Dear Toni Goren,

when studies are cited adressing the issue “PEMF and cancer” it has to be distinguished between invitro and invivo studies … for a number of reasons because in a living body cancer is regulated centrally / cancer is not merely a localized illness, but is affecting the entire human being, respectively. And it always needs to be considered what interests are behind a study, because followers of electromagnetic emissions do have a good lobby. Futhermore it also has to be made a distinction between “PEMF as a therapy for cancer” and whether a healthy organism develops cancer under PEMF.

1. PEMF in treatment of tumor diseases

a. Invitro

PEMF have been extensively studied in vitro using various human cancer cell lines, such as pheochromocytoma-derived breast cancer or colon cancer. These studies have shown that PEMF may exert proliferativ inhibition and mitotic spindle disruption [1],[2] and blocks the development of neovascularisation required for tumor supply [3],[4],[5]. Without fail it seems to obviously that PEMFs exert selective cytotoxic effects on cancer cells making this therapy **a highly promising strategy** [6],[7],[8].

Here some examples: Human **breast cancer** and **colon cancer** cell lines. PEMF 50 Hz, 10 mT / exposure 24 and 72 h; Result: PEMF increased apoptosis in MDA-MB-231 (55 % and 20 %), SW840 (11% and 6 %) and HCT-116 cell lines (2% and 3 %) after 24 and 72 h exposure, respectively, compared with untreated control cancer cell lines [9]. Or short PEMF application / Undifferentiated PC123 pheochromotycoma cells and differentiated PC12 cells / PEMF 50 Hz, 0,1 - 1,0 mT/ only for 30 minutes and long-term PEMF session (50 Hz, 0,1- 1,0 mT for 7 days). **Results**: 30 min PEMF session in undifferentiated cells increased ROS levels and decreased catalase activity - without change in intracellular Ca2++ concentration. But 7-day session in undifferentiated cells resulted in increased intracellular Ca2++ concentration and increased catalase activity. No significant findings were observed in differentiated cells [10]

For example MCF7 breast cancer cells and their normal (healthy) counterparts MCF10 cells were exposed to different frequencies between 20 - 50 Hz and intensities ranging from 2 mT - 5 mT [11]. Exposure duration was 30 - 90 minutes per day. As a **result** the MCF7 cancerous cells were **vulnerable** to intensities of **3 mT** magnitude, **20 Hz** frequency and a exposure duration of **60 minutes** a day. Or the growth rate of resistant cancer cells to chemotherapy (Adriamycin) exposed to PEMF was significantly lower than in the non-exposed resistant cells at all Adriamycin conentrations. Obviously PEMF promotes the undifferentiated cell but progressively suppresses the growth of more differentiated cell, i.e. PEMF controls cell growth depending on the degree of cell differentiation. The authors conclude that **PEMF are an adjunctive treatment method for malignant tumors** [12]: Especially in Russia there have been carried out many cancer studies by using PEMF.

In another study there has been investigated the not yet known mechanism explaining the **anti-proliferative effect** of very low intensity electromagnetic fields [13]. Here hepatocellular carcinoma cells (HCC) were exposed to 27,12 MHz radiofrequency electromagnetic fields. The **modulation frequencies** were

previously indentified by **biofeedback methods** in cancer patients (100 Hz - 21 KHz). **Results**: The growth of HCC and breast cancer cells was significantly decreased by HCC-specific and breast-cancer-specific modulation frequencies, respectively. However, the same frequencies did **not affect proliferation** of **nonmalignent** hepatocytes or breast epithelial cells. There was a strong experimental evidence that the biological effects are only mediated by a combination of narrowly defined, tumour-specific modulation frequencies.

Also from the point of view of immunology and the immunosuppressive functions of regulatory T cells that are central for tumor progression a study imposes which deals with immune status of patients operated for bladder cancer and exposed postoperatively to PEMF. **Results**: PEMF application was followed by higher T- and B-lymphocyte and CD4+, Cd16+ cell levels as well as enhanced T-cell activity whereby the tumor relapse rates were relatively low [14].

Additional studies: [15],[16]

b. In vivo (widely using animals)

23 Albino mice. Subcutaneous injection of melanoma cells on the dorsal side of the mouse ear. PEMF (0,5 Hz, 200 mT, 30 min, 3 x a day for 6 days. **Result**: All mice exhibited significant **shrinkage** of **tumor cell nucles**. By **54 % within a few minutes** after PEMF therapy and by 8 % within 3 h and reduction in the blood flow in this area in about 15 min following PEMF [17].

4 Albino mice. Subcoutaneous injection of melanoma cells on the mouse skin. PEMF (5 - 7 Hz, 200 mT, 6 min daily for 10 days. **Result**: Melanoma cells **shrank** within **an hour** post PEMF / shrinkage of tumor cell nucle within 24 h post treatment. Altogether showed mice a **complete remission** of melanoma [18].

Or immundeficient mice were divided in 4 groups / injection of metastatic mouse breast tumor cells into the mammary fat pad. Group 1, 2 and 3 were exposed to PEMF (1 Hz, 100 mT daily for 60, 180 or 360 min, respectively, for 4 weeks. Group 4 did not receive any treatment and was used as a control. **Results**: Mice exposed to 60 and 180 min daily showed a **30 %** and **70 % tumor reduction**, respectively, at week 4, if compared to baseline [19].

You remember my last statements last week: There are big differences between animals that get injected cancer cells and prisoners which voluntary take part in the study. Animals underlie the highest stress that badly damages their immunological response.

In a study with 114 breast cancer patients (T3, N1-N3, MO) PEMF application was **highly effective** (according the clinical, reontgenological and histological evidence on the end-results. Also postoperative lymphorrhea expected was shorter and less extensive [20].

Additional studies: [21],[22],[23]

c. Clinical studies

A fundamental study identified a total of **1 524 different tumor-specific frequencies**, ranging from **0,1 - 114 KHz** in **163** patients affected by different types of cancer, including brain tumors, colorectal cancer, HCC carcinoma, pancreatic, colorectal, ovarian, breast, prostate, lung, thyroid and bladder cancer. **28** patients got self-administered PEMF-therapy: 3 times a day, for an average of about 278 months (median treatment duration **4,1 months** per patient) with breast cancer, ovarian cancer, prostate cancer, glioblastoma, HCC carcinoma, mesothelioma, neuroendocrine tumor, non-small-cell lung cancer, sarcoma, thyroid tumor. **Results**: 4 patients presented stable disease for 3 years (thyroid cancer, 6 months (mesothelioma metastatic to the abdomen), 5 months (non-small lung cancer) and 4 months (pancreatic cancer with biopsy proven liver metastasis) respectively. Best response = 3, 6 %, partial response = 3,6 %, stable disease = 28,6 %, progressive disease = 21,4 %, not available for response assessment = 60,7 % [24]. These results are particularly interesting because a large number of these frequencies may result in successful long-term disease management.

While **most frequencies are tumor-specific** (in breast cancer, hepatocellular carcinoma, ovarian cancer and prostate cancer only 75 % are tumor-specific) , unfortunately the frequencies for breast, hepatocellular cancer, prostate and pancreatic cancer were relatively high (MHz).

In another study [25] found surprising clinical benefits from using the specific AM-EMF signals (“amplitude-modulated”) to treat advanced hepatocellular carcinoma HCC, stabilising the disease and even producing partial responses up to 58 months in a subset of the patients. Though they used radiofrequencies (**27,12 MHz**). In the study mentioned before HCC was treated with frequencies ranging between 100 Hz and 21 KHz.

d. Frequencies
Sure, a user of QRS could be frustrated about Diathermy-frequencies of 27,12 MHz and its modulation in a range between 0,1 - 21 000 Hz. But there are also cancer-specific extremely low frequencies (PEMF) or frequency modulated radiotherapy that are able to inhibit and retard cancer.

For example 50 Hz:
Human colon adenocarcinoma and human breast adenocarcinomas exposed to 3 mT static MF, modulated in amplitude with 3 mT ELF-MF at **50 Hz** showed morphological evidence of increased apoptosis [26]. In this trial has been implemented a second independent experiment, when mice bearing tumors were exposed to the same treatment for **four consecutive weeks**, significant **inhibition of tumor growth (40%)** was reported, together with a **decrement in tumor cell mitotic index** and **proliferative activity**. A significant increase in apoptosis was found in tumors of treated animals, together with a reduction in immunoreactive p53 expression.

The same author carried out another study with mice bearing a subcoutaneous human breast cancer tumour exposing them to modulated extremely low frequency fields at **50 Hz** at an intensity of 5,5 mT under chemotherapy [27]. Here was the **survival time** of mice treated with cis-platin (3mg/kg i.p.) and exposed to MF was **significantly longer** than that of mice treated only with cis-platin or only exposed to MF, superimposing that of mice treated with 10mg/kg i.p. of the drug, showing that MF act synergically with the pharmacological treatment.

In another study was investigated *in vitro*, and with computer simulation, the influence of a **50 Hz EMF** on three cancer cell lines: breast cancer MDA-MB-231, and colon cancer SW-480 and HCT-116. After 24 h preincubation, cells were exposed to 50 Hz extremely low frequency (ELF) radiofrequency EMF using in vitro exposure systems for 24 and 72 h. **Results**: Experimental results clearly showed disintegration of cells treated with a 50 Hz EMF, compared to untreated control cells. A large percentage of treated cells resulted in increased **early apoptosis** after 24 h and 72 h, compared to the controls [28]

Other extremely low frequencies / some examples:
Murine malignant tumor growth of mice inhibited, apoptosis of cancer cells induced, and arrest of neoangiogenesis was observed by a pulsed 0,16- 1,34 Hz treatment [29].

Growth of sarcoma cells in mice was inhibited by a pulsed magnetic field at **0,8 T, 1 Hz** [30].

A significant decrease in tumor growth and increase in survival were observed for male and female mice exposed for 8h/day to **100 mT, 0,8 Hz** square-wave from the onset of tumor until death or until the tumor volume reached a predetermined volume [31]

A pronounced decrease in tumor growth rate in animals exposed to a **5 Hz** interferential frequency for 1 hr daily has been shown [32].

A significant decrease in cell growth (56 %) of colon adenocarcinoma cells has been shown in cells exposed to **1 Hz** or **25 H**z for 2- 6 hours/ **1,5 mT** in the presence of dexaethasone [33].

The inhibition growth rate was significantly higher of murine ostoeosarcoma cells, treated with doxorubicin in the presence of 10 x **10^{-3} mT** PEMF at **10 Hz**, compared to both non-exposed resistant cell and those non-treated with doxorubicin [34].

Electromagnetic exposure by **0,4 T**, **7,5 Hz** for 43 days inhibited the growth and metastasis of melanoma cancer cells and improved immune function of the malignant carcinoma [35].

Exposure of breast tumors to a **120 Hz** magnetic field 10 minutes per day with **0,1 mT, 15 mT** oder **20 mT** significantly reduced tumor growth, reduced the percentage of area stained for CD31 indicating a reduction in the extent of tumor necrosis [36]

e. Cancer promotion
It must not be kept in ignorance that PEMF fields also can promote cancer cells in vitro. However there are indexed only a few studies. Examples: PEMF of 5 mT at frequencies of **15 Hz**, **125 Hz** and **625 Hz** were tested on cancer cell lines derived from various types of tumors. **Results**: PEMF of 125 Hz and 625 Hz for 24-48 hours continuously increased proliferation activity in the 2 types of cancer cell lines used [37].

Due to great number of electrosmog followers there has been carried out a lot of studies on **power supply**. There is described a risk of childhood leukemia that is increased at exposure **higher than 0,3 µT** according to National Cancer Institute

Electromagnetic fields and cancer. But meanwhile it has turned out as nonsence. Namely a case–control study using **53 515 children** from the National Registry of Childhood Tumours 1962–2008, matched controls, and calculated distances of mother's address at child's birth to powerlines at 132, 275, and 400 kV in England, Wales and Scotland. Previous findings of an excess risk for leukaemia at distances out to 600 m declines over time has to be cancelled because any physical effect of the powerlines is more likely to be the result of changing population characteristics among those living near powerlines [38].

2. Voltage / membrane potential / resting potential of health cells

Hypothesis Jerry Tennant
I was particulary amazed to read that voltage or membrane potential of a healthy cell shall be about **-20 to -25 millivolts** and we start to get sick when that voltage drops below -15 millivolts or less. Unfortunately Tennant **lacks to deliver any study proof**. Also typically and rather superficial he does not distinguish between the individual cell types, because the value of the resting membrane potential varies from cell to cell, and ranges **from about -20 mV to -100 mV**.

At least there are indexed some **studies** proofing different membrane potentials. It has by now become a matter of common knowledge that **neurons** get a resting potential of **- 70 mV**. The resting membrane potential in **skeletal muscle** cells is about similar to that of neurons and tends to **-95 mV** (-70 to -100 mV) [39]. Erythrocytes do have 8,4 - 12 mV [40], astrocytes **-80 to -90 mV**, **liver cells** do have **-37 mV** (28 - 44 mV) **[41]**, **smooth muscle** cells is **-37** to **-50 mV** [42], **skeletal muscle** cells **-95 mV**, **astrocytes -80/-90 mV**, **neurons - 70 mV**, **erythrocytes -12 mV, arterioles -38 to -40** [43] and membrane potential of **mitochondria** is **-150 mV**, because that's necessary for the respiratory complex [44],[45]. As last week told: In **carcinomas** there is a resting potential of **-15 mV** [46,47].

It is assumed generalized membrane defects in cancer or rather alterations of the membrane system are a regular feature of tumor cells [48]. Already in the 1950's there was recognized a general correlation between **proliferation** and **membrane potential**, respectively that there is a significant depolarization during malignant transformation of normal cells [49],[50],[51]. In a trial with an infiltrating ductal carcinoma (breast cancer) mean membrane potential in breast biopsy tissue from 9 women was significantly **depolarized,** compared with values measured in tissue from 8 women with benign breast disease [52]. For example cell division was blocked at a membrane potential of **-75 mV** [53] .

A high membrane potential is an expression of vitality and vigilance and has to be created every few seconds by ions pumps and production of ATP, because there is a "principle of dam" that allows a rapid material exchange. That's life. In short: It seems doubtful whether Jerry Tennant is an expert in these fields of membrane potential. It has been known for a long time that membrane potential does control wound healing [54],[55],[56]. That's no invention of Mr. Tennant. **Therefore I do guess that there is no need for further explanation or discussion**.

3. Causing cancer by PEMF

You know. The IARC (International Agency For Research on Cancer) is an intergovernmental agency of the WHO and is repeatedly attracting increasing levels of interest by announcements like “long-term exposures” to electromagnetic fields > 0,4 µT is possibly carcinogenic to humans.

They relay, in this respect, on a meta-analysis (50 and 60 Hz frequencies / 99.2% of children residing in homes with exposure levels < 0.4 µT had estimates compatible with no increased risk, while the 0.8% of children with exposures ≥ 0.4 µT had a relative risk) [57] and an erroneous interpretation of a study with Sprague-Dawley rats[58]. For explanation only: These inbreeded rats do have a spontaneous tumor incidence of 45% [59]. So it has to be stressed the need of extreme caution in evaluation of carcinogenicity studies.

In this (faked) study the rats got the carcinogen **DMBA** that can induce tumors like mammary cancer in susceptible rat strains after one single dose. Than they used the following tendencious trial design:

Group 1: 10 mg DMBA / without an magnetic field
Group 2: 10 mg DMBA / magnetic field 100 µT, 50 Hz, 26 weeks
Group 3: 10 mg DMBA / magnetic field 500 µT, 50 Hz, 26 weeks
Group 4: 10 mg DMBA / magnetic field 100 µT, 60 Hz, 26 weeks

Results:
Group 1: Tumors in 96 % of the rats
Group 2: Tumors in 90 % of the rats
Group 3: Tumors in 95 % of the rats
Group 4: Tumors in 85 % of the rats

According to these findings those rats **without** any electromagnetic application had the most cancer incidence. There is nothing more to be said. How **believable is the whole “scientific” system still ?** …. You see it makes little sense to deliver studies that PEMF < 40 µT are not carcinogenic. How that can be proved ?

Best regards
Rainer Krapf

---

[1] Kirson ED, Dbaly V, Tovarys F et al. Alternating electric fields arrest cell proliferation in animal tumor models and human brain tumors. Proc. Natl. Acad. Sci. USA. 2007;104:10152–10157.
[2] . Zimmerman JW, Pennison MJ, Brezovich I et al.. Cancer cell proliferation is inhibited by specific modulation frequencies. Br. J. Cancer. 2012;106:307–313
[3] Fang M, Zhang H, Xue S. Role of calcium in apoptosis of HL-60 cells induced by harringtonine. Sci. China C Life Sci. 1998; 41:600–607
[4] da Silva CP, de Oliveira CR, da Conceicao M et al. Apoptosis as a mechanism of cell death induced by different chemotherapeutic drugs in human leukemic T-lymphocytes. Biochem. Pharmacol. 1996; 51:1331–1340
[5] Zhang X, Zhang H, Zheng C et al. Extremely low frequency (ELF) pulsed-gradient magnetic fields inhibit malignant tumour growth at different biological levels. Cell Biol. Int. 2002; 26:599–603
[6] Barbault A, Costa FP, B. 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

[7] . Crocetti S, Piantelli F, Leonzio C. Selective destabilization of tumor cells with pulsed electric and magnetic sequences: a preliminary report. Electromagn. Biol. Med. 2011; 30:128–135
[8] Costa FP, de Oliveira AC, Meirelles R et al. Treatment of advanced hepatocellular carcinoma with very low levels of amplitude-modulated electromagnetic fields. Br. J. Cancer. 2011; 105:640–648
[9] Filipovic NDT, Radovic M, Cvetkovic D et al. Electromagnetic field investigation on different cancer cell lines. Cancer Cell Int. 2014; 14:1–10
[10] Morabito C, Guarnieri S, Fano G et al. Effects of acute and chronic low frequency electromagnetic field exposure on PC12 cells during neuronal differentiation. Cell. Physiol. Biochem. 2010; 26:947–958
[11] Crocetti S. Beyer C, Schade G et al. Low intensity and frequency pulsed electromagnetic fields selectively impair breast cancer cell viability. PLOS One. 2013; 8(9): e72944
[12] Miyagi N, Sato K, Rong Y et al. Effects of PEMF on a murine osteosarcoma cell line: drug-resistant (P-glycoprotein-positive) and non-resistant cells. Bioelectromagnetics. 2000; 2000; 21(2): 112-121
[13] Zimmerman JW, Pennison MJ, Brezovich I et al.. Cancer cell proliferation is inhibited by specific modulation frequencies. Br. J. Cancer. 2012;106:307–313
[14] Zlatnik Elu, Kapkina NN, Zaderin VP et al.Immunocorrective effect of alternating magnetic field in the postoperative period in malignant bladder cancer. Vopr Onkol. 2001; 47(3): 312-314
[15] Kaszuba-Zwoinska J, Wojcik K, Bereta M et al. Pulsating electromagnetic field stimulation prevents cell death of puromycin treated U937 cell line. J Physiol Pharmacol. 2010; 61(2): 201-215
[16] Saliev T, Tachibana K, Bulanin D et al. Bio-effects of non-ionizing electromagnetic fields in context of cancer therapy. Front Biosci (Elite Ed). 2014, 6: 175-184
[17] Nuccitelli R, Pliquett U, X. Chen X et al. 2006. Nanosecond pulsed electric fields cause melanomas to self-destruct. Biochem. Biophys. Res. Commun. 2006; 343:351–360
[18] Nuccitelli R, Tran K, Sheikh S et al. Optimized nanosecond pulsed electric field therapy can cause murine malignant melanomas to self-destruct with a single treatment. Int. J. Cancer 2010; 127:1727–1736.
[19] Tatarov I, Panda A, Petkov D et al. Effect of magnetic fields on tumor growth and viability. Comp. Med. 2011; 61:339–345
[20] Letiagin VP, Protchenko NV, Rybaov IuL et al. Experience with turbulent magnetic field as a component of breast cancer therapy. Vopr Onkol. 2003; 49(6): 748-751
[21] Kirson ED, Dbaly V, Tovarys F et al. Alternating electric fields arrest cell proliferation in animal tumor models and human brain tumors. Proc Natl Acad Sci U S A. 2007; 104(24): 101532-10157
[22] Cameron IL et al. Therapeutic electromagnetic field (TEMF) and gamma irradiation on human breast cancer xenograft growth, angiogenesis and metastasis. Cancer Cell Int. 2005 Jul 26;5:23
[23] Bakhmutskii NG et al. Vopr Onkol 1991;37(6):705-8
[24] Barbault A, Costa FP, B. 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
[25] Costa FP, de Oliveira AC, Meirelles R et al. Treatment of advanced hepatocellular carcinoma with very low levels of amplitude-modulated electromagnetic fields. Br. J. Cancer. 2011; 105:640–648
[26] Tofani S, Cintorino M, Barone D et al. Increased mouse survival, tumor growth inhibition and decreased immunoreacitve p53 after exposure to magnetic fields. Bioelectromagnetics. 2002; 23(3): 230-238
[27] Tofani S, Barone D, Beradelli M et al. Static and ELF magnetic fields enhance the in vivo anti-tumor efficacy of cis-platin against lewis lung carcinoma, but not of cycolphosphamide against B16 melanotic melanoma. Pharmacol Res. 2003; 48(1): 83-90
[28] Filipovic N, Djukic T, Radovic M et al. Electromagnetic field investigation on different cancer cell lines. Cancer Cell Int. 2014; 14: 84
[29] Zhang X, Zhang H, Zheng C et al. Extremely low frequency (ELF) pulsed-gradient magnetic fields inhibit malignant tumour growth at different biological levels. Cell Biol Int. 2002; 26(7): 599-603
[30] Chang H, Li G, Pan Y. Experimental observation on the effect of magnetic field on S-180 sarcomas in mice. Chinese J Physics Med. 1985; 7(3): 169-170
[31] De Seze R, Tuffel S, Moreau JM et al. Effects of 100 mT time varying fields on the growth of tumors in mice. Bioelectromagnetics. 2000; 21(2): 107-111
[32] Ghannam MM, El-Gebaly M, Gaber H et al. Inhibition of Ehrlich tumor growth in mice by electric interference therapy (in vivo studies). Electromag Biol Med. 2002; 21(3): 255-266
[33] Ruiz-Gomez MJ, De Pena L, Prieto-Barcia MI et al. Influence of 1 and 25 Hz, 1,5 mT magnetic fields on antitumor potency in a human adenocarcinoma cell line. Bioelectromagnetics. 2002; 23(8): 578-525
[34] Miyagi N, Sato K, Rong Y. Effects of PEMF on a murine osteosarcoma cell line: drug-resistant (P-glycoprotein-positive) and non-resistant cells. Bioelectromagnetics. 2000; 21(2): 112-121

[35] Emara SO, El-Kholy SM, Kazem A et al. Therapeutic effects of low frequency pulsed electromagnetic fields on rat liver cancer. Res. Inventy Int. J. Eng. Sci. 2013;2:17-18
[36] Williams CD, Markov MS, Hardman WE at al. Therapeutic electromagnetic field effects on angiogenesis and tumor growth. Anticancer Res. 2001; 21(6A):3887–3891
[37] Loja T, Stehlikova O, Palko L et al. Influence of pulsed electromagnetic and pulsed vector magnetic potential field on the growth of tumor cells. Electromagn. Biol. Med. 2014; 33:190–197
[38] Bunch KJ, Keegan TJ, Swanson J et al. Residential distance at birth from overhead high voltage powerlines: childhood cancer risk in Britain 1962-2008. Brit J Cancer. 2014; 110:1402–1408

[39] Hopkins PM. Skeletal muscle physiology. Cont Educ Anesth Critical Care Pain. 2006; 1(1): 1-6
[40] Cheng K, Haspel HC,Vallano ML et al. Measurement of membrane potentials (psi) of erythrocytes and white adipocytes by the accumulation of triphenylmethylphosphonium cation. *J. Membr. Biol*. 1980; 56(3): 191-201
[41] Graf J, Petersen OH. Cell membrane potential and resistance in liver. J Phyiol. 1978; 284: 105-126
[42] Casteels R, Droogmans G, Hendrickx. Membrane potential of smooth muscle cells in K-free solution. J Physiol.1971; 217(2): 281-295
[43] Loutzenhiser R, Chilton L, Trottier G. Membrane potential measurements in renal afferent and efferent arterioles: actions of angiotensin II.Renal Phyiol. 1997;273(2): F307-F314
[44] Gunter KK, Gunter TE. Transport of calcium by mitochondria. J Bioenerg Biomembr 1994, 26:471-485
[45] Nicholls DG, Budd SL. Mitochondria and neuronal survival. Physiol Rev 2000, 80:315-360
[46] Valone TF.Bioelctromagnetic healing, its history and rational for its use. Presented at Whole Person Healing Conference & Tesla Energy Science Conference, Nov 4th and 5th 2003. Washington D.C.
[47] Cone CD Jr. Variation of the transmembrane potential level as a basic mechanism of mitosis control. Oncology 1970; 24(6): 438-70
[48] Wallach DF. Generalized membrane defects in cancer. N Engl J Med. 1969; 280(14): 761-767
[49] Tokuoka S. Morioka H. The membrane potential of the human cancer and related cells. I. Gan. 1957; 48: 353-354
[50] Johnstone BM. Microelectrode penetration of ascites tumour cells. Nature. 1959; 183, 411
[51] Cone CD Jr. Unified theory on the basic mechanism of normal mitotic control and oncogenesis. J Theor Biol. 1971; 30: 151-181.
[52] Marino AA, Iliev IG, Schwalke MA et al. Association between cell membrane potential and breast cancer. Tumour Biol. 1994; 15(2): 82-89
[53] Yang M, Brackenbury WJ. Membrane potential and cancer progression. Front Phyiol. Membrane potential and cancer progression. 2013; 4(185): 1-10
[54] Nuccitelli, R. Endogenous electric fields in embryos during development, regeneration and wound healing. Radiat Prot Dosimetry. 2003;106: 375-383
[55] Nuccitelli R. A role for endogenous electric fields in wound healing. Curr Top Dev Biol. 2003; 58, 1–26
[56] McCaig CD, Song B, Rajnicek AM. Electrical dimensions in cell science. J. Cell Sci. 2009; 122: 4267–4276
[57] Ahlbom A, Day N, Feychting M et al. A pooled analysis of magnetic fields and childhood leukaemia. Br J Cancer. 2000; 83(5): 692-698
[58] Boorman GA, Anderson LE, Morris JE et al. Effect of 26 week magnetic field exposure in a DMBA initiation - promoting mammary gland model in Sprague-Dawley rats. Carcinogenesis. 1999; 20(5): 899-904
[59] Prejean JD, Peckham JC, Casey AE et al. Spontaneous tumors in Sprague-Daweley rats and swiss mice. Cancer Res. 1973; 33: 2768-2773