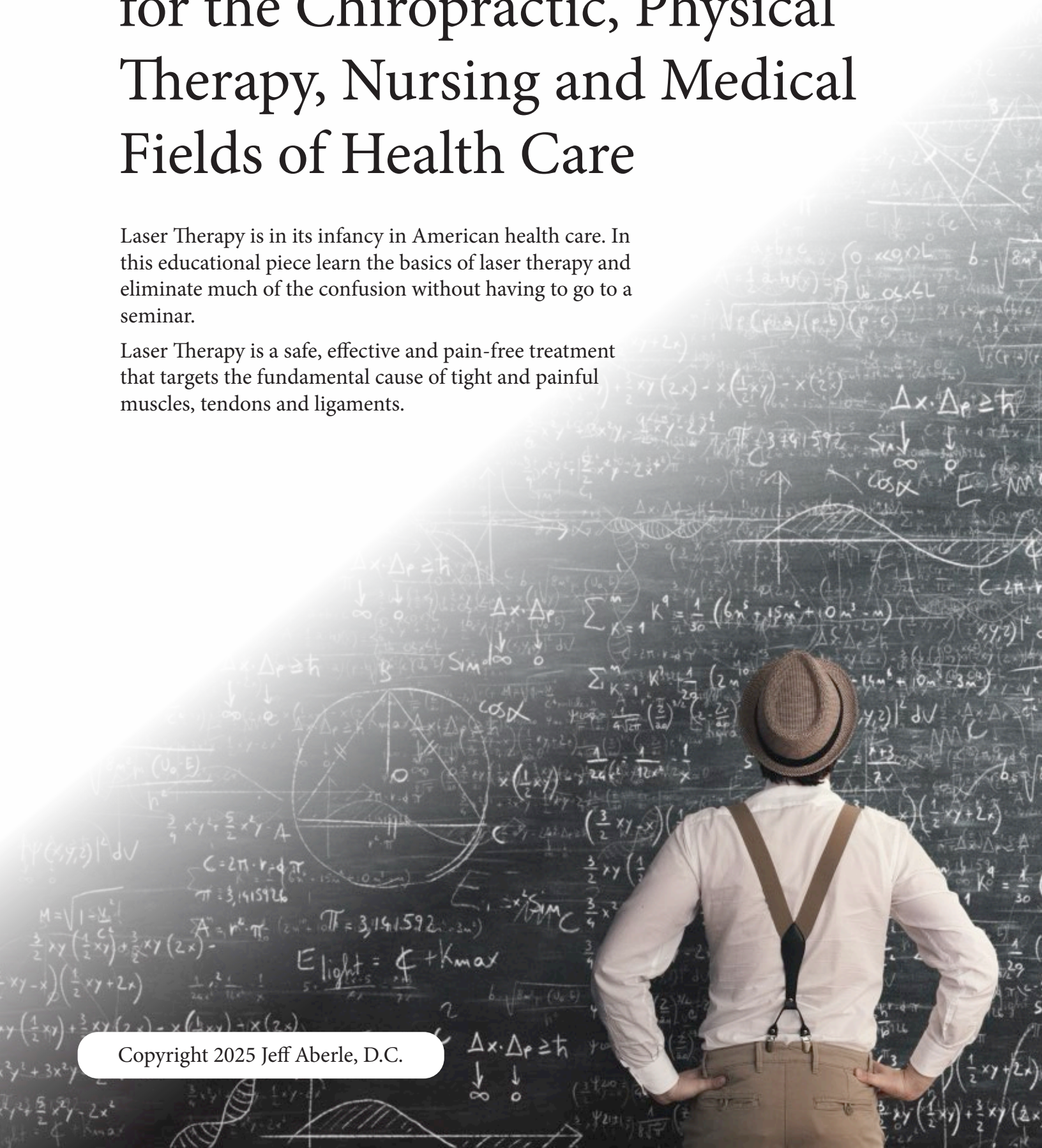
Laser Therapy Made Simple for the Chiropractic, Physical Therapy, Nursing and Medical Fields of Health Care

Laser Therapy is in its infancy in American health care. In this educational piece learn the basics of laser therapy and eliminate much of the confusion without having to go to a seminar.

Laser Therapy is a safe, effective and pain-free treatment that targets the fundamental cause of tight and painful muscles, tendons and ligaments.



What is the value of pain relief?

Pain is a fact of life for many. For individuals suffering with pain it comes with a high cost, placing a healthcare burden not only on themselves, but also the families and communities that support them.

Today we have the ability to provide safe, non-addictive pain treatment alternatives with therapeutic lasers. Laser therapy is a confusing topic which I'm hoping to make more understandable in this document.

Why is Laser Therapy Confusing?

It is not necessary to understand everything about laser therapy. They can simply be point and shoot type devices, but the more you know about them the better your treatments will be for you and your patients.

After reading this you will have a better understanding of laser therapy. It will be easier to understand the parameters of any machine you are interested in buying to see if it is worth the money. I am also going to talk about the latest technology called Super Pulsed lasers. It is a real thing and not marketing hype.

It is important for you to own a laser and know how to use it for your health and wellbeing because you are probably in as much pain as some of your patients and you are probably disappointed in the treatment you have received over the years. Laser therapy is most likely the treatment solution you have been looking for. It certainly was for me. Let's get started.

Tight Muscles are a Chemical Problem

Think of tight muscles in a living person just like Rigor Mortis in a dead one. 'Rigor' means stiffness and 'mortis' means death. When a person dies everything tightens up so much that the person is stuck in the position that they died in. Now of course you are alive, but the reason for the rigor (stiffness) in a dead person and a living person is a lack of Adenosine Triphosphate (ATP) energy production in your muscle cells. Rigor in a dead person is due to lack of circulating blood. Rigor in your muscles is due to a problem in your cells which lasers correct.

Without getting into chemistry, the lasers re-invigorate your muscle cells to make more ATP energy. After the treatment is over you continue to make more ATP energy even after the lasers are removed. It is this increased production of ATP energy that loosens your muscles.

Lasers do not directly loosen up your muscles, but rather indirectly. In fact, people often notice they are even more loose the day after their treatment or even the day after that, all because they have had time to make more ATP energy. The point is lasers work chemically, not by heat.

Lasers directly influence the Krebs cycle energy production pathways. There are many other effects, but muscle relaxation via increased energy production is number one in my opinion as it delivers incredible pain relief and a sense of well being.

Earlier I asked how the therapy you have received over your lifetime helped with your aches and pains? For me it was quite discouraging. As the years went by I continued to get worse and worse. I had been trying to solve my tight muscles with physical solutions when the true problem was chemical. I needed a chemical solution. And this is where lasers come into the story.

I cannot tell you how much they have helped me and my patients. People are happy to pay for the laser care they receive in my office. I believe lasers are part of the next evolution in health care. Just like antibiotics changed the world, lasers will change the world. But there is a problem.

Not all lasers are the same!!!

Just a few days ago I got a call from a woman who moved across town and wanted to get adjusted. I told her I use lasers more often than adjusting and she insisted she wanted to get adjusted. I said sure thing, but said I would laser her as well. She said she had already tried that hinting that it did not work. I said you have not tried this laser yet.

And this is what I'm trying to avoid. I can already see what will happen over the next five years. It happened in chiropractic as well. When I first opened my practice in 1997 I would go to health expos and talk about chiropractic. Most people had not tried chiropractic so they were open to trying it. As the years went by however there was much less interest because it was not new to them and they were more than likely a little disappointed in the results. So I stopped going to health expos because they were a waste of time.

Lasers are new and exciting, but with the systems out there, the results are less than exciting. The machine matters. The parameters matter. What is under the hood matters (to reference a car engine analogy).

Let's start with a laser we are all familiar with. The laser pointer. The laser pointer is well known to you and maybe even your cat. They are constantly on. Meaning they do not flash at all. They are very low power, about 5 milliwatts, and an incidental glance passed your eye does not harm your vision. These lasers are called **Continuous Wave** lasers because they are on constantly and only turn off when you turn them off.

Next, let's go with a **Continuous Wave Pulsed laser (CW).** I'm not exactly crazy about this name, but it is what it is. This type is what you find in 90%+ of the laser systems that are on the market today in the chiropractic and physical therapy industries. The lasers are turned on and off really fast, usually twenty thousand times per second. Impossible with your thumb on a laser pointer, but easy for modern electronics. Some lasers can pulse as fast as one hundred thousand times per second.

Next, let's go with **Super Pulsed lasers (SP).** There are only a few of these available at this point in time. This type of laser system gives very high pulse powers, but realistic average powers similar to other systems on the market. Due to the high pulse powers, greater depth is achieved and therefore greater results if depth is your goal. For chiropractors and physical therapists who are treating deep muscle, ligament, tendon and bone structures, this is a good thing indeed.

How does one tell the difference in these machines?

Well you cannot tell by looking at them. You have to know their specifications which is what I'll be teaching in this manual. Every laser does something, but what something are you trying to achieve? I'm going to be upfront right away by telling you that I'm going to be making the case for Super Pulsed lasers because I've tried five other laser systems and Super Pulse crushed them all for what I was trying to achieve.

Whether you have a therapeutic laser or not, you will find this booklet helpful especially when talking to sales people about their lasers.

If you page ahead you will see I'm going to get into some of the details of what is going on. Just like fast food chains are all fast food, there are vast differences. Just like there are ten chiropractors who practice the exact same technique they are actually quite different. Just like all laser systems use the word laser, these systems can differ greatly. To put it another way, it is what's under the hood that needs to be understood.

Understanding Class 1,2,3,3b & 4

Let's start with this Class 1,2,3,3b and 4 stuff. If you ask people with a therapeutic laser what kind of laser they have some will simply say they have a class 4 laser. Oh, OK, but can you tell me anything more about it? It is a class 4 laser they will say. Yea, but what kind is it? Now they might just say the brand name, but they do not know what is under the hood.

The class thing is simply based on eye safety and has nothing to do with therapeutic value. It is simply a measure of power and light density or concentration. Class 1 and 2 lasers cannot hurt your eyes because they are very, very low average power. Class 3b can hurt your eyes if you stare at it and class 4 can be damaging to your eyes. In addition, class 3b lasers by definition can emit up to 0.5 Watts of power. Class 4 lasers emit over 0.5 Watts of power. This is the straightforward definition. To give an example, a laser that was 0.4 Watts would be a class 3b laser. A laser that was 0.6 Watts would be a class 4 laser. However, a laser that was 1 billion Watts would also be a class 4 laser because it was over 0.5 Watts. The point is that the class laser you are using or looking to buy does not tell you that much.

Where is laser therapy commonly applied?

To the best of my knowledge laser therapy can be applied anywhere except directly to the eyes. They can be used for pain relief, muscle relaxation, burns, broken bones and more. Here are common areas that you and your patients might be complaining about...

Why do Laser Manufacturers use Different Wavelengths?

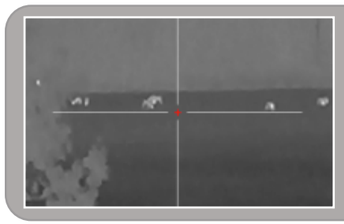
Different wavelengths penetrate tissue differently. We think of light as just the visible spectrum, but even radio waves are still considered light, we just can't see it. The way the different wavelengths of light behave can be used for different purposes.

Color only refers to what we see on the visible part of the spectrum from red to violet. Even though we cannot see above or below these wavelengths with our eyes, there are still things happening there.

If we go further away from violet we get into ultraviolet (black light, suntanning rays). Above that we get into the x-ray wavelengths. On the other side of the spectrum beyond the red, it is called infra-red. Many lasers use infra-red wavelengths. You cannot see the light directly so an additional low power red laser is added to the beam so you can see where you are aiming but the infra-red wavelengths have the unique feature of better penetration into human bodies.

If you keep going passed the infra-red you get into the far infra-red wavelengths. These are the wavelengths of body heat and far infra-red saunas. If you have ever watched a "Searching for Big Foot" TV show you see them using far infra-red cameras to detect living creatures body heat. Body heat can be detected with special cameras over long distances in pitch black conditions as shown below.

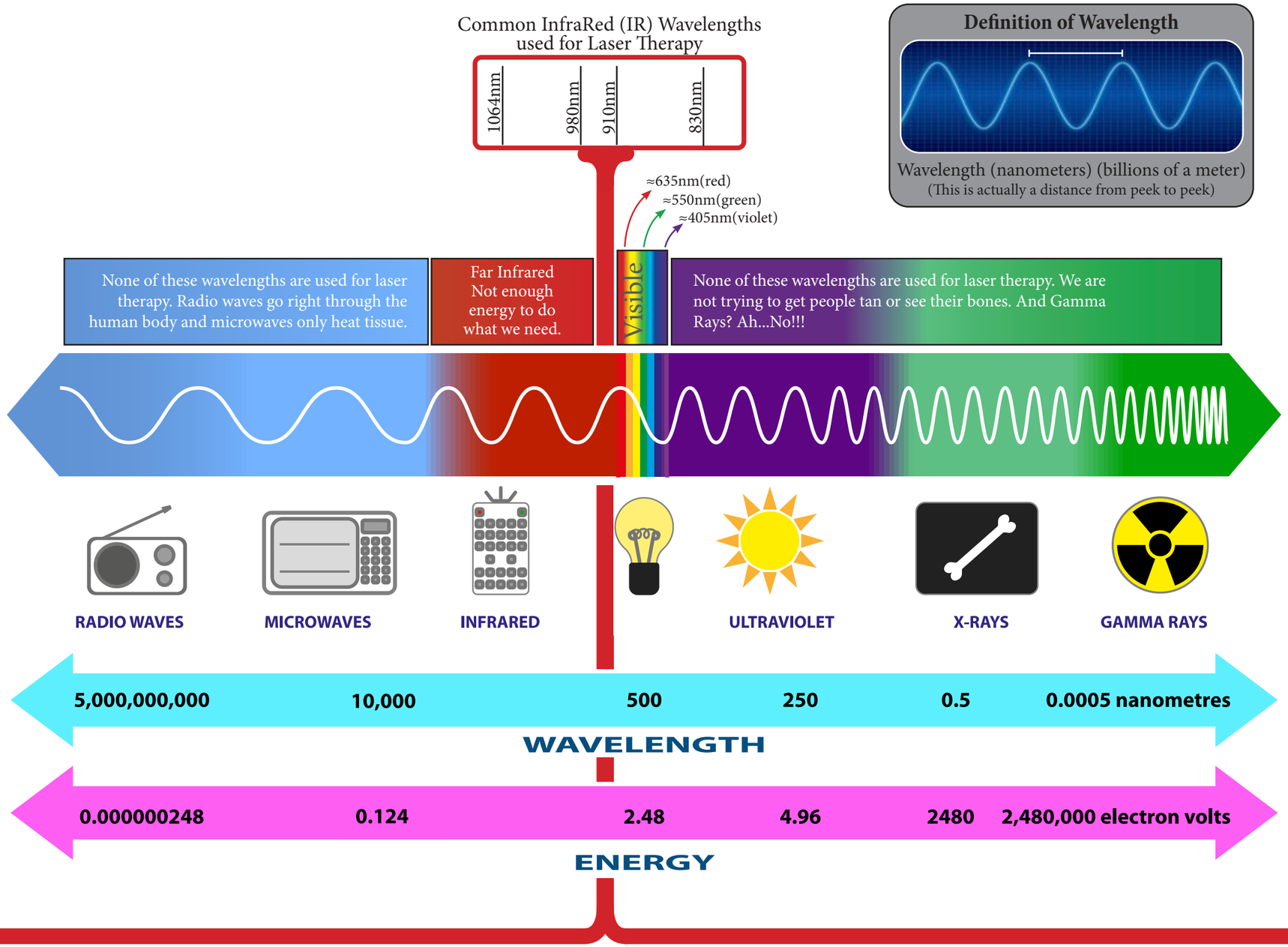
Unfortunately for us far infra-red wavelengths do not have the therapeutic effects that we are looking for. Oh, do I wish they did. Because even though a far infra-red sauna can penetrate really well into a person it simply does not have enough energy per photon to do the chemical reactions that are needed to jump start ATP production in the body. And if far infrared wavelengths healed, we would not need lasers because our own body heat would heal us.



Deer in a corn field seen from over 100 meters at night using a far infrared camera. These cameras only pick up body heat.

The Sweet Spot

We are left with a sweet spot for obtaining depth of treatment in the 800 to 1100 nanometer wavelengths. This is just physics. It cannot be changed no matter what the marketing says. Radio waves pass right through you and so do microwaves, but they won't work for our purpose. Ultraviolet doesn't penetrate so that won't work plus it can damage tissue. X-Rays do create the reactions we're looking for, but also cause damage. Red would be great if it could get the penetration, but it cannot. And green and violet even less so. So 800 to 1100 nanometers it is. With this we get good depth of penetration and enough electron volts per photon to affect our physiology.



How is Power Measured in Laser Therapy?

Power is measured in Joules/Second. What is a Joule? It is simply a measure of energy that you can learn more about if you choose, but it is not necessary. Let's take an example that most of you will be familiar with: The hundred watt light bulb.

Many of us grew up with hundred watt light bulbs. Forget about the LED bulbs we have today. Go back 20 years and reminisce. Do you remember them giving off a good amount of light? How about heat?

A hundred watt light bulb uses 100 Joules of energy every second that it is on. It uses 0 Joules of energy when it is off. That is all you need to know. We can all relate to this easy but accurate explanation.

The formula is this: 1 Watt = 1 Joule/Second or in our light bulb case 100 Watts = 100 Joules/Second

Let's say your hand is on the light switch and you turn the light on for half a second then turn it off for half a second. How much energy in Joules did the light consume? Well it took 100 Joules per second but only for half a second which would be 50 Joules. Then it was off for half a second which did not take any energy at all.

So 50 J + 0 J = 50 J of energy used for the entire second of time. (Shown in Image A)

What about the waveform in Image B? How much energy is consumed here? 25J for the first quarter of a second. 0J for the second quarter of a second. 25J for the third quarter of a second and 0J for the 4th quarter of a second. 25J+0J+25J+0J = 50J. Again we get the same total amount of energy used every second as the prior example. You will also see that for all the other examples the total energy consumed is the same even if the laser is pulsing at 50kHz (50,000 cycles/second). This is the nature of Continuous Wave Pulsed lasers.

All of these waveforms consume 50 Joules of energy per second whether we are talking a hundred watt light bulb, or a hundred watt laser. The take away is that the 100 Watt (or Joules per second) device pulsed on and off equally delivers 50 Joules of energy per second. It is really important to understand the implications of this. In laser jargon, the pulse power would be the 100 Joules value. The average power would be 50 Joules per second or half the pulse power. It is this annoying fact that really puts a limit to the pulse powers that can be used with continuous wave pulsed lasers.

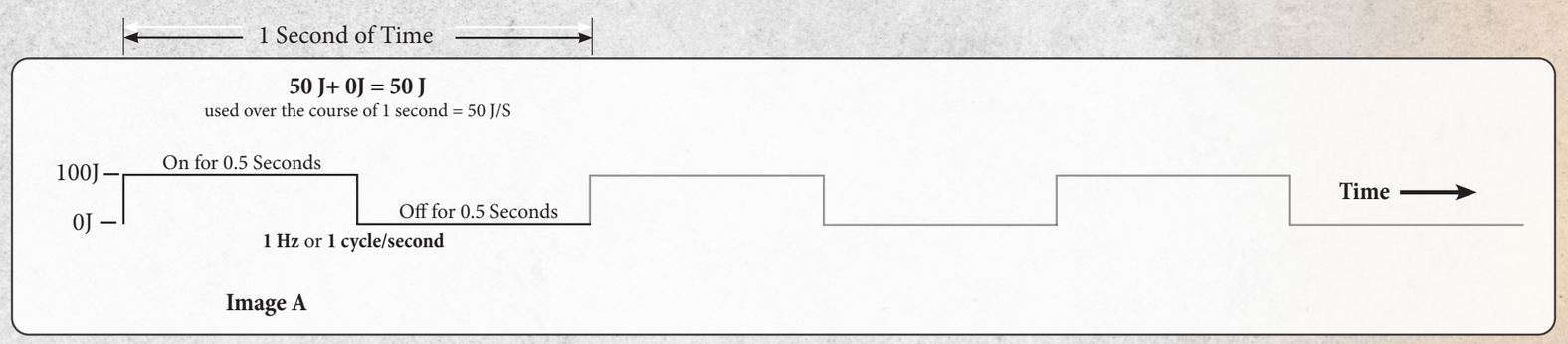


Image A

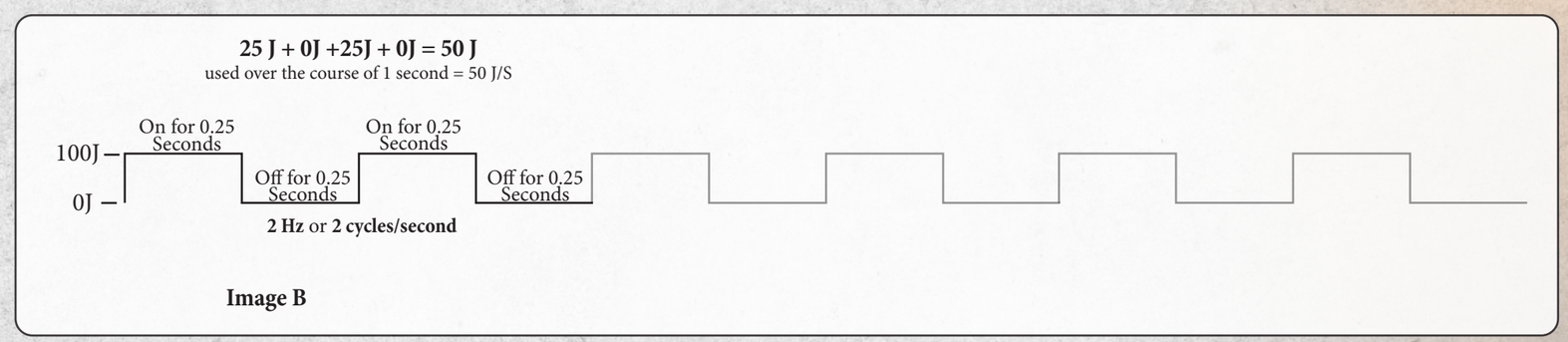


Image B

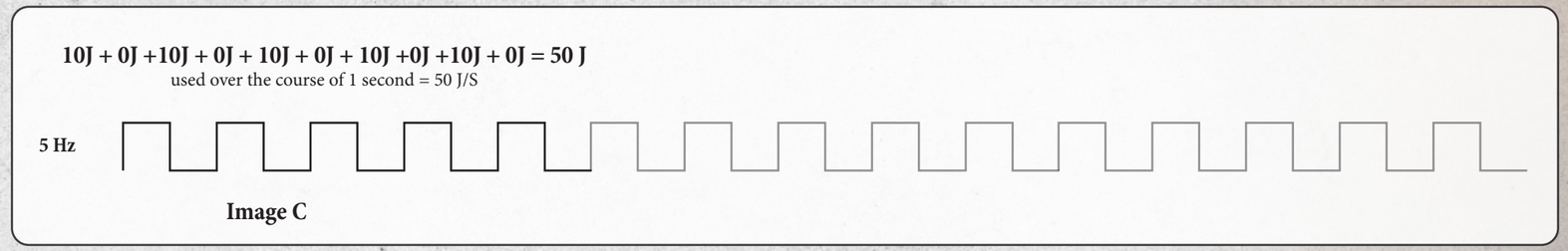


Image C

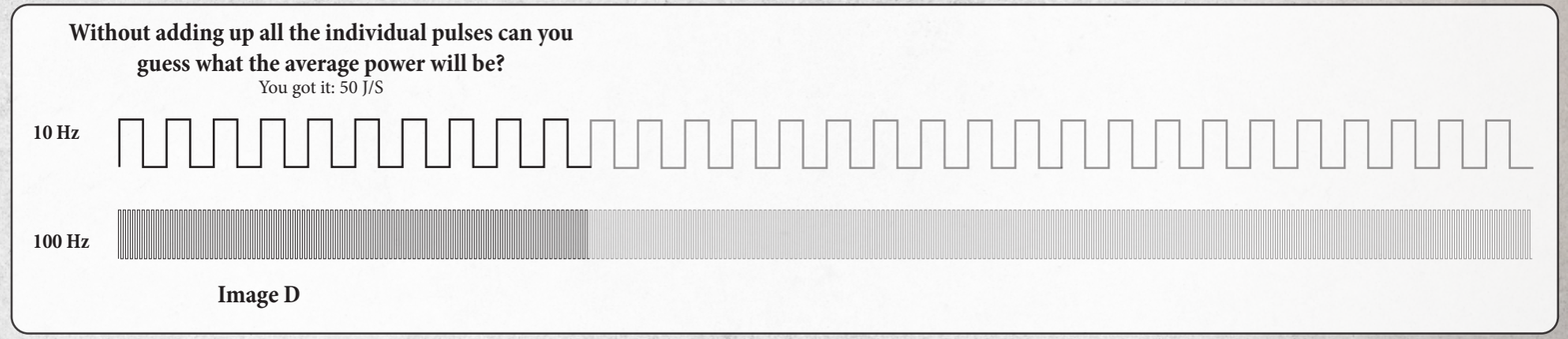


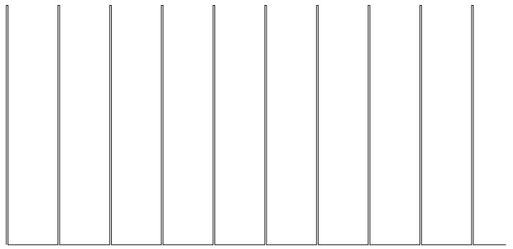
Image D

Why does this matter? Heat!!! It is all about the heat. With laser therapy heat is the enemy. It prevents higher pulse powers in the 15 to 20 watt range per laser. However, a laser can only penetrate as much as its pulse power allows. In this example we used the simple 100 watt light bulb (50 watt average). With lasers being used on humans 50 watts average is too much power because of the heat production on the skin and deeper tissues due to it being CW pulsed.

Super Pulsed lasers get around this problem with a trick of physics which I'll explain shortly. Now that you have seen how CW Pulsed lasers work to some degree, understanding Super Pulsed lasers will be easier to grasp.

Super Pulse Lasers

When I first heard this term I thought it was a marketing ploy, but it is a real thing and will overtake the laser market at some point in time in my opinion. Super pulsed lasers allow much deeper penetration into tissue with much less heat by using a simple trick of physics. Just look at the waveform of a super pulsed (SP) laser and see if you can tell the difference from a CW pulsed laser



What is the difference? Well it is not on and off equally like the CW pulsed laser. Additionally the pulses are much more narrow and taller. Why is this absolutely brilliant? You can use much higher pulse powers without all the heat accumulation on the patient. With CW pulsed lasers the peak powers are limited as I said earlier, but with SP lasers the peak powers can go as high as 132,000 watts. That is crazy you say? What is even crazier is the average output power can be only 9 watts which is very tolerable on a person or animal.

Super pulsed lasers must switch on and off really quickly to achieve pulses this narrow. The pulses are on for only a few billionths of a second and then off for very long relative times. Remember with the CW Pulsed lasers we added up the energy for the first quarter of a second and it was 25 Joules. Well for comparison sakes each pulse of a SP laser is in the micro Joules range or millionths of a Joule. These are completely different technologies other than they use lasers. (Granted I'm not taking into account the frequency here so this is not a perfect comparison.)

Comparison of Super Pulse and Continuous Wave

You can see the waveforms to the right are completely different. The vertical axis is also not to scale. If it was, the tops of the super pulse pulses would reach past your ceiling where you are reading this right now. But you get the point. A person cannot feel these individual pulses. It is not like it is prickly. They are on for such a short time they cannot be felt. When they are added up a person does feel the heat energy from them, but that is experienced as warmth no different then a heating pad.

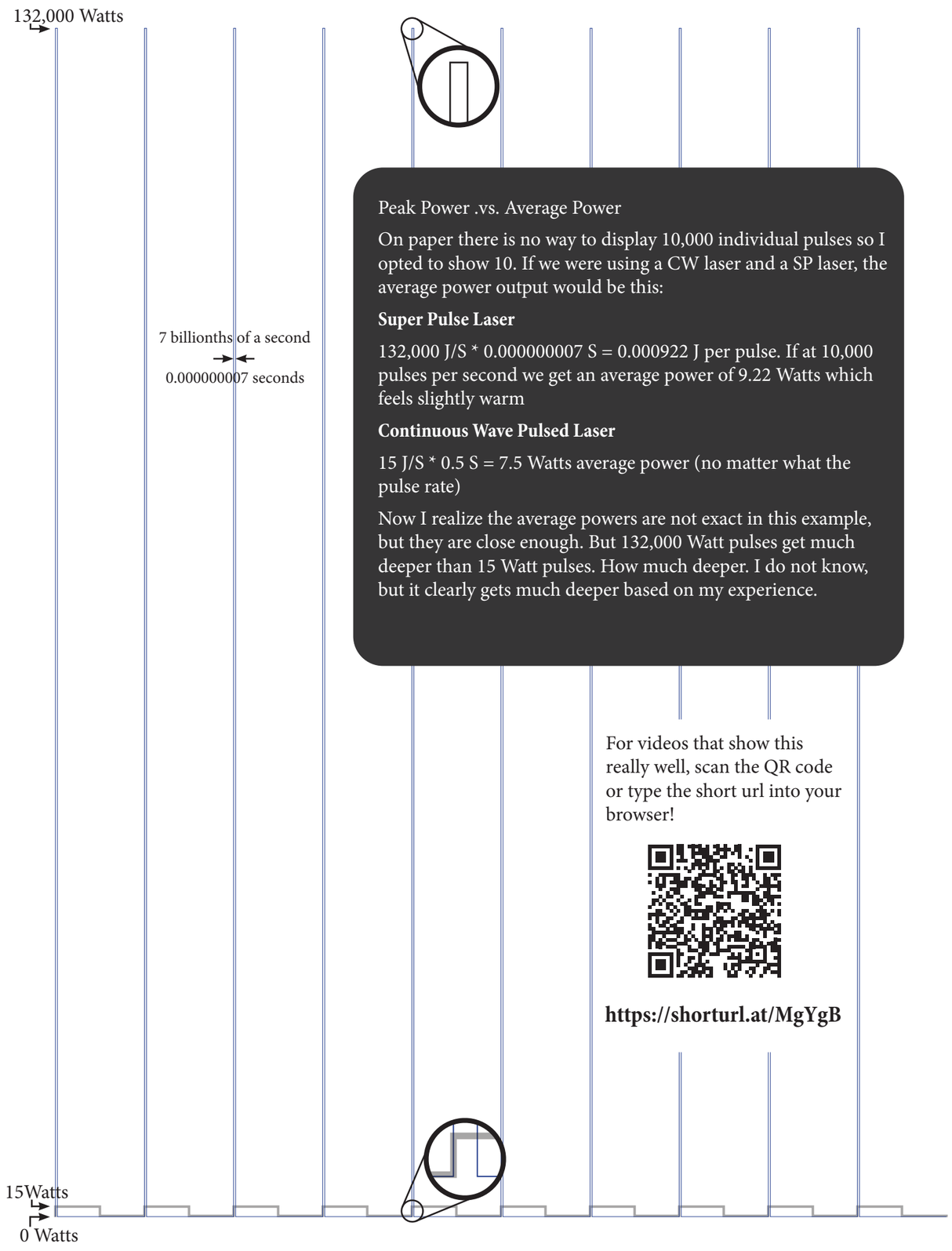
The 7 billionth of a second is also not to scale. I wanted you to see these were on and off pulses so I made them narrow but not too narrow as to not be seen in print.

It is important to understand that most lasers on the market are continuous wave pulsed lasers and that the average power is always half of the pulse power.

To be called super pulse the pulse power needs to be 10x the average power by definition. With the 132,000 watt pulse power and 9.22 Watts average this definitely qualifies as super pulse. Even if it were only 1000 watt pulse power and 20 watts average, this to would qualify. Or 110 watt pulse power with 0.5 watts average. A 15 watt pulse power with 7.5 watt average is not super pulse. So continuous wave pulsed lasers are definitely not super pulse because their pulse powers are only 2x the average power. Now granted some parameters in a CW pulsed laser can be changed to get the average powers much lower, but the point is their pulse powers are by design low. Usually only 15 watts peak power per laser.

I have put together videos that explain this much better than I can in print. The QR code to the right will get you there, but they are better viewed on a larger screen than your phone. Here is a short code that also takes you to the YouTube playlist:

https://shorturl.at/MgYgB



Peak Power .vs. Average Power

On paper there is no way to display 10,000 individual pulses so I opted to show 10. If we were using a CW laser and a SP laser, the average power output would be this:

Super Pulse Laser

132,000 J/S * 0.000000007 S = 0.000922 J per pulse. If at 10,000 pulses per second we get an average power of 9.22 Watts which feels slightly warm

Continuous Wave Pulsed Laser

15 J/S * 0.5 S = 7.5 Watts average power (no matter what the pulse rate)

Now I realize the average powers are not exact in this example, but they are close enough. But 132,000 Watt pulses get much deeper than 15 Watt pulses. How much deeper. I do not know, but it clearly gets much deeper based on my experience.

For videos that show this really well, scan the QR code or type the short url into your browser!

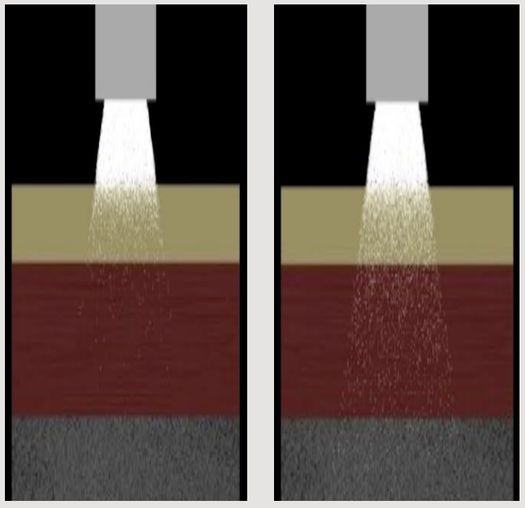
https://shorturl.at/MgYgB

How do Lasers Work?

Lasers work by emitting photons of light. I liken them to particles even though they have wave like and particle like properties. The photons do the work we are trying to accomplish by interacting with the Cytochrome C Oxidase enzymes in our mitochondria. If the photons cannot get past the skin what good are they if we are trying to treat deep muscle tightness and pain. Super pulsed lasers get much deeper. How much you ask? I do not know, but they do get deep enough to affect anything I've ever had to get to. In the image below you can see an illustrative comparison of a CW pulsed laser on the left and a SP laser on the right. High pulse powers on for billionths of a second make this possible. This is the trick of physics I was referring to.

In my opinion all laser therapy systems should eventually go to super pulse. The reason being they simply work better and the public needs to know the potential of lasers and I do not think they are that impressed with the laser systems currently in use.

Illustrative comparison of CW Pulsed lasers on the left to SP laser on the right. Notice the white dots which represent photons of light penetrate much further into tissues with the SP laser.



Continuous Wave Pulsed
15 Watt Peak Power
Low Depth of
Penetration

Super Pulsed
132,000 Watt Peak Power
High Depth of
Penetration

What About Safety?

When I first heard about these high pulse lasers I immediately questioned the safety. How can a laser with such high power be safe? I did a little research, asked a few questions and realized they are really, really safe. In fact, lower power CW lasers can pose more of a safety risk, with untrained use. Being a chiropractor and an electrical engineer helped me realize why. Then I asked the developer and he confirmed what I believed.

All lasers require absolute "fail-safe" mechanisms to meet FDA safety requirements. If a pulse became "stuck" in the ON position and exceeded its designed pulse duration, the laser emission simply cuts off, whether in CW or SP lasers. The real safety of super pulse lasers is the lack of thermal buildup created by the extremely short emissions followed by the relatively long non-thermal "relax" phase.

The super pulsed laser pulse widths of Lumix lasers are maximum 70 billionths of a second long. Compare that to the CW pulse widths of milliseconds, or thousandths of a second long. Shorter bursts are safer. A super pulse laser can ONLY produce high pulse energies for extremely brief periods of time. Exceed those short pulse durations and it simply stops working with no harm to anyone. If the circuitry failed somehow all you might notice is that the gentle warmth of the laser treatment would stop.

Is Laser Therapy Scary to Learn?

Simply put, laser therapy is as scary to learn as teaching your kids how to use a steak knife for the first time. I'm not kidding. When doctors are in my office I put the laser on full power and let them work on themselves. Five to ten minutes later they are comfortable with the process and asking more questions.

Lasers are easy to use, but just like that little bit of trepidation you have when your kid picks up the steak knife for the first time, that is how you will feel when you are holding the laser head for the first time. It is a short lived fear. Then you will get to work on the problem you are trying to fix on yourself. Then a few days later you are asking how you can get one and how much they cost.

Practice on yourself when you first get your laser. Do not practice on your patients right away. Even if it is ten minutes on yourself, learn what it feels like, how fast you have to move around, etc. I remember when I gave my first adjustment. It was a simple thoracic adjustment but I was terrified. Everyone around me was like, "just push!!!" Afterwards I realized it was not such a big deal.

If you are extra nervous start at a low power and work your way up. There is nothing wrong with being conservative with your laser settings.

Do you need to hire someone?

I personally treat patients with the laser in my office and I would like to have another laser room going at the same time. Other clinics prefer to have staff operate the laser. The doctor would tell the staff where treatment is needed and it would be up to the staff to deliver the treatment. Laws most likely vary greatly from state to state on how this is done and if the staff needs training from the state or simply from the doctor.

How do I treat the spine?

In school I learned motion palpation techniques and used that in practice for many years. I know all chiropractors learn motion palpation to some degree or another, but we all know that when vertebra are locked together it is not a good thing.

When I have patients prone I simply feel for the stuck and rigid areas of the spine that in the past I would adjust to try and loosen. Using the Lumix Q I just apply the laser over the spine where it is stuck and the vertebra start to loosen up. It is either tight muscles or tight ligaments that are seizing the vertebra together and the laser loosens both simultaneously. It cannot over loosen them so there is no need to be concerned about that.

This is one way I use the laser in my office. Of course laser therapy can be used on any tight muscle or ligament that you can find. I bet you are thinking of where you would like to try it right now on yourself. Maybe on an ache or pain you have had for a long time and nothing seems to work on resolving it.

Laser Therapy is About to be in High Demand!!!

People are starting to question general medicine and distrust is building. What will people do if they cannot trust the medical industry? Who will they turn to? It will be chiropractors, physical therapists and nurses and medical doctors who take more natural approaches with less drugs and surgery.

Lasers are a huge part of the solution because they address the underlying chemical problems in the muscles, ligaments and tendons that are causing pain. Yes adjusting can give amazing results, but I have found it does little for loosening tight muscles therefore you have to adjust over and over.

Exercises and stretches do not get to the root cause of muscle tightness either. Medications have side effects and do not usually get to the root cause of problems. And as necessary as surgery can be at times, it often does not solve problems either and can easily increase pain and dysfunction.

Lasers on the other hand are very safe and very effective provided you can reach your target tissues.

Lasers are not very well known at this point in time, but now is the time to learn how they work and how to use them.

Introducing the Lumix Q Laser

I know it looks like just another laser, but it is special. You simply have to try it. The controls on the Lumix Q are the easiest I have seen. By changing just the frequency the other parameters are changed automatically so it is very simple to operate.

My most common setting on the Lumix Q is 19kW pulses (19,000W) and 19Watt average power. I find that 19kW pulses get as deep as I usually need plus I get a really nice average power. Perfect for most areas I treat. Plus there are no click fees as I've seen with other laser manufacturers.

What about treating animals?

Super pulse lasers penetrate through hair better than CW Pulsed lasers because the photons pass through the hair much easier. Hair still picks up energy but less so with super pulse lasers. The Q laser would be ideal for treating animals especially with dark fur.

You Have to Feel The Changes For Yourself

Come to my office or I'll come to you if you are within a few hours of my office in Madison Wisconsin and feel the changes for yourself. If you have problems even better. Not that I'll solve your decade old problem in one visit, but you will feel that it does something.

When people come in for their first visit I have to improve them in some way. Pain relief is usually easy to get on their first visit. Not full pain relief, but usually a lot.

I joke with people that I end up chasing pains around which is true. You have already figured out that pain is not just due to a problem where a person hurts, but is coming from other areas as well.

Take for example a person with low back pain. They might be able to push on the exact spot where they hurt, but once they are prone on your table you find all these other spots where they hurt as well. I usually have to treat all these other spots in addition to their "spot" to get complete resolution to their problem. I'll often have to work their glutes, hamstrings and adductors to get the low back pain to completely resolve.

This can all be done with the Lumix Q. Treatment depth is key to solving these deep seated, chronic problems of which you might be suffering.

Seriously....Call Me and learn how you can benefit from Super Pulsed technology not just in your office, but with you personally. Nobody deserves to suffer especially you when it is in your power to do something about it!!!

My office address is:
Aberle Chiropractic Clinic
4710 East Broadway Suite 100
Madison, WI 53716
Cellphone: (608) 219-7723

About Me

I received a Bachelor of Science degree in Electrical and Computer engineering in 1991. I changed careers and became a chiropractor in 1997 to try and solve my pain and that of others. I have additional interests in graphic design, 3d animation and software programming. I have been fascinated with lasers from ten years of age, but never thought they would be useful in treating pain. I first started using laser therapy in 2017 and it changed my understanding of the human body. I've learned many techniques over the years searching for something to solve my problems. I can honestly say that lasers have helped me the most. I'm very grateful for the discovery of super pulse lasers which have changed my life significantly over the last few years. I am now on a mission to share this discovery with others. Hopefully you can feel my passion as you read this document and speak to me in person. I look forward to meeting you.

Jeff Aberle, D.C.