RF and Health: A WHO Perspective

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OUTLINE

- Introduction
- Assessing the health risk
- Managing the potential risk
- Conclusions
WHO values

WHO has been at the forefront of improving health around the world since 1948.

Health:

is a state of complete physical, mental and social well-being, not just the absence of disease or infirmity

is the fundamental right of every human being, everywhere

is crucial to peace and security

depends on the cooperation of all individuals and States

should be shared: extending knowledge to all peoples is essential

Our leadership priorities give focus and direction to our work. They are areas where it is vital for WHO to lead—the key issues which stand out from the body of our work.
Our vision
Health is a fundamental human right; everyone has the right to the highest possible level of health.

Who we are
World Health Organization is the United Nation's specialized agency for health, with 194 Member States and supported by more than 7,000 staff based in 154 countries, six regional offices, and headquarters in Geneva.

What we do
Our primary role is to direct and coordinate international health; we provide leadership on essential public health topics; we set health research agendas; define norms and standards for health; and articulate policy options for health.

Programmatic reform
1
Programmatic reform to improve people’s health

Governance reform
2
Governance reform to increase coherence in global health

Managerial reform
3
Managerial reform in pursuit of organizational excellence

Reform – our pathway
Programmes & Priorities
Leadership priorities give focus and direction to WHO’s work:
- Advancing universal health coverage
- Achieving the health-related Millennium Development Goals
- Addressing the challenge of noncommunicable diseases and mental health
- Implementing the International Health Regulations
- Increasing access to essential, high-quality and affordable medical products
- Reaffirming health inscriptions by addressing the social, economic and environmental determinants of health

Governance
Reform of the World Health Assembly, Executive Board and its committees, and improved co-ordination through the Health Action Framework, harmonization of governance processes, internal strengthening, decision-making, and transparent communication.

Management
Enhancing managerial processes and organizational structures will build an organization that is more efficient, effective, responsive, accountable, transparent, and accountable.

Key elements include a results-based management, a new financing mechanism, a new human resource model, and a strengthened culture of evaluation.

Reform – our story
The first decade of the 21st century brought unprecedented challenges and opportunities for people’s health. Critical public health problems persist and new ones emerged. New technologies, aging populations, globalisation, migration, climate change, disasters and pandemics all increase the complexity of health challenges we face.

The global public health landscape is crowded and poorly coordinated. This demands renewed leadership in global health from WHO, focused on the main priorities in global health, responding to rapid emerging needs, adapting to new ways of working, ensuring resources efficiently and effectively.
Twelfth General Programme of Work 2014/2019

Social, economic and environmental determinants

The big idea
To improve people’s health outcomes and increase healthy life expectancy requires action across the range of contextual factors associated with ill health as well as inequitable health outcomes.

What will we do?
We will work with other sectors to act on what causes disease and ill health. Our work will address health determinants and promote equity.
WHO
Department of Public Health, Environmental and Social Determinants of Health

- Climate change
- Air pollution (indoor and outdoor)
- e-waste
- Energy and health
- Housing and health
- Water, sanitation and health
- Radiation…
The Present EMF Context

- Increasing EMF human exposure due to electricity use, wireless devices and medical technologies
- Increasing concern from the public
"Using EMF to achieve the smartest sustainable city"
Martin Röösli

Source: M. Röösli, 2014
ICT and smart cities
Applications using radiofrequency fields
Smart Meters

- Smart meters are increasingly being installed in homes and businesses to collect/report on electrical, water and natural gas consumption.

- Allows remote real-time monitoring using two-way (radio) communication to relay information to the utility companies and to the consumers to help manage their energy use.

- Increased public resistance due to concerns about health, privacy and cost to consumers.
Mobiles ‘boost cancer’
Radiation may make tumours grow faster

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 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.

Stop Smart Meters!
Fighting for health, privacy, and safety
The Present Scientific Knowledge

Large and increasingly sophisticated database

Known mechanisms

Health effects not established below international guidelines

Scientific uncertainty
WHO International EMF Project

- Established in 1996
- Coordinated by WHO HQ
- A multinational, multidisciplinary effort to create and disseminate information on human health risk from EMF
WHO Partners in Radiation
mHealth
an ITU/WHO initiative

ITU and WHO launch mHealth initiative to combat noncommunicable diseases

Plan to save lives and reduce costs agreed at ITU Telecom World 2012

Joint ITU/WHO news release

17 OCTOBER 2012 | DUBAI, UNITED ARAB EMIRATES - The International Telecommunication Union (ITU) and WHO today launched a new partnership called the 'mHealth' Initiative to use mobile technology, in particular text messaging and apps, to help combat noncommunicable diseases (NCDs) such as diabetes, cancer, cardiovascular diseases and chronic respiratory diseases.
"We should all work to meet targets to reduce NCDs."

US$ 7T
Healthcare costs & productivity losses 2011-2025

9M
Premature deaths / year

6.8 Billion
Mobile cellular subscriptions

mHealth initiatives

Figure 1. Member States reporting at least one mHealth initiative, by WHO region

mHealth initiatives

Figure 3. Adoption of mHealth initiatives and phases, globally

Do EMFs pose a health risk?

Risk Assessment
The Evidence

Risk Perception
The Public Concern

Risk Management
The Policies

World Health Organization

2006 WHO Research Agenda for Radio Frequency Fields

In 1997, the WHO International EMF Project developed a Research Agenda in order to facilitate and stimulate research worldwide on the possible adverse health effects of electromagnetic fields (EMF). In subsequent years, this agenda has undergone periodic update and expansion.

International EMF Project

EMF World Wide Standards

4th ITU Green Standards Week, 25 September 2014, Beijing, China
OUTLINE

- Introduction
- Assessing the health risk
What do we know?

50 Hz … 100 kHz  300 MHz  10 GHz

Frequency

≠
What do we know?
Mechanisms of interaction

Induced currents

Induced currents and heating

Surface heating

Non-thermal effects??

Frequency

50 Hz … 100 kHz 300 MHz 10 GHz
What type of research is needed?
Research

Balance of studies needed

Laboratory Studies

Mobile phone-related experimental studies

Laboratory Studies

- Cellular studies
  - Genotoxicity
  - Gene expression

- Animal studies
  - Cancer
  - Behaviour
  - BBB
  - Skin

- Human studies
  - Sleep
  - EEG
  - Hormones
  - EHS
Short-term effects
( WHO fact sheet 193, June 2011)

To date, research does not suggest any consistent evidence of adverse health effects from exposure to RF fields at levels below those that cause tissue heating.

Research has not been able to provide support for a causal relationship between exposure to EMF and self-reported symptoms, or “electromagnetic hypersensitivity”.
Epidemiological studies
Studies on mobile phones

Mobile phone related epidemiological studies

Epidemiological studies
Studies on mobile phones

- Tumours in head and neck
  - Glioma, meningioma, acoustic neuroma, parotid gland

- Numerous studies on the use of mobile phones
  - Published: USA, Nordic countries, INTERPHONE, CEFALO
  - Ongoing: MOBI-Kids, COSMOS
Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case–control study

The INTERPHONE Study Group*

Cases:
- 2,765 gliomas
- 2,425 meningiomas
- 1,121 acoustic neuroma
- 109 malignant parotid gland

Controls:
- 7,658
**Long-term effects**

(WHO fact sheet 193, June 2011)

- No increased risk of glioma, meningioma or acoustic neuroma with mobile phone use > 10 years
- Indications of increased risk of glioma for heavy users
  - But biases and errors prevent a causal interpretation
- No available data for long-term use (15-20 years)
- Studies on children ongoing
Media centre

Electromagnetic fields and public health: mobile phones

Fact sheet Nº193
June 2011

Key facts

- Mobile phone use is ubiquitous with an estimated 4.6 billion subscriptions globally.
- The electromagnetic fields produced by mobile phones are classified by the International Agency for Research on Cancer as possibly carcinogenic to humans.
- Studies are ongoing to more fully assess potential long-term effects of mobile phone use.
- WHO will conduct a formal risk assessment of all studied health outcomes from radiofrequency fields exposure by 2012.
Epidemiological studies
Base stations and wireless networks

- Some studies have been performed
  - Well-being and performance
  - Cancer

- Difficulty of personal exposure assessment

Conclusions:
“Considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects”
How do we evaluate the health risk from EMF?
WHO Monographs on Electromagnetic fields

- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans
  - Volume 89: Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields
  - 2002

- Environmental Health Criteria 230: Static Fields
  - 2006

- Environmental Health Criteria N°236: Extremely Low Frequency Fields
  - 2007

- Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields
  - 2013

- RF Fields
  - 2015-16
Health Risk Assessment

Problem Formulation

Exposure Assessment
Determine the amount, duration and pattern of exposure to the agent

Hazard Identification
Review key research to identify any potential health problems that an agent can cause

Exposure-Response Assessment
Estimate how much of the agent it would take to cause varying degrees of health effects that could lead to illnesses

Risk Characterization
Assess the risk for the agent to cause cancer or other illnesses in the general population

Cancer
RF fields classified as "possibly carcinogenic to humans" (Group 2B) based on
- **limited evidence in humans**, based on positive association between glioma and acoustic neuroma and exposure to RF-EMF from wireless phones (epidemiologic studies)
- **limited evidence in experimental animals** for the carcinogenicity of RF-EMF
- **weak mechanistic evidence** relevant to RF-EMF-induced cancer in humans

Evidence for other exposures (e.g. base stations, Wi-Fi) and outcomes (other cancers) considered insufficient for any conclusion
## Agents Classified by IARC (950)

<table>
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<tr>
<th>IARC Classification</th>
<th>Examples of Agents</th>
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| Carcinogenic to humans (107) (usually based on strong evidence of carcinogenicity in humans) | Asbestos  
Alcoholic beverages  
Benzene  
Mustard gas  
Radon gas  
Solar radiation  
Tobacco (smoked and smokeless)  
X-rays and Gamma |
| Probably carcinogenic to humans (59) (usually based on strong evidence of carcinogenicity in animals) | Creosotes  
Diesel engine exhaust  
Formaldehyde  
Polychlorinated biphenyls (PCBs) |
| Possibly carcinogenic to humans (267) (usually based on evidence in humans which is considered credible, but for which other explanations could not be ruled out) | RF fields  
ELF magnetic fields  
Coffee  
Gasoline engine exhaust  
Pickled vegetables  
Styrene |
Health Risk Assessment (cont'd)

Problem Formulation

Hazard Identification
Review key research to identify any potential health problems that an agent can cause

Exposure Assessment
Determine the amount, duration and pattern of exposure to the agent

Exposure-Response Assessment
Estimate how much of the agent it would take to cause varying degrees of health effects that could lead to illnesses

Risk Characterization
Assess the risk for the agent to cause cancer or other illnesses in the general population

All studied outcomes

International EMF Project
Scope

- Frequency range:
  - 100 kHz - 300 GHz
  - Include UWB, pulses, mm-waves

- Sources:
  - RFID, EAS, mobile telephony, radar, smart meters, …

- Health benefits not included
  - Hyperthermia, MRI, medical treatments, diathermy, RF ablation surgery

- Systematic review of scientific evidence of health risks

- Update on research recommendations

- Review of national RF policies
EHC on RF Fields
Process

(Systematic) search for papers
- Predefined and registered search criteria
- First selection based on title
- Second selection based on abstract or full paper
- Apply inclusion and quality criteria

NEED HELP WITH TRANSLATION OF CHINESE PAPERS
# EHC on RF Fields

## Preamble

1. Summary and recommendations for further study
2. Sources, measurements and exposures
3. Electric and magnetic fields inside the body; SAR and heat
4. Biophysical mechanisms; tissue heating
5. Brain physiology and function
6. Auditory, vestibular and ocular function
7. Neuroendocrine system
8. Neurodegenerative disorders
9. Cardiovascular system and thermoregulation
10. Immune system and haematology
11. Fertility, reproduction and development
12. Cancer
13. Health risk assessment
14. Protective measures
Radio Frequency Fields

Consultation on the scientific review for the upcoming WHO Environmental Health Criteria

The consultation is open until 15 November 2014

The World Health Organization is undertaking a health risk assessment of radiofrequency electromagnetic fields, to be published as a monograph in the Environmental Health Criteria Series. This publication will complement the monographs on static fields (2006) and extremely low frequency fields (2007), and will update the monograph on radiofrequency fields (1993).

The draft chapters of this document containing the scientific content are now open for consultation by RF experts. We are seeking comments on the accuracy and completeness of these chapters. Please note that the literature searches have been done up to December 2012 (in a few instances to December 2013), so the more recent studies are currently not included. While the searches and chapters will be updated before finalization of the document, any suggestions for inclusion of peer reviewed studies are welcomed. The introductory chapters, summary, health risk assessment and protective measures will be added at a later stage.

The public consultation will be open through 15 November 2014. After this time, a revised draft will undergo peer-review by an external expert group and will be published in the Environmental Health Criteria series.

In delivering your comments, please consider the document "Review Principles" which describes the overarching criteria used in developing the chapters.

Please provide your comments in the boxes below using page numbers to reference specific items within the draft chapters.
Note that all comments will be collated and considered, but no individual feedback will be given.

If you have questions, please contact us at: emfproject@who.int

Fields marked with an asterisk (*) are mandatory.

Contact and Organization Details

Country *
Organization name *
Last name *
OUTLINE

- Introduction
- Assessing the health risk
- Managing the health risk
Standards and Guidelines

- **Emission standards** have specifications that limit the EMF emissions from devices.

- **Exposure standards** have specifications that limit EMF exposure to people.
Relevant Authorities
Non-governmental and international organizations

- Emission standards
- Measurements standards
- Exposure standards
Reference Levels
Policy documents ....

http://www.who.int/peh-emf/standards/
National management approaches

- Relevant authorities
  - National level

Ministry of Health
Ministry of Labour
Ministry of the Environment
Ministry of Telecommunications
Ministry of Energy
Ministry of Transport
....
National management approaches

Relevant authorities

- National level
- Provincial level
- Local level

• Dispense building and planning permits
• Direct contact with public and operators
• May introduce further conservative measures based on politics rather than science
Management Options

Reduce concern
- No action
- Communication
- Research

Reduce uncertainty
- Planning measures
- Engineering measures

Reduce exposure
- Exposure limits
- ....
Risk Perception and Communication
WHO Risk Handbook

For programme managers who need basic information on EMF risk perception, communication and management

Available in English
Translated into Chinese, Spanish, Italian, German, French, Russian, Bulgarian, Dutch, Polish, Portuguese, Hungarian and Japanese

Available on the web www.who.int/emf
OUTLINE

- Introduction
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- Conclusions
Challenges to governments....

- Rapidly evolving RF technologies
- Launched on the market before health evaluation
- Disparities in risk management measures and regulations around the world
- Concern from the public
Conclusions

● Need for clear roles and responsibilities in government on this topic

● Need for adoption and compliance of health-based standards

● Need for a public information program and dialogue with stakeholders

● Need for promoting research to reduce uncertainty

*We are a "global village"*
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