



EMF-NET Coordination Action 2004-2008



The view from a broad European scientific consortium: the EMF-NET conclusions

Paolo Ravazzani



Institute of Biomedical Engineering
National Research Council - Italy

Workshop on EMF and Health: Science and Policy to address public concerns
Bruxelles, February 11-12, 2009



EMF-NET Coordination Action 2004-2008



EC FP6 Coordination Action: EFFECTS OF THE EXPOSURE TO ELECTROMAGNETIC
FIELDS: FROM SCIENCE TO PUBLIC HEALTH AND SAFER WORKPLACE

Duration: March 1, 2004 – August 31, 2008

To provide:

- A framework for the co-ordination of the results of the ongoing research activities on EMF and health (EC projects and other national and international actions)
- Policy relevant interpretation/advice for the facilitation of policy development options by the EU (and other bodies)

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Workplan





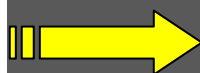
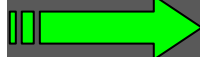
- ➔ **MT1:** Scientific evaluation of the results of the studies on EMF health effects
 - Laboratory studies (ELF, RF, IF, THz, IM, medical applications)
 - Epidemiological studies (ELF, RF, OF)
- ➔ **MT2:** EMF exposure related risk in the working environment
- ➔ **MT3:** Improvement of specific common aspects of the research on EMF and health
- ➔ **MT4:** Risk perception and communication
- ➔ **MT5:** Observatory functions
 - Monitoring emerging technologies
 - Monitoring EMF research plans
 - Coordination with acceding and 3rd Countries



Four-Point Scale



A four-point scale would be used to describe the degree of uncertainty for the effects evaluated.

-  ■ sufficient evidence of effects
-  ■ limited evidence of effects
-  ■ inadequate evidence of effects
-  ■ evidence suggesting lack of effects



RF and Blood Brain Barrier, Auditory system, Behaviour, Cardiovascular system and Nervous System (2008) [1/2]



Type of biological system	Evidence for effects (<i>classification based on studies published in years 2000-2007</i>)
BLOOD BRAIN BARRIER	
<i>In vitro</i> studies	<i>Inadequate evidence</i>
Short-term <i>in vivo</i> studies	<i>Evidence suggesting lack of effects</i>
Long-term <i>in vivo</i> studies	<i>Evidence suggesting lack of effects</i>
AUDITORY SYSTEM	
<i>In vitro</i> studies	<i>Inadequate evidence</i>
<i>In vivo</i> studies	<i>Evidence suggesting lack of effects</i>
Human studies	<i>Evidence suggesting lack of effect</i>
BEHAVIOUR	
<i>In vivo</i> studies: Spatial memory and place learning	<i>Limited evidence</i>
<i>In vivo</i> studies: Effects on immature animals	<i>Inadequate evidence</i>



Report on RF lab studies BBB, Auditory system, etc... 2008 [2/2]



Type of biological system	Evidence for effects (<i>classification based on studies published in years 2000-2007</i>)
NERVOUS SYSTEM	
Human studies: EEG and Neurophysiology	<i>Limited evidence</i>
Human studies: Cognition and Sleep	<i>Limited evidence</i>
<i>In vivo studies</i>	<i>Inadequate evidence</i>
CARDIOVASCULAR SYSTEM	
Human studies: Blood pressure	<i>Limited evidence</i>
Human studies: ECG and HRV	<i>Inadequate evidence</i>
<i>In vivo studies</i>	<i>Inadequate evidence</i>



RF and cancer related results at
cellular and molecular level (genotoxicity, cell differentiation,
apoptosis, gene expression, etc.) (2008)



Endpoint	Evidence for effects
Genotoxicity	<i>Inadequate evidence of genotoxic effect under low-level RF exposure in vitro. Inadequate evidence that low-level RF potentiate the effects of genotoxic agents in vitro.</i>
Transformation	<i>Evidence suggesting lack of effects of low-level RF on initiation, promotion and co-promotion of neoplastic cell transformation in vitro.</i>
Apoptosis	<i>Evidence suggesting lack of effects on apoptosis in normal cells in vitro.</i> <i>Limited evidence of pro-apoptotic effect in tumoral cells exposed to low-level RF in vitro. Inadequate evidence that low-level RF exposure interacts with known pro-apoptotic agents and/or genetic background in vitro.</i>
Proliferation, cell cycle	<i>Inadequate evidence of effects on cell proliferation and cell cycle in vitro under low-level RF exposures.</i>
Differentiation	<i>Inadequate evidence of effects due to very few studies available.</i>
Gene and protein expression	<i>Evidence suggesting lack of effect of low-level RF exposure on cancer-related gene and protein expression in vitro.</i>



Report on ELF lab studies 2008 [1/2]



Type of biological effect	Evidence for effects from electric fields		Evidence for effects from magnetic fields	
	Baseline evaluation	Updated evaluation	Baseline evaluation	Updated evaluation
Carcinogenicity in animals	<i>No data</i> (evaluation by IARC)	No changes	<i>Inadequate evidence</i> (evaluation by IARC)	No changes
Cancer-relevant effects (in vitro and short-term animal studies)	<i>Inadequate evidence</i>	No changes	<i>Limited evidence</i> for genotoxic effects* <i>Limited evidence</i> for non-genotoxic cancer relevant effects	No changes
Reproduction and development	<i>Evidence suggesting lack of effects</i>	No changes	<i>Limited evidence</i> for developmental effects	<i>No changes</i> for developmental effects
				<i>Inadequate evidence</i> for reproductive effects



Report on ELF lab studies 2008 [2/2]



Type of biological effect	Evidence for effects from electric fields		Evidence for effects from magnetic fields	
Nervous system and behaviour	<i>Sufficient evidence of perception of strong fields</i>	No changes	<i>Sufficient evidence of perception of strong fields</i>	No changes
	<i>Inadequate evidence for other effects</i>		<i>Limited evidence for some other effects</i>	
Cardiovascular system	<i>Inadequate evidence</i>	No changes	<i>Inadequate evidence</i>	No changes
Immune system	<i>Inadequate evidence</i>	No changes	<i>Inadequate evidence</i>	No changes
Endocrine system	<i>Inadequate evidence</i>	No changes	<i>Inadequate evidence</i>	<i>Inadequate evidence for effects in humans</i>
				<i>Limited evidence for effects in animals</i>
Subjective non-specific symptoms	<i>Evidence suggesting lack of effects</i>	No changes	<i>Evidence suggesting lack of effects</i>	No changes
Basic research on biological effects	<i>Inadequate evidence</i>	No changes	<i>Limited evidence of effects on signal transmission and gene expression</i>	No changes



IF laboratory studies (2008)



[...]

Due to limited technical applications and the borderline location, *in the IF range scientific knowledge* on specific aspects in regard to interaction mechanisms and biological data *are sparse, and studies are lacking investigating synergistic effects of heating and stimulation.*

[...]

In the absence of specific data IF limits *have been established by extrapolation from the LF- and RF- range.*



EMF-NET Highest Priority Research Needs Summary Table [1/2] April 2006



Short title of the research need	Description of the research need	Suggested solutions	Notes
RF electromagnetic fields			
Prospective cohort studies of mobile phone users	Previous epidemiological studies may not have detected cancers with long latency, have not addressed diseases other than cancer, and may have been affected by recall and selection biases.	Large-scale prospective cohort studies of mobile phone users.	Other knowledge gaps exist concerning RF fields (such as possibility of cognitive effects, replication studies of the positive in vitro findings), but these are of lower priority
Studies on potential health risks from long-term use of mobile phones by children	Few relevant studies have addressed the potential effects of RF exposure on children.	a - Epidemiological studies of the risk of brain and CNS tumors associated with RF exposure in children and adolescents, <i>b - Studies on effects of prolonged exposure to RF radiation of immature animals.^[9]</i>	
ELF magnetic fields			
Studies relevant to assess possible causality between ELF magnetic fields and cancer	Epidemiological studies suggest rather consistently an association between ELF magnetic fields and childhood leukaemia, but it has yet to be verified whether this association is causal. There is currently no demonstrated mechanism that could explain the results, experimental studies have not provided clear support, but bias cannot be excluded as a possible explanation for the epi findings.	a - Animal, in vitro and theoretical studies on plausible biophysical and biological mechanisms to clarify epidemiological results suggesting carcinogenic effects of magnetic fields; <i>b - Epidemiological studies on highly exposed populations, using designs that are less prone to selection bias, to be undertaken only after thorough investigations of feasibility.</i>	Other knowledge gaps exist concerning ELF fields (such as risk of neurodegenerative diseases, developmental effects), but these are of lower priority



EMF-NET Highest Priority Research Needs Summary Table [2/2] April 2006



Short title of the research need	Description of the research need	Suggested solutions	Notes
Static magnetic fields			
Risk assessment of static magnetic fields	Human exposure is increasing up to high field strengths, and data on biological and health effects are lacking.	Studies on carcinogenicity, genotoxicity, developmental and neurobehavioral effects, considering also high exposed subjects such as operators of MRI devices in medical environment.	Data on other health effects are also lacking, but these are the most important to start with.
IF electromagnetic fields			
Risk assessment of Intermediate Frequency electromagnetic fields	Basic laboratory and epidemiological data on biological and health effects are lacking; human exposure is increasing.	a- Exposure to identify and assess high occupational/environmental exposures. b- <i>Laboratory studies on carcinogenicity, genotoxicity, neurobehavioral effects. Epidemiological studies (cancer, pregnancy outcome).</i>	Data on other health effects are also lacking, but these are the most important to start with.
Exposure assessment			
Exposure assessment	Quantitative exposure assessment is needed for scientific studies, as well as for health risk assessment and exposure monitoring. Information needed on changes in environmental exposure patterns. Particular attention needs to be given to workers.	Development of exposure meters for static field and improvement of those ones for RF as well as for health risk assessment strategies in inhomogeneous field exposure, taking into consideration real time-, frequency- and spatial- parameters.	Particular need for implementation of directive 2004/40/EC, for rapid development and dissemination of new technologies, for informative epidemiological studies



EMF-NET: a few facts



- ➔ Interpretation reports: around 50
- ➔ Fact-sheets and short report: around 24
- ➔ Other reports and support to EC services: around 15
- ➔ Organization/co-organization of events: around 30
- ➔ Interviews, Press Releases, etc...: around 15
- ➔ Scientific publications: 3 (plus one) books and 1 Special Issue of Bioelectromagnetics
- ➔ Other publications: catalogue of EC FP5 research on EMF and health



EMF-NET: in summary



- EMF-NET Interpretation Reports as input for risk analysis and/or risk assessment tasks performed by EC, or other bodies in EU, Europe and outside Europe
 - Committees at national level in Europe
 - Other EC projects and initiatives (e.g., EFHRAN (2009-2012), COST BM0704)
 - EC committees
 - GLORE
 -
- EMF-NET Interpretation Reports as input for identification of research priorities



EMF-NET Coordination Action 2004-2008



The Universe is a grand book which cannot be read until one first learns to comprehend the language and become familiar with the characters in which it is composed



Galileo Galilei

<http://emf-net.isib.cnr.it>

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