



# EMF and health effects: Research and protection at the international level

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Former Coordinator, Radiation and Environmental Health World Health Organization, Geneva, Switzerland

30 years of Bioelectromagnetism in Italy (Martino's Symposium) Roma, Italy

#### Martino started at ISS as a student in Sept. 1963 and has had an illustrious career in radiation health

#### mazon.com



t, Lasers, and Synchroton Radiation: A Health Risk Assessment (NATO Science Series: B:) by Martino dolfo, A. Rindi, and D.H. Sliney (Hardcover - Mar 31, 1991)

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ntly unavailable

gical Effects and Dosimetry of Nonionizing Radiation: Radiofrequency and Microwave Energies by Martino; aelson, Sol M.; and Rindi, Alessandro Grandolfo (Paperback - 1983)



Radio Vaticana di S. Maria di Galeria - Roma

- La cronologia delle iniziative
- Le ultime novità
- Chi parla di noi



#### and Martino met the Pone

#### Same desk for 44 years, a record?





Development of Advice to the EC on the Risk to Health of the General Public from the Use of Security and Similar Devices Employing PEMFs

The objective is the production of an advisory document to the European Commission and member states addressing the issue of possible adverse effects on public health from exposure to pulsed electromagnetic fields (PEMFs) associated with electronic security and similar devices.

Coordinator: Jürgen Bernhardt, German Federal Radiation Protection Office, Oberschleissheim, Germany. Participants: Anders Ahlbom, Karolinska Institute, Stockholm, Sweden; Jean-Pierre Césarini, Rothschild Foundation, Paris, France; Martino Grandolfo, National Institute of Health, Rome; Frank de Gruijl, Utrecht University Hospital, Utrecht, The Netherlands; Maila Hietanen, Finnish Institute of Occupational Health, Vantaa, Finland; Rüdiger Matthes, German Federal Radiation Protection Office; Alastair McKinlay, National Radiological Protection Board, Chilton, U.K.; Michael Repacholi, World Health Organization, Geneva, Switzerland; and Laszlo Szabo, National Research Institute for Radiobiology and Radiation Hygiene, Budapest, Hungarv.

### Radiation ....what do people think?

Can't smell Can't hear Can't see Can't sense Can't taste

Maybe its dangerous to health...

#### People's fear of radiation is triggered by past events and especially media reports







23 July, 2007

291 C

## Iraqis blame U.S. depleted uranium for surge in cancer

CAIRO, July 23 (RIA Novosti) - Iraq's environment minister blamed Monday the use of depleted uranium weapons by U.S. forces during the 2003 Operation Shock and Awe for the current surge in cancer cases across the country.

### **Ionizing radiation: Science**

#### Sources of Radiation Exposure

From: NCRP Report No. 93



Radon (55%)

Natural Sources (excluding Radon) (26%) Medical X-rays (11%) Nuclear Medicine (4%)

Consumer Products (3%)



>80% of people's exposure comes from natural sources: radon, other radionuclides in materials and air.

But people are NOT concerned about this "natural carcinogen" o about medical X-rays (especially CT). WHY?

- Smokers inhale about 0.04 pCi of radioactive polonium 210 from each cigarette (uranium daughters are selectively absorbed by growing tobacco plants)
- Po-210 is a highly toxic α-emitter..
   very damaging to lung tissue.
   Recently used to kill former Russian spy (Alexander Litvinenko)
- > 30 cigarettes smoked each day gives the same radiation dose to the lungs as about 300 chest X-rays a year\*

Prof Robert N Procter (Stanford University) article in the Herald Tribune (2-3 Dec. 2006, p6)

Is there really any scientific uncertainty or do people choose not to take notice of the science?



#### **Smoking Polonium**

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

## **Brief History of EMF Concerns**



Technicians warm themselves in front of radars during winter at northern Canadian early warning sites (1950s) 1st RF heating?

Studies of radar technicians: Korean war (1970s). Introduction of MW ovens (1970s) Reason for regulations. MW signals in US Embassy, Moscow (1970s) Introduction of workplace computer VDTs (1970-80s) Wertheimer and Leeper study (1979) on power line fields and "confirmation" by Savitz et al (1982) Brain tumour law-suit on Motorola mobile phones (1990s) Rapid uptake of mobile telephony (1990s) Concerns about wireless technologies...WiFi (2000s) Increase in activism and their use of the internet (2000s)

Press has a huge influence on 24 October 2002 people's perception of EMF Page 43 risks

## Mobiles 'boost cancer'

Radiation may make tumours grow faster

#### By Tim Utton

Science Reporter

NEW safety fears about mobile phones emerged yesterday over a possible link with cancer.

Radiation from the phones could promote the growth of tumours, according to scientists.

A new study suggests the radiation can kick cancer cells into 'high gear' and make tumours grow much more aggressively.

There are 40million mobile users in the UK, but despite the millions spent on research in the last decade, the health implications of sustained use are still unclear.

The biggest British study, led by Sir William Stewart two years ago, could find no evidence of a risk to health. But Sir William still recommended a precautionary approach, particularly in children.

The World Health Organisation has called for more research and has urged people to limit mobile use.

Now Italian scientists believe they could be closer to the truth.

Dr Fiorenzo Marinelli, of the National Research Council in Bologna, exposed leukaemia cells in the laboratory to 48 hours of continuous radio waves at a similar power and frequency to mobile phone emissions.

Initially, the radiation killed the cancer cells. But then the scientists noticed this lethal effect had gone into reverse as a 'survival mechanism' was triggered, which made them replicate at a ferocious speed.

Dr Marinelli said: 'We don't know what the effects would be on healthy human cells.

'But in leukaemia cells the response is always the same.'

The radiation may initially damage DNA, he said, interfering with chemical signals in a way that ultimately triggers the defensive reaction prompting cancer cells to replicate faster. Cancer develops when control signals in a normal cell go wrong and an abnormal cell results. Instead of destroying itself the mutant cell keeps on dividing and forms a lump or tumour.

The results of the Italian study support the belief of some scientists who say radiation can damage DNA and destroy the cell repair system – making tumours more deadly.

Dr Peter de Pomerai of the University of Nottingham, who studied effects on the body earlier this year, said the research was 'intriguing'.

Radiation may indirectly damage DNA by affecting its repair system, he said. If the DNA repair mechanism does not work as well as it should, mutations in cells could accumulate – with disastrous consequences.

'Cells with unrepaired DNA damage are likely to be far more aggressively cancerous,' said Dr de Pomerai. Dr Marinelli presented his results at the International Workshop on the Biological Effects of Electromagnetic Fields, held in Greece.

The study is published in this week's New Scientist.

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## In developing countries people are happy to be able to communicate and have electricity





#### People are mainly worried about Base Stations

Scientific evidence strongly uggests no health effects rom their RF signals

• Do people think masts are nsightly and they should be idden?







Base station blended with historical building



2 tree base

stations

#### Some milestones in standards

ANSI and Soviet RF standards (1960-70s)

- BEMS concept discussed IMPI meeting Ottawa (1975). (Stuchlys Justesen, Repacholi, Osepchuk, Rozzell). BEMS established 1978
- Formation of IRPA NIR Working Group (1974-1975)
- Formation of IRPA NIR Study Group (1975-1977)

IRPA establishes INIRC (Paris, 1977)

Discuss changing INIRC to ICNIRP (Surfer's Paradise, 1988). 1s INIRC workshop in Melbourne

IRPA signed charter for independent ICNIRP (Montreal, 1992).
2nd INIRC NIR workshop in Vancouver

WHO International EMF Project (Geneva, 1996) to do health risl assessment, promote research, inform the public and recommend ICNIRP guidelines hat recommended formation of an independent commission

urie Institute, Paris

9-21 Nov. 1974

John Villforth George Wilkening

Mogens Faber

Przemyslaw Czerski Henri Jamme

(Chair)

Annette Duchêne

**IRPA Working Group Mandate (1974-5)** Dr Carlo Polvani, President of IRPA (1973-7) wanted the WG to: Consider role and composition of international commission for protection against NIR Recommend sponsors and financial sources for activities of the commission Assess actions IRPA should take to contribute to the international movement for NIR protection Examine collaboration between IRPA, WHO and other international organizations with a new

international commission on NIR

**IRPA Working Group Report (1974-5)** The WG reported to the Executive Council (Amsterdam, May 1975) that IRPA should: **Establish a separate and independent International Commission on NIR Protection (ICNIRP) ... as the** International Congress of Radiology sponsors ICRP **Change IRPA constitution to include NIR Indicate to WHO, IEC, ILO, URSI, etc IRPAs intention** to sponsor ICNIRP and seek financial support provided **ICNIRP** independence is guaranteed Stimulate research and exchange of scientific information on NIR by of seminars and symposia and include NIR topics in future IRPA Congresses

## IRPA NIR Study Group (1975-7)

Vith the same members as the WG it became the SG to:

- Prepare documents and criteria for standards, measurements etc
- Recommend rules for a possible future international body on NIE protection

RPA reported this activity to 28th WHO General Assembly (1975). Executive Council rejects proposal for an independent international ody at IRPA Congress (Paris, 1977) and establishes INIRC instead

> Martino attended the SG meeting at ISS in Rome 27-31 Oct 1975 with Dr Carlo Polvani

#### VHO/INIRC meeting on Magnetic Fields, Kiev

3 months after Chernobyl accident

#### Ioscow University hill



## INIRC Surfer's Paradise, Australia, 1988



## Last meeting of INIRC before becoming ICNIRP Vancouver 1992



## A later ICNIRP Committee



#### WHO International EMF Project



Started 1996 because: > No expertise in many countries to manage **EMF** issues >IRPA/INIRC became ICNIRP in 1992 and had worked with WHO since 1978, but needed an international umbrella to focus on EMF

#### Motivation for the WHO EMF Project

WHO is the only UN organization with a mandate to deal with EMF health effects; has excellent reputation

WHO >60 yrs experience and criteria for assessing health risks from exposure to biological, chemical and physical agents Huge public concern about EMF With ICNIRP as an NGO of WHO on EMF the Project had sound scientific support, as demonstrated by 6 EHCs with INIRC and 2 with **ICNIRP** (2 more with ICNIRP after EMF Project started

## WHO EHC Monographs

1. WHO/IRPA EHC #14 Ultraviolet Radiation, 1979

- 2. WHO/IRPA EHC #16 Radiofrequency and microwaves, 1981
- 3. WHO/IRPA EHC #22 Ultrasound, 1982
- 4. WHO/IRPA EHC #23 Lasers and optical radiation, 1982
- 5. WHO/IRPA EHC #35 Extremely Low Frequency (ELF) Fields, 1984
- 6. WHO/IRPA EHC #69 Magnetic Fields, 1987
- 7. WHO/ICNIRP EHC #137 Electromagnetic Fields (300 Hz to 300 GHz), 1993
- 8. WHO/ICNIRP EHC #160 Ultraviolet Radiation, 1994
- 9. WHO/ICNIRP EHC #232 Static Fields, 2006

10. WHO/ICNIRP EHC #238 Extremely Low Frequency Fields, 2007





#### WHO Management of Research

What has been done?

What is being done?

What needs to been done?

time

WHO Research Reviews WHO Research Database WHO Research Agenda

#### WHO Research Agendas

VHO International EMF Project has developed Research Agendas to facilitate and coordinate research worldwide on EMF. Research agendas for each part of the EMF spectrum undergo eriodic review, especially after EHC reviews.

lost recent research agendas are given below:

#### tatic fields:

ttp://www.who.int/peh-emf/research/smf\_research\_agenda\_2006.pdf

RF fields: ttp://www.who.int/peh-emf/research/rf\_research\_agenda\_2006.pdf

#### **LF fields:**

ttp://www.who.int/peh-emf/research/elf\_research\_agenda\_2007.pdf

National Research Agendas Iational EMF research programs have used the WHO esearch agendas as a guide for their own research Stimated >\$250 million spent by countries and EC on EMF research

Australia, China, France, Fermany, Italy, Japan, Ietherlands, South Korea, Witzerland, UK (MTHR), JSA (recent NAS agenda) nd many others



## Key Issues Children's exposure to EMF



WHO workshop on Children sensitivity to EMF Istanbul, June 2004  Children dont seem to be more susceptible to EMF than adults
 ICNIRP guidelines, with their increased safety factor for the genera public exposure limits, seem to provide adequate protection for children exposed to EMF

Outstanding issue to resolve with ELF magnetic fields and childhood leukaemia

Few studies applicable to children;
more research needed

Key Issues: Wireless technologies

WHO workshop on Base stations and wireless networks Geneva, June 2005

Research has not established adverse ealth effects at RF levels used by wireless echnologies

• Base station and WiFi signals so low they an have no health consequence (WHO, 006)

• Focus of research should be on mobile hone handsets







**ARC** classification



Key Issues: ELF Fields WHO EHC ELF 2007 > 2B: ELF magnetic fields a possible human carcinogen

Based on epidemiological studies suggesting incidence of childhood leukaemia increased with magnetic fiel exposures > 0.3 - 0.4 μT

Little or no support for epi results from laboratory studies

Epi results too weak to be used for exposure restrictions

WHO ELF EHC recommends no or very low cost precautionary measures to reduce unnecessary exposure

# After 30 years of EMIF health effects research?

- Hundreds of millions of \$s spent
- > 6000 scientific papers published



- Great advances in EMF dosimetry.. making earlier research results doubtful or unreliable for standards?
- Only RF heating found to affect health. Basis of ICNIRP. Non-thermal effects don't have any apparent health consequence..
  In ELF association between 50/60 Hz magnetic fields and childhood leukaemia ..since 1980s. Will science solve this dilemma? ELF fields are extremely weak, so how do they act?
  In static fields, limit of 2T could be increased to 8T provided protective measures are adopted. Only short-term effects are seen
  Need more research on children and EMF



nnette and Bernard say éicitations pour votre etraite

Jammet telling jokes in ncouver

Mike says Caro Martino, è stato un piacere lavorare con te. Adesso goditi la pensione

