Physiological Basis of Microcurrent Therapy

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Microcurrent Therapy is low-volt pulsed microamperage stimulation. It is based on the hypothesis that microamperage currents more closely approximate the naturally occurring bioelectric currents in the body and therefore more effectively augment the body's tissue healing and repair. Studies also indicate human tissue appears to heal more rapidly with microcurrent application.

Bioelectric currents in the body are generally found to be in the microamp range. Changes in the bioelectric voltage potentials across muscle cell membranes allow for more efficient membrane transport and metabolic processes. The cell's increased permeability to sodium ions is followed by an increased permeability to potassium ions. Energy is needed for these activities to occur within the muscle fiber. When a local stimulus is applied to the nearby surrounding membrane, changes occur in the ionic conductance of the membrane, which tend to restore the resting potential even if the stimulus persists.

Three variables critical to the healing process are ATP (adenosine triphosphate), protein synthesis, and membrane transport.

ATP (adenosine triphosphate) concentration serves a direct vital function in the "active transport" mechanism known as the Sodium Pump. The Sodium Pump is directly responsible for the trans-membrane movement of sodium, potassium, calcium, metabolic waste and metabolites. Active Transport means that this system requires large amounts of energy to move vital ions in and out of the cell. If this energy is unavailable, metabolic waste builds up in toxic concentrations.

An injury or trauma to a muscle decreases ATP and causes spasm which results in decreased oxygen and nutrients to the cells. It also disrupts the sodium pump which results in the accumulation of metabolic by-products. All of these events are perceived by an individual as pain. Damaged tissue cells produce an electrical current through the loss of intracellular ions and the disruption of the sodium pump mechanism. The current then changes the normal electrical potential patterns. The uninjured cells attempt to restore normal function to the damaged tissues by restoring the normal electrical potential.

Re-establishment of the sodium pump, either naturally or by microcurrent stimulation, occurs when the increase in intracellular current creates increased mitochondrial function, which enhances the cell's concentration of ATP. When ATP is replenished in injured tissues, the membrane active transport is increased, allowing the flow of nutrients into the cells and the flow of waste materials from the cells. With this process, healthy tissue emerges.

Microcurrent stimulation also increases the ability of the cell to synthesize protein. ATP provides the fuel for the transmigration of metabolite and metabolic waste across the cell membranes as well as the re-establishment of the cellular bioelectronic ionic concentration gradient. What this means is that cell membrane potential is re-established, levels of intracellular metabolic waste (i.e. lactic acid) are reduced and fresh concentrations of usable cellular metabolites are introduced into the exhausted cell. At this point the cell can enter its regenerative phase and pain levels are noticeably reduced.

The electric message is carried along the nerves as a result of changes in the quantities of potassium and sodium salts inside and outside the cell. Outside the cell is an abundance of sodium salt and little potassium, inside is an abundance of potassium and little sodium. The effect is like that of a wet battery where different solutions separated by a semi-permeable membrane give rise to an electric current.

Each cell can be viewed as possessing its own immediate electro-magnetic environment that combines with the fields of similar adjacent cells, thereby creating the electro-magnetic field of a particular system within the human body. The cell in the living organism is like a small electric battery with the mitochondria as the powerhouse. All functions of the human body are electro-chemical in their operations

The mitochondria provide the fuel for the transmigration of metabolite and metabolic waste across the cell membranes. The increased activity of the mitochondria enhances the production of ATP in the cytoplasm and the establishment of the cellular bioelectronic ionic concentration gradient. So the cell membrane potential is re-established and pain levels are noticeably reduced. At this point the cell can enter its regenerative phase.

Nerve fibers normally operate electrically; using the flow of positively charged ions through water in the same way that electronic circuits use the flow of negatively charged electrons through metal conductors. This means that externally applied electrical currents can influence neurons.

Regeneration is a series of endothermic and electrochemical reactions. This means that minute amounts of electricity are needed by the cells to provide energy to fuel the regenerative process. The body normally contains more than enough energy to produce this desired effect.

After the body receives bioelectric therapy, there is electronic input into various points regulating the functioning of cells and neuro-muscular systems of the body. Glycogen utilization of the muscle tissue increases and the amino acid content of the brain tissue also increases. At the same time, activities of some enzymes in the tissue become stronger. These changes indicate that treatment can promote the metabolic process of tissues in their movement to help invigorate the body's power of resistance, thereby promoting the recovery of damaged tissues.

One of the reasons microcurrent treatment is becoming more widely used is the patient comfort factor. With microcurrent, tissue resistance is overcome utilizing a much lower voltage than other types of electrotherapy. With such low voltages, the patient feels no discomfort, and, in fact, often feels no sensation at all from the treatment.

Bioelectric stimulation produces electrochemical changes in the body that set the stage for healing. With recharged cellular batteries, the body can take over and perform the healing of which it is capable.

