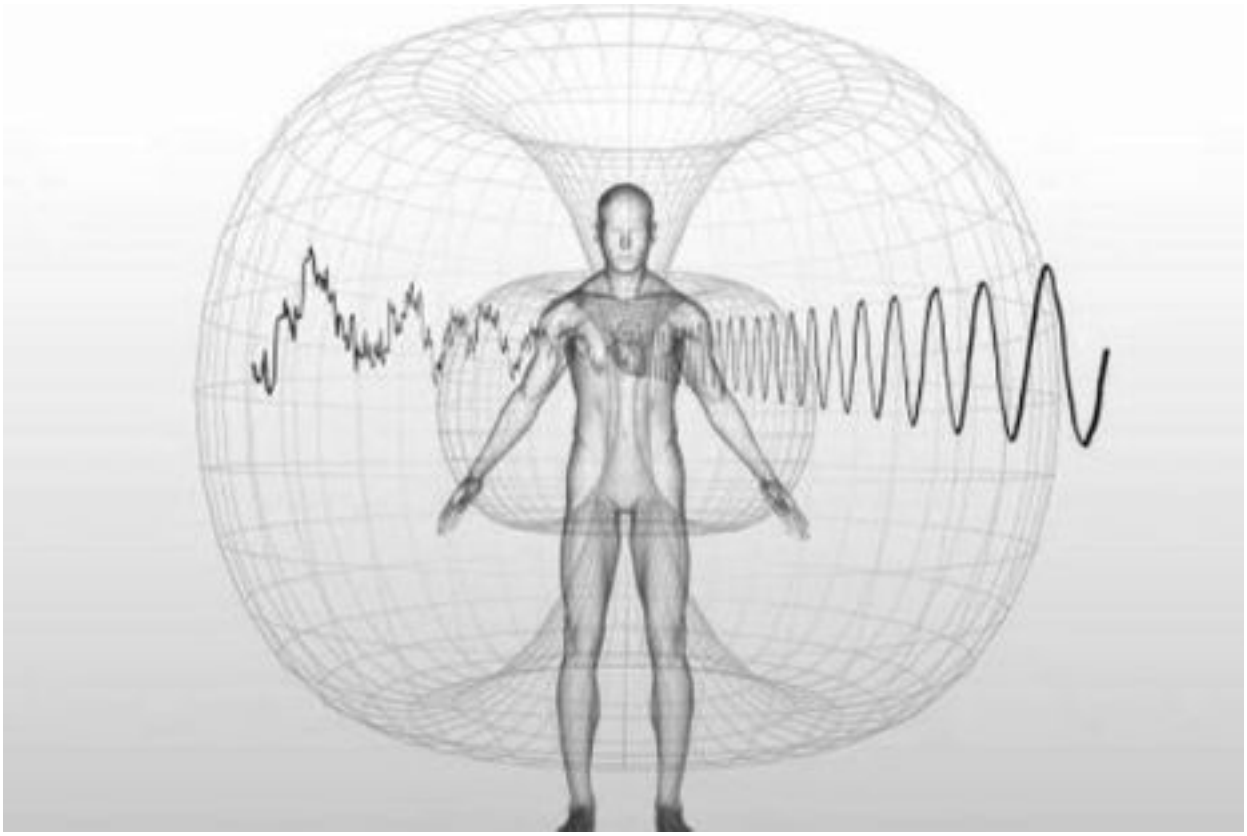


possible effect of Heart electromagnetic field on Cancer cells

–

Mohamed Elfatih Suliman
johnlgg9@gmail.com , +249999013413

Abstract

Considering that the Heart has a powerful electromagnetic field surrounding the whole body and outside it's boundaries ,and this field frequencies and pattern changes alternatively according to the person state (happy , furious , sad etc..) [2].

applying this specific frequencies and pattern of the heart electromagnetic field during different individual state on cancer cells are very Promising ,especially by comparing the interesting results from applying RadioFrequency (RF)ElectroMagnetic fields(EMF) amplitude-modulated at tumor-specific on cancer cells , and the results from the Heart math institute shows that the Heart electromagnetic field is alternate by the emotional state of an individual and the observations that shows an improvement of cancer patients and their tolerance to treatment by their emotional state and family support.

In this study i tried to compare the results of studies that use the electromagnetism (apart from Heart Electromagnetism) in cancer cell and the Heart math institute studies about Heart electromagnetism and the studies that demonstrate the mitochondrial VOLTAGE DEPENDENT ANION SELECTIVE CHANNELS (VDAC) role in cancer cells.

positive effect of electromagnetic field on cancer cells

- Effect of the Electromagnetic field on cancer cells (apart from heart electromagnetism) by Targeted treatment of cancer with **RadioFrequency** (RF)**ElectroMagnetic fields**(EMF) amplitude-modulated at tumor-specific frequencies[1] , the clinical results provide strong evidence that the intrabuccal administration of RF EMF amplitude-modulated at tumor-specific frequencies is safe and well-tolerated and may lead to long lasting therapeutic responses in patients with advanced cancer. their *in vitro* experiments demonstrate that cancer cell proliferation can be targeted using tumor-specific modulation frequencies, which were identified in patients diagnosed with cancer. Tumor-specific modulation frequencies block the growth of cancer cells, modify gene expression, and disrupt the mitotic spindle (**Figure** 6)[1]. Studies are underway to dissect the biophysical mechanism leading cancer cells to respond to specific modulation frequencies identified in patients with a corresponding diagnosis of cancer but not to randomly selected or tumor-specific frequencies identified in other tumor types. Elucidation of this mechanism of action is likely to unveil novel pathways and targets.
- **Pulsed** electric fields have been developed for localized treatment of tumors. This approach is based on the use of short electric pulses inducing either irreversible or reversible changes in cell membrane permeabilization. Irreversible changes lead to cell death, and reversible changes allow for markedly increased chemotherapy penetration[3]. The addition of therapeutic modalities based on RF EMF with minimal adverse effects is an exciting prospect for patients with cancer.

- **Pulsed** EMF have shown efficacy on osteoarthritis[4]. Alternating electric fields have been used to induce fracture healing, with suggested efficacy similar to that of bone graft[5]. The proposed action of pulsed EMF is through the induction of directed migration and differentiation of bone marrow-derived mesenchymal stem cells[3]. Currently, RF EMF is used as a therapeutic option in cases ranging from tibial stress fractures to spinal cord injury.
- In 2001, Barbault *et al.*[6] hypothesized that the growth of human tumors may be sensitive to specific modulation frequencies. To test this hypothesis, they initiated a patient-based research using novel biofeedback devices and techniques, which led to the discovery that patients with the same tumor type had biofeedback responses to the same frequencies, irrespective of their sex, age, or ethnic status[6]. Interestingly, the majority of frequencies identified in a given tumor type was only found in patients with the same tumor type[6]. For example, 85% of the frequencies identified in patients with HCC were only found in other patients with HCC. Similarly, 75% of the frequencies identified in patients with breast cancer were only found in patients with the same tumor type[6]. They also discovered that a small number of frequencies, e.g., 1,873.477 Hz, 2,221.323 Hz, 6,350.333 Hz, and 10,456.383 Hz, were found in the majority of patients with breast cancer, HCC, prostate cancer, and pancreatic cancer[6]. Examination of healthy individuals without a diagnosis of cancer did not reveal any biofeedback responses to the frequencies identified in patients with a diagnosis of cancer.
- Enhanced Ca^{2+} flux after exposure to **RadioFrequency** (RF)**ElectroMagnetic fields**(EMF) is very interesting and rational with our hypothesis that Heart Electromagnetic field affect VDAC which participate in Ca^{2+} homeostasis , Calcium (Ca^{2+}) is crucial for a number of cellular processes ranging from embryonic patterning to transcription factor activation and apoptosis. EMF modulation of Ca^{2+} is especially appealing because investigators generally agree that the majority of the fields evaluated are not capable of causing direct effects on cellular structure or chromatin. Early studies illustrated enhanced Ca^{2+} flux in the brains of cats under local anesthesia following exposure to sinusoidally amplitude-modulated RF EMF, providing rationale for numerous subsequent studies[7]. Study outcomes have been dependent on cell lines used, duration of EMF exposure, choice of EMF exposure levels, and whether exposure has been continuous or pulsed[8],[9]. One model of Ca^{2+} efflux has described a “windowing” phenomenon, similar to that previously described in chick brains in which efflux reaches a maximum at discrete EMF windows[10],[11]. Although the specific findings and subsequent hypotheses differ, the literature strongly suggests that exposure levels to EMF can impact Ca^{2+} flux; however, the biological significance of these fluctuations remains unclear and the demodulation mechanism leading to changes in Ca^{2+} flux has not yet been elucidated[9].

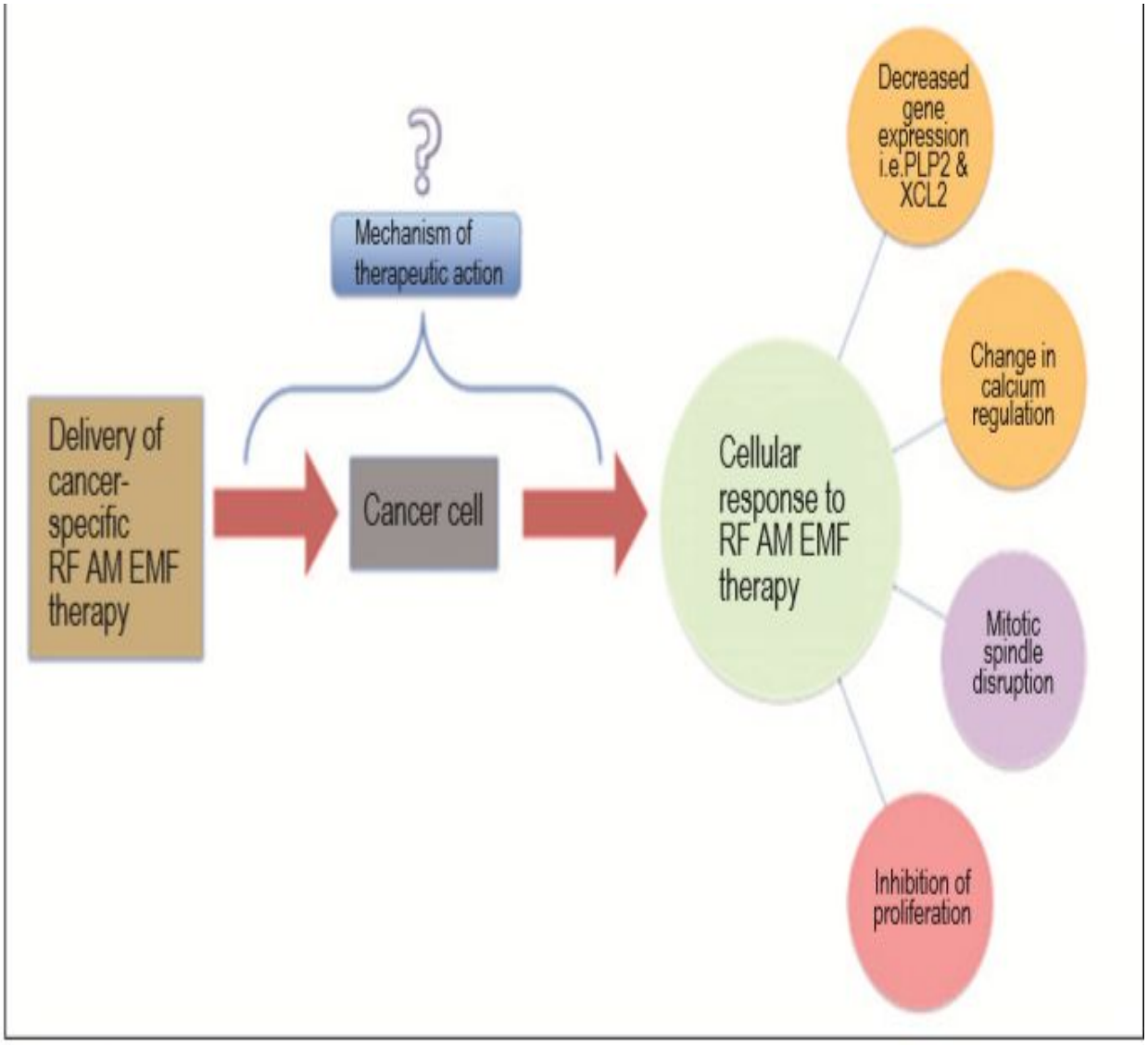


Figure 6. **Cancer-specific treatment and responses. Theoretical flowchart representing the published biological responses to amplitude-modulated RF EMF therapy that may in part explain the antitumor effect.**

- The Heart Math institute researches about the Heart electromagnetism and its alterations according to the emotional state of the individual is very helpful to determine the specific frequencies and pattern in certain individual stat at specific period of time to apply on cancer cells (figure B)[2].

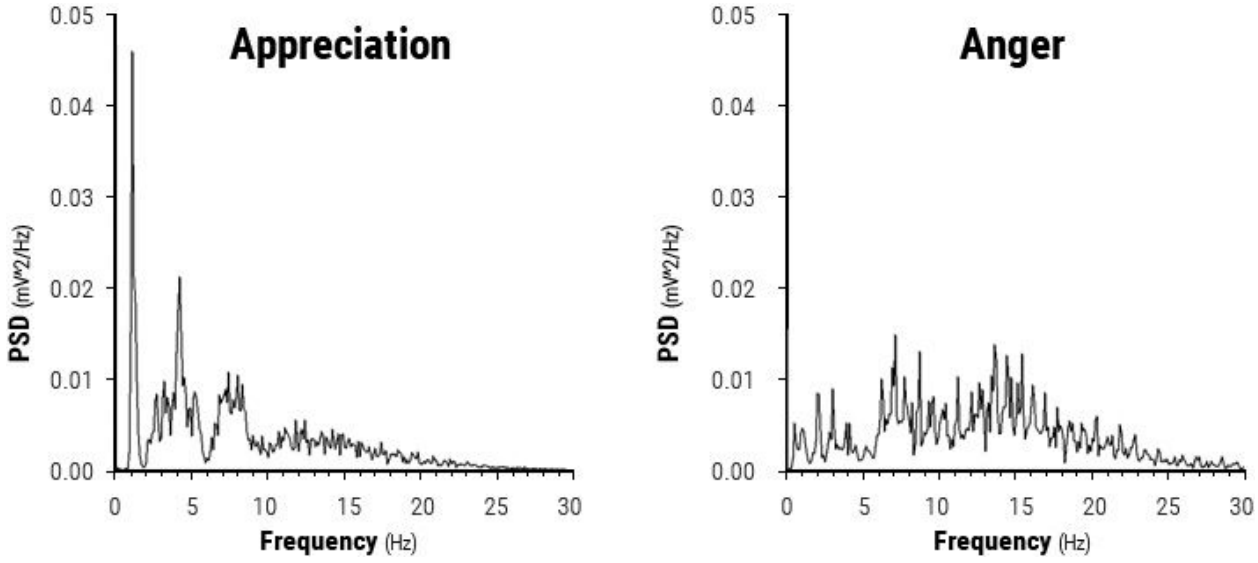


Figure B ECG spectra during different emotional states. The above graphs are the average power spectra of 12 individual 10-second epochs of ECG data, which reflect information patterns contained in the electromagnetic field radiated by the heart. The left-hand graph is an example of a spectrum obtained during a period of high heart-rhythm coherence generated during a sustained heartfelt experience of appreciation. The graph on the right depicts a spectrum associated with a disordered heart rhythm generated during feelings of anger.

The Heart Electromagnetic field may affect the whole cell ,but the possible effect may be in the Mitochondria.

Cancer cells has more hyperpolarized Mitochondrial outer membrane potential (ΨIM) than normal cells.

ΨIM = ~-220 mV in cancer cells

ΨIM = ~-140 mV in normal cells

This make the VOLTAGE DEPENDENT ANION SELECTIVE CHANNELS (VDAC) in cancer cells open and close in different values of differ Mitochondrial outer membrane potential (ΨIM) from normal cells because it open and close according to the change in the outer Mitochondrial membrane potential (The channel adopts an open conformation at low or zero membrane potential and a closed conformation at potentials above 30–40 mV in NORMAL cells).

VDAC play role in regulation of apoptosis and Ca(2+) homeostasis (Ca^{2+} flux into mitochondria, lead to permeability transition and cell death) ,by comparing the the results of electromagnetism on cells The electromagnetic field of the heart may affect the VDAC closure and open state of cancer cells selectively due to it's hyperpolarized state and different outer mitochondrial membrane potential inducing selective apoptosis or necrosis.

Suggested Methodology

- The primary research method is to obtain the different heart electromagnetic frequencies in different individual emotional state especially positive emotions and apply it on cancer tissues and observe the changes in the cancer cells and especially VDAC of the mitochondria in vitro.
- Studying on animals , the targeted animal for testing is elephants because :
    1. Compared with other mammalian species, elephants appeared to have a lower-than-expected rate of cancer
    2. elephant cells demonstrated increased apoptotic rate.
    3. Elephants experience many of the same emotions as people do, ones that are usually restricted to being that of humans, seldom seen in animals. Elephants are capable of sadness, joy, love, jealousy, fury, grief, compassion and distress.

  Considering this facts our target is to measure the heart electromagnetic frequencies and its effect on elephants cells and observe the changes in vivo

Conclusion

Heart electromagnetic field is surrounding the whole body and its frequencies changes alternatively according to the person state ,so applying the specific frequencies of the heart electromagnetic field during different individual state on cancer cells are very Promising ,especially by comparing the interesting results from applying RadioFrequency (RF)ElectroMagnetic fields(EMF) amplitude-modulated at tumor-specific on cancer cells , and the observations that shows an improvement of cancer patients and their tolerance to treatment by their emotional state and family support. The Table below show the effect of Electromagnetic field on cancer cells , cells differentiation and Ca+2 homeostasis and comparing it with heart electromagnetism features and the importance of VDAC.

VDAC importance	Electromagnetic field effect on cancer cells , cells differentiation and Ca+2 homeostasis	Heart Electromagnetism results by HeartMath institute[2]
• It dependence on the outer mitochondrial membrane voltage (**ΨIM**) which is different in cancer cells from normal cells **ΨIM = ~-220 mV in cancer cells** **ΨIM = ~-140 mV in normal cells** • The role of VDAC in regulation of apoptosis	• It produce effect when introduced in pules state • It produce effect at specific frequencies • Pulsed electric fields localized treatment of tumors markedly increase chemotherapy penetration • Enhanced Ca2+ flux after exposure to **RadioFrequency** (RF)**ElectroMagnetic fields**(EMF)	• The Heart electromagnetic field is surround the whole body • There is Heart-Brain Synchronization • It produced in pulsed manner • Its frequencies changes according to person emotional state and it changes alternatively • there is a direct relationship between the heart-rhythm patterns and the spectral

and Ca(2+) homeostasis • VDAC1-based peptides interact with anti-apoptotic proteins to induce apoptosis, thereby overcoming the resistance of cancer cell to chemotherapy[12] • silencing of VDAC1 expression induces an inhibition of tumor development[12]	• Alternating electric fields have been used to induce fracture healing the proposed action of pulsed EMF is through the induction of directed migration and differentiation of bone marrow-derived mesenchymal stem cells	information encoded in the frequency spectra of the magnetic field radiated by the heart. Thus, information about a person's emotional state is encoded in the heart's magnetic field and is communicated throughout the body and into the external environment.

References

1. Jacquelyn W. Zimmerman, Hugo Jimenez, Michael J. Pennison, Ivan Brezovich, Desiree Morgan, Albert Mudry,Frederico P. Costa, Alexandre Barbault, Boris Pasche,Targeted treatment of cancer with radiofrequency electromagnetic fields amplitude-modulated at tumor-specific frequencies ,Chin J Cancer. https://dx.doi.org/10.5732%2Fcjc.013.10177 (2013)
2. Rollin McCraty, Ph.D. *SCIENCE OF THE HEART* , HeartMath Institute Boulder Creek, CA 95006 (2015) www.heartmath.org
3. Breton M, Mir LM. Microsecond and nanosecond electric pulses in cancer treatments. Bioelectromagnetics. 2011 Aug 3; doi: 10.1002/bem.20692.[PMC free article] [PubMed]
4. Trock DH, Bollet AJ, Markoll R. The effect of pulsed electromagnetic fields in the treatment of osteoarthritis of the knee and cervical spine. Report of randomized, double blind, placebo controlled trials. J Rheumatol. 1994;21:1903–1911. [PubMed]
5. Aaron RK, Ciombor DM, Simon BJ. Treatment of nonunions with electric and electromagnetic fields. Clin Orthop Relat Res. 2004;419:21–29. [PubMed]
6. Barbault A, Costa FP, Bottger B, et al. Amplitude-modulated electromagnetic fields for the treatment of cancer: discovery of tumor-specific frequencies and assessment of a novel therapeutic approach. J Exp Clin Cancer Res. 2009;28:51. [PMC free article] [PubMed]
7. Adey WR, Bawin SM, Lawrence AF. Effects of weak amplitude-modulated microwave fields on calcium efflux from awake cat cerebral cortex. Bioelectromagnetics. 1982;3:295–307. [PubMed]
8. Carson JJ, Prato FS, Drost DJ, et al. Time-varying magnetic fields increase cytosolic free Ca2+ in HL-60 cells. Am J Physiol. 1990;259:C687–692. [PubMed]

9. Still M, Lindstrom E, Ekstrand AJ, et al. Inability of 50 Hz magnetic fields to regulate PKC- and Ca(2+)-dependent gene expression in jurkat cells. Cell Biol Int. 2002;26:203–209. [PubMed]
10. Thompson CJ, Yang YS, Anderson V, et al. A cooperative model for Ca(++) efflux windowing from cell membranes exposed to electromagnetic radiation. Bioelectromagnetics. 2000;21:455–464. [PubMed]
11. Blackman CF, Benane SG, Elliott DJ, et al. Influence of electromagnetic fields on the efflux of calcium ions from brain tissue *in vitro*: a three-model analysis consistent with the frequency response up to 510 Hz. Bioelectromagnetics. 1988;9:215–227. [PubMed]
12. Shoshan-Barmatz V, Ben-Hail D, Admoni L, Krelin Y2, Tripathi SS,The mitochondrial voltage-dependent anion channel 1 in tumor cells ,Biochim Biophys Acta doi: 10.1016/j.bbamem.2014.10.040. Epub 2014 Nov 4 https://www.ncbi.nlm.nih.gov/pubmed/25448878 (2014)
13. Wenzhi Tan ,Marco Colombini ,VDAC closure increases calcium ion flux topic,https://dx.doi.org/10.1016%2Fj.bbamem.2007.06.002 (2007)