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IN THIS ISSUE...

IN MEMORIAM: SHIN-TSU LU (1943 - 2009)

BY JANIE PAGE

Longtime BEMS member Dr. Shin-Tsu Lu (June 13, 1943 - September 18, 2009) devoted his career to radiation biology and made numerous contributions to the understanding of microwave bioefffects. He is survived by his loving wife Shwu-Jen Lu, sister Pai-Ho Lu, brother Ming-Fu Lu, sister Hing-Hong, son John Lu, son Robert Lu and his wife Irene Tham, and granddaughters Alexis Lu and Samantha Lu.

He was born in Taipei, Taiwan. He graduated from Taiwan University with a BVM and the University of Rochester with a PhD in radiation biology. He worked 14 years in at the Department of Biophysics, School of Medicine and Dentistry at the University of Rochester where he developed a research program in endocrinological and immunological effects of microwave radiation and ELF and Cancer. Over the years Dr. Lu's work examined biological effects of microwave and radio frequency radiation; biological effects of extremely low frequency electric and magnetic fields; endocrinology; thermal regulation; cardiovascular physiology, experimental surgery; radiation biology, histology, statistics, laboratory animal medicine, reviewing scientific findings, grants, and contract applications, experimental design and interpretation; and many computer skills.

In 1990 Dr. Lu joined the McKesson BioServices Co. in Rockville, MD as a Research Physiologist and conducted microwave bioeffects research at the Walter Reed Army Institute of Research (WRAIR), Forest Glenn, MD. In 1994, he continued this research at Brooks Air Force Base, Texas where McKesson BioServices operated the Microwave Bioeffects Branch of the US Army Medical Research Detachment of the WRAIR. While there, Dr. Lu studied biological effects of high peak power microwaves and published original research papers on microwave induced eye injuries and several review papers.

From 2001 through 2004, Dr. Lu was the Project Manager of a group developing and standardizing microwave dosimetric procedures such as calorimetric and thermometric procedures for in vivo and in vitro radiofrequency radiation dosimetry. In May of 2005 Dr. Lu joined the Naval Health Research Center, also at Brooks AFB, TX, where he continued his research on the biological effects of nonionizing radiation and electrical stimulation on organ systems of the body.

Dr. Lu applied this knowledge to the development of safety standards. He worked on the IEEE Standards Coordinating Committee 28 SCC-28, Subcommittee IV in vivo Review Working Group on biological effects of radiofrequency radiation from 1997 until his death. He was a member of the Bioelectromagnetics Society and the IEEE Engineers in Medicine and Biology Society. He was an invited speaker at many national and international symposia most notably as an Invited speaker at the Third International Conference on Electromagnetic Fields and Human Health, Fundamental and Applied Research, Moscow-Saint Petersburg, Russia, September 2002. He authored more than 70 scientific publications and 61 scientific presentations.

RISK ASSESSMENT AND TERMINOLOGY IN NIR ICNIRP/WHO INTERNATIONAL WORKSHOP 23-24 NOVEMBER 2009, SALZBURG, AUSTRIA

Risk Assessment and Terminology in NIR ICNIRP/WHO International Workshop 23-24 November 2009, Salzburg, Austria

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) held an International Workshop "Evaluation and Communication of Scientific Evidence and Uncertainty - Towards a Consistent Terminology in Non-Ionizing Radiation" on 23-24 November 2009 at the Old Library at the University of Salzburg, Hofstallgasse 2-4, Austria. The Workshop is co-sponsored by the World Health Organization (WHO).

Background

National and international health related agencies use different systematic approaches for evaluating scientific evidence on which to base health policy. These processes provide a structure that formalizes quantitative and qualitative assessments of the risk to health and prescribe specific language to communicate the strength of evidence. Applying quantitative evidence review to the effects of non-ionizing radiation on human health is under discussion. Another challenge is to provide an accurate translation of scientific information and terminology for the media, policy-makers and the general public.

The workshop will allow a discussion of quantitative and qualitative classification of risk and of levels of uncertainty and variability based on the scientific evidence at hand. Examples from different national and international bodies and disciplines will be presented. Expected outcomes are the development of both a simple classification approach and a narrative evaluation that can describe the strength of evidence and the relevance of different types of studies (epidemiological, animal and human laboratory).

In the special session organized by the research network on the Implications of Biomedicine for the Assessment of Human Health Risks (IMBA) the focus will be on emerging genomic technologies, i.e. the use of micro-arrays in cancer risk assessment. The interpretation of these arrays amplify the already existing risk characterization and communication problems.

Objectives

- To develop a shared vision among agencies on the approach to evaluating scientific evidence for health risks from NIR exposure;
- To decide on a consistent terminology in NIR;
- To discuss ways of describing the scientific terminology in lay-person's

terms to ensure the best, accurate, evidence based information for the public.

For further information, see www.icnirp.org

BEMS ELECTION SCHEDULE ANNOUNCED

Phil Chadwick, Secretary of the Bioelectromagnetics Society, recently announced the schedule for the 2010 election of officers. If you are a Member of the Society, you may suggest to the Nominating Committee potential candidates for the positions to be filled. Candidates must be Members of the Society. It would be helpful to determine the potential candidate's willingness to serve before suggesting his or her name. The option for nomination by petition is also described below.

1. THE 2010 ELECTION SCHEDULE IS AS FOLLOWS:

- January 4, 2010 - Deadline for receipt by the Chairman of the Nominating Committeeof nomination suggestions and/or petitions signed by 5% of the qualified (voting) members. (Be sure to renew your membership.)
- April 1, 2010 - Election open, ballot distributed to the voting members.
- April 30, 2010 - Ballot closed. Announcement of the election results on website.
- June 17, 2010 - 32nd Annual Business Meeting – new Board term begins.

2. LIMITATIONS ON NOMINATION SUGGESTIONS:

Article IV, Paragraph 8 of the Constitution states "No Officer or Member of the Board, except the Editor-in-Chief, shall be eligible for election to the same office for two (2) consecutive terms." Current Officers and Board Member and the final year of their terms of office are:

OFFICERS

- Michael Murphy, President (2011)
- Jeff Carson, Vice President/President-Elect (2012)
- Niels Kuster, Past-President (2010)
- James Lin, Editor-in-Chief
- Vijayalaxmi, Treasurer (2010)
- Philip Chadwick, Secretary (2010), Treasurer-Elect (2012)

BIOLOGY /MEDICAL SCIENCES

- Carl Blackman (2010)
- Maren Fedrowitz (2010)
- David Black (2011)
- Ann Rajnicek (2011)
- Maria Scarfi (2012)
- Thomas Vernier (2012)

ENGINEERING/PHYSICAL SCIENCES

- Indira Chatterjee (2010)
- Art Thansandote (2011)
- Osamu Fujiwara (2012)

AT LARGE

- Chiyoiji Ohkubo (2010)
- Andrei Pakhomov (2011)
- Andrew Wood (2012)

3. POSITIONS TO BE FILLED

- Vice President (President/Elect)
- Two (2) Members for the Biological/Medical Sciences, both three (3) year terms (ending 2013)
- One (1) Member for the Engineering/Physical Sciences, a three (3) year term (ending 2013)
- One (1) Member at Large, for a three (3) year term (ending 2013)

4. MECHANISMS FOR NOMINATING POTENTIAL CANDIDATES

If you are a Member of the Society, you may suggest to the Nominating Committee potential candidates for the positions to be filled. Candidates must be Members of the Society. It would be helpful to determine the potential candidate's willingness to serve before suggesting his or her name.

To further exercise your rights and privileges in the nominating process, you may nominate by petition, by-passing the Nominating Committee process for naming candidates. The origin of nominations, whether by petition or Nominating Committee action, will not be designated on the official ballot and the candidate's names for each position will be in alphabetical order. With approval of the recent Constitutional Amendment a petition nominating a candidate must contain the signatures and names of five percent (5%) of eligible Members of the Society (for this election 20 names are required) and must be received according to the guidelines indicated below.

To be included on the ballot, each nominee must consent to stand for election and should submit with the petition a short biographical sketch and photograph, which will appear with the Ballot Materials.

The format of the sketch should have a total length of approximately 8 - 10 typed lines with this general form:

- LAST NAME, First (or normally used) name, middle initial
- Present job title and affiliation.
- Education.
- Professional employment history.
- Highlights of research and/or professional activities.
- Research interests.
- Professional societies, etc.

Send your nomination suggestion or petition to Niels Kuster by email (preferred): nk@itis.ethz.ch or by surface mail to

IT'IS Foundation
Zeughausstrasse 43
Zurich, 8004, Switzerland

Names suggested or petitioned must be received by Dr. Kuster no later than **January 4, 2010** to appear on the ballot.

SUMMARIES OF RESEARCH PUBLISHED IN BEMS JOURNAL IN 2009

*Editor's note: The Bioelectromagnetics Society recently implemented a "Best Paper" award (see related call for nominations in this issue of the newsletter). While not directly connected with that award, several recently published authors have submitted summaries of their work for publication here (and in issues 207 and 208 of this newsletter). We publish them **in the order received** as space is available. In providing additional focus on the reported research, it is our hope that communication within the society is enhanced, providing a stronger basis for assessing and selecting the best paper(s) published each year.*

We invite all authors of recently published full research articles in the Bioelectromagnetics journal (Volume 30, Numbers 1 - 8, 2009) to provide a short summary of the background and context of the research documented in their articles so that Society members can from different disciples can better understand the reported work. For copyright reasons, these summaries are different from the abstracts published in the journal. Send summaries for publication in this newsletter to bemsnewsletter@gmail.com.

Effect of Weak Combined Static and Extremely Low-frequency Alternating Magnetic Fields on the Tumor Growth in Mice Bearing the Ehrlich Ascites Carcinoma

Bioelectromagnetics, Volume 30, Number 5, pages 343-351 (2009)

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Summary by Vadim V. Novikov

This work is the result of the accidentally detected experimental fact of the strong beneficial effect of weak combined magnetic fields (MF) on the organism of mice with the intraperitoneally inoculated Ehrlich ascites carcinoma (EAC).

Our earlier experiments have been conducted in a relatively simple physicochemical system consisting of a solution of amino acids and electrodes from inert material to which low voltage was applied (tens of mV), and very weak collinear direct and alternating magnetic fields (DC corresponds to the geomagnetic range; AC corresponds to the range of natural fluctuations of the geomagnetic field of tens and hundreds of nT) [Novikov, Zhadin, 1994; Zhadin et al., 1998]. We found that the solution responds to the weak field by a jump-like enhancement of the ionic current. Interestingly, the effect was maximal at the cyclotronic frequencies of amino acids and depended on the amplitude of AC in a nonlinear manner.

We chose to examine the effect of these fields on different biological processes (regeneration of planarians, tumor growth, and others) which were shown by a number of authors to be sensitive to weak MF (Liboff; Blackman; Lednev; Akoev, and others). Even the first experiments showed that the whole-body exposure to weak MF at particular regimes (determined in special experiments) produces a pronounced antitumor effect [Novikov et al., 1996].

The present work was devoted to the detailed study of this effect. The study was performed on a rather great experimental material (about 1500 mice); the dependence of the effect on the amplitude of the alternating component of MF at different frequencies was examined in detail. To avoid the possibility of artifacts and provide the validity of measurements, experiments were carried out using the method of double-blind control and adequate methods of statistical processing of the results.

As a result, the parameters of the ultralow-frequency (1, 4.4, 16.5 Hz or the sum of these frequencies) extremely weak (300, 100, 150—300 nT, according to frequencies) alternating component of combined magnetic fields (MFs) have been found at which the exposure to MFs induces a marked antitumor activity, specifically, the inhibition or suppression of the growth of Ehrlich ascites carcinoma (EAC) in mice. It was shown that the exposure of mice with EAC to the alternating MF (sum of frequencies 1 Hz, 300 nT; 4.4 Hz, 100 nT; 16.5 Hz, 150 nT in combination with a collinear static magnetic field of 42 μT) causes structural changes in some organs (liver, adrenal glands), which are due probably to the total degradation of the tumor tissue. In mice with transplanted EAC, the tumor tissue after the exposure to weak MFs was practically absent, as distinct from control animals in which the invasion of the tumor into the adipose tissue surrounding the kidneys, mesenteric lymph nodes, and spermatic appendages was observed. In animals without tumors, no pathological deviations from the norm in the structure of organs and tissues occurred after exposure to weak MF, indicating that this factor per se is not toxic for the organism.

The importance of this study for Bioelectromagnetics is that it revealed a very great potential of investigations along this line, in particular, the pronounced inhibiting action on tumor growth. The inhibition of tumor growth is related to the activation of the system of natural resistance (macrophages, the tumor necrosis factor) and probably the endocrine system (adrenal glands). We believe that the most probable primary damaging agents that mediate the effect of MF on the tumor tissue are reactive oxygen species.

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Effects of 60 Hz 14 μT magnetic field

on the apoptosis of testicular germ cell in mice

Bioelectromagnetics, Volume 30, Number 1, pages 66-72 (2009).

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Summary by Yoon-Won Kim

Sixty Hz electromagnetic fields (EMF) are generated from human-made sources such as domestic electric devices, electric transport system, etc. The 60 Hz EMF is not a natural electromagnetic wave and it may affect human health, therefore, it has triggered an increasing interest among researchers as well as the general population. We have been studying the impact of 60Hz EMF on human health for the last 10 years.

We showed a biological effect of 60 Hz extremely low frequency (ELF) elelctromagnetic field (EMF) in a mice multi-generation study [Kim et al., 2001]. Mice were continuously exposed to 60 Hz of 5 kV/m, 30 kV/m, 0.5 mT and 1.5 mT from the first to the third generation. Interestingly, the testicular weight was decreased in the group of 1st and 2nd generation mice exposed to 60 Hz MF of 0.5 mT or 1.5 mT for 46 weeks.

It is speculated that the 60 Hz MF may affect the most actively growing and differentiating tissue, for example testicular germ cell tissue. Therefore, we evaluated the effect of exposure to 60 Hz MF of 0.1 mT or 0.5 mT on the testis of mice for 8 week [Lee et al., 2004]. In that report, the 60 Hz MF exposure did not significantly affect the body weight or the testicular weight, but significantly decreased the testicular biopsy score and increased the testicular germ cell apoptosis.

In the present study, we further extended our previous findings by showing that the apoptotic death of testicular germ cells induced by continuous exposure to 14 μT for 16 weeks. We chose 14 μT MF exposures in this experiment because the maximum EMF under Korean power lines is about 14 μT in non-restricted areas. Also, exposure to 200 μT was used as a positive control in the experiments.

The safety guideline of International Commission on Non-Ionizing Radiation Protection (ICNIRP) is a set for the momentary exposure. Therefore, we are now doing animal studies to find the reasonable safety guideline by using various parameters like dose- and time-dependent effect of exposure to 60 Hz MF based the histology and function of testis.

Effects of Strong Static Magnetic Fields Used in Magnetic Resonance Imaging

on Insulin-Secreting Cells

Bioelectromagnetics, Volume 30, Number 1, pages 1-8 (2009).

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Summary by Junji Miyakoshi

Magnetic Resonance Imaging (MRI) machines are non-invasive diagnostic units with no requirement for exposure to ionizing radiation that are widely used in clinical fields worldwide. The strength of the static magnetic field used in MRI has gradually increased, with 6 T instruments coming into clinical use in the United States. However, few studies have been conducted on the biological effects of static magnetic fields with strengths higher than 1 T. Therefore, there is no evidence to support the biological safety of the high magnetic field strengths in modern MRI machines, and this may pose a serious risk of exposure to strong static magnetic fields in common future applications.

In this paper, we assess the biological effects on insulin-secreting cells of strong static magnetic fields of the sort used in MRI machines, in an effort to address this problem. The development and progression of diabetes mellitus is also associated with loss of insulin-secreting cells, and therefore our assessment of the effects of strong static magnetic fields on these cells may produce significant results regarding the development of diabetes mellitus, for which the morbidity rate has grown steadily worldwide.

Insulin-secreting cells were exposed to strong static magnetic fields (density; 3 to 10T, field gradient; 0 to 41.7 T/m) for 30 min to 1 h to assess the effects on insulin production during exposure, and on the insulin gene expression level, response to glucose stimulus, insulin content, intracellular mitochondrial activity, and cell count immediately after exposure. Insulin production increased during 1-hour exposure to a strong magnetic field (gradient 41.7 T/m) and insulin gene expression was upregulated immediately after exposure. An increase in the response to glucose stimulus occurred after 30-minute exposures to static magnetic fields of 3 to 10 T. The intracellular mitochondrial activity, cell count, and insulin content did not vary after exposure.

These findings demonstrate that MRI machines using strong static magnetic fields have few effects on insulin-secreting cells. Furthermore, the findings of our study, which was conducted as part of a cellular assessment of the effects of strong static magnetic fields, suggest that treatment of diabetes mellitus patients by exposure to strong static magnetic fields may be feasible.

Prolonged weakening of the geomagnetic field (GMF)

affects the immune system of rats

Bioelectromagnetics, Volume 30, Number 1, pages 21-28 (2009).

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Summary by Adam Roman

The biological effects of geomagnetic field (GMF) disturbances are not a well-known phenomenon, but they have recently been attracting more and more attention, which is reflected in numerous publications. These issues seem interesting because of their cognitive and practical importance. “Bioelectromagnetics” appears to be the most suitable journal to present the results of investigations into the above-mentioned subject-matter.

In the era of rapidly proceeding industrialization and the spectacular development of technology, the GMF is often disturbed by various metal constructions or interior design elements such as, e.g., steel elements found in almost every building and means of transport. Such problems are also encountered in livestock, especially in animals kept on industrial and semi–industrial animal farms, which are bred and raised in metal cages.

At our university (The University of Agriculture in Cracow), studies into the influence of geomagnetic field disturbances on animals were initiated by Prof. Tomasz M. Janowski in the nineteen eighties. Professor T. M. Janowski was the scientific supervisor of the Ph.D. thesis of B. Tombarkiewicz, M.Sc., who studied the effect of natural disturbances of the GMF (geopathogenic zones) on cows.

The impulse to undertake that research arose from the fact that in some stalls of the cowshed, certain health problems (including death) of unexplained pathogenesis had occurred for many years. It was found that cows kept in those stalls showed changes in the blood picture (an increased number of leucocytes, a decreased number of lymphocytes) and alterations in the concentration of some elements in hair [Tombarkiewicz, 1996].

The measurement carried out in those stalls using the Geo-Magnetometer BPM 2010 (Bio-Physik Mersmann GmbH), showed disturbance of the GMF, which measured 10 μT/m on the Mersmann scale [Mersmann, 1983] and was considered to be very high. Another investigations revealed that sows chose places free from the geomagnetic field in pens (caused, among others, by metal troughs and bars separating resting and manure areas) [Tombarkiewicz et al., 1998]. The latter findings made us carry on our research into the influence of anthropogenic disturbances of the GMF on animals.

Our paper, recently published in Bioelectromagnetics [Roman & Tombarkiewicz, 2009], proposed that long-term shielding of the GMF may affect some immunity parameters in rats. We observed a delay in physiological thymus involution, an increased number of peritoneal macrophages and a diminished ability of macrophages to release nitric oxide and to synthesize the superoxide anion. Those effects were differentially expressed in males and females. We proposed that the observed changes in the immune system occurred as a consequence of the protective effect of GMF shielding on the circadian rhythm-dependent level of melatonin.

In the past years we undertook multidisciplinary studies on three generations of laboratory rats of the Wistar strain, kept under conditions of long-term GMF shielding. The aim of our investigation was to search for an effect of the hypomagnetic conditions on biological parameters, including the whole organism, selected organs, various kinds of cells and their metabolic and biochemical parameters, as well as for an impact on reproduction indices, body weight gains and the mental condition of animals. Furthermore, we also tried to find out how strong such an effect was.

A paper by Tombarkiewicz, published in Environmental Toxicology and Pharmacology [Tombarkiewicz, 2008], showed that long-term GMF deprivation caused a reduction in the iron, copper, chromium and manganese content of hair in rats from experimental groups compared to control animals kept under undisturbed GMF conditions.

Changes in the sodium and potassium content of hair, hematological disturbances, alterations in stress hormone concentration in the blood, behavior disorders and an increased body weight were observed in rats kept under hypogeomagnetic conditions (unpublished results). Those changes were often sex-dependent. Histological analyses revealed a hyaline degeneration of kidneys in rats kept under weakened GMF conditions (unpublished results). In the available literature there are reports on anatomical and functional disturbances in amphibians [Asashima et al., 1991] and mammals [Kopanev et al., 1979; Zhang et al., 2007], caused by a shielded GMF.

Our studies give further support to these reports. Moreover, in all generations (F1, F2, F3) of the experimental group offspring, a certain number of blind rats were born. In a group of rats kept under hypomagnetic conditions, the number of blind rats of the F1 generation amounted to 4% of the total number of the animals born, while in F3 generation rats that percentage was as high as 8.2%. Recent genetic investigations carried out by Prof. J. Styrna of the Department of Genetics and Evolutionism of the Institute of Zoology, the Jagiellonian University, were aimed at explaining the mechanism of blindness. It is noteworthy that no case of blindness or any change in kidneys was found in any generation of control rats (kept under normal GMF conditions).

The majority of the studies discussed above are still in the stage of being prepared for publication.

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Exposure to a MRI-type high-strength static magnetic field stimulates megakaryocytic/erythroid hematopoiesis in CD34+ cells from human placental and umbilical cord blood

Bioelectromagnetics, Volume 30, Number 4, pages 280-285 (2009).

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Summary by Ikuo Kashiwakura

Man-made static magnetic fields (SMF) are used in research and in medical applications, such as in magnetic resonance imaging (MRI) which provides three-dimensional images of the brain and other soft tissues. Scanned patients and machine operators can therefore be exposed to very high-strength SMF. The biological response after exposure to a high-strength SMF has recently been widely discussed from the perspective of possible health benefits as well as regarding potential adverse effect. Guidelines for patient exposure to MRI are given by The U.S. Food and Drug Administration and International Electrotechnical Commission, the National Radiological Protection Board and International Commission on Non-Ionizing Radiation Protection [Rockville, 1982; IEC 60601-2-33, 2002; Kanal E, 2002; International Commission on Non-Ionizing Radiation Protection, 2004].

Despite these guidelines and the study of various biological effects induced by a high-strength SMF [Miyakoshi, 2005], there are still important safety issues regarding exposure to high-strength SMF. The hematopoietic system is sensitive to extracellular oxidative stresses, such as radiation or chemotherapy [Hamimovitz-Friedman, 1998; Wright et al., 1998; Nagayama et al., 2002; Schmidt-Ullrich et al., 2000; Kashiwakura et al., 2007]. However, very few studies have so far described the effects of SMF on the proliferation and differentiation of human hematopoietic stem-progenitor cells, in comparison to other cellular investigations.

In order to clarify the biological response of human hematopoietic stem-progenitor cells after exposure to a high-strength SMF, CD34+ cells prepared from human CB were exposed under conditions of 10-T SMF without any cytokine stimulation in vitro. The exposed CD34+ cells to SMF for 16 hrs resulted in a significant increase in the total megakaryocytic and erythroid progenitor cells-derived colony formation in comparison to the sham control.

By the analysis of genes expression, early hematopoiesis-related genes, such as c-KIT, GATA2, RUNX1 and TEL, and cell cycle-related genes, such as CDC25B and ERN1, were found to be significantly higher in the cells exposed to SMF in comparison to the sham control.

These results suggest that the 10-T SMF exposure may change gene expressions and result in the specific enhancement of megakaryocytic/erythroid progenitor (MEP) differentiation from pluripotent hematopoietic stem cells and/or the proliferation of bipotent MEP.

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Evaluation of Current Densities and Total Contact Currents in Occupational Exposure at 400 kV Substations and Power Lines

Bioelectromagnetics, Volume 30, Number 3, pages 231-240 (2009).

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Summary by Leena H. Korpinen

We decided to do the research because the European Union published the new directive proposal 2004/ 40/EC and in earlier studies at TUT, we had measured electric fields in eight 400 kV substations (owned by Fingrid Oyj) which exceeded the action value (10 kV/m) of the directive 2004/40/EC. The action value was exceeded locally and the highest value was 12.4 kV/m. According to the directive proposal, when the action value is exceeded, it has to be assessed whether the exposure limit value (10 mA/m2) is also

exceeded.

Before this study, some research groups had published different computational models which they used to calculate electric currents induced in human body from electric fields. In addition, there had been publications of measurement results reached using a mannequin simulating the human body (physical model).

Our idea was to use a new measurement system to be able to measure the currents in the head and body of a worker who is actually working in the field, i.e. moving and taking different positions. Then we calculated the average current density in the neck because the highest current density in the central nervous system is usually induced in the neck. With the help of conductivities, the current densities in different tissues can also be calculated.

The goal of the study was to investigate occupational exposure at 400 kV substations and power lines. Using the new measurement system we determined the current density in the neck in different kinds of work situations. In addition, we measured the total contact current which also has an action value in the directive.

In our measurements, some workers voluntarily simulated their normal work tasks (151 measured cases) using the new measurement system in 400 kV substations, in 400...110 kV towers and the cutting of vegetation under 400 kV power lines. The highest calculated average current density in the neck was 6.4 mA/m2 and the highest total contact current was 458.4 μA. These values do not exceed the limit or action values (10 mA/m2 and 1 mA) of the new EU-directive proposal 2004/40/EC.

Our paper discusses currents induced in human body by electric fields under power lines and at 400 kV substations. This question is part of bioelectromagnetical research. Our paper can provide new ideas and knowledge to other research groups in the same area. For example, other groups can compare their calculated results to our measurements and take the ideas further.

A Newly Designed and Constructed 20 kHz Magnetic Field Exposure Facility for invivo Study

Bioelectromagnetics, Volume 30, Number 1, pages 36-44 (2009).

Tsukasa Shigemitsu

Japan EMF Information Center

http://www.jeic-emf.jp

Summary by Tsukasa Shigemitsu

To introduce recent research trend of biological effects of intermediate frequency (IF) magnetic field in Japan, first, I would like to give you the brief review of background of these researches:

For more than 30 years, research has been conducted on biological and health effects of extremely low frequency (ELF) electromagnetic field. After the evaluation of these researches, World Health Organization (WHO) released the Environmental Health Criteria for Extremely Low Frequency Fields in 2007 (WHO, 2007). Currently research is actively being conducted on biological and health effects of high frequency (RF) electromagnetic field. The WHO is planning to conduct a risk assessment for RF electromagnetic field and develop Environmental Health Criteria for this field in a few years.

In recent years, various devices including household induction heating (IH) cookers, RFID tag readers and electronic article surveillance (EAS) tags for theft prevention have been using IF for their operating frequencies. Thus, interest in the biological effects and health risk assessment for IF magnetic field from tens of kHz to about 100 kHz is growing.

For example, household IH cookers have gained popularity in Japan. IH cookers generate magnetic field at frequencies around 20 kHz. As IH cookers become popular, concerns have been raised regarding the relationship between IF magnetic field and human health. It becomes necessary to clarify biological effects of IF magnetic field from the standpoints of safety and consumer peace of mind. Compared to the research on ELF and RF electromagnetic fields, very few studies have addressed the biological effects of IF magnetic field.

There is a global consensus that there is insufficient basic research information on biological effect and health risk assessment of IF magnetic fields (Shigemitsu et al., 2007). The WHO Environmental Health Criteria (EHC 238) noted the need for assessment of the health risk of IF magnetic field. Especially since sufficient research for health risk assessment had not been conducted, the need for exposure assessment, epidemiological and human laboratory experiments as well as animal and cellular experiments was identified.

In Japan, there is a long history of research on biological effects of ELF and RF electromagnetic fields and these works have been recognized by BEMS members for its outstanding results (Otaka, 2001). Based on these traditional situations, and in order to ensure safety to IF magnetic field exposure, pioneering research on the biological effects of IF magnetic field has been started in Japan. Although several universities have taken lead from about 5 years ago in this field, the Central Research Institute of Electric Power Industry (CRIEPI) has started to conduct experimental research project with animals and cells, starting with the design and development of world leading IF magnetic field generating equipment and has succeeded in the development of animal exposure facilities (Shigemitsu et al., 2009). The environmental conditions are controlled and a specific pathogen-free (SPF) environment is achieved to meet the request of animal exposure experiments. Animals can be reared and a continuous exposure to 20 kHz magnetic field can be maintained in this facility.

The facility has been already used for experiments with pregnant rats that have shown that there were no effects on fetal rat organogenesis. In parallel to animal exposure experiments, cellular exposure experiments have been initiated (Nakasono et al., 2008). CRIEPI's IF magnetic field research project leader, Dr. Negishi said to me, CRIEPI has been using the new animal facility to investigate toxicological and reproductive effects by in vivo studies, and effects on genes and chromosomes by in vitro studies to accumulate replicable data and compile scientific knowledge for health risk assessment. He said CRIEPI might conduct the carcinogenicity experiment in future research.

In vitro study of IF magnetic fields have been initiated by Prof Miyakoshi of Hirosaki University. In these cellular experiments, microorganisms and cells were used to investigate the mutagenic effects of IF magnetic field. Some of these results have been published in BEMS (Miyakoshi et al., 2007). The in vitro exposure systems for IF magnetic fields have also developed by Panasonic and Tokyo Utility Power Company (Fujita et al., 2007).

In addition to above, a new research project called "Health risk evaluations of IF magnetic field in house environment" has just started in 2009. Prof Ohkubo of Meiji Pharmaceutical University, Director of the JEIC, is the principle investigator. The project has a 4 year plan for animal and cellular experiments. Consideration of plans for epidemiological research has been also planned, if the results of the project need further evaluation of IF magnetic exposure effects on human. Research funding of this new research project is being provided by the Ministry of Health, Welfare and Labor. Researchers from Tokyo Metropolitan University, National Institute of Information and Communications Technology, National Institute of Public Health, Railway Technological Research Institute, Meiji Pharmaceutical University are participating in this new research project.

Japanese researchers have initiated research addressing the biological effects of IF magnetic field and published already various results in BEMS. Japanese initiative research projects investigating the biological effect of IF magnetic fields are accumulating fundamental data and these data are expected to make substantial contributions to IF magnetic field effect research and health risk assessment. New experimental results of ongoing research project were presented in BioEM2009, June, Davos (Ikehata, 2009).

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BEMS MEMORIAL FUND COMMITTEE

The mission of the Memorial Fund Committee is to regularly honor the memory of individual deceased BEMS members in a manner that is appropriate to the deceased and in accord with the principals and philosophy of The Society. Consistent with this, the Memorial Fund Committee invites BEMS members to contribute information about BEMS members who have passed on. Information can be submitted to any of the members of the committee listed below. The type of information solicited about the deceased includes: birth date and place of birth, date of death and location, description of the research conducted and how it relates to BEMS, whether the person was a BEMS member, cause of death, etc.

Written contributions to the write-ups on BEMS members who are already honored on this website will also be greatly appreciated by the committee.

Please also feel free to contact either the chair or any of the members of the committee in order to contribute funds in the name of any of the deceased. These funds have in the past typically been used for presenting cash awards to students who present papers at the annual BEMS conferences.

The specific objectives of the Memorial Fund Committee are to:

- communicate with friends and relatives of the departed about their thoughts on honoring the deceased
- collect information and thoughts from all BEMS members on whom to memorialize and how they might be best memorialized
- solicit money in the name of deceased individuals in coordination with the Developing Committee
- administer the fund in a manner determined by the Committee
- decide on the type and size of the awards made in the name of a deceased BEMS member
- develop consensus on written statements describing the award, its purpose and operations
- develop consensus on other Committee actions including announcements, booklets at the Annual Meeting, Certificates, Memory Book, Web discussion boards, etc.
- recognize memorial contributions in the BEMS newsletter or on WebPages
- assist the Board in matters of eulogies and condolences to next of kin
- make recommendations, subject to approval by the Board, on the number and amount of awards
- coordinate Memorial Fund distributions with the Awards Committee
- cooperate with the Technical Program Chair and Development Committee on the selection of speakers and funding for presentations (poster or oral presentation) in memory of specific BEMS members at annual BEMS meetings

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A SHORT HISTORY OF URSI COMMISSION K

In 1993, in Kyoto Japan, Commission K, now known as the International Union of Radio Science (URSI) Commission on Electromagnetics in Biology and Medicine held its innaugural scientific session.

The driving issue behind the creation of Commission K at that time was health risk assessment mainly related to mobile telephony. Today there are a wide range of new EMF-emitting devices (e.g., WiFi, Wimax, RFID) linked with dosimetric and standardization issues, and the biomedical applications of biomedical imaging (eg, very high field MRI, microwave imaging, thermal imaging, near infrared imaging, optical imaging and hybrid imaging including optical/acoustic and microwave/acoustic), electrical mapping (eg, electrical encephalography or EEG and electrical magneto encephalography or EMG) and electrical simulation (eg, direct electrical stimulaton and inductive non-invasive stimulation).

At the time of the next URSI General Assembly and Scientific Symposium (XXXth URSI GA) in Istanbul, Turkey, from 13 to 20 August 2011, it will have been almost 20 years since this historic meeting. Recognizing this, James C. Lin, Paulo Bernardi, and Jorgen Bach Andersen recently published "The Formation and Early Years of URSI Commission K on Electromagnetics in Biology and Medicine" (The Radio Science Bulletin, September 2009, ISSN 1024-4530, No. 330, pages 51-58.) to document the progress, publications, and presentations that have taken place under the auspices of this group.

A link to the publication referenced in this article can be found at http://ursi-test.intec.ugent.be/?q=node/63 (http://ursi-test.intec.ugent.be/?q=node/63)

FOLLOW UP: OCCUPATIONAL EXPOSURE TO EMF: PAVING THE WAY FOR A FUTURE EU INITIATIVE

The deadline for transposition of EU directive 2004/40/EC on occupational exposure to electromagnetic fields (EMF) intended to be implemented in the member states by 30th of April 2008 has been postponed until 30th of April 2012 due to the fact that new scientific studies on the impact on health of exposure to electromagnetic fields have been made public after the directive was adopted and been brought to the attention of the European Parliament and the Council. These studies may shed another light on some difficult issues regarding how to deal with the exposure in some specific situations, like for instance workers near a magnetic resonance imaging (MRI) scanner.

A meeting on this topic was held in Umea, Sweden from 6-8 October 2009. Final reports from this meeting are still in development and may be viewed, when completed, at http://www.av.se/inenglish/aboutus/eu/electromagnetic.aspx

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CALENDAR (NL ISSUE 210)

INTERNATIONAL CONFERENCE ON ELECTROMAGNETIC FIELDS, HEALTH AND ENVIRONMENT

Date: Nov 17–19, 2009

Location: São Paolo, Brazil

Notes: Participants at this global forum discussed ELF and RF EMF in relation
to health and the environment. The agenda covered a wide range of topics, including experimental and epidemiologic research, exposure assessment, exposure guidelines, health risk communication, and environmental safety and policy.

Conference website: http://www.ehe09.usp.br/

BEMS WINTER BOARD MEETING

Date: 6 February 2010

Location: San Antonio, Texas

PROGRESS IN ELECTROMAGNETICS RESEARCH SYMPOSIUM (PIERS)

Date: 22-26 March, 2010

Location: Xi'an, CHINA

Notes: This conference provides an international forum for reporting progress and recent advances in the modern development of electromagnetic theory and its new and exciting applications starting 1989. Spectra ranges from statics to RF, microwave, photonics, and beyond. Topics include radiation, propagation, diffraction, scattering, guidance, resonance, power, energy and force issues, and all other modern developments. BEMS member C. K. Chou is organizing the session on RF Safety Issues (see article in May/June 2009 issue of BEMS Newsletter (#208)).
Key dates
- 7 December, 2009 --- Preliminary Program will be available online
- 7 January, 2010 --- Advance Program will be available
- 7 February, 2010 --- Final Program will be available

Conference website: http://piers.mit.edu/piers/

2010 ASIA-PACIFIC INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY (APEMC)

Date: 12-16 April 2010

Location: Beijing, China

Notes: a special seection on Biomedical EMC is planned on April 13-14, 2010. Key topic areas:
- RF Dosimetry
- Biological Effects and Medical Applications
- EMC in Medical Equipment

The aim is to provide a platform to discuss these common EMC concerns of biomedical work and to promote the progress of this research area. Registration fee for all participants is US$450, and no financial aid is available for invitees. All participants are required to register.

Conference website: http://www.apemc2010.org/

SOCIETY FOR THERMAL MEDICINE

Date: 23-26 April 2010

Location: Clearwater Beach, FL (USA)

Conference website: http://www.thermaltherapy.org

EUROPEAN SOCIETY FOR HYPERTHERMIC ONCOLOGY (ESHO) 26TH ANNUAL MEETING

Date: 20-22 May 2010

Location: Rotterdam, The Netherlands

Conference website: http://www.esho.info/

32ND ANNUAL MEETING OF THE BIOELECTROMAGNETICS SOCIETY

Date: 13-18 June 2010

Location: Seoul KyoYuk MunHwa HoeKwan (Also known as: SEOUL EDUCATION CULTURAL CENTER), South Korea

Conference co-chairs: Dariusz Leszczynski (Technical Program)

and Nam Kim (Local Organizing Committee)

PROGRESS IN ELECTROMAGNETICS RESEARCH SYMPOSIUM (PIERS) 2010

Date: 5-8 July 2010

Location: Cambridge, MA (USA)

Notes: Founded by Professor Jin Au Kong in 1989, PIERS provides an international forum for reporting progress and recent advances in the modern development of electromagnetic theory and its applications.

Important Dates

- 20 December, 2009 --- Abstract Submission Deadline
- 20 February, 2010 --- Full-length Paper Submission Deadline
- 20 February, 2010--- Pre-registration Deadline
- 20 March, 2010 --- Preliminary Program will be available online
- 20 April, 2010 --- Advance Program will be available
- 20 May, 2010 --- Final Program will be available

Suggested Topics:

1. Electromagnetic theory
2. Computational electromagnetics, hybrid methods
3. Spectra, time, and frequency domain techniques
4. Fast iteration, large scale and parallel computation
5. Transmission lines and waveguide discontinuities
6. Resonators, Filters, interconnects, packaging, MMIC
7. Antenna theory and radiation
8. Microstrip and printed antennas, phase array antennas
9. RF and wireless communication, multipath
10. Mobile antennas, conformal and smart skin antennas
11. Power electronics, superconducting devices
12. Systems and components, electromagnetic compatibility
13. Nano scale electromagnetics, MEMS
14. Magnetic levitation, transportation and collision avoidance
15. Precision airport landing systems, GPS
16. Radar sounding of atmosphere, ionospheric propagation
17. Microwave remote sensing and polarimetry, SAR
18. Subsurface imaging and detection technology, GPR
19. Active and passive remote sensing systems
20. Electromagnetic signal processing, wavelets, neural network
21. Rough surface scattering and volume scattering
22. Remote sensing of the earth, ocean, and atmosphere
23. Scattering, diffraction, and inverse scattering
24. Microwave and millimeter wave circuits and devices, CAD
25. Optics and photonics, gyrotrons, THz technology
26. Quantum well devices, microwave photonic systems, PBG
27. Medical electromagnetics, biological effects, MRI
28. Fiber optics, optical sensors, quantum computing
29. Biological media, composite and random media
30. Plasmas, nonlinear media, fractal, chiral media, LHM
31. Constitutive relations and bianisotropic media
32. Moving media, relativity, field quantization, and others

2010 U.R.S.I. COMMISSION B INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC THEORY

Date: 16-19 August 2010

Location: Berlin, German

Conference website: http://www.cem.tf.uni-kiel.de/emts2010/

NOTE TO CONTRIBUTORS

The Bioelectromagnetics Society newsletter is published and distributed to all members of the Society. Institutions and libraries may subscribe to the newsletter at an annual cost of $85USD.

The newsletter serves as a forum for ideas and discussion of issues related to bioelectromagnetics research. Contributions may include news items, meeting reports, short notes on reseach, book reviews, and relevant items of historical or other interest. All submissions must be signed. While it is understood that contributions by individual authors reflect the views of the contributor, the editors may require that contributing writers submit a statement of affiliation and/or disclosure of possible conflict of interest at the time an article is submitted for consideration. Advertisements included in the newsletter are not to be considered endorsed by the Society.

To submit items for the newsletter, please send electronic files to

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