



EC FP6  
Coordination Action

## EFFECTS OF THE EXPOSURE TO ELECTROMAGNETIC FIELDS: FROM SCIENCE TO PUBLIC HEALTH AND SAFER WORKPLACE

### **Comments on the BioInitiative Working Group Report (BioInitiative Report)**

*October 30, 2007*

The "BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)", co-edited by David Carpenter and Cindy Sage, was released on 31 August 2007. In the covering letter it is noted: "The information and conclusions in each chapter are the responsibilities of the authors of that chapter". This means that this report is not a consensus of a working group, but rather an assembly of chapters written by various scientists and consultants. There is no mention of who initiated this review or who funded the work, nor of potential conflicts of interest.

Ms Cindy Sage of Sage Associates (USA) is the author of the "Summary for the public" that is written in an alarmist and emotive language and whose arguments have no scientific support from well-conducted EMF research. She is also the author of five more chapters (with a total of 6 out of 17 chapters) and the co-author of the final key chapter on policy recommendations.

There is a lack of balance in the report; no mention is made in fact of reports that do not concur with authors' statements and conclusions. The results and conclusions are very different from those of recent national and international reviews on this topic (see Annex 1 and 2).

The stated purpose of the BioInitiative Report is to assess the scientific evidence of health effects of low-level EMF exposure below current international limits, and to establish which changes are needed to reduce public health risks from EMF exposure.

If this report were to be believed, EMF would be the cause of a variety of diseases and subjective effects, including: Sleeplessness, headache, fatigue, skin disorders and changes in skin sensitivity, loss of appetite, tinnitus, impairment of memory and concentration, Alzheimer's and Parkinson's disease, cardiac problems, changes in brain and nervous systems activity, stress reactions, inflammatory and allergic reactions, genotoxic effects, changes in immune system function, and many types of cancers.

None of these health effects has been classified as established in any national or international reviews that assessed biological and health effects from exposures below internationally accepted EMF limits when the whole database of scientific literature is reviewed according to well-accepted international risk assessment methods and criteria (see Annex 1 and 2).

Table 1.1 (pp. 34-49) gives the overall conclusions of the BioInitiative Report.

None of these conclusions is supported by the major national or international reviews as listed in Annexes 1 and 2, that have made use of the internationally accepted weight-of-evidence approach to study results. The BioInitiative Report advocates the use of precautionary measures. Consideration of precaution is also recommended by WHO, who notes however that it is the responsibility of national authorities to adopt precautionary measures if deemed appropriate, and that, if adopted, such measures should be based on local priorities and cost-effectiveness.

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The chapter headings and their authors are given below:

1. Summary for the public and conclusions (Ms. Sage)
2. Statement of the problem (Ms. Sage)
3. The existing public exposure standards (Ms. Sage)
4. Evidence for inadequacy of the standards (Ms. Sage)
5. Evidence for effects on gene and protein expression (transcriptomic and proteomic research) (Drs. Xu, Chen)
6. Evidence for genotoxic effects – RFR and ELF DNA damage (Dr. Lai)
7. Evidence for stress response (stress proteins) (Dr. Blank)
8. Evidence for effects on immune function (Dr. Johansson)
9. Evidence for effects on neurology and behavior (Dr. Lai)
10. Evidence for brain tumors and acoustic neuromas (Drs Hardell, Mild, Kundi)
11. Evidence for childhood cancers (leukaemia) (Dr. Kundi)
12. Magnetic field exposure: melatonin production; Alzheimer's disease; breast cancer (Drs. Davanipour, Sobel)
13. Evidence for breast cancer promotion (melatonin links in laboratory and cell studies) (Ms. Sage)
14. Evidence for disruption by the modulating signal (Dr. Blackman)
15. Evidence based on EMF medical therapeutics (Ms. Sage)
16. The precautionary principle (Mr. Gee)
17. Key scientific evidence and public health policy recommendations (Dr. Carpenter, Ms. Sage)
18. List of participants and affiliations
19. Glossary of terms and abbreviations
20. Appendix - ambient ELF and RF levels, average residential and occupational exposures
21. Acknowledgements

## **Annex 1: Statements from Governments and Expert Panels Concerning Health Effects and Safe Exposure Levels of Radiofrequency Fields (RF)**

### **EC FP6 EMF-NET Coordination Action**

EMF-NET EFRT Comments on Health Risk Posed by Aerials of Mobile Telephone Base Stations (RE: Written Question QE4450/06), October 30, 2006, 4/2006

EMF-NET EFRT Opinion on the Possible Risk Concerned with Living at a Given Distance from Radio Base Stations, December 7, 2006

EMF-NET EFRT Opinion on Health Effects of Telephone Masts, December 16, 2004

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## **Annex 2: Statement from the World Health Organization (WHO) Concerning Health Effects of Extremely Low Frequency Fields (ELF)**

**Reference: World Health Organization (2007) Fact sheet N°322 June 2007, Electromagnetic fields and public health: Exposure to extremely low frequency fields.**

In 2002, IARC published a monograph classifying ELF magnetic fields as "possibly carcinogenic to humans". This classification is used to denote an agent for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence for carcinogenicity in experimental animals (other examples include coffee and welding fumes). This classification was based on pooled analyses of epidemiological studies demonstrating a consistent pattern of a two-fold increase in childhood leukaemia associated with average exposure to residential power-frequency magnetic field above 0.3 to 0.4  $\mu\text{T}$ . The Task Group concluded that additional studies since then do not alter the status of this classification.

However, the epidemiological evidence is weakened by methodological problems, such as potential selection bias. In addition, there are no accepted biophysical mechanisms that would suggest that low-level exposures are involved in cancer development. Thus, if there were any effects from exposures to these low-level fields, it would have to be through a biological mechanism that is as yet unknown. Additionally, animal studies have been largely negative. Thus, on balance, the evidence related to childhood leukaemia is not strong enough to be considered causal.

Childhood leukaemia is a comparatively rare disease with a total annual number of new cases estimated to be 49,000 worldwide in 2000. Average magnetic field exposures above 0.3  $\mu\text{T}$  in homes are rare: it is estimated that only between 1% and 4% of children live in such conditions. If the association between magnetic fields and childhood leukaemia is causal, the number of cases worldwide that might be attributable to magnetic field exposure is estimated to range from 100 to 2400 cases per year, based on values for the year 2000, representing 0.2 to 4.95% of the total incidence for that year. Thus, if ELF magnetic fields actually do increase the risk of the disease, when considered in a global context, the impact on public health of ELF EMF exposure would be limited.

A number of other adverse health effects have been studied for possible association with ELF magnetic field exposure. These include other childhood cancers, cancers in adults, depression, suicide, cardiovascular disorders, reproductive dysfunction, developmental disorders, immunological modifications, neurobehavioural effects and neurodegenerative disease. The WHO Task Group concluded that scientific evidence supporting an association between ELF magnetic field exposure and all of these health effects is much weaker than for childhood leukaemia. In some instances (i.e. for cardiovascular disease or breast cancer) the evidence suggests that these fields do not cause them.

For high-level short-term exposures to EMF, adverse health effects have been scientifically established (ICNIRP, 2003). International exposure guidelines designed to protect workers and the public from these effects should be adopted by policy makers. EMF protection programs should include exposure measurements from sources where exposures might be expected to exceed limit values.

Regarding long-term effects, given the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukaemia, the benefits of exposure reduction on health are unclear. In view of this situation, the following recommendations are given:

Government and industry should monitor science and promote research programmes to further reduce the uncertainty of the scientific evidence on the health effects of ELF field exposure. Through the ELF risk assessment process, gaps in knowledge have been identified and these form the basis of a new research agenda.

Member States are encouraged to establish effective and open communication programmes with all stakeholders to enable informed decision-making. These may include improving coordination and consultation among industry, local government, and citizens in the planning process for ELF EMF-emitting facilities.

When constructing new facilities and designing new equipment, including appliances, low-cost ways of reducing exposures may be explored. Appropriate exposure reduction measures will vary from one country to another. However, policies based on the adoption of arbitrary low exposure limits are not warranted.