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Common questions about health effects from using mobile phones

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Biological and Health Effects

What's the difference?

- A **biological effect** is any measurable physiological response to EMF exposure ...not necessarily hazardous...this must be evaluated
- An **adverse health effect** is a biological effect outside the body's normal range of physiological compensation that is detrimental to health or well-being

Common questions about using mobile phones



- Do mobile phones cause brain cancer?
- What is the meaning of IARC's 2B classification of RF fields?
- Do base stations and other wireless networks affect peoples' health?
- Will mobile phone use affect my child's health?
- Can people be hypersensitive to RF?
- Are precautions needed to prevent health effects in the future from mobile telecommunications?

Brain cancer: Interphone study



- The Interphone pooled analysis from 13 participating countries found no increased risk of glioma or meningioma with mobile phone use >10 years.
- Some indications of increased risk of glioma for the highest 10% of cumulative hours of cell phone use, but no consistent trend of increasing risk with greater duration of use.
- The researchers concluded biases and errors limit the strength of these conclusions and prevent a causal interpretation.
- An increased risk of brain tumors is not established

Systematic review: Cell phone use and brain cancer*

- Conducted to reduce perception of bias in reviews
- Most transparent and systematic type of review
- A protocol sets out how the review will be conducted and is agreed by all authors before the review begins
- All relevant positive and negative studies are assessed; no studies are rejected.
- Worksheets with criteria to assess study quality give weightings based on compliance with each criterion

*Repacholi MH, Lerchl A, Rösli M, Sienkiewicz Z, Auvinen A, Breckenkamp J, d'Inzeo G, Elliott P, Frei P, Heinrich S, Lagroye S, Lahkola A, McCormick DL, Thomas S, Vecchia P. (2012) Systematic review of wireless phone use and brain cancer and other head tumors. *Bioelectromagnetics* 33: 187-206.

In Vivo Study Quality Assessment Worksheet

Reviewer's name:

First author, year and brief title:					
Study Criteria	Summary of criterion (refer protocol item number provided in brackets for full criterion).	Additional Weight			
		Full ††	Partial †	None #	
Funders	Discloses funding source				
Reporting	Clear statement of hypothesis				
Reporting	Description of study methods sufficient for replication of study				
Reporting	Data reported sufficient to independently confirm results of analyses				
Data analysis	Results derived using all of the appropriate standard statistical methods, unless other methods convincingly justified				
Blinding	Researchers blinded to which exposed and control groups				
Blinding	Researchers blinded during data management and analyses				
Bias	Random assignment of animals to experimental groups				
Duration	Sufficient duration after exposure for effect to be observed				
Treatment & management	Exposed and control groups treated and managed same way, except for exposure				
Controls	Positive and sham controls used as appropriate to study				
Sentinels	Used sentinels to detect pathogens that could affect outcome				
Environment	Properly controlled and documented environmental conditions				
Sterile technique	Used in all appropriate procedures				
Exposure system	Properly calibrated and delivers dose known to reasonable accuracy				
GLP	Applicable good lab practices used				
Animal restraint	Animals habituated before exposure, same restraint for exposed and controls, <i>and</i> detailed analysis of range of dose received, especially if animal growth taken into account, as applicable				
Dose range if animals move	Detailed analysis of range of dose received if animals free to move, especially in long term studies if animal growth taken into account, as applicable				
Histopathology	Diagnoses reviewed by independent panel of pathologists				
Consistency	Extent of internal consistency across data sets				
††Criterion fully satisfied [including when the criterion is satisfied as a result of the study design] † Criterion partially satisfied [Refer to protocol for additional detail] #Criterion not satisfied [including when not addressed in the study]. Insert comments on study and complete data extraction table below.					
Mouse/Rat numbers* (Cross out which animal type not applicable to study reviewed)					
Exposed with tumors	Exposed without tumors	Sham exposed with tumors	Sham exposed without tumors	Exposure level (W/kg)	First author, year

* Only tumor outcomes are to be inserted here, not genotoxic outcomes such as gene expression, DNA fragmentation/mutation

Systematic review contd.

- All studies are combined in a meta analysis of epidemiology studies and a pooled analysis of in vivo studies that are independent of the study quality assessments
- All results are then assessed using the Hill (1965)* criteria to determine whether there is a causal association; whether RF causes brain tumors

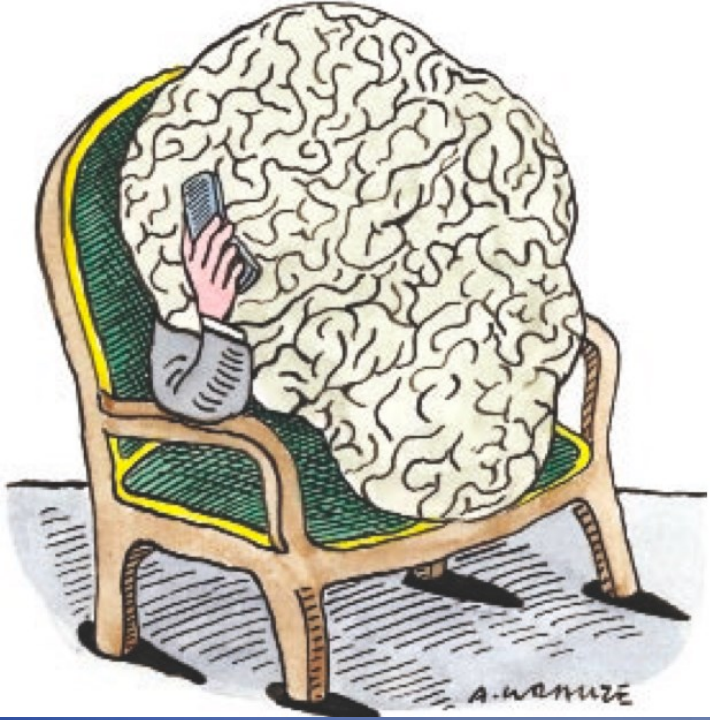
*Hill AB. 1965. The environment and disease: Association or causation? Proc R Soc Med 58(5):295–300.

Systematic review findings

- When study quality criteria were applied, the epidemiology studies overall did not show an association between cell phone use and head tumours.
- A meta-analysis of all epidemiology studies did not show any increased risk for head tumours.
- Animal studies, including genotoxicity studies and pooled analyses, showed no risk between RF exposure and head tumours.
- There is insufficient data to make any assessment of cell phone risk among adults using them ≥ 10 years or by children.
- Overall there is no evidence that cell phone use causes brain cancer or other head tumours

Brain cancer: Summary

Brain and other head cancers from mobile phone use have been extensively studied in adults.



- Large Interphone study found no evidence of head cancers except in the heavy user group. Almost certainly due to recall bias
- Hardell group has published positive results, but they are distinct “outliers” to most other epidemiological studies
- Recent “systematic review” found no evidence mobile phones use up to 10 yrs causing any head cancer (>10 yrs?)
- Only a few epidemiological studies have been conducted but found no evidence of head cancers in children; more research is needed.

ICNIRP

- Methodological deficits limit conclusions drawn from Interphone, but its results, along with those from other epidemiological, biological and animal studies, and brain tumour incidence trends, suggest that within about 10-15 years after first use of mobile phones there is unlikely to be a material increase in the risk of brain tumours in adults.
- Data for childhood tumours and for periods beyond 15 years are currently lacking.
- Although there remains some uncertainty, the trend in the accumulating evidence is increasingly against the hypothesis that mobile phone use can cause brain tumours in adults.

*Swerdlow et al. (2011) Mobile phones, brain tumours and the Interphone study: Where are we now? *Environ Health Perspect* 119(11):1534-1538.

IARC

- WHO specialized agency for research on cancer
- Classified* RF as a “possibly carcinogenic to humans” based on increased risk of glioma from cell phone use
- Weakest classification for a potential carcinogen
- Does NOT mean RF causes cancer but there is some “weak” scientific evidence to suggest it may
- This category is used when a causal association is considered credible, but chance, bias or confounding cannot be ruled out with reasonable confidence
- This merely means more research is needed before any firm conclusion can be reached.

*WHO/IARC Press Release 208 (May 2011) IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans

*Non-Ionizing Radiation, Part 2: Radiofrequency electromagnetic fields. IARC Monographs Vol. 102. IARC, Lyon, 2013

Base stations and wireless technologies



- RF exposures from base stations 0.002% to 2% of ICNIRP ...lower or comparable to RF emissions from radio or TV
- Only established health effect from RF fields.. increase in body temperature ($>1^{\circ}$ C). Basis for ICNIRP guidelines. Need high field intensities to increase temperature
- No significant temperature rise from weak wireless network RF signals. A mobile phone against the head raises the temperature by 0.1° C
- RF signals from wireless technologies in public areas (e.g. schools and hospitals) normally 1000s times below ICNIRP

Base stations and wireless technologies (2)

- Body absorbs up to 5x more RF from FM radio and TV than base stations .. Because radio and TV use lower RF frequencies and the body absorbs more of than the higher mobile phone frequencies
- Radio and TV have operated for over 50 years without any known health consequence.
- Digital versus analogue signals? There seems to be no unique health effects due to different RF modulations because base station and wireless technology signals are too weak; modulation effects occur at much higher intensity levels.

Children

WHO currently recommends more RF research related to children.



From studies conducted so far we can conclude:

- Children text more than call, so exposures are lower than adults
- Permittivity and conductivity of RF in tissues higher in children than adults causing higher SARs, but not significant
- No cognitive or behavioral effects reported
- The few epidemiology studies on children have not found evidence of any cancers from mobile phone use
- Multigenerational animal studies, where offspring are exposed for their whole lifetime have shown no evidence of cancer
- Workshops have concluded that children don't seem more sensitive to EMF than adults (WHO, 2004; HCN, 2011)

Hypersensitivity

Hypersensitive individuals complain of dermatological symptoms (redness, tingling, and burning sensations) as well as subjective symptoms such as fatigue, tiredness, concentration difficulties, dizziness, nausea, heart palpitation and digestive disturbances when they know they are being exposed to EMF

- A WHO workshop on EMF hypersensitivity concluded that, while these individuals suffered, their symptoms were not due to EMF
- Laboratory provocation studies have convincingly demonstrated that hypersensitive individuals cannot detect when they are exposed to EMF.
- The best the medical community can do is treat their symptoms, but not suggest to patients that their symptoms are due to EMF

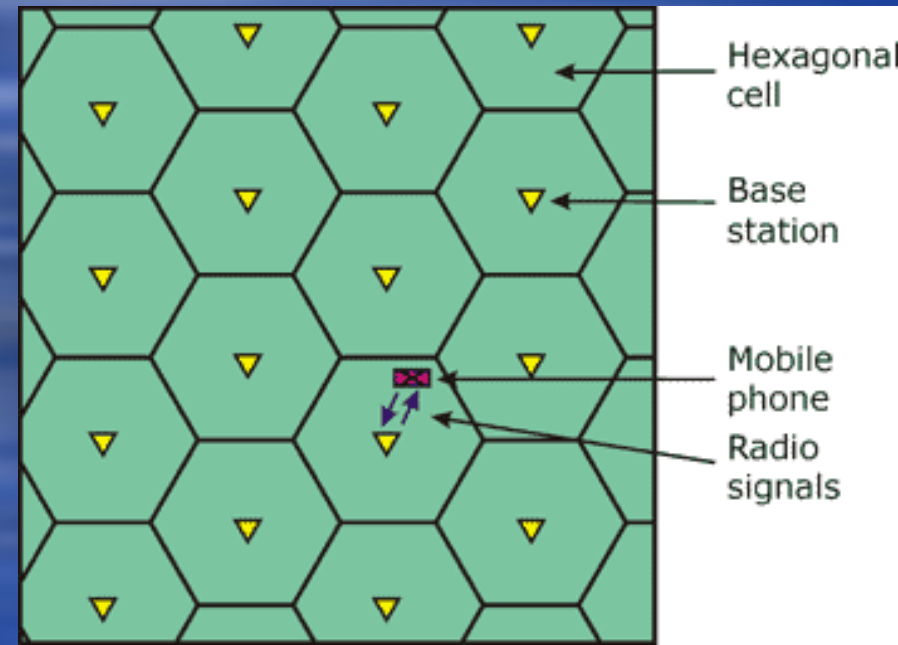
Precaution is not necessary from a health viewpoint since ICNIRP exposure limits incorporate large safety factors, however:

Manufacturers of base stations and operators can:

- Co-location of antennas where practicable
- Use best practice engineering for antennas
- Optimize the antenna network (more antennas less individual exposure)

If mobile phones users are worried they can reduce their exposure by

- Using hands-free kits
- Using loud-speaker option
- Texting instead of calling
- Reducing call times



What should policymakers do?

- Get **SOUND** advise on EMF from reputable bodies like WHO...its available on their web site at: www.who.int/emf
- WHO Fact Sheets exist on **ALL** EMF topics e.g. the fact sheets mobile phones, and base stations and wireless networks are in many languages
- Adopt international standards; over 50 countries have and the EC recommends ICNIRP to its Member States
- Inform your population that you are using international standards based on sound science; you will get greater trust and acceptance

Reliable sources of information

- World Health Organization, fact Sheets and reports
- International Commission on Non-Ionizing Radiation (ICNIRP), reports, statements and guidelines
- EC Scientific Committee on Emerging and Newly Identified Health Risks, Health Effects of Exposure to EMF, (SCENIHR) reviews
- UK Health Protection Agency, reviews and fact sheets
- U.S. National Cancer Institute fact sheets
- Australian Radiation Protection and Nuclear Safety Agency, reports and fact sheets
- Health Council of the Netherlands, reports
- Sweden SSI, reports

**Thank you for your
attention**



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