Medical near infrared light working mechanism for the medical professional

Near-Infrared (NIR) polychromatic spectrum has been well studied since 1960s and has been documented through thousands of fundamental research studies to analyze the effects of NIR on tissue repair, rejuvenation and pain relief mechanisms as described in a summary below. NIR photobiomodulation therapy is a non-invasive and highly effective adjunct therapy in the field of prevention as well as in healing of the pressure related, bed sores and diabetic foot ulcers.

NIR polychromatic light is emitted by a plasma arc light source for its high energy intensity and effectiveness at a distance. The exposure area is as wide as a sq. foot in order to prevent any pressure sores in the neighbouring areas.

NIR photons easily travel through gauze and moisturizing jell along with clothing, bed sheets and linens before reaching to the patients skin. Effective photobiomodulation wavelengths are employed for the maximum penetration depth to be effective on the fibroblasts in the soft tissue and osteoblasts in the bones.

Non thermal, polychromatic near infrared light photons of non-pulsed, non collimated, non ionising type photonic energy incident on the epidermis, penetrate through the tissue, refracted many times and absorbed by the cell structure to produce the following effects in sequence;

- Dilation of partially obstructed blood flow vessels to transport higher volume of oxygen and nutrients for the initial therapy to begin.
- Cytochrome-C oxidase (COX) is a large trans membrane protein of the inner mitochondrial membrane. Irradiation of COX increases the activity of the mitochondrial respiratory chain producing more adenosine triphosphate (ATP). In addition, COX is auto-inducible and its gene expression is activity dependent, such that NIR irradiation may increase the amount of available COX over time.
- Higher ATP amount triggers viable proliferation of fibroblast cells for increased collagen fibers, elastin and fibrin.
- Antibacterial effects by induction of reactive oxygen species (ROS).
- ROS are involved in cell signalling, enzyme activation, nucleic acid synthesis, protein synthesis, and the activation of transcription factor.
- Anti-inflammatory effects of NIR therapy can be explained by inhibition of prostaglandin, interleukin, and cytokine in cell models.
- Increased platelet activity for faster wound closing
- Adhesive protein delivery to the inflammation site
- Quicker re-epithelization for covering the open wounds, scar formation
- NIR released NO (nitric oxide)induces endothelial cell migration by activating growth factors and improved perfusion.
- Homeostasis followed by ANGIOGENESIS
- NIR light spectrum also increase the diameter and blood flow velocity of the peripheral arterioles and will enhance the microcirculation.
- Increased speed of mitosis, facilitating cell multiplication to aid in new vessel formation.
- Viable proliferation of fibroblast cells-stimulation of cell division and cell growth of fibroblasts plays an important role in wound healing.
- Polychromatic wavelengths of NIR irradiation have been tested on cellular migration, viability, and proliferation in diabetic wounded and unwounded human skin fibroblast cells.

The main work of the mechanism uses leukocyte proliferation, neovascularization, fibroblastic proliferation and rapid epithelization. All these mechanisms produce rapid closure of wounds and stronger scar formation. NIR also reduce the pain around lesions along with reduced inflammation for the patient comfort.