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"Nano-mechanism HFGW delivery systems for dermatological applications"

By

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ABSTRACT

The objective of this paper is to present a theory for the influence of high-frequency gravitational waves or HFGWs and electromagnetic waves, delivered by nano-mechanisms, on muscle cells and myofibroblasts. The method for developing the theory involves nano-mechanisms, consisting of miniaturized film bulk acoustic resonators or FBARs, excited by miniaturized Magnetrons operating at 2.45 to over 24.5 GHz that are hypothesized to generate HFGWs having a frequency of 4.9 to over 49 GHz. The HFGWs have been predicted by Landau and Lifshitz to modify a gravitational field locally and, along with the electromagnetic Magnetron radiation, will affect the specific cells near the surface of the skin. These cells, skin or muscle cells, having polarity or electrical potential may be more susceptible to gravitational waves. The primary cell that may be involved is the myofibroblast. This is a less differentiated cell that contains features of muscle cells and skin fibroblasts. The electrical potential of a cell is across its outer cell membrane and is stored from sodium inside the cell and chloride outside, creating a positive inner cell and negative outer cell. Such cells may exhibit an aspherical form, possibly representing a quadrupole mass distribution. In particular no one has carefully analyzed the relaxation period or relaxation tension of muscle or, more importantly for dermatologists, the skin and a preliminary novel theory concerning this relaxation tension is presented. In addition, the actin-myosin complex of muscle cells and myofibroblasts may be a target of the HFGWs because of the nanostructural motion created in the cellular movement. In addition, there has been preliminary work on low-voltage micro-current delivery to the skin, termed an Electrolift device or apparatus, and the underneath aponeurotic muscle plane by the authors that demonstrates contraction and tightening of the skin and muscle planes. A novel theoretical framework concerning these relaxation phenomena, which is validated by photographs taken during clinical trials, is one result of the paper. Another result is the analysis of the possible delivery

system of the nano-FBAR-generated HFGWs, the actual power of the generated HFGWs, and the system's application to dermatology in nanostructural modification of the skin or muscle cells. It is concluded that a series of non-evasive experiments, which are identified will have the potential to test theory by detecting and analyzing the HFGWs change in polarization and frequency after their interaction with the skin cells.

1. INTRODUCTION

Nanotechnology deals with mechanisms that are on the order 1000 nanometers (one micrometer) across and the piezoelectric components of the HFGW generator are of this size as are the nanostructures of the cells they affect. Our preliminary work was to deliver pulsed current to the skin utilizing an Electrolift device. The electrical potential (about four volts) that we created in this model is from the dipole effect of the low-frequency (less than sound frequency, on the order of 10 to100 Hz, subject to experimental determination) micro-current (less than 0.1milliamps). The electrical potential of a cell is across its outer cell membrane and is stored from sodium inside the cell and chloride outside, creating a positive inner cell and negative outer cell – a dipole. Such cells may exhibit an aspherical form, possibly representing a quadrupole mass distribution. Thus the concept is to emulate the possible effect of high-frequency gravitational waves (HFGWs) on these cells by electromagnetic means. Figure 1 exhibits the multidirectional aspects of facial muscles and aponeurotic layer and then and then a digital representation of the skin over muscles demonstrating smooth skin.

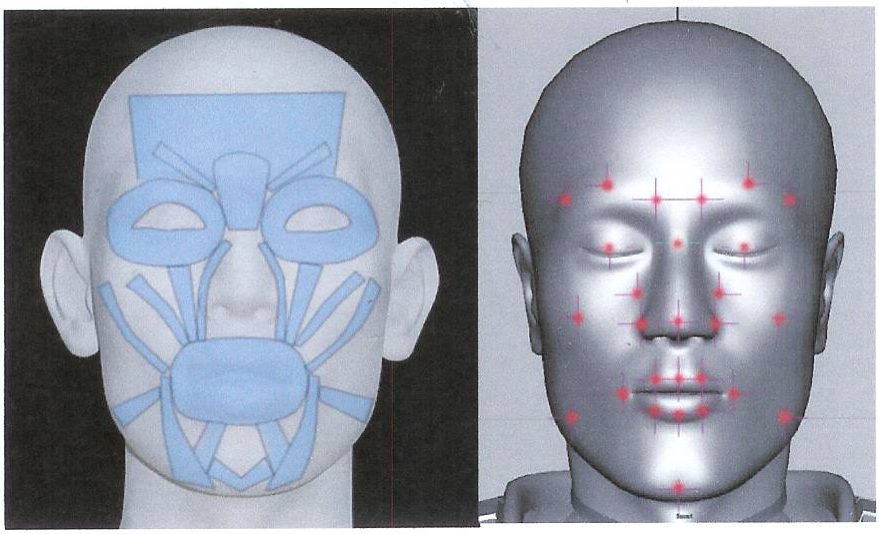


Figure 1. Multidirectional aspects of facial muscles and aponeurotic layer and then and then a digital representation of the skin over muscles

This aponeurotic layer is composed of a thin 2-3 mm thick layer of muscle that is tied together by a *fibrotic* network, which is a bunch of muscle and facial-skin fibers all bundled together. The *aponeurotic layer* is fastened and tightly to the underside of the

reticular dermis (that is, the underside of the skin) and then a digital representation of the skin over the muscles demonstrating smooth skin. The key to the model is the creation of active frequency motion that we can observe in the skin. Dynamic motion is a functional component of the facial skin. Unlike the skin of any other anatomical body area, the facial and neck skin has the aponeurotic layer. Underlying the skin there is a single muscle group (unlike, for example, muscles in the arm and elbow) and it can react as a unit to micro currents and high-frequency gravitational waves (HFGWs).

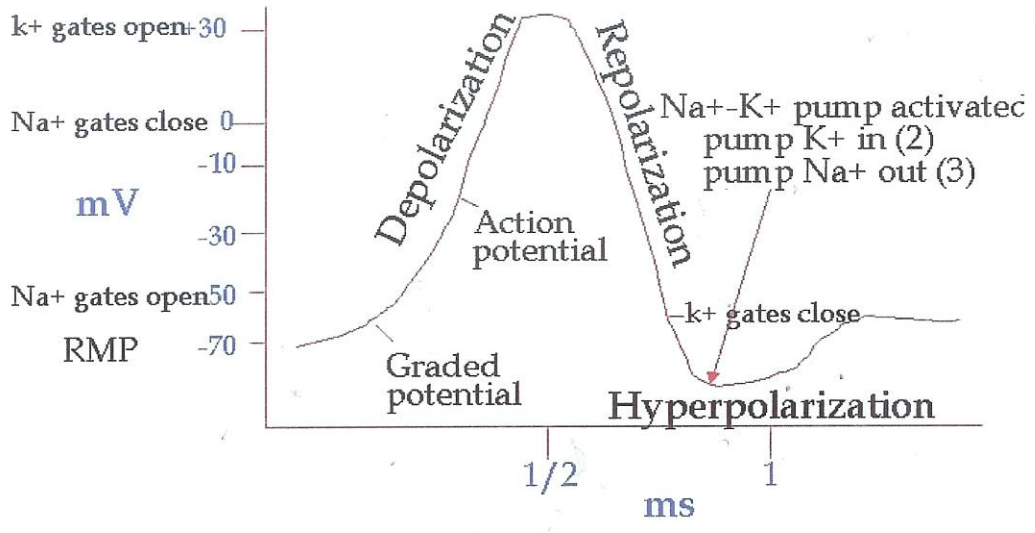


Figure 2 The cytoplasmic energy and ionic potential

As shown in Fig. 2 at the bottom of this figure the *cytoplasmic energy* (that is the stored energy of the cell, like a capacitor) and ionic potential can be measured at the points shown in the upper right drawing. By activating the *Na-K pump* (like a galvanic battery), the cytoplasmic electrical potential can be fluctuated and pulsed. This electrical potential will increase the Ca++ to surrounding *actin-myosin structures* (that is the protein structures that interact together), causing a contractile sequence. The muscle that is contained within the aponeurotic layer is fast-twitch skeletal muscle, although the traditional insertions of skeletal muscle are not present. The network of muscles and fibrotic material gives a flat plane of movement that is a complex of muscle interaction. In the graph the voltage in mV (millivolts) is the root mean potential or RMP. Depolarization and repolarization are of the skin cells and hyper polarization means that the polarization potential (that is, the potential of a cell created from sodium inside the cell and chloride outside, i.e., a cell galvanic battery) is relatively high, the time scale is in milliseconds.

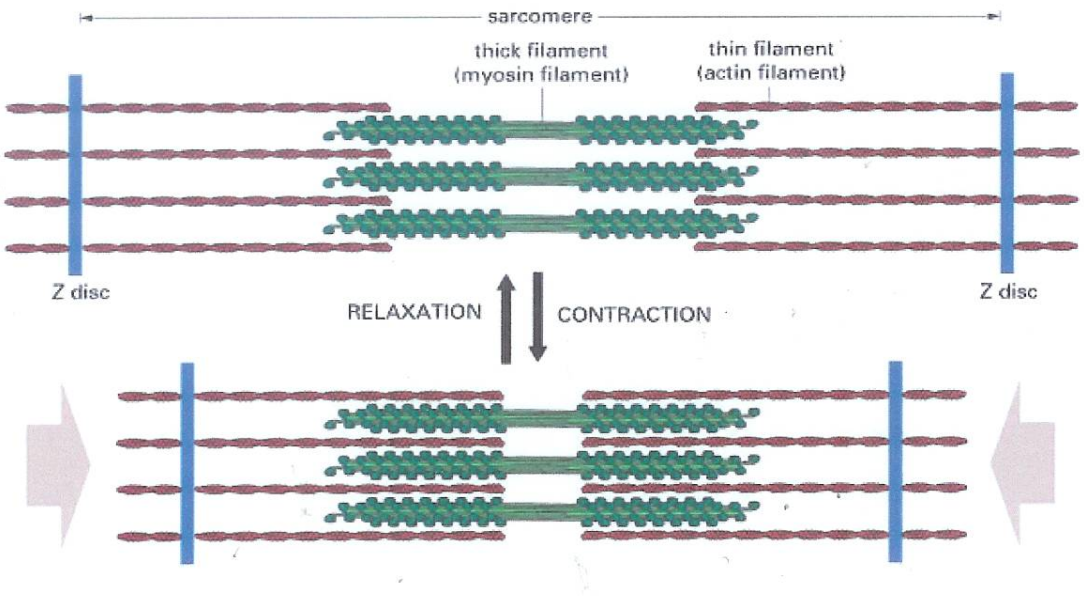


Figure 3. Actin and myosin physical interaction to cause relaxation and contraction sequence.

In Fig. 3 at the top actin and myosin are the proteins that physically interaction to cause a relaxation and contraction sequence. Steady-state ultra-pulsation (at sub-audio frequencies) can cause an increase in the frequency of this sequence, the value of which will be an outcome of the proposed experiment as will the increase in the strength of the interaction. Both of these effects can increase the overall resting tension of the muscle and hence the skin. The actin-myosin complex of muscle cells and *myofibroblasts* (that is the rejuvenating protein-structured skin cells) may be a target of the HFGWs because of the nanostructural motion created in the cellular movement. In addition, there has been preliminary work, which we will show you, on micro-current delivery to the skin and the underneath aponeurotic muscle plane, that demonstrates contraction and tightening of the skin and muscle planes.

Here's the concept in non-medical terms: The facial skin behaves something like a rubber band. As time goes by and after exposure to the elements and many extensions and relaxations, the rubber band looses some of its elasticity. If one now subjects **short sections** of the rubber band, sections that include small groups of rubber molecules and their bonds to each other (nanoclusters), to a sequence of relaxations and contractions, then the elasticity could improve. Unlike actual rubber bands, however, the facial skin actually rejuvenates and its elasticity **does** improve due to localized contraction and tightening. Also the facial skin (different from body skin) behaves like a rubber band in two rather than one dimension. We propose to first do this localized contraction and tightening of the facial skin artificially by current impulses and then directly by the high-frequency gravitational waves (HFGWs). An additional advantage is that HFGWs, and hence their pulses, can be focused inside the facial skin in rather small volumes of the

skin whereas the current pulses can only be applied to a plane of facial skin from outside the skin.

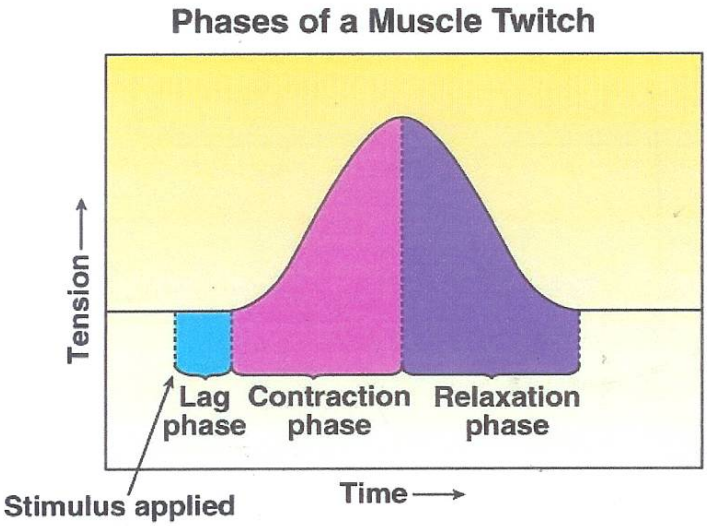
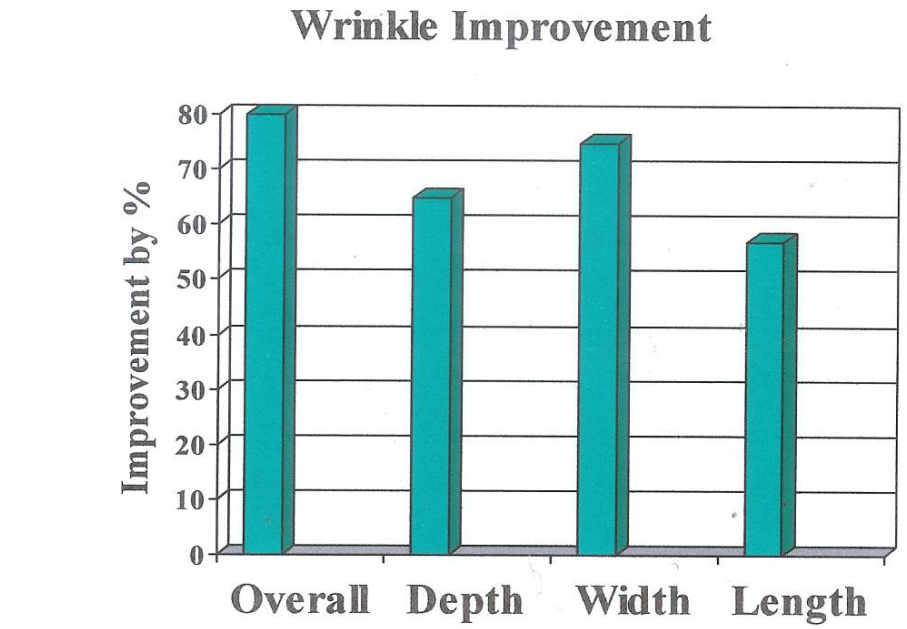


Figure 4. Phases of a muscle twitch.

If there are constant ultra-pulsation stimulations to the muscle cells as shown in Fig. 4, then there can be a minimization of the relaxation and lag phases, keeping the muscle at rest in a higher tension level. This can be a state called "isometric," where the muscles do not actually change in length. Wrinkles and aging of the face may be due to changes in the aponeurotic layer. One postulation is that the fast-twitch cycle of the muscles at a steady state resting phase is still at a high frequency (less than audio frequencies however). This resting frequency maintains a resting contractile tension. Thus mechanism may be a priority factor toward the skin maintenance and facial skin smoothness. With a degradation of uniform muscle frequency that occurs with age and sun damage, the muscle looseness subsequently causes skin laxity. Further postulation is that decreasing the force of uniform muscle and facial tension leads to an unbalance.

2. RESULTS

A generic microcurrent machine was utilized to provide some results equivalent to those of an Electrolift device. Certain skin cells, including special facial muscles express unique electrical patterns and also will absorb the same patterns. All the patients were expressed interest in treatment for wrinkles, lines, and sagging skin. Photographs were taken serially with the treatment by Dr. Moy in his medical office. The skin was carefully logged and tracked for improvement in wrinkle depth, wrinkle_width, wrinkle length, tightness in the skin, texture, sagging and overall improvement of the skin. It is anticipated that the HFGW treatment will have even more beneficial_effects since it_acts directly on each cell causing nanostructural motion directly and not indirectly by pulsed current.



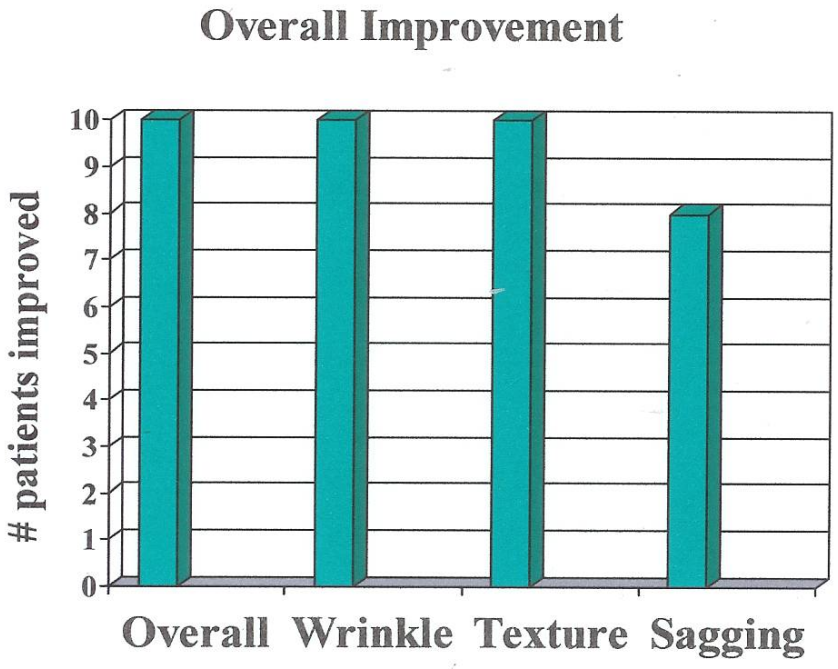


Figure 5. Wrinkle improvement.

These are subjective judgments not quantitative measurements. Such quantitative measurements of wrinkle depth, width, and length and overall improvement as to texture and sagging will be part of the clinical trials.

The results of the clinical trials to date using generic low-voltage, low-current devices, whose electrodes are in direct contact with the skin, are exhibited in Figs. 6 A through 6F.

Figure 6A. Results after two 15 minute sessions.

Figure 6B. Results around mouth and chin after two 15 minute sessions.

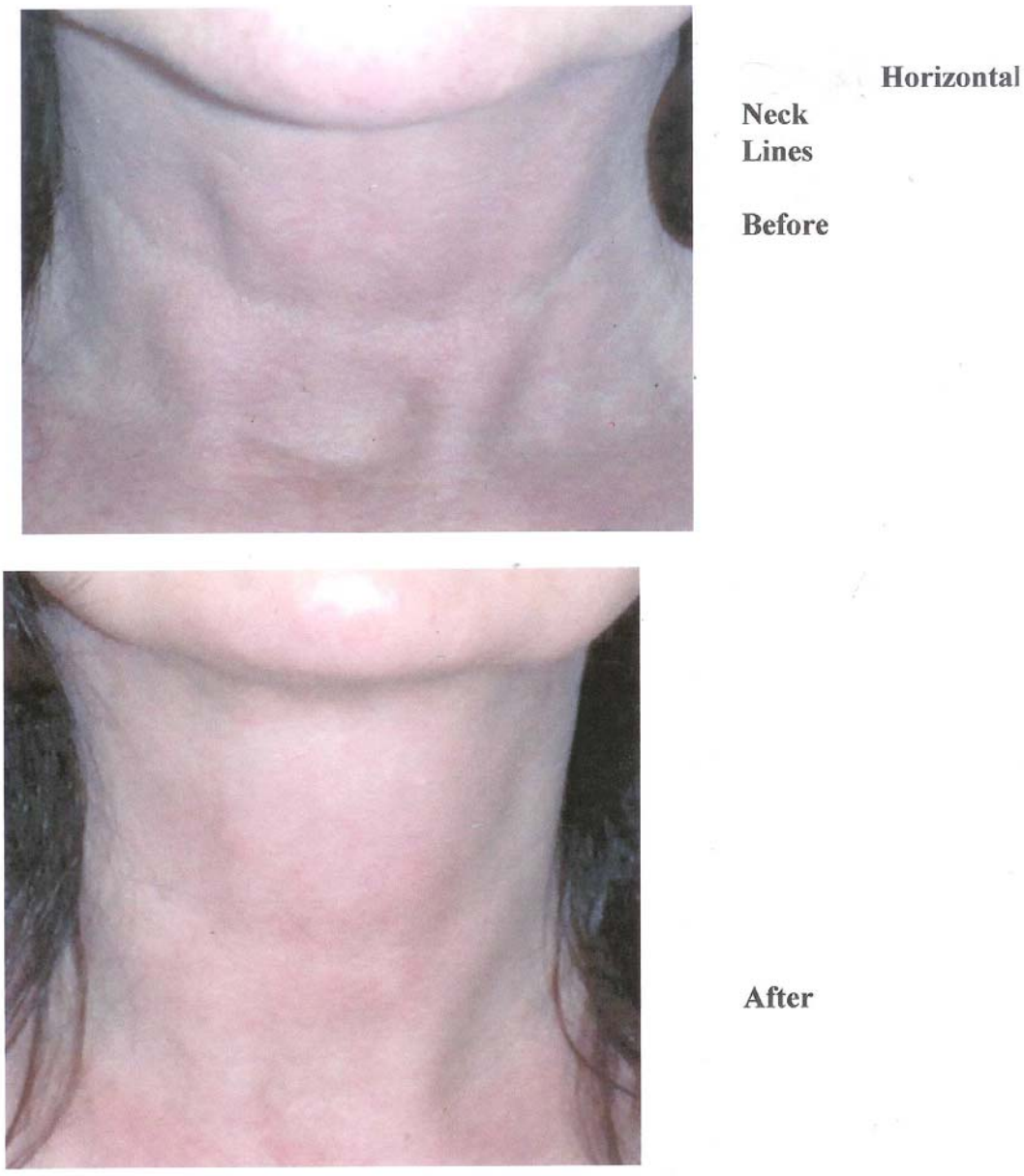


Figure 6C. Neck lines after two 15 minute sessions.

Before

After

Figure 6D. Neck after two 15 minute sessions.

Lines around
The Mouth

Before

After

Figure 6E. Lines around the mouth after two 15 minute sessions.

Lines above and
Below the mouth

Before

After

Figure 6F. Lines above and below the mouth after two 15 minute sessions

3. CONCLUSIONS

Recent analyses (Baker, Woods and Li, 2006) have shown that the HFGW power, *P*, generated by a microwave-stimulated piezoelectric system as envisioned is on the order of 1.4×10^{-8} watts per square meter (too small for FDA regulation; but will test on lab animals first)

• For the HFGWs having frequency of $\nu = 4.9$GHz (4.9×10^{9} Hz), which are generated by microwave-oven-like magnetrons energizing piezoelectric crystals (FBARs), the number of gravitons per square meter per second through the skin, *N,* is given by

$$N = P/h\nu = 1.4 \times 10^{-8}/(6.626 \times 10^{-34})(\ 4.9 \times 10^{9}) = 4 \times 10^{15}$$

• Assuming 1 % efficiency then the number per second through a square centimeter of skin is about 10^{9} gravitons The face will be completely shielded from the microwaves and only the HFGWs will irradiate the skin and produce nanostructural motion in the cells

• Landau and Lifshitz (1975), on page 349 of their fundamental (and internationally recognized authority on gravitational radiation) treatise, state: **"**Since it has definite energy, the gravitational wave is itself the source of some additional gravitational field... its field is a second-order effect **...** But *in the case of high-frequency gravitational waves the effect is significantly strengthened* ..." Thus it is possible to change the gravitational field near cells and facial muscles by means of HFGW and **move them**.

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