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BEMS 2008 ELECTION RESULTS

The results of the 2008 BEMS election were announced at the Annual Business Meeting, held June 11, 2008 in San Diego, CA. Each year, at least five new members join the Board of Directors to replace those retiring from their three year terms. Retiring members of the board in 2008 include Past President Ben Greenebaum, Biological Sciences members James McNamee and Joseph Salvatore, Engineering and Physical Sciences member Frank Hart, and At Large member **Michael Murphy**. New Past President **Ewa Czerska** handed the gavel to incoming President **Niels Kuster** after announcing these election results:

Incoming Vice President **Michael R. Murphy** holds a PhD in neuroscience from MIT, Cambridge, MA and is currently the Scientific Director, Directed Energy Bioeffects Division of the USAF Radio Frequency Radiation Branch, where his interests include both laser and RF bioeffects and protection. He hopes to expand opportunities for younger members to get involved in the Society's operations, and to use his develop new materials to broaden the support for and membership in our Society.

One of the new Biological and Medical Sciences board members, **David Black**, is a specialist in Occupational and Environmental Physician and a Senior Medical Academic at the School of Population Health of the University of Auckland in New Zealand. He is a fully qualified specialist medical practitioner recognised and in good standing with the Medical Council of New Zealand. Prior to commencing his medical training he was an electronic engineer originally trained in the New Zealand Broadcasting Corporation.

The other new Biological and Medical Sciences board member, **Ann Rajnicek** may be familiar to BEMS members from her plenary talk at the 2007 BEMS meeting held in Kanazawa, Japan. She is a lecturer and research scientist in the School of Medical Sciences at the University of Aberdeen (Scotland, UK) and she holds a PhD in 1990 from Purdue University and is part of a European research consortium (funded by the European Commission) developing an implantable electrochemical device to aid mammalian spinal cord repair.

Filling the Engineering and Physical Sciences position on the board, **Art Thansandote** holds a Ph.D. in electrical engineering from Carleton University, Canada. In July 1991, he joined Health Canada where he is currently chief of the Electromagnetics Division which assesses, monitors and assists in the reduction of possible health risks from EMF exposure. Being a native of Thailand, he has cooperated with the Thai Ministry of Public Health in its development of a national program on non-ionizing radiation protection.

The newest At-Large board member, **Andrei G. Pakhomov** is a Research Associate Professor at Frank Reidy Research Center for Bioelectrics of Old Dominion University in Norfolk, VA. He holds a Ph.D. in radiation biology/biophysics from the Medical Radiology Research Center (MRRC) in Obninsk, Russia and worked at Brooks AFB and the University of Texas Health Science Center before moving to Old Dominion University.

IN THIS ISSUE...

COST ACTION BM0704 BEGINS

By Alastair McKinley, Chairperson, COST

COST
COST is the abbreviation for 'European Cooperation in the field of Scientific and Technical research', which is one of the longest-running European bodies supporting cooperation among scientists and researchers across Europe. It is also the first and widest European intergovernmental network for coordination of nationally funded research activities.

The work of COST is carried out through "Actions". These are new, innovative, and interdisciplinary scientific networks of nationally funded research teams of at least five COST countries. They cover basic and pre-competitive research for peaceful purposes as well as activities of public utility. They also contribute to the scientific, economic, cultural or societal development of Europe, by supporting networking activities such as meetings, conferences, short term scientific exchanges and outreach activities.

This article summarises a new COST 'Action' on emerging electromagnetic field (EMF) technologies and associated health risk management.

EMF technologies: Health Concerns
The use of devices emitting electromagnetic fields (EMF) ranging from static to microwave frequencies has significantly increased in recent years. Their presence has affected almost every aspect of day-to-day living, at home, while travelling and at school, college and work. By far the most significant impact has been through the rapid expansion of personal mobile telecommunication and wireless network systems for voice, picture and video communication, internet access and other data transfer applications. Other applications of EMF are found in the widespread use of electronic article surveillance, radiofrequency identification, metal detection and inductive heating devices. New digital public and commercial radio and television broadcast systems are currently being introduced throughout Europe. Applications in medicine abound, including advances in novel magnetic resonance imaging (MRI) equipment design and new MRI scanning techniques. There is also potential for new medical applications of ultra wide band (UWB), for example in cardiology, detection of breast tumours, detection of intracranial hemorrhage, and the use of implantable sensors that rely on UWB communication.

While the benefits of technologies that have already been introduced are clear and widely accepted by society, significant concern continues to be expressed about consequential increases in EMF exposure of people and potential related adverse health effects. Generally, in the public arena, concern has been often expressed about potential effects of EMF exposure on children's health and on that of older and/or sick people and pregnant women (including the unborn child). This is exemplified by public and media attention on potential adverse health effects that might result from the exposure of young people through the rapid expansion of the use of WiFi systems in schools and colleges.

In contrast, in one important occupational setting, concern has been expressed by medical practitioners and other clinical staff using MRI for diagnosis and for research and by those concerned with the manufacture, calibration and maintenance of MR equipment, over the likely adverse effect on working practices and patient care of the implementation of an EU Physical Agents Directive that sets limits on occupations exposure to EMF. The clearest trend in MRI is the move to systems utilising higher field strengths, with 3 T installations accelerating and moving into clinical rather than solely research settings. Use of high and ultrahigh systems for structural and molecular imaging will increase particularly in the study of degenerative neurological diseases, high-resolution vascular imaging, detailed monitoring of the effectiveness of anti-angiogenetic and genetic based drugs for the treatment of cancer.

It is clear that there is generally a paucity of data on these and other occupational exposures, and that experimental and computational studies are needed to resolve these issues.

Against this background, a successful submission was made to the COST programme for support for an Action entitled "Emerging EMF Technologies: Health Risk Management".

The Action, in the COST Domain 'Biomedicine and Molecular Biosciences', designated as Action BM0704, has been developed by and represents a consensus of scientific experts covering the disciplines of medicine, epidemiology, biology, physics, engineering and risk assessment and management. Experts from some 27 European countries are participating in the Action.

The European Commission, national governments and international advisory bodies, such as the World Health Organization, have all recognised the importance of high quality scientific research as fundamental to addressing such concerns and the Action will effectively facilitate the ongoing exchange of information and the results of such research and provide information that can be transposed by relevant authorities into sound health risk management based on scientific evidence. The Action will also contribute to the training of early-stage scientists in respect of supporting their interaction with more experienced scientists and the skills and knowledge transfer that ensues.

Action Objectives
The main objective of the Action is to create a structure in which researchers in the field of EMF and health can share knowledge and information on:

- How existing EMF technologies change either in their operating characteristics or in novel ways and applications in which they are used.
- Identifying what entirely new EMF technologies are introduced and on what time-scale.
- What novel emission and operating characteristics might result and what impact these would have on the device-

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specific and overall EMF exposure of people.
- What possible health effects could consequently arise and the scientific evidence for health concerns if any.
- How such concerns should be addressed through the use of evidence-based information.
- What tools are effective in communicating and managing such risks and perceived risks.

Action Programme

The initial focus will be on those existing EMF technologies where concern has already been expressed about their use and where further developments in respect of their applications are foreseen in the shorter term. These include:

- WiFi – and more generally wireless networks - particularly in respect of their mass roll-out across Europe in schools, other educational establishments and elsewhere, and the potential exposure of young people. This is a complex issue due to the variable proximity of such devices and the efficiency of coupling of EMF with the body.
- MRI - where there is already considerable research in progress in assessing occupational exposures to medical staff and to patients and volunteers. Increases in specialised MRI techniques, such as cardiac imaging and interventional procedures, will lead to the emergence of greater numbers of specialised medical units with further uncertainties in exposures of staff. It is important that the results of dosimetry and other studies are shared and discussed in respect of assessment of compliance with an EU Physical Agents Directive and in national and European policies for the care of patients and volunteers undergoing MRI procedures.
- Electronic article surveillance and RFID devices - where the International Commission on Non-Ionizing Radiation Protection (ICNIRP), in a report commissioned by the EU, recommended the measurement of levels of exposure. Such exposures include those to workers and to the general public (including children). For this, and for other exposure characterisation purposes, the further development and dosimetric application of anatomically realistic computational phantoms, including those of children, based on medical imaging data is recommended.

The focus will subsequently shift to identify those EMF technology applications and services currently in use and/or likely to be rolled out over future years and, where possible, to characterise likely exposures and identify potential health concerns associated with their use. Likely candidates might include, for example: so-called 4G (and further developments in mobile telephony), ad hoc networks, W-LANS, WiMax, Zigbee, Bluetooth, Wimedia, UWB, broad-band over power transmission lines, various EASD and RFID applications and further digital broadcasting.

Benefits

The Action will be of benefit to:

- Researchers: - in respect of sharing information on ongoing research multidisciplinary forums, early identification of research gaps and needs, encouraging opportunities for international collaboration and co-publication and, for early-stage researchers, the opportunity to acquire relevant further experience, skills and knowledge.
- Risk managers and communicators: - in providing multidisciplinary forums to share complementary knowledge with scientific researchers supporting the development of health risk communication strategies.
- EU and national and local government officials and elected representatives: - in their task of developing proportionate policies to minimise health risk in the face of often technically complex and apparently conflicting health information.
- International health protection advisory and technical standardisation organizations: - in providing scientific information on EMF and health related to emerging technologies, useful to the work of bodies such as WHO, ICNIRP, the European Committee for Electrotechnical Standardization (CENELEC), the International Electrotechnical Commission (IEC) etc.
- Industry and commerce: - in respect of having the information to judge whether there is likely to be adverse public and media concern about their products and services before launching them, to consider likely EMF emissions and exposures of people at an early stage of product design and development.
- Society as a whole: - in ensuring that, when new EMF-technologies are introduced, potential risks are seen in perspective with the benefits. This supports open communication and dialogue based on facts rather than 'beliefs'.
- The media: - in making available facts about new EMF technologies in order to inform their readers/viewers/listeners.

Working Groups

The scientific programme of the Action is carried out through the multidisciplinary activities of working groups. Initially, these comprise five working groups, viz.:

- EMF Technologies and Measurements – Chaired by Georg Neubauer
- Computational Dosimetry – Chaired by Joe Wiart
- Epidemiology and Human Studies – Chaired by Maria Feychting
- Biology – Chaired by Isabelle Lagroye
- Risk Management – Chaired by Peter Wiedemann

Collaboration

International coordination of activity in EMF-related scientific research and health risk management has been significantly improved by the activities of previous COST actions in this field, particularly one, which addressed the health issues related to mobile communication systems. Through effective multidisciplinary scientific collaboration, major improvements in providing stakeholder-specific information for health risk communication should be possible. There are many partners contributing to this process internationally including WHO, ICNIRP and na-

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tional agencies and advisory bodies. The Action seeks to build upon and strengthen this cooperative complementary approach with other bodies.

Further Information

The Chairperson of the Action is Alastair McKinlay and the Vice- chairperson, Mirjana Moser. The Scientific Secretariat is led by Gerd Friedrich with professional administrative support from Daniela Wernze. Further information about this and other COST actions and activities can be obtained online at http://www.cost.esf.org/index.php?id=211. COST Action BM0704's own Website is currently being developed and will be online by August 2008.

STRONG START FOR KUSTER

Niels Kuster opened his term as BEMS President by thanking the membership for their trust in him to lead the society over the next year and expressing his confidence that the upcoming joint meeting with EBEA in Davos will be a success.

He reminded colleagues at the meeting of the concerns he noted in his candidate statement:

- That the Society had, as a whole, diverged from its original focus on outstanding, new research.
- That the research agency, in general, had become too driven by the interests of funding bodies rather than scientific needs.
- That the scientific discourse is increasingly being taken over by political concerns.
- That good scientists are becoming disenchanted with this "hostile environment" and will leave this field to return to more mainstream science unless we address the issue directly.
- That we face a competitive disadvantage in obtaining funding for BEMS related projects.

He reminded members that he promised to work towards promoting excellence in bioelectromagnetics work through encouraging good scientists to become board members, inviting outstanding speakers to the annual meeting, pushing for more lively and balanced discussions within the BEMS community, expanding our work to focus on therapeutic effects, and initiating a Best Paper award related to BEMS research. He hopes to revitalize the Society to make BEMS "the premium source of information and enlightened gatherings." Towards this end, he asked members to contact him (and other Board members) to identify their needs from the Society (journal, meeting format, meeting location, member services, web and newsletter content).

UPCOMING BEMS MEETINGS

The BEMS Board of Directors has selected locations for upcoming BEMS meetings. As has been announced earlier, the 2009 meeting will be a joint meeting with EBEA, and will be held June 14th-19th in Davos, Switzerland. In 2010, the meeting moves to Korea (exact location to be determined by the local organizing committee chaired by BEMS member, Nam Kim), and the 2011 meeting will be held in Halifax, Nova Scotia.

Davos, Switzerland

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 **bemsnewsletter@gmail.com** or bemsoffice@aol.com or (by surface mail) to:

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www.bioelectromagnetics.org

WHEN WORDS MATTER

by Cindy Sage, Sage Associates

A Comparison of Recent EMF Reviews and How Expert Groups Can Come to Opposite Conclusions Looking at the Same Evidence

In judging the sufficiency of scientific evidence to determine the likelihood that an environmental exposure is related to a health outcome, the answer one will arrive at very often depends on the professional background and training of the person interpreting it.

Approaches and terminology that are used in assessing, communicating and managing risks commonly differ in the view and practices of the various professional groups that can be involved in judging science. Evaluating the strengths of scientific evidence on public health and environmental hazards requires that these differences are recognized and transparent in expert reviews. Decision-makers and the public will be best served by a clear recognition that differing standards of evidence and levels of proof are expected and justified, and that making them explicit in review processes will go far to defusing misunderstandings and unnecessary conflicts.

Real life decisions are made every day about how to take EMF into account, with the evidence in hand. Societal judgments about where and whether to commit new resources for development needs to incorporate wise planning for EMF exposures given what we know (and do not know) today. However, waiting until all is known about EMF before we build new homes, schools, day-care and pre-school facilities and the like just will not happen. Its been the same question for nearly 20 years now.

Different approaches to evaluating scientific evidence have resulted in diametrically opposed conclusions about what the evidence means on EMF and health impacts. How can we look at the same evidence and come to such different conclusions about what it means? And, perhaps more importantly,what to do about it?

I recently looked at five reviews, each by recognized experts in the field, to determining what the current science tells us. These included the BioInitiative Report, the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), the WHO ELF Monograph, the UK SAGE Report and the UK Royal Commission on Environmental Pollution (RCEP) documents. All were released in 2007.

Comparing the conclusions of the BioInitative Report and the SCENIHR review, the BioInitiative Working Group concluded that the existing public safety limits (ICNIRP and FCC/IEEE) are insufficiently protective of public health. Further, the BioInitiative Report recommends development of new, biologically-based public exposure standards because the substantial evidence we already have suggests that chronic, long-term exposures to ELF and to new wireless technologies are not satisfactorily handled under the old thermally-based safety limits. The SCENIHR review concludes that no changes in the ICNIRP limits are warranted. The WHO ELF Monograph reviews essentially the same science as the BioInitiative Report and the SCENIHR (limited to ELF, of course) and also finds no reason to suggest changes in the ICNIRP limits (even confirming that the IARC 2B designation for ELF is valid). The WHO ELF Monograph and SCENIHR conclusions can only be explained if they adhere to a standard of evidence requiring virtual certainty* (scientific certainty, proof, adverse health risks are established, a causal link is demonstrated). How could so many experts come to so many different conclusions? We examine that question below.

In each case, the outcome was determined in large part by the approach taken. A careful reading of each document, together with the original "instructions" to each working group or committee can illustrate why results differ so widely. There are four important questions to ask about each one.

How is the central question framed?
What standard of evidence (level of proof) is employed?
What terminology guides the assessment?
What level of evidence is used to recommended action?

Framing the Question – What are we asking?
How the question is originally framed to the working group is the most central issue in defining the outcome. Whether the group actually sticks with this definition, or shifts it during the evaluation, is also of paramount importance.

For example, if the question is "is there a health risk demonstrated?" this virtually guarantees that causal scientific evidence (the highest burden of proof) will be required before the resulting analysis will say "EMF causes health risks".

But, if the question is "is there a possible effect on health?" or some similar phrasing, then evaluation of the same evidence will result in a conclusion that has a lower burden of proof, and is far more likely to result in a conclusion that "EMF is likely to present health risks".

How the question is structured, and whether this question is answered largely determines whether a report will say "no, EMF is not proven to be a health risk" or "yes, it appears possible or probable".

** Conformance with EU policies would rule out using a strictly scientific standard of evidence. To be consistent with the EU Constitutional Principle on Health (Section 3.1) and the European Union Treaties Article 174, the WHO ELF Monograph process needed to be consistent with a public health/precautionary principle-based approach to judging the evidence. These two policies require that the precautionary principle be the basis for environmental protection for the public, and that protecting public health and taking preventive action before certainty of harm is proven is the foundation of the Precautionary Principle.*

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WORDS MATTER, *continued from page 5*

What Standard of Evidence (Level of Proof) is Used?
What is the implicit assumption about which levels of proof will be used going into an assessment of the EMF data? It needs to be made transparent at the outset, because if it is not, there will likely be significantly different views about "when we have enough information" to make policy changes or to require new regulatory action.

There are four basic professional approaches to judging the sufficiency of evidence in order to "take action" appropriate to their professional training and experience.

- Scientific standard (95% - 99% certainty/causal)
- Legal standard (51%+ - possible/probable range)
- Environmental standard (10% - 30% potential for impact)
- Public Health standard (variable, depends on both how much evidence there is, and severity of impact, if true).

The most rigorous is a scientific standard, where virtual proof of causation is typically required by scientists to arrive at consensus about an effect. This approach works best in mathematics, physics and chemistry. In biological systems this is rarely possible.

The second level of proof is the standard applied in civil legal proceedings, which is "more likely than not". This is to say if there is a 50%+ likelihood of harm, this is taken as evidence for a relationship. It is not necessary that there be conclusive evidence of harm, nor is some uncertainty of causation a reason to conclude that no relationship exists between exposure and harm. In fact, some uncertainty is allowable even under the more stringent (criminal) standard of evidence, which is "beyond a reasonable doubt". No legal standard requires complete certainty of effect in order to make a defensible judgment on the evidence at hand.

Environmental decision-making requires only the potential for a significant impact. National and state environmental quality acts (The National Environmental Policy Act) and various state environmental quality acts (SEQAs) require that assessments use a standard which is a relatively low level of certainty (10% to 30%). The potential for a significant impact requires that mitigation strategies be developed, i.e, require precautionary or preventative actions when only the potential for risk is present. We plan for environmental risks all the time without certainty that an adverse risk will occur (seismic events, landslides, flooding, etc).

The standard of evidence in Public Health Policy decision-making should reasonably be based on many factors, including how widespread the risk, how dread the disease, the cost of inaction (doing nothing until there is proof, but many may be harmed and so on). A slim showing of evidence coupled with a highly adverse public health impact (large numbers of individuals harmed, a very large public health impact if the early warnings are ignored) may warrant early precautionary actions. When the public health consequences are not so severe by ignoring early warnings, waiting for more evidence may be warranted since the consequences of doing nothing immediately may not be so great. For potential risks of small overall magnitude, waiting for substantially more evidence before taking actions (particularly costly actions) is reasonable.

A key to understanding how the same evidence can be so differently weighed and judged, in order to set a course for action, is to understand the way in which different professional groups approach this task. As noted above, this has not always been made explicit because different disciplines inherently use different standards.

What Terminology Guides the Assessment?
Selecting and defining key words to be used in an assessment is vital before the review starts. These typically include:

- evidence (as opposed to proof)
- effect
- adverse effect or risk
- proof
- consistent (or inconsistent)
- certainty (or uncertainty)
- plausible (as in mechanism)
- demonstrated or establihed (as in proven)
- acute versus chronic

What level of evidence is used to recommend action?
This could also be phrased as "what is the conclusion or outcome of the review?" and is it consistent with the original question asked, the standard of evidence which is appropriate to answer that question, and whether the terminology used in the assessment and conclusions are both transparent and consistent with answering the question.

Risk assessments are not only done by scientific expert review panels, but depend on many other stakeholders' viewpoints. Thus, it is wrong to let the highest burden of proof (the scientific standard for judging the sufficiency of evidence) be a pre-condition to taking action, precisely because valid clinical and public health approaches for assessing the evidence set the bar far lower in terms of certainty, and in judging when it is sufficient to take action.

Whether an environmental or public health policy standard, as opposed to a strict scientific certainty standard is appropriate is a matter of debate and great consequence. The costs of inaction in terms of public health and resources will be enormous on a global scale if we ignore, or worse, refuse to use the proper screening assessments to determine these outcomes. At a minimum we should expect transparency in reviews – what is being asked and answered, whether the right levels of proof are being used, and whether the answers given follow from the evidence in light of these explicit approaches can be validated.

Editor's note: At the BEMS 2008 meeting Jan Cuppen reported on a series of experiments performed with an ELF stimulus that showed an apparent enhancement of the immune system in carp cells, and whole animimal goldfish, chicken broilers, shrimp, and piglets. This work, using relatively simple fields appeared to be of great interest to many members at that meeting and could have significant impacts on the efficiency of food stock production in the future. Given that, we asked him for a synopsis of the work, printed below.

REPORT ON IMMUNE STIMULATION IN FARMED ANIMALS BY LF EMF

Jan Cuppen, Ph.D., Immunent BV, The Netherlands

INTRODUCTION

Parts of this work were done in collaboration with Geert Wiegertjes at Wageningen University, Anton Beynen and Mohammed Elmusharaf at Utrecht University, and Willem Smink from FIS BV in The Netherlands.

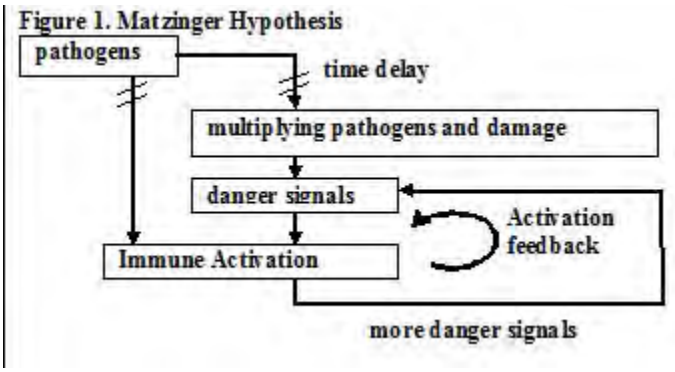
At the BEMS 2008 meeting we reported on a series of experiments performed with an ELF stimulus that showed an apparent enhancement of the immune system in carp cells, and whole animal, goldfish, chicken broilers, shrimp, and piglets. This work, using relatively simple fields (detailed in the Cuppen reference given at the end of this article), was of such interest to many members that we describe it briefly here, with references, so that members may learn more about our work. We believe that a key characteristic of our work is that we work with large numbers of animals, so the experiments are sensitive for effects, but with limited sophistication (and cost) of measurements. This work could, potentially, have significant impacts on the efficiency of food stock production in the future.

Some of our data has been published (Cuppen et al. 2007) and further papers are in preparations.

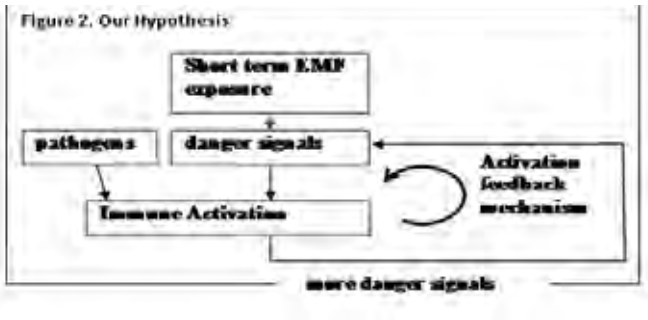
HYPOTHESIS

Several publications have demonstrated the production of cytokines, increased immune parameters and stress effects and concluded that EMF causes stress at the cellular level and that this leads to production of cytokines and consequently biological response, including immune response. This has led Simkó and Mattson (2004) to proposes that macrophage activation could be effected through ROS due to short term EMF exposure.

In Immunology, Matzinger (2002) recently proposed that immune response is not only due to the presence of non-self cells but also needs the presence of promotors called "danger signals" like HSP's, Interleukins and other cytokines. Danger signals are formed when cells get stressed or damaged. The idea behind the view is that strange DNA that does not cause damage, such as a foetus or food, does not and should not trigger an immune response.



The danger signal hypothesis can be schematically represented as in Figure 1.



We propose an extended hypothesis which can be schematically represented as in Figure 2.

The core of the proposed hypothesis is that short term LF EMF exposure, possibly repeated, can produce danger signals that can trigger the immune system activation feedback mechanism in the presence of pathogens. As such, the EMF induced danger signals take the place of the danger signals that would be produced by multiplying pathogens and the damage they cause to cells and tissues. In this way, a timely EMF treatment can avoid the delay given by the time it takes for enough damage to occur and danger signals to be produced in a normal disease development. Thus, the immune response to pathogens can be advanced in time and damage and a well developed pathogen attack can be avoided.

In a first series of experiments, *in vitro* common carp head kidney-derived phagocytes were used to determine ROS (Reactive Oxigen Species) production as a measure for immune activation. Exposure to LF EMF signals (250-5000 Hz) at 5 μT or 1,5 mT led to 42% or 33% increase in immune activity, respectively, compared to negative control values. EMF could also additionally stimulate chemically pre-stimulated samples up to 18% (5 μT) or 22% (1,5 mT). Significance of increase in ROS production due to EMF in the total series was: $p<0.0001$.

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IMMUNE STIMULATION, *continued from page 7*

In a second series of experiments, in vivo commercial goldfish with infectious disease were used. Groups of fish were housed under equal conditions in at least 4 control tanks and 8 to 16 EMF-exposed tanks.

Without treatment, mortality was about 50% after 18 days, while the treatment at 5 μT reduced it to 20% on average.

Finally, experiments were done with commercial chicken broilers, exposed to Coccidiosis, which is a common infectious disease in poultry, causing major economic losses.

We found that feed conversion, the ratio of the amount of food required to produce a given weight gain in the chicken broilers, was significantly lower for the EMF exposed group with infection than for controls in both experiments. We believe that one explanation for reduced feed uptake in chickens could be less energy spent on developing infections.

Moreover it should be noted that the reduction in feed conversion achieved rivals the best results achieved in comparable trials with preventive antibiotics (now illegal in animal feed in the EU). This indicates that EMF treatment is as effective in suppressing infections and the resulting productive loss in chicken as preventive antibiotics were.

Piglet experiments were performed in a commercial farm as well. Here we used one department as control and another department as test, with 14 meters distance in between. We limited coil size such that the stray fields at the control were calculated to be smaller than 1 nT. At the piglets we achieved 0.4 μT which we hope to increase to 2 to 5 μT in the near future. Results for our early tests showed that the exposed piglets had an 8.6% higher growth per day as % of starting weight than the controls on average over 6 runs, with a standard deviation of 6.3%. Also a 3% better feed conversion was obtained.

Finally, in the Brazilian shrimp industry there is a widespread problem with reduced growth due to inbreeding because of a national ban on importing fresh brood stock for fear of diseases. Because of this we performed a field trial with farmed shrimp in Salvador, Brazil.

In a first run we obtained 50% faster growth from the experimental pond in contrast to that observed in the control pond. The harvest from the treated pond was 808 kg, while the control pond delivered 520 kg, for the same amount of feed employed. The treatment seems to restore normal growth rates and again, much better feed conversion!

CONCLUSIONS

This research indicates that this ELF EMF treatment is capable of stimulating the immune system. LF EMF treatment reduces the damage, in terms of intestinal lesions of Coccidiosis infection in broilers. Moreover LF EMF treatment was shown to improve feed conversion up to 12 points, equivalent to some 8% reduced feed uptake for equal growth. Pilot studies with piglets and shrimp growth showed similar feed conversion improvements.

Because of the low field strengths required, and the surprisingly large effects on animal health, the results indicate that practical application with important economic advantages for farmers is possible.

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ICNIRP NON-IONIZING RADIATION WORKSHOP ANNOUNCED

ICNIRP is happy to announce its quadriennial International NIR Workshop to be held from 14 to 17 October 2008 in Rio de Janeiro, Brazil.

Non-ionizing radiation protection is a broad field demanding knowledge of many scientific disciplines including epidemiology, medicine, biology and physics and engineering. Every four years, an international workshop is organized by the International Commission on Non-Ionizing Radiation (ICNIRP) to present an up-to-date overview of the advancement of science and protection in different areas of non-ionizing radiation.

The 6th International Non-Ionizing Radiation Workshop will be co-sponsored by the Brazilian Ministry of Science and Technology and the World Health Organization.

Further information on the scope of the workshop and the program are available at www.icnirp.org/NIR2008.htm. For additional inquiries related to this workshop, please contact info@icnirp.org

REPORT FROM THE EDITOR-IN-CHIEF OF BIOELECTROMAGNETICS

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Bioelectromagnetics continues to publish at a frequency of 8 issues per year. To improve print publication times for the Journal, in calendar year 2007, we purchased 63 extra pages for a total of 671 pages and published 95 articles of various types. In addition, an EarlyView has been implemented nearly two years ago to facilitate rapid online publication, ahead of print publication. Currently, the Bioelectromagnetics journal is ranked #23 out of 70 in the biology category.

The Journal's 2007 (current) Impact Factor (IF) is 1.80. Table 1 shows the 2007 IFs of some related journals bassed on 2007 information from ISI Web of Science. It is noteworthy that the median IF for the biology subject category is 1.29. For comparison, Table 2 shows the variation in Impact Factor for our journal over the last three reporting years. I am pleased to report that the Impact Factor for Bioelectromagnetics increased to 1.80 for 2007, after a dip during the last reporting period (2006). As you know, Bioelectromagnetics is essential reading for all who are engaged in the topics. Your assistance in encouraging your colleagues to submit manuscripts reporting their research for publication in our journal is greatly appreciated.

Table 1: Journal Impact Factors

Journal Title	2007 Current
Bioelectromagnetics	1.80
Electromagnetics in Biology and Medicine	0.53
Environmental Health Perspectives	5.86
Health Physics	0.87
International Journal of Radiation Biology	1.47
Radiation and Envirnmental Biophysics	1.07
Radiation Protection Dosimetry	0.45
Radiation Research	2.60

Table 2: Bioelectromagnetics Journal Impact Factors

Journal Title	2005	2006	2007 Current
Bioelectromagnetics	2.19	1.51	1.80

I am delighted to report that the Board of Directors of the Bioelectromagnetics Society has approved two initiatives: (1) Best Paper Award for a paper published in the Bioelectromagnetics journal, starting with the current 2008 volume, and (2) funded open access option for articles published in the Journal, effective immediately.

An objective of the Bioelectromagnetics journal is to publish high-quality papers reporting studies that are conducted with scientific and technical rigor. The Best Paper Award will recognize the scientific accomplishments of our colleagues. The Award will be selected on recommendation of the Editorial Board and approval of the Board of Directors of the Bioelectromagnetics Society. It will consist of a certificate along with a monetary prize, presented during the Annual Scientific Meeting of the Society.

Funded access option to the Bioelectromagnetics journal would allow open access to a funded article once published. With this online option, the author pays a fee to ensure that the article is made available to non-subscribers upon publication. The cost to the authors is $3000. The funded open access option will be offered only to those authors whose articles have been accepted for publication and only at the point when the article is accepted, to ensure that the funded access option has no influence on the peer review and acceptance process.

We look forward to continuing to publish high-quality papers in Bioelectromagnetics reporting studies that are conducted by our colleagues worldwide

LEADERSHIP AWARDS PRESENTED

Richard Nuccitelli accepts the Leadership Award from outgoing BEMS President Ewa Czerska

Historically, the Technical Program Committee for each annual meeting of the Bioelectromagnetics Society has been chaired by the incoming President. For the Kanazawa meeting, however, Rich Nuccitelli, who was not the president elect, ably assumed the difficult task of organizing BEMS' first Asain meeting and developing plenary sessions. In recognition of his efforts, the Society created the Leadership Award, presented here by outgoing BEMS President Ewa Czerska. For the San Diego meeting, Michael McLean assumed leadership of the Technical Program Committee and was also recognized for his efforts with a Leadership award.

Michael McLean accepts the Leadership Award from outgoing BEMS President Ewa Czerska

SCIENTIFIC CULTURE CLASH AT BEMS: DIAGNOSIS AND TREATMENT

By Raymond Richard Neutra, Chief Emeritus
Division of Environmental and Occupational Disease Control
California Department of Public Health

The presentations of Niels Kuster, Frank Barnes and Dariusz Leszczynski at the last session of the San Diego BEMS meeting reminded me again of the fact that those who work in this field operate within different scientific cultures including but not limited to: physics, biophysics, electrical engineering, physical chemistry, molecular biology, cellular biology, physiology, toxicology and epidemiology. These different scientific cultures have different ideas of what evidence and what inferential rules go into making a convincing claim of causality. This leads to different scientific conclusions and to a lack of agreement on research priorities.

Over the years I have noticed that each discipline uses their own inferential rules of thumb to guide them as to what scientific observations to "enter into evidence". However though these rules are inculcated during training in the particular discipline and by now taken for granted, they are rarely explicitly stated. For example regulatory toxicologists want to exclude any evidence not generated by "Best Laboratory Practices" and their extensive audit trails, while most academic researchers cannot afford to adhere to these and instead use usual scientific quality control. Each discipline uses other unstated rules of thumb to move from the evidence to claims about their certainty that the EMF mixture, or one of its ingredients is capable of causing an effect observable within their particular domain. Physicists used to dealing with relatively simple situations demand a kind of replication or repeatability that is not always achievable in complex biological systems driven by multiple variables and feed back loops. Each discipline uses still other unstated inferential rules to make claims about the relevance of the effects they have observed to pathological or therapeutic effects in humans. As a result there are endless arguments as to what would constitute a convincing argument for causality and relevance. Also there are unresolved arguments as to what series of experiments or observations are most likely to move the field further. This goes beyond the usual lobbying for one's own research unit.

When there is miscommunication within a team comprised of different cultures, one needs a culture consultant to figure out what is going wrong and help the team figure out how to overcome their communication problems.

If I were a contract officer again for a research program, I would set aside some money for the following activities to overcome this problem:

1. I would issue a request for proposal for an interdisciplinary team which, with the promise of reimbursement for their time, would agree to meet face to face and through internet meeting modalities to explore the differences in their inferential assumptions about (a) what should be entered into evidence, (b) how one should move from evidence to causal claims and (c) how one should move from claims about bioeffects to claims about pathology or cure. The team effort would be coached by experts in argument theory and philosophy of science. These facilitators would write the final report with input and comment from team members. I would have at least two such parallel teams, one of self declared doubting Thomas's, and one of self declared "high index of suspicion" scientists. At the end of the process the two teams would meet, in a series of facilitated meetings to discuss the inevitable difference in approaches. And the argument theorists and philosophers of science would be charged with writing a summary report on lessons learned.
2. The second task of the teams would be to recommend priorities for future research on the basis of the above understandings.
3. Since EMF effects may be sensitive to experimental conditions (for example strain of animal used, etc) I would ask the teams to work with investigators to discuss ahead of time the possible results of proposed experiments or observations. Next steps and valid inferences should be laid out ahead of time not made up after the results are seen (as was the case with the hen house study). If replications fail, there should be a protocol and a budget to find out why they failed. In the budget should be funds for skilled arbitrators and argument theorists who have the ability to help participants move through emotionally charged scientific disagreements.

IN CASE YOU MISSED IT...

SWEDISH AGENCY CHANGES NAME

The Swedish Radiation Safety Authority, a new central regulatory authority responsible for radiation protection and nuclear safety, will be established on 1 July 2008. This new authority will assume the responsibilities of both the Swedish Radiation Protection Authority and the Swedish Nuclear Power Inspectorate when these authorities cease to exist on 30 June 2008.

For more information about the new authority and its operations, see www.stralsakerhetsmyndigheten.se

VENICE RESOLUTION RELEASED

Professor Livio Guiliani, spokesman for the International Commission for Electromagnetic Safety, reports that his group on international scientists has released a new statement expressing concerns about the possible biological effects of pervasive EMF exposure that recommends reduced exposure standards and limit use of cell phones and other wireless devices by minors. The text of this resolution can be seen at www.icems.eu.

IN MEMORIAM: ROBERT BECKER

Robert Otto Becker, whose early opposition to high-voltage power lines because of suspicions about health effects initiated a controversy that remains unsettled to the present day, died May 14 in New York at the age of 84.

Becker's career began with studies of the "currents of injury" and the role of electric stimulation to regenerate limbs and bones (with the late Andrew Bassett, a BEMS d'Arsonval Awardee). In 1963, he reported a correlation between geomagnetic activity and psychiatric admission rates. Later, in a 1967 article in the journal Nature, Becker and colleagues examined the possible impact of magnetic fields on human reaction times. He also reported, in 1981, on a possible link between power frequency magnetic fields and suicide rates.

Becker may be best known for his testimony at a hearing related to plans of New York power companies to build two 765,000-volt powerlines in New York. At that hearing, he and one of his staff, Andrew Marino (presently a professor at Louisiana State University Medical Center in Shreveport), described various physiological effects in rats and mice exposed to electromagnetic fields comparable to those associated with powerlines. These results were substantiated by EPRI ten years later.

Becker's evaluation of US Navy studies performed in connection with its plans to build submarine communication systems (Project Sanguine, later Project Seafarer, and the Project ELF) led to his appearance on 60 Minutes, conflict with Phillip Handler, then the president of the National Academy of Sciences, and forced his retirement at the age of 56 (Details of these events are in The Electric Wilderness by Andrew Marino and Joel Ray (San Francisco Press, 1986)).

Dr. Becker attended Gettysburg College and the NYU School of Medicine. He completed a residency in Hanover, N.H., and served in the Army medical corps in the early 1950s. In 1956, he joined the SUNY Upstate Medical Center in Syracuse where he served as a professor of surgery and later as chief orthopedist at the Veterans Administration Hospital in Syracuse, NY. He authored two books about EMF: "The Body Electric" (1985, focusing more on therapeutic regeneration) and "Cross Currents: The Promise of Electromedicine, the Perils of Electropollution" (1990).

He is survived by his wife, three children, and two grandchildren.

IN MEMORIAM: W. H. FLETCHER

William Henry Fletcher, a professor of anatomy at Loma Linda University in Redlands, CA, who pioneered work with gap junctions, especially the role of connexin43 in heart development, died on May 8 in Loma Linda, California at the age of 67.

Dr. Fletcher collaborated with BEMS members Craig Byus, the late W. Ross Adey, and BEMS past president Richard Luben to study the effects of modulated RF and ELF exposures on gap junctions. His work was reported at several BEMS and DOE/EPRI Contractors Review meetings in the mid 1980s.

Dr. Fletcher earned a doctorate at the University of California, Berkeley in 1972 and went on to do post graduate work at Duke University School of Medicine (North Carolina) and at the Universite Libre in Brussels (Belgium) under a National Institutes of Health Fellowship. Fletcher was a faculty member at the University of California at Riverside then moved to the Loma Linda University (LLU) School of Medicine. In 1985, he was invited to become an independent investigator at the Jerry L Pettis Memorial VA Medical Center while teaching at LLU. While there, he performed and published groundbreaking research uniting biochemistry, physiology, structural, cell and molecular biology with clinical medicine, with a special emphasis on cellular communication via gap junctions.

Recipient of numerous merit and career development awards, he is survived by his wife, his son, and his daughter.

CALENDAR

Gordon Research Conference in Biochemistry
Date: July 20-25, 2008
Location: University of New England, Biddeford, ME
Notes: see September/October BEMS newsletter, page 2

XXIXth URSI General Assembly
Date: August 9-16, 2008
Location: Hyatt Regency Chicago Hotel on the Riverwalk,151 East Wacker Drive, Chicago, Illinois, USA.
Notes: see article in BEMS Newsletter, Jan/Feb 2008, page 11
Information: http://www.ece.uic.edu/2008ursiga/

6th International Non-Ionizing Radiation Workshop
Date: October 14-17, 2008
Location: Rio de Janeiro, BRAZIL
Notes: see article in this issue
Contact: http://www.icnirp.org/NIR2008.htm

See Calendar, continued on page 12

CALENDAR, *continued from page 11*

12th International Conference, International Radiation Protection Association, IRPA 12
Date: October 19-24, 2008.
Location: Buenos Aires, ARGENTINA.
Focus: 1. Epistemology of radiation: Methods, current knowledge of physical and biological sciences in relation to effects of radiation exposure. 2. Radiation Protection of people 3. Practice of radiation protection by practitioners and industries.
Contact: http://www.irpa12.org.ar

SPIE Energy-Based Treatment of Tissue and Assessment
Date: January 24-29, 2009
Location: San Jose, CA (USA)
Notes: see March/April BEMS newsletter
Contact: http://spie.org/BiOS

Progress in Electromagnetics Research Symposium (PIERS) for 2009
Date: March 23-27, 2009
Location: Beijing, CHINA
Notes: PIERS 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 of interest range 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. The 2009 meeting will have two sessions that are being organized by BEMS members: Both are under Topic 27: "Medical Electromagnetics, RF biological effect, MRI":

- Advances in the Bioeffects and Exposure Standards for Non-Ionizing Radiation - Organized by Michael R. Murphy

- RF Exposure Safety Issues - Organized by C-K Chou

A third session of possible interest to BEMS members is:

- Biomedical Applications of Electromagnetic waves - Organized by Xu Li.

Abstract submission deadline: September 7, 2008
Contact: http://piers.mit.edu/piers

Society for Thermal Medicine Annual Meeting
Date: April 3-7, 2009
Location: Tucson, AZ
Abstract submission deadline: December 5, 2008
Contact: http://www.thermalmedicine.org

BioEM2009: Joint Meeting of The Bioelectromagnetics Society and the European BioElectromagnetics Association
Date: June 14-19, 2009
Location: Davos, Switzerland
Contact: http://www.bioelectromagnetics.org

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