

EU Research into possible health effects --- Project Overviews *

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1) ADVICE PULSED FIELDS: Development of the advice to the EC on the risk to the health of the general public from the use of security and similar devices employing pulsed electromagnetic fields

The project will produce an advisory document for the EC and Member States on the use of equipment (electronic security and similar devices) using pulsed EMF. Experts of the International Commission on Non-Ionising Radiation Protection (ICNIRP) have been appointed to carry out this task. Through contact with governmental organisations, WHO, and with equipment manufacturers, designers and suppliers, the expert group will review existing and possible future technologies in this field. The resulting scientific evidence on the health caused by the technology will be discussed, and the outcome published in a final report for the EC.

Contact: Prof. Jürgen Bernhardt, ICNIRP (DE), e-mail : j.h.bernhardt@t-online.de

2) INTERPHONE: International case-control studies of cancer in relation to mobile telephone use **

The study focuses on brain tumours (malign and benign gliomas), meningeal tumours (malign and benign meningiomas), acoustic nerve tumours (acoustic neuromas) and malignant parotid gland tumours and acute leukemia.

It is a population-based case-control study and the population base consists of all subjects in the age range of 30-59 years, mainly in metropolitan areas. Cases and controls are currently recruited over a period of 2 to 3 years.

The study will analyse how and for how long time the mobile phone has been used, type of phone etc., in each subject. The localisation of the tumours will be regarded.

The results will be available for publication in 2005.

Participating countries in the Interphone Study are Australia, Canada, Denmark, Finland, France, Germany, Israel, Italy, Japan, New Zealand, Norway, Sweden, UK-London and UK- Leeds.

Contact: Dr. Elizabeth Cardis, IARC (FR), e-mail: cardis@iarc.fr

3) GUARD: Potential adverse effects of GSM cellular phones on hearing

GUARD will study potential adverse effects

- on hearing and hearing-related cognitive functions
 - o of rats and guinea pigs
 - o of humans (normal hearing subjects)

of GSM cellular phones at both 900 & 1800 MHz bands.

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4) RAMP 2001: Risk assessment for exposure of nervous system cells to mobile telephone EMF: From *in vitro* to *in vivo* studies

The project will achieve a very comprehensive “data fusion” of the results obtained from animal and *in vitro* experiments, with theoretical modelling at molecular level and computer simulations. In addition, well reproducible *in vivo* and *in vitro* tests of the vulnerability of nervous system cells to radiofrequency exposure (900 MHz, 1800 MHz, UMTS) shall be defined.

In vivo experiments in rats and mice will include

- mapping of changes in brain functional activity
- brain imaging of genomic expression
- correlation of RF-induced changes in brain activity with the behavioural test observations.

In vitro studies on RF-exposed of neurons, astrocytes, and human derived nerve cells will evaluate

- the induction of genes as sensitive indicators of “cell behaviour modifications”
- changes in cell response to growth factors and use the data for explanation of changes in cell proliferation, differentiation and potential damages.

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5) REFLEX: Risk evaluation of the potential environmental hazards from low-energy electromagnetic field (EMF) exposure using sensitive *in vitro* models

The REFLEX project analyses primary cellular effects of electromagnetic field (EMF), with special emphasis on the following parameters:

- genotoxicity: EMF at levels below ICNIRP guidelines may not alter DNA directly, but could do so indirectly by triggering metabolic changes
- cell differentiation and function: is studied in animal cell lines as a model for central nervous system cells exposed to EMF from mobile phones

- gene expression and protein targeting
- effects on the immune system, and
- effects on processes involved in cancer development and programmed cell death (apoptosis).

Contact: Prof. Franz Adlkofer, Foundation for Behaviour & Environment, Munich (DE)
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6) CEMFEC: Combined effects of electromagnetic fields with environmental carcinogens

The project addresses the concern whether radiofrequency electromagnetic fields (RF) can enhance the effects of known carcinogens.

The *in vivo* part of CEMFEC comprises a study in which rats are exposed to a carcinogen alone (in their drinking water) or the RF and the carcinogen simultaneously. The aim is to see whether those rats subjected to the combined exposure develop more cancers.

The second part is an *in vitro* study of mouse cells, one of the cell lines studied being a cancer cell line. The cells are treated either with RF alone or with RF and a carcinogen. The aim is to compare markers associated with cancer development in these models.

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7) PERFORM-A: *In vivo* research on possible health effects related to mobile telephones and base stations (carcinogenicity studies in rodents) ***

PERFORM-A will provide research results on possible carcinogenic or co-carcinogenic effects of electromagnetic fields (EMF) in the animal species rats and mice. Restrained animals are exposed to EMFs of 900 and 1800 MHz.

Four toxicology research institutes take part in PERFORM-A: RCC Ltd. (Itingen, Switzerland), the Austrian Research Centre Seibersdorf (ARCS), LCG-RBM (Colleretto Giacosa, Italy), and Fraunhofer ITA (Hannover, Germany). The project is sponsored by the European Commission, the Swiss Federal Office of Education and Science, the GSM Association (GSMA), and the Mobile Manufacturers Forum (MMF). The Fraunhofer ITA has taken on the scientific co-ordination and is supported by the University of Helsinki, which is responsible for the financial management.

The first partial project was started at the Fraunhofer ITA in November 2001. In two carcinogenicity studies, B6C3F1 mice are exposed 5 days per week for 2 hours a day to EMFs at 900 or 1800 MHz. In summer 2002 two analogous carcinogenicity studies on Wistar rats were initiated at the RCC Ltd.

The third partial project at the ARCS, started in September 2002, will investigate possible co-carcinogenic effects of HF-EMF exposure at 900 MHz on mammary tumours induced in female Sprague Dawley rats by DMBA (7,12-dimethylbenz(a)anthracene).

Last, the fourth partial project at the LCG-RBM in Italy, running since November 2001, will review the results of the study by Repacholi et al.¹⁾

In addition, the Foundation IT'IS (Zürich, Switzerland; director: Prof. Niels Kuster), together with the ARCS and the University of Thessaloniki (Greece), take part in the EU research project. The IT'IS is responsible for the design, construction and operation of the exposure set-ups. The exposure units, in shape of wheels, consist of two parallel circular stainless steel plates with polycarbonate tubes at the border that are secured in-between the plates. The antennas are placed in the centre between the plates. The radial position of the exposure tubes guarantees the most homogeneously possible exposure of all animals. In each experiment three "dose" groups and one sham control group are investigated. The animals of this control group are also secured in fixation tubes positioned in an identical wheel, but without RF exposure.

All animal experiments are conducted as blind studies and according to the principles of Good Laboratory Practice (GLP) and the testing guidelines for carcinogenicity of the EU, OECD and the U.S. Environmental Protection Agency (EPA).

The studies will each last two years. Another year will be needed for the histopathological examination and for the total evaluation.

Therefore, the results of the total project PERFORM-A will be available in mid-2005. By that time the results of the epidemiological multi-centre study INTERPHONE, which is also conducted under the EU's 5th Framework Research Programme, are expected. The EU, the WHO/IARC and other institutions will then assess with great certainty whether EMFs, as they are emitted from mobile phones and base stations, cause an increase in cancer risks.

¹⁾ Repacholi, M. H., Basten, A., GebSKI, V., Noonan, D., Finnie, J., Harris, A. W. (1997). Lymphomas in E μ -Pim1 Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields. *Rad Res* 147: 631-640.

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9) THz-BRIDGE: Tera-Hertz radiation in biological research, investigation on diagnostics and study on potential genotoxic effects

Recent technological break-through in the field of Terahertz radiation (T-rays) is triggering new applications in biology and biomedicine. Particularly, biological applications are based on the specific spectroscopic fingerprints of biological matter in this spectral region. The aim of this research project is to investigate the interaction of Terahertz (THz) radiation with biological systems following a streamline of increasing complexity, from bio-molecules to cells.

The objectives of the project are:

- Production of a spectroscopic database for selected enzymes, proteins, biological membranes and cells in the frequency range from 100 GHz to 20 THz (the so-called "THz gap")
under irradiation conditions that preserve the integrity and functionality of the biological samples.
- Identification of critical frequencies, which might induce damages on biological systems, and to determine the spectral regions for optimal contrast in imaging applications
- Assessment of potential risks due to the exposure of membranes, cells, and DNA to pulsed and CW THz radiation and
- Definition of safe exposure standards for THz biomedical imaging applications.

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Remarks:

* Project overviews can be found under the website <http://www.cordis.lu>, additional short project descriptions for projects 1, 5, 6 in the Key action 4 brochure (pp. 14-16) of the 5th FP on the website <http://europa.eu.int/comm/research/quality-of-life/ka4/pdf/brochureka4-en.pdf>.

** INTERPHONE is not subject of the presentation, it is listed for completeness.

*** Upon request of the organizers, the project overview focusses on PERFORM-A.

The project abstracts are purely those of the author and may not in any circumstances be regarded as an official version of the European Commission.

“QoL - Environment & Health - Health impact of electromagnetic fields” within the 5th FP of
EC:

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