionate about near-infrared therapy, and believes it's one of the most impactful things you can do for your health. A recommendation to further improve the benefits from the sauna metabolically and for your mitochondria, is to use cold water therapy afterward.

After a sauna session, take a cold shower. But, whether you prefer hot or cold water, you'll definitely want to wash off the sweat and not leave it on your body to dry. Scrubbing all the skin of your body with a natural stiff bristle brush is very effective for getting toxins off the skin, helps exfoliate and feels great. Also, be sure to collect the

sweat with a towel when using the sauna, and remove after, as it will be loaded with toxins.

## Sources and References


- [1] SaunaSpace.com
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- [3] Research Gate, Infrared and Skin: Friend or Foe December 2015
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