

**Radio Frequency:
Brief Review of
Science**

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A bit about myself

- 20 years in RF and ELF research
 - EPRI, Stanford
 - World Health Organization
 - Now UCLA
 - Over 100 publications
- Numerous Review and Advisory Committees:**
 - National Academy of Sciences, EMF-Net EU, WHO, ILO, IARC, NIEHS, Independent Scientific Advisory Group to Swedish Radiation Protection Authority (SSM)
 - ICNIRP - Member of the Standing Committee on Epidemiology



History of RF Research

MTHR
Mobile Telecommunications and Health Research

- Investigation of possible changes in biological parameters in laboratory ~1970
- Animal studies on embryo and fetal development due to heating ~1980
- Animal studies on possible effects on brain;
Investigation of cancer incidence with proximity to radio and TV transmitters ~1990
- Start of active research on mobile telephony ~2000 - present



Exposure

Depends on:

- Power
- Distance
- Length of use/transmission



“Electromagnetic Hypersensitivity”

- EHS is characterized by a variety of non-specific symptoms that differ from individual to individual
- The symptoms are certainly real and can vary widely in their severity
- No scientific connection between EHS and exposure to RF

WHO Fact Sheet N° 296

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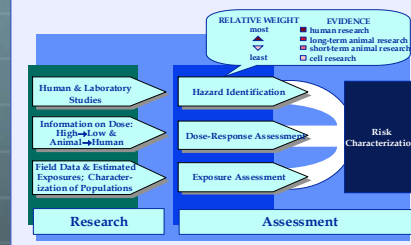
IARC Carcinogenicity Classification

IARC Classification	Examples of Agents
Carcinogenic to humans (107) Usually based on strong evidence of carcinogenicity in humans)	Asbestos Alcoholic beverages Benzene Radon gas Solar radiation Tobacco (smoke and smokeless) X-rays and gamma
Probably carcinogenic to humans (58) Usually based on strong evidence of carcinogenicity in animals)	Biomass smoke Diesel engine exhaust Formaldehyde Polychlorinated biphenyls (PCBs)
Possibly carcinogenic to humans (250) Usually based on evidence in humans which is considered credible but for which other explanations could not be ruled out)	Coffee ELF magnetic fields Gasoline engine exhaust Glass wool Pickled vegetables Radiofrequency fields
Not classifiable (512)	Vinyl toluene Tea Hair coloring products (personal use of) Magnetic fields, Static fields
Probably not carcinogenic to humans (1)	Caprolactam

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Evaluating Evidence

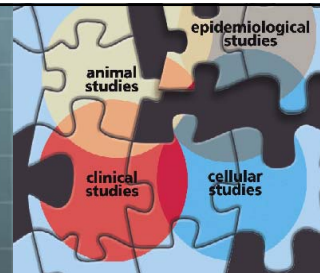
Risk Assessment



- 🌐 A mistake often made by non-scientists is to give inordinate weight to positive studies and to overemphasize selected results within a study that supports their position
- 🌐 Need a balanced weight of evidence approach
 - 🌐 Weight depends on the type of evidence, relevance, quality etc.

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Evidence to date



- 🌐 Thermal effects form the basis for guidelines
- 🌐 Some indication of risk from selected studies
 - IARC 2B classification
- 🌐 Overall no consistent indication of risk, but important uncertainties

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CCST REPORT FINDINGS

- Wireless smart meters, result in much smaller levels of RF than cell phones and microwave ovens
- FCC standard provides safety against known thermally induced health impacts
- To date, scientific studies have not confirmed non-thermal impacts of RF
- Not enough is currently known about potential non-thermal effects to recommend additional standards
- Continue Research

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Sage Report


Assumes:

- 100% duty cycle
- A uniform field at peak power density
- Very High Enhancement by reflections
- No frequency weighting for different sources
- Effects claimed are not recognized as confirmed or definitive

NB: Assumptions completely unrealistic and even impossible, at odds with FCC

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 **World Health Organization (WHO):**
<http://www.who.int/peh-emf/project/en/>

 **Environmental Defense Fund (EDF)**
<http://www.edf.org/SmartMeterResponse>

 **California Council on Science and Technology**
<http://www.ccst.us/news/2011/20110111smart.php>

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