

A Review of Cancer Electromagnetic Frequency Therapy: Towards Physics of Cancer

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Abstract. It is known that conventional chemotherapy has average success rate of less than 25%, which seems to suggest that we need a better therapy for cancer. Chemotherapy and radiation employ non-specific toxic effects to inhibit the proliferation of both normal and tumor cells. In this regard, specific low frequency EMT has been reported to restore the homeostatic function of genes involved with controlling cell growth. Here I discuss possibility of a novel approach of cancer treatment using various applications of electromagnetic frequency.

Introduction: Problems with conventional cancer treatment

Cancer constitutes one of the most serious causes of death worldwide and according to WHO, it accounted for 7.6 million deaths (around 13% of all deaths) in 2008 [5]. Deaths from cancer are projected to continue rising to over 11 million in 2030 [5]. Cancer is the end result of a series of genetic alterations that modify the control of proteins that promote (i.e. oncogenesis) or inhibit (i.e. suppressor genes) cell proliferation [1].

It is known that conventional chemotherapy has average success rate of less than 25%, which seems to suggest that we need a better therapy for cancer. Chemotherapy and radiation employ non-specific toxic effects to inhibit the proliferation of both normal and tumor cells. Hence side effects include hair loss, digestive problems and immune suppression. In order to reduce toxicity, current academic and pharmaceutical investigations are focusing on identifying novel methods to reverse cancer specific alterations in oncogenes or suppressor genes.

In this regard, specific low frequency EMT has been reported to restore the homeostatic function of genes involved with controlling cell growth. An assembly of cells, as in a tissue or organ, will have certain collective frequencies that regulate important processes, such as cell division. Hence, providing the correct or “healthy” frequency that entrains the oscillations back to coherence can restore growth control.[1, p.8]

Here I discuss possibility of a novel approach of cancer treatment using various applications of electromagnetic frequency.

In vivo and clinical Study

Published studies using cancer cell cultures and animal tumor models demonstrate that EMT induces cell death (i.e. apoptosis). The correlation between cell membrane potential and cancer cell proliferation was detailed in a classic paper by Cone (1970), see [1, p.8].

In vivo: several studies come to prove that anticancer activity of certain electric fields. In one of them, low intensity, intermediate frequency (100-300 kHz), alternating electric fields were used in in vivo treatment of tumours in C57BL/6 and BALB/c mice (B16F1 and CT-26 syngeneic tumour models, respectively) and induced significant slowing of tumour growth and extensive destruction of tumour cells within 306 days.[5, p.253].

In another study of Barbault *et al.*, it is proposed that a combination of tumour-specific frequencies may have a therapeutic effect. A total of 1524 frequencies, ranging from 0.1 to 114 kHz, were identified from 163 cancer patients, while a compassionate treatment was offered to 28 patients with advanced cancer (breast, ovarian, pancreas, colon, prostate, sarcoma, and other types). None of

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the patients, who received experimental therapy, reported any side effects of significance. Thus, the tumour-specific frequencies provide an effective and well tolerated treatment which may present antitumour properties in end-stage patients [3], [5].

In the meantime, the study of cancer treatment with nanoparticles in an oscillating magnetic field began in the 1950s. In the late 1970s, researchers suggest that special coatings on the magnetic nanoparticles would cause them to selectively penetrate into cancer cells. This concept would allow intravene delivery of the nanoparticles into the body, followed by natural aggregation of the cancer tumor with nanoparticles. Recent developments in biochemistry make this novel approach feasible. Once selective coatings is available, electromagnetic heating will offer the unique advantage of selective heating only the cancer tumor. [2]

Possible mathematical model

There are many models of DNA, both the linear ones and the nonlinear ones [6]. One interesting model in this regard is the sine-Gordon model of DNA as proposed by Salerno [7], see also Daniel and Vasumathi [8]. It belongs to nonlinear model of DNA which is close to realistic model. A review of physical significance of this sine-Gordon model was given in [9].

Assuming the wavefunction Ψ to be a function of x and t , then the sine-Gordon (SGE) model of DNA can be written as follows: [8, p.7]

$$\Psi_{tt} - \Psi_{zz} + \sin(\Psi) = 0 \quad (1)$$

Meanwhile, perturbed SGE come in a variety of forms. One common form is a damped and driven SGE: [10, p.17]

$$\Psi_{tt} + \phi\Psi_t - \Psi_{zz} + \sin(\Psi) = F \quad (2)$$

In addition, the following two versions of the perturbed SGE have been studied in the literature, including:

a. Directly forced SGE: [10, p.19]

$$\Psi_{tt} - \Psi_{zz} + \sin(\Psi) = Mf(\omega t) \quad (3)$$

b. Damped and driven SGE:

$$\Psi_{tt} - \Psi_{zz} + \sin(\Psi) = Mf(\omega t) - \alpha\Psi_t + \eta \quad (4)$$

In their in-depth review of SGE, Ivancevic and Ivancevic [10] discuss potential applications of SGE solitons in DNA, protein folding, microtubules, neural impulse conduction and muscular contraction soliton.

Considering that sine-Gordon equation has been used extensively by particle physicists, then it would be interesting to study possibility to improve or alter DNA using electromagnetic field such as electromagnetic frequency or magnetic vibration. This may be considered as a method for novel cancer treatment. However, physical mechanism of such an application of electromagnetic frequency for cancer treatment should be studied carefully.

New insights may be expected in the near future in these biological fields, based on sine-Gordon equation soliton.

Concluding remarks

Considering that sine-Gordon equation has been used extensively by particle physicists, then it would be interesting to study possibility to improve or alter DNA using electromagnetic field/pulse such as electromagnetic frequency or magnetic vibration. This may be considered as a method for novel cancer treatment. New insights may be expected in the near future in these biological fields, based on sine-Gordon equation soliton.

However, physical mechanism of such an application of electromagnetic frequency for cancer treatment should be studied carefully.

To conclude, despite ongoing research is needed, it seems that application of electromagnetic frequency can be a promising method either as complementary or alternative cancer treatment. It is not a popular approach yet, however as listed in Appendix, there are specialists and institutes offering this treatment in USA, Europe, Asia and elsewhere.

Appendix: Table of Clinics offering Electromagnetic Frequency Therapy (not limited to cancer treatment)

Name	Institute/Method	URL	City	Country
Panos T. Pappas	BioElectroDynamics	www.papimi.gr	Athens	Greece
Hans Kempe	GKA System	www.mcm-fp.ch		Switzerland
Margit Michel-Donate		www.ams-magneticfieldtherapie.de		Germany
Zoetron Therapy		www.csct.com		Europe, North America
Electromagnetic Biofeedback Institute		www.bicomresonance.com		Germany
Demetrio Sodi Pollares				Mexico
Darko Mardjetko	Sanoviv Health Retreat			Mexico
Beam Ray Corporation			Alabama	USA
Rife Technology				Canada
David Spall	Quantronic Resonance Therapy			Australia

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