

Attachment 10

Mexican Society of Bioelectromagnetism

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Abstract In July 2007 physicians, biologist and physicist that have collaborated in previous meetings of the medical branch of the Mexican Physical Society constituted The Mexican Society of Bioelectromagnetism with the purpose of promote scientific study of the interaction of electromagnetic energy (at frequencies ranging from zero Hertz through those of visible light) and acoustic energy with biological systems. A second goal was to increase the contribution of medical and biological professionals in the meetings of the medical branch of the Mexican Physical Society. The following paragraphs summarize some objectives of the Mexican Society of Bioelectromagnetism for the next two years.

The tenth anniversary of the medical branch of the Mexican Physical Society is full of accomplishments. (see G. Herrera remarks). As physician, I see three ways in which we can contribute to this remarkable effort: a) Foster a better understanding of medical physics among clinicians and biologist, b) increase the participation and contributions in the meetings of the medical branch of the Mexican Physical Society and c) augment research projects and contributions in the non-ionizing part of the electromagnetic spectra.

In the modern society electric and magnetic fields are ubiquitous and represent a fastest growing environmental concern. The health risks from exposure to extremely low frequency electric and magnetic fields (ELF-EMF) have been a driving force behind epidemiologic research regarding possible adverse effects of human exposure to electromagnetic fields. Cellular and animal experiments have obtained important advances in the understanding of the interaction of electromagnetic fields with biological systems. Controlled clinical research protocols have demonstrated the beneficial effects of electromagnetic fields in several human diseases, and diffusion of this field among medical professionals and the general public has increased the understanding of electromagnetic fields (EMF) issues.

A) Epidemiologic research regarding possible adverse effects of human exposure to electromagnetic fields

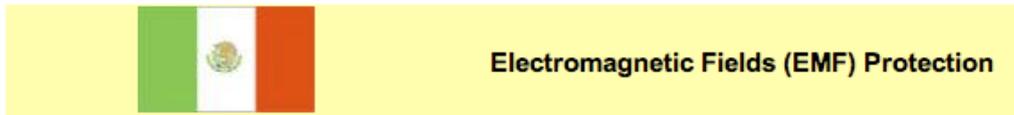
Since electromagnetic fields were first linked to cancer in 1979¹, public anxiety and speculation began to grow. Only the US, costs of mitigation and litigation relating to the electromagnetic-cancer association cost more than 23 billion dollars in a decade². In 1992 the United States Congress instructed the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health and the U.S. Department of Energy (DOE) to start a program aimed at providing scientific evidence about the health risks from exposure to extremely low frequency electric and magnetic fields. The conclusion of this work, published in 1999³, indicated that the scientific evidence suggesting that exposure to ELF-EMF represented a health risk was weak. At approximately the same period, the

American Physical Society published in 1995 a statement declaring that the epidemiological publications associating exposure to electromagnetic fields to cancer were unsubstantiated⁴. However, scientist intrigued by the hypothesis that exposure to EMF fields increases the risk of cancer, continued to work on research projects in areas of major human exposure: a) static and extremely low-frequency magnetic fields, present in high voltage transmission lines, home appliances and equipment used in diagnosis and treatment of diseases. B) radio frequency fields used in radio and TV transmission, mobile phones and industry.

Protective norms against potential exposure hazards were initiated in 1974, when the International Radiation Protection Association formed a working group on non-ionizing radiation. In 1977 this group, became the International Non-Ionizing Radiation Committee, and in 1992, the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This commission has published guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields⁵⁻⁷ and several publications have reviewed the epidemiological literature on EMF and health^{8,9}.

The world health organization responded to the public concern over health effects, creating in 1996 the International EMF project, to assess the scientific evidence of possible health effects of EMF in the frequency range from 0 to 300 GHz, and define internationally acceptable standards limiting EMF exposure. In addition the EMF Project has several publications aimed at governmental and non-governmental authorities that explain how to understand and control the public EMF risk perception, increase a better public understanding of EMF issues and define risk management programs¹⁰⁻¹⁴. Finally a model legislation to implement internationally acceptable standards for EMF exposure was developed¹⁵. Many of these publications are free to download and more information can be reach at: <http://www.who.int/peh-emf/project/en/>

Many countries have implemented the international regulation to protect their societies from EMF exposure. These norms can be seen in the Internet address mentioned above. The page of México show the lack of regulation existing at the present time. One objective of the Mexican Society of Bioelectromagnetism is to propose and adapt in Mexico the international standards for EMF exposure.



Country #1(see notes below)	Mexico
EMF protection #2	unknown
Instrument type #3	
Instrument coverage #4	
Title of Instrument #5	
a.	
b.	
c.	
Issued by whom? #6	
Issued when? #7	
Is there a revision pending? #8	
Are the limits based on ICNIRP? #9	
Compliance #10	
If mandatory - how is compliance verified? #11	
Group protected #12	
Frequency range covered #13	
Quantities #14	
Basic restriction quantities #15	
SAR details #16	
a. averaging time	
b. averaging mass	
c. measurement method reference	
Reference level quantities #17	
Measurement method for reference level quantities #18	
Multiple frequency exposure #19	
Pulsed field exposure #20	
Contact details #21	
Request for limit data #22	

B) Animal and cellular experiments to understand the mechanism of interaction of electromagnetic fields with biological systems.

Living organisms evolved in the presence of two major sources of magnetic and electromagnetic fields. The geomagnetic field generated in the Earth's interior and the electromagnetic fields known as the Schumann resonances and the Whistler Waves. These naturally occurring electromagnetic waves resonate between the ionosphere and the Earth surface and are related to lightning strikes.

The interaction of the Earth magnetic field with living organisms has been investigated through behavioral experiments. This quest found that many organisms orient themselves by sensing the Earth magnetic field, while migrating and homing. Diverse classes of animals have this capability including certain species of bacteria, mollusks, insects, fishes, amphibians, reptiles, birds, and mammals. The ability of an animal to orient its movements with respect to the Earth's magnetic field is referred as *magnetic compass sense*^{16,17}, and the ability to return to a home area, from unfamiliar locations is known as *map*

sense^{16,17}. The physical basis of these behaviors, have been reduced to three principal mechanisms: The first is the discovery of biogenic magnetite that has been studied in magnetotactic bacteria. Magnetoreception is carried out in these organisms by means of magnetosomes, membrane-bound intracellular magnetic particles containing the iron mineral magnetite (Fe₃O₄). This magnetic mineral has also been detected in honeybees, salmon, trout, sea turtles, birds, and several other animals, that use this mechanism to orient themselves to the Earth's magnetic field^{18,19}. A second mechanism involves electromagnetic induction, a mechanism postulated to explain how elasmobranch fish (sharks, skates, and rays) detect the Earth's magnetic field¹⁷. The third alternative involves magnetic field-dependent chemical reactions that are affected by Earth-strength magnetic fields²⁰.

Experiments at a cellular level consider two conditions: a) physical determinants of the non-ionizing radiation i.e.: the thermal vs non-thermal nature of the magnetic and electromagnetic fields and the specific exposure conditions. And b) the biological determinants i.e.: the biological status of the cell. Interactions of EMF at cellular level have demonstrated a growing central role of cell membranes in the reception, transduction and amplification of signals²¹. ELF-EMF increase Ca⁺⁺ influx, activate the transduction cascade²², interact with DNA²³, increase gene expression²⁴, up-regulate the synthesis of growth factors^{25,26}, among many other effects reported. These biophysical mechanisms are behind biological effects such as: angiogenesis, extra-cellular matrix and bone formation, cell growth, cell proliferation and apoptosis, to mention just a few. In Mexico several groups have been working independently in the interaction of electromagnetic fields with biological systems, the Mexican Society of Bioelectromagnetism, will provide a forum to exchange ideas among these investigators.

B) Biomedical research on the beneficial effects of electromagnetic fields.

Electromagnetism is one of the central fields of physics research, EMF are responsible for good part of the industrialization of modern societies and modern biomedical technology. On the other hand, medicine, biochemistry, molecular biology and physiology, constitute the rational basis of scientific medicine. These two disciplines form the scientific background behind the clinical applications of ELF-EMF^{27,28}, that have been successfully documented in the treatment of fractures and non-unions²⁹, spinal fusions³⁰, nerve regeneration³¹, wound healing³², osteoarthritis and arthritic pain³³, among other clinical applications. It is the aim of the Mexican Society of Bioelectromagnetism to impulse the application of the beneficial effects of ELF-EMF.

D) Diffusion

The use of ELF-EMF provides a non-invasive, safe, easy and less expensive method to treat disease and it is important to diffuse the scientific foundations of these technologies among the medical community. Several scientific journals are dedicated to the publication of bioelectromagnetic research and the acceptance of these works in other prestigious journals has increased logarithmically in the last decade.

Better public understanding of EMF issues is essential in risk perception, protection from exposure and acceptance of the beneficial effects of ELF-EMF. To achieve this goal it is necessary to explain the nature of bioelectromagnetism in public forums, radio and TV, and local journals focused to the general public. Diffusion of EMF issues and complete a library of EMF Journals and books, will be an activity of this Society.

I invite you to join the Mexican Society of Bioelectromagnetism, participate in the definition of the Mexican EMF standards, study the nature of electromagnetic field interaction with living systems, investigate the beneficial effects of the electromagnetic fields and diffuse the knowledge of this field to the general public

Thank you,



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