Dynamic Chiropractic

SOFT TISSUE / TRIGGER POINTS

A Review of the Biophysics of the Microcurrent Generation of ATP

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The clinical application of direct microcurrent (50 to 500 microamperes (uamp) is becoming increasingly popular with the publication of peer review articles on this subject in the scientific literature. Therapeutic application of this modality has enjoyed popularity primarily in the treatment of injuries to soft tissue, as is the case with injuries of athletic origin.

This will serve as a review of the mechanism of adenosine triphosphate production relative to direct current application.

An artificial proton gradient is formed across the functional membrane, created by acid/base transition, and results in ATP synthesis. This supports the chemiosmotic Theory of Mitchell.

During electrostimulation, electrons react with the water molecules at the cathode to produce -OH ions, while protons (H+) are formed at the anode. Accordingly, at the anode/cathode interface, a proton gradient and a potential gradient across the tissue and the medium (cytosol) is created. The net pH of the system remains undisturbed because the rate of proton formation at the anode is equaled by the rate of proton consumption at the cathode.

As the migrating protons reach the mitochondrial membrane, bound H+-ATPase, ATP will be formed. The migrated proton (H+) will activate the adenosine triphosphatase, which is necessary to achieve ATP synthesis.

Substrate oxidation, which is accompanied by proton migration across the membranes, may be equally stimulated by the electrically induced proton current, which function in a feedback manner.

To summarize, direct current tissue electrostimulation results in the creation of protons at the anode and a proton gradient is formed across the tissue and in the cytosol. The protons which migrate to the mitochondria activate adenosine triphosphatase, the enzyme which catalyzes the formation of ATP.

Amino acids are transported by the electrical gradients across the mitochondrial membrane and are then available for use in the synthesis of protein. Since protein synthesis is an endothermic process, energy derived from the created ATP is used to supply the energy needed for the endothermic synthesis of these proteins.

Figure Caption:

ATP product = mitochondrial proton (H+) migration > chemiosmotic Theory of Mitchell

Amino acid transport = modification in the electrical gradients across the membranes

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