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Microcurrent Sculpting

Cosmetic Microcurrent
What is Microcurrent?

The Body
Microcurrent is naturally generated in the body to produce the energy required for muscle movement and nerve impulses. It is the body's own electrical system that provides the voltage for ionic exchanges across the cell membranes allowing for cell functions including the intake of nutrients from the blood, removal of cellular waste and movement of impulses along nerve pathways.1 The harmonious flow of these tiny electrical signals is also essential for healthy cell function and cell-to-cell communication. In the event of injury or disease there is signal disruption that obstructs the pathways of intercellular communication.
Cells are analogous to miniature batteries and electrical generators.2 They conduct electricity, create electrical fields, and are powered by a very low level of electrical voltage known as microcurrents. A unique bi-polar membrane surrounds each cell and serves as medium that separates intracellular and extracellular fluids. Imbedded in this membrane are channels that allow for communications in and out of the cell. The opening and closing of these channels are carefully regulated in order to influence cell function under normal and pathological conditions.3 Single molecules or complexes of molecules within the channels allow for the passage of positively and negatively charged atoms (ions) such as sodium, potassium, chloride and calcium. The voltage difference in electrical potential across cell membranes is called membrane potential (Cooper, Hausman, Ch 13). Membrane potential arises from the interaction of ion channels and ion pumps that are embedded in the membrane, which maintain different ion concentrations on the intracellular and extracellular sides of a cell membrane.

Discovery of ionic channels
Earlier scientific studies confirmed the existence of ion channels in biological cells. There were numerous difficulties, however, in being able to define the specific types of channels. Ionic channels are very minute and arduous to measure. These difficulties were resolved through the development of an extracellular patch clamp method 4 invented by German Nobel prizewinners, Erwin Neher and Bert Sakmann. By inserting an electrode pipette through the cell membrane, they were now able to closely study and measure the flow of ions including identifying the single channel currents in the cell membranes. This enabled them to confirm and study the regulation of ion channels that influences the life of the cell and its functions (Physiology of Medicine). Furthermore, Neher and Sakmann were able to record how a single channel molecule alters its shape to control the flow of current in and out of the cell, all within a few millionths of a

second (Physiology of Medicine). Ionic channels play an important role in the generation of action potential in cells. Their revolutionary discoveries sanctioned further studies towards understanding the effect of defective ion channel regulation in the presence of disease as well as toxic substances.

Mitochondria

Mitochondria are essential to the growth and function of all cells and accomplish a multitude of metabolic tasks. Our body has 250 different cells containing specific genes tailored to meet the requirements of each cell.5 There can be as many as 500 to 2000 mitochondria scattered throughout the cytoplasm of a cell. The amount is specific to the location of the cell in the body. Mitochondria are the sites for aerobic respiration and energy production and contain their own DNA. They act as storage units for energy converted from food nutrients. Chemical energy is stored as sugars, amino and fatty acids and is used for conversion into ATP (Adenosine Triphosphate).6 Energy is manufactured in the form of ATP through the collaborative actions of proteins located in and on the inner mitochondrion membrane that is called the electron transport chain (Naviaux, p. 3). Electrons are passed down this transport chain releasing energy at each step of the conversion process (Krebs Cycle). This complex electrochemical process is known as ATP synthesis. New research reveals that the role of the mitochondria in health and disease is far reaching. Once defined as an energy factory, mitochondria also have specialized duties that adapt to each phase of life from embryo to old age. They are closely involved with most of the major metabolic pathways used by the cell to build, break down, and recycle of its molecular building blocks (Naviaux, p. 3). Moreover it is also these progressive metabolic changes that become significant when assessing the actual biological age of cells and the state of their health. This information cascades into evaluating the probability of optimum response when performing esthetic treatments. The study of the cell indeed is complex but also cultivating for continual exploration in disease and optimum health. As members of the health care and beauty industry, grasping the core foundation of the physiology of cells and body systems creates new paradigms in the understanding of our technologies and how they impact our ability to perform critical thinking when selecting treatment modalities including cosmeceuticals.

Microcurrent in Esthetics

Innovative applications for microcurrent technology encompass the beauty industry for face and body sculpting. There are significant benefits when applying these external energy sources. The application of microcurrent also supports skin correction by encouraging the repair process. Damaged skin requires a program of restoration that is gradual and progressive for long-term optimum health. Microcurrent mitigates the practice of aggressive peels and thermolysis (laser) as newer research has revealed that these modalities may be adding more injury to compromised skin. Clearly all modalities of correction certainly have their place.

Prior to choosing a course of treatment including product selection,
the first step in skin correction is to determine the level of damage caused by sun damage, the ageing process, and other skin conditions. Microcurrent gently encourages repair of the stratum corneum, the bi-layers and dermal components to foster the skin into a healthier state. Cosmetic microcurrent is beneficial for improvement in the appearance of the skin.

- ✔ Aged and slackened skin.
- ✔ Improvement of skin texture.
- ✔ Fine lines and wrinkles.
- ✔ Reduction of acne scars.
- ✔ Use pre and post surgery to improve the both muscle and tissue for optimum outcome.
- ✔ Post surgically the application of microcurrent supports reduction of trauma, irritation, inflammation and helps foster skin healing as well as minimizing scar tissue.
- ✔ Muscle tightening in the abdominal area.

The effects of microcurrent are accumulative and studies have confirmed that there are significant side benefits including muscle re-education. Be aware that the results are also dependent upon lifestyle, age, health, and condition of the skin tissue. The concept that ATP can be stored is a valid reason for performing a series of sessions whereby there is a re-education process of muscle tissue. Furthermore, the low intensity of microcurrent cannot cause visible muscle contractions or marked discomfort.

The Technology – Microccurent

The use of microccurent in medicine and cosmetic improvement has been studied for more than 30 years. Stimulation with microcurrents is also called bio stimulation or bioelectric therapy because it encourages cell physiology and growth. Essentially, microcurrent is a low level of electrical current that mirrors the natural current flow of the body. It serves as a non-invasive augmentation of the body's natural electrophysiology through frequency, polarity balancing, and homeostasis. The effects of microcurrent (electroporation) in clinical medicine has demonstrated acceleration of healing bone tissue, wound healing, muscle rehabilitation, TMJ, tendon repairs, lymphedema, diabetes, and collagen remodeling.7.

In summary microcurrent

- ✔ Promotes cell metabolism and tissue repair
- ✔ Supports circulation – blood and lymph
- ✔ Reduces inflammation
- ✔ Diminishes lymphedema in cancer patients
- ✔ Helps increase mitochondria activity through increasing ATP
- ✔ Increase natural production of collagen and elastin
- ✔ Support scar repair by dispersing scar tissue and collagen remodeling

✔ Increase protein synthesis, gluconeogenesis (GNG) and membrane transport.
✔ Reeducate and rejuvenate muscle tissue
✔ Supports healing of bone8
✔ Heals skin ulcerations9,10
✔ Used in equine medicine

The Research

Reports in the research involving the application of electrical stimulus on wounded tissue have been documented since the 1830's when Carlos Matteucci confirmed that electrical current was generated in injured tissue. During the past 30 years and with the invention of sophisticated instrumentation, scientists are able to explore and measure the effects of low level of electrical stimulation and the positive effects on tissue. The principles of microcurrent in both healing and beauty therapy applications share a commonality and consensus regarding its effects on improving the function and appearance of tissue. In wounded skin there is a specific biological pathway for repair. Referred to as current of injury,living tissue has a direct current surface electro-potential to regulate this healing process.11 Moreover intervention is critical in order to prevent further deterioration.

It is reasonable to believe that this concept holds true for ageing and damaged skin including injury to the acid mantle,stratum corneum and epidermis. There is an interruption in the biological movement of electricity that controls cell behavior for normal skin function (Wounds, UK, p 1). The ability for the skin to repair and maintain water balance, the process of epidermal differentiation, collagen synthesis, and maintaining an overall healthy appearance becomes increasingly challenged. More so this is apparent in xerosis skin (abnormal dryness). It has been confirmed that the application of low levels of microcurrent directly effects circulation (capillary density and perfusion), increased ATP, and improved fibroblast activity for collagen synthesis.

Study review

In a study with important implication for electrotherapy using microcurrent, Ngok Cheng (1982) verified the effects of electric current of changeable intensity on variables crucial to the healing process. At 500μA (microamps) the production of ATP (cell energy) increased by approximately 500%, while amino acid transport increased by 30-40% over control levels using 30 to 40 percent above the control levels using 100 to 500 μA . When microamps were increased to the milliampere range, ATP generation was depleted, amino acid uptake was reduced by 20-73 percent and protein synthesis was inhibited by as much as 50 percent. Conclusively it was suggested that the higher milliamp currents inhibit healing whereas the lower currents promote healing.12 Robert O. Becker, M.D. author of "The Body Electric", performed pioneering research with his study of the field of

regeneration and its relationship to electrical currents in living things. He made reference to comparing microcurrent to acupuncture reflecting on the system of meridians that connect all parts of the body. Furthermore, he recognized the action of electrical currents, via the perineural cells and circulatory system.13 Robert Beck for treating AIDS, HIV and Hepatitis, Epstein-Barr and Herpes B.14,15 William Stanish, M.D., physician for the 1984 Canadian Olympic team, implanted electrodes delivering 10-20 μA of electrical current expedited the recovery of ruptured ligaments and tendons. The normal 18-month recovery period was reduced to six months.16 A 1959 study performed by L.E. Wolcott and his team applied microcurrent to various wounds using a range of 200-800 μA to the areas. The treated group showed a 200%-350% faster healing rates, with stronger tensile strength of scar tissue and antibacterial effects.17
A 2003 study performed by Emil Y. Chi, PhD at the University of Washington noted that microcurrent technology works in harmony with the body. Application of microcurrent produced a 45% increase in the number of elastin fibers in the dermis with doubling the length of the fibers. Collagen thickness in connective tissue increased by 10% and an increase in angiogenesis by 35%. The skin showed firmness and tightening.

In Summary

The future for the use of microcurrent relies on education and understanding of the cells and body systems and the benefits that are available from this innovative technology. The intended use for microcurrent in esthetics is to present a powerful and effective tool to aid in inspiring a healthy skin transition from youth to maturity.

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