MODULE 2: BASIC LIGHT THERAPY UNDERSTANDING

I. INTRODUCTION.

Now that you have completed Module 1, you have a basic understanding of cellular metabolism and a good foundation upon which to build your understanding of the fundamentals of light therapy.

You will be exposed to the basics principles of light therapy in this module. If you desire to pursue additional studies concerning the therapeutic uses of light, there is plenty of available information. As of this writing, more than 2,500 papers have been written by professionals (doctors, scientists, physical therapists and the like), and more that 150 double-blind studies have been conducted on the therapeutic uses of light.

II. BASIC LIGHT THERAPY UNDERSTANDING

A. Historical Overview.

1903- The idea that light can be used to stimulate vital processes in living tissue is not new. In fact, **Niels Ryberg Finsen**, received the 1903 Nobel Prize for Medicine for his discoveries regarding the use of lightwaves for the treatment of disease. Finsen is considered to be the **father of "photo therapy,"** which is another way of saying light therapy.

1960'-s The use of Low Level Laser Therapy (LLLT) began to be used successfully for the treatment of many different medical conditions, including soft tissue injury, joint rehabilitation, arthritis and associated conditions, and chronic pain. At this time, the majority of research and development in the field of light therapy was done in Eastern Europe. During this same time, light therapy was also being used in the equestrian world of the United States for the treatment of soft tissue and joint injuries/rehabilitation.

1980's- NASA and other institutions release study information regarding cellular repair using both RED and IR Light. Surgeons and clinical trials note that injuries heal an average of 50% faster. Acceptance of the technology continues to grow…….

2001- LIGHTWAVE therapy is conceptualized and engineering begins with a viable and effective product that enters the market in early 2003. LIGHTWAVE professional systems are one of the first light therapy device that uses variable-pulsed visible red and infrared energies alternatively to address aesthetic and therapeutic issues and concerns. With advances and further development LIGHTWAVE therapy will continue to progress into the coming years….

B. How LIGHTWAVE Therapy Stimulates Rejuvenation Of Living Tissue.

There are many scientifically proven and well-documented life processes that are light dependent. For instance:

(a) Photosynthesis (plants)
(b) Production of vitamin D in human skin
(c) Regulation of moods and circadian rhythm in both humans and animals

LIGHTWAVE therapy stimulates the rejuvenation of living tissue through the process of **"photo-bio-stimulation"**, which means **"the stimulation of life with light."** Photo-bio-stimulation is very similar to the process of photosynthesis. As you remember from high school, **photosynthesis** is the process by which plants manufacture chlorophyll. Chlorophyll is the energy, which drives the functions of the plant at the cellular level, allowing the plant to thrive. Chlorophyll is to the plant what Adenosine triphosphate (ATP) is to the human body. Neither chlorophyll nor ATP can be manufactured without the presence of specific-wavelength light.

If you planted something in the best soil, and gave it the highest quality of water and fertilizer but no sunlight, the plant would die. This is because, in the absence of sunlight, the plant cannot make use of the great nutrients at its disposal. Similarly, if you fed your body the best foods, took the highest-grade supplements, drank the purest water available, but didn't have access to specific-wavelength light; your body will not be able to produce ATP. As a result, each of the cellular processes we discussed in module I would grind to a halt, resulting in death at the cellular level.

Realistically, you are not going to be totally deprived of light. However, as you age, your cellular metabolism slows down and your cells get "tired". While increasing the quality of your nutrient intake may help you look and feel somewhat better, this alone will not significantly affect the rate of cellular metabolism. The nutrients you ingest need to be converted to ATP before they can fuel life processes at the cellular level. This is where light therapy can help. To put it simply, **LIGHTWAVE therapy is the process of supplementing your body with light, so that the body can heal itself.**

In the previous module we learned that ATP is the fuel that powers life at the cellular level. LIGHTWAVE therapy stimulates the mitochondria and increases the production of ATP within the treated tissues. In addition to sparking ATP production, LIGHTWAVE therapy also stimulates specific cellular organelles, depending on the condition being addressed. **It is important to note that the (visible red and Infra-red) energies used in a LIGHTWAVE treatment do not heal/rejuvenate the tissues being treated. LIGHTWAVE simply provides the tissues being treated with the energy necessary to spark the production of ATP.** Once ATP is produced, the body will use this energy to carry out repair and rejuvenation. The body will heal itself.

City Analogy, continued…

Returning to the city analogy used in the previous module, if there was an energy shortage within the city and fuel was rationed; all municipal services would slow down, including: garbage collection, bread production, building and repair, waste treatment, logistical functions, etc. Over time, the city environment would become increasingly toxic. Bringing more raw materials (increasing nutrients) into the city would not solve the problem. The power plant (mitochondria) has to produce more energy for the crisis to be solved. Once the power plants production of energy is increased, each of the municipal services will in turn increase production, resulting in a much healthier municipal environment.

C. LIGHTWAVE Therapy: Basic Concepts in Physics.
The LIGHTWAVE system, which you will use to treat your clients, is known as a Low-Level Laser. **Low Level Laser Therapy (LLLT) or LEDt,** the process you will use to treat your clients, is defined as "…laser treatment in which the energy output is low enough so that the temperature of the treated tissue does not rise above 98.6°F (36.5° C) or normal body temperature." In short, this means that **the properties of LIGHT (i.e., photons), not HEAT, are what you are using to treat your client's concerns.**

Each of the therapy pads on the LIGHTWAVE machine has a total of 200 **LEDs**, or **Light Emitting Diodes**. One hundred of these diodes emit **visible red light**, which is light that is visible to the naked eye. The other hundred diodes emit **infrared (IR) energy**, which is electromagnetic energy that is invisible (below the visible spectrum). The LIGHTWAVE machine uses both infrared energy and visible red light in order to provide the most comprehensive photo-bio-stimulation currently possible.

While both Red and Infrared wavelengths affect tissue similarly with similar effects, each wavelength has a more intense effect on tissues of different densities and depth.

Red Light (wavelength 630nm-640nm) penetrates human tissue more superficially. Approximately 80% of the energy is absorbed in the first 2cm and decreases to less than 1% at 8cm. **Red light stimulation** has a greater effect on increasing metabolic (mitochondrial) activity as well as stimulating superficial circulation.

Infrared Energy (wavelength 800nm - 900nm) penetrates deeper into tissue. Approximately 50% penetrates to 8cm and decreases to less than 1% at 20cm (NASA study). **Infrared energy stimulation** is known to heat tissue, and its effects are well documented for therapeutic pain management. For cosmetic applications IR increases cell membrane permeability, thereby facilitating equilibrium of cellular pH and increasing both absorption of nutrients and the elimination of waste byproducts.

Although visible red and infra-red energies can be used individually to conduct photo-bio-stimulation, **using a combination of Red and Infra-red energies is more effective than using either energy alone.**

Tissues are affected differently by varying the pulse rate of energies (both visible red and IR) between 10 Hz - 10,000 Hz.

Slow pulses reduce nerve sensitivity by decreasing the production of Brinikin lucitrin necessary in the transmission of pain signals.

Mid-range pulses stimulate endorphin production.

Intense pulses stimulate mitosis (cellular reproduction) and cellular repair.

By incorporating multiple pulse frequencies into a treatment session, in addition to using both visible red and IR, LIGHTWAVE has been designed to provide optimum photo-bio-stimulation to effect the best possible rejuvenating response.