Light Therapy's Many Uses *written by Dan Kenner, Ph.D., L.Ac.*

In 1905, the 26-year-old Albert Einstein proposed that light could be both a wave and a particle. It's not an exaggeration to say that light is the fundamental "stuff" that composes the Universe. It's more fundamental than the chemical nature of things, which is regarded scientifically as the essence of life. When we use light for treatment, we are operating at a very fundamental level.

Light therapy is often referred to as "Photobiotherapy," or "Photobiomodulation." It is a treatment modality using powerful multi-spectrum LED light emanations that have been researched extensively in recent years and found to be effective for not only arresting progression, but sometimes even reversing symptoms of Alzheimer's disease, Parkinsonism, and other nervous system problems. Photobiotherapy increases ATP (the cellular energy molecule) levels, decreases inflammation, speeds up healing and stimulates nerve function.

New non-chemical approaches to solving problems in health care are seldom welcomed by pharmaceutical-dominated mainstream medicine. But the emergence of light therapy seems to be an exception to this. It's being researched for treatment of a wide variety of afflictions, including many that have no effective treatment, especially central nervous system problems. Case studies with successful outcomes and research into using light therapy for central nervous system disorders like Alzheimer's disease, Multiple Sclerosis, and Parkinsonism in particular have attracted attention.

The Photobiotherapy Light Device utilizes multiple wavelengths of blue (three each), red (three each), and near-Infrared (two each). It does not produce ionizing, or any type of harmful radiation.

- Blue light affects the skin surface and lymph drainage
- Red light penetrates tissue and is absorbed by the blood; penetrates tissue ~ 1 cm ≈ 3/8 inch
- For a given wavelength, the greater the light intensity, the greater the permeation depth of tissue

Output power is a very important factor for permeation depth. While lower-powered devices (typically operating in the range of 500 milliwatts or less) may benefit cells at the superficial level, they fail to penetrate deeper tissue, which is often the root problem of chronic disease.

More power equates to more photon energy being transmitted to the cells, which also reduces the duration and number of treatments.
The benefits of 850nm and 940nm near infrared light include increased ATP production, vasodilation in injured tissues of arteries, lymphatics, and veins, **stimulation of stem**

cells, reduced inflammation, relief of pain, myofascial release, increased delivery of oxygen into the mitochondria, increased production of collagen, and boosting of immunity.

This translates to an ability to stimulate more energy production, **activate stem cells**, and relieve any congestion that might interfere with the dynamic flow of fluids and information throughout the body.

Extensive research has shown that light particles, or photons, have the effects listed below on the pathophysiology of the dysfunctional neurons of Alzheimer's disease and very likely in other dementias.

This summary was published by a noted researcher in the field of photobiomodulation, Michael Hamblin, Ph.D., of Harvard Medical School, in the journal, *Photonics*:

- Increases blood flow by releasing endothelial nitric oxide
- Increases ATP (the cellular energy source) production by injured cells
- Light absorbed by mitochondria results in more ATP production
- Neuroprotective
- Decreases oxidative stress
- Reduces inflammation
- **Attracts and activates stem cells**
- Increases lymphatic drainage
- Increases neurogenesis
- Increases synaptogenesis improving signaling
- Stimulates gamma brain rhythms
- Improves cell membrane electric potential

It is easy to see how the ability of Photobiotherapy to stimulate all of these essential cellular healing mechanisms can help to restore function to diseased or damaged cells. These are the mechanisms of action that have made effective treatment with light possible in the following neurological conditions:

- Degenerative diseases: Alzheimer's disease, Parkinson's disease, and Multiple Sclerosis
- Traumatic events: stroke and traumatic brain injuries
- Psychiatric disorders: depression, anxiety, and PTSD

In the case of Alzheimer's disease, it has been shown that when even low levels of infrared light are applied to a tissue culture of mice neurons with Alzheimer's disease, the classic pathological neurofibrillary tangles of the tau protein and beta-amyloid plaques begin to resolve within hours to days.

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An estimated 5.6 million Americans over the age of 65 have some form of dementia, of which Alzheimer's disease makes up 80% of cases. In 2017, Alzheimer's and related dementia was the third leading cause of death in the U.S., appearing as an underlying cause of death on nearly 262,000 death certificates.

https://gero.usc.edu/2020/08/24/us-dementia-mortality/#:~:text=An%20estimated%205.6%20million%20Americans,on%20nearly%20262%2C000%20death%20certificates.

Near Infrared Light therapy appears to slow dementia progression and enhance cognitive performance; it stimulates neuronal growth and connectivity and increases oxygenated hemoglobin in cortical blood flow and tissue oxygenation. Red light therapy and near infrared light therapy have been used extensively for chronic pain; it has also been found to be helpful for chronic fatigue syndrome, and to decrease risk of seizures in seizure disorders.
Effects of Light Therapy on Various Tissues:

Muscles: Numerous studies have shown that red and near infrared light affect muscle performance, recovery from exercise, and adaptations (i.e., enhanced strength, endurance, muscle growth, fat loss) to exercise.

Brain: red and near infrared light have been shown to benefit brain function. Studies have confirmed improvements in cognitive performance and memory, improved functioning after traumatic brain injury, improved mood, as well as improvements in certain neurological diseases, including Alzheimer's disease. Suggested mechanisms include enhancement of mitochondrial function, reduction of inflammation, and an increased level of Brain-Derived Neurotropic Factor (BDNF).

Nerves (Pain): Some studies have shown that red and near infrared light can dull pain by blocking conduction at nerve fibers. Anti-inflammatory activity, as well as blocking substance P could play a role.

Healing (Bones, Tendons, and Wounds): Numerous studies have shown that red and near infrared light can stimulate and accelerate healing of numerous types of injuries – from tendon/muscle/ligament tears to bone fractures, and skin wounds. This could be due to stimulation of local growth factors involved in cellular repair, as well as an anti-inflammatory effect.

Wound healing is a strong indication for light therapy. In animals, increased connective tissue cell growth by 140-200% and epithelial cell growth by 155-171% was observed. In humans, healing time of soft tissue injuries in soldiers was reduced by 40%, and the healing time of wounds was decreased by 20%.

Source: Whelan M. Effect of NASA Light Emitting Diode Irradiation on Wound Healing, *Journal of Clinical Laser Medicine and Surgery* 2001;19: 305-314.

Hair: Red and near infrared light are also used to stimulate hair regrowth. Numerous studies have shown it to be effective for this purpose. This could be due to local blood vessel dilation and an anti-inflammatory effect.

Skin: Numerous beneficial effects on skin wrinkling and laxity, cellulite accumulation, collagen production and other aspects of skin health have been observed. Anti-aging of the skin is one of the most common uses for red and near infrared light.

Fat: Numerous studies have shown that red and near infrared light can stimulate the release of fatty contents from fat cells, and ultimately lead to body fat loss.

Red and near infrared light benefits cellular function and overall health by means of at least two mechanisms:
1. Stimulating ATP production in the mitochondria through interacting with a photoreceptor called cytochrome c oxidase.
2. Creating a temporary, low-dose metabolic stress (known as hormesis, which is also a primary mechanism of why exercise works) that ultimately builds up the anti-inflammatory, anti-oxidant and cellular defense systems of the cell
Source: *The Ultimate Guide to Red and Near-Infrared Light Therapy*, by Ari Whitten

Light Therapy and COVID
The latest news on light therapy is its potential for treating COVID and resolving post-COVID or long COVID symptoms. An international team of researchers claims that "Light-based technologies have a demonstrable broad range of activity over standard chemotherapeutic antimicrobials and conventional disinfectants, negligible emergence of resistance, and the capability to modulate the host immune response."

Photobiomodulation is more effective on hypoxic cells, suggesting it could be effective for COVID-19 infection, which seems to be characterized by severe hypoxia, just like brain cells in Alzheimer's disease. Increasing oxygen supply could also make photobiomodulation a potential treatment for post-COVID "brain fog."

Another research team noted: "In recent years, photobiomodulation (PBM) has shown promising results in reducing acute pulmonary inflammation. Considering the high potential impact of PBM on immune responses, we hypothesized that using PBM could be an effective treatment modality for ARDS (acute respiratory distress syndrome) management in COVID-19 patients."