WIRELESS RADIATION AND HUMAN HEALTH POLICIES: HOW RELIABLE IS THE SCIENTIFIC EVIDENCE?

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WHO I AM… EDUCATION AND WORK

- Two doctorates and docentship in biochemistry
- Independent expert; actively advising and lecturing
  - 2014 – e.g. Norway, South Africa, USA, India, Australia
  - 2015 – e.g. Switzerland, USA, Serbia, Turkey, Australia
- 22 years (1992-2013) at STUK – Radiation and Nuclear Safety Authority
  - 2003-2007 as Head of Radiation Biology Laboratory
  - 2000-2013 as Research Professor
- Assistant Professor at Harvard Medical School, USA; 1997-1999
- Guangbiao Prof. at Zhejiang Univ., Hangzhou, China; 2006-2009
- Visiting Prof. at Swinburne Univ. Technology, Melbourne, Australia; 2012/13

WHO I AM… EXPERT EXPERIENCE

- 18 years of experimental work on EMF and health
- Testified
  - In the Canadian Parliament's House of Commons' hearing on cell phones and health in 2015
  - before Minister of Health and Family Welfare of India in 2014
  - In the US Senate Appropriations Committee hearing on cell phones and health, in 2009
- Member of 2011 IARC Working Group for classification of the carcinogenicity of cell phone radiation
- Advised e.g.: Parliament of Finland; National Academies, USA; World Health Organization; Bundesamt für Strahlenschutz, Germany; International Commission on Non-Ionizing Radiation Protection (ICNIRP); Swiss National Foundation; The Netherlands Organization for Health Research and Development;

As we know, there are known knowns.
There are things we know we know.
We also know, there are known unknowns.
That is to say we know there are some things we do not know.
But there are also unknown unknowns,
the ones we don't know we don't know.

Donald H. Rumsfeld,
during the US DoD press conference on Feb. 12, 2002

There is a general agreement that any, and all, human health policies, should be firmly based on science

Scientific Evidence
&
Interpretation of the Scientific Evidence

Scientific Evidence (examples)

Health effect

Physiological effect on organ/organism

Physiological effect on cellular level

Biochemical effect on cellular level

Biophysical interaction

Epidemiology

Human studies

Animal studies

In vitro studies

Epidemiological evidence is considered as the most important in evaluation of human health risk

Problems with the quality of epidemiology on cell phone radiation and cancer

- case-control studies
- cohort studies
- trend-studies

IARC 2011: Epidemiology

- Bruce Armstrong, Australia
- Maria Blettner, Germany
- Elisabeth Cardis, Spain
- Lennart Hardell, Sweden
- Peter Inskip, USA
- David Richardson, USA
- Martin Röösli, Switzerland
- Jonathan Sammet, USA
- Malcolm Sim, Australia
- Jack Siemiatycki, Canada, Chair

- Interphone & Hardell studies
  - no reliable exposure data based on person's memory
  - risk increase in long-term avid users
- Children – only CEFALO
  - exposures for 2-4 years
  - has no statistical power to detect small risk

Case-control studies

- To date, three sets of case-control studies
  - Interphone; Europeans + Canada, Japan, Australia (the largest study)
  - Hardell group in Sweden
  - CERENAT study from France
- Definition of 'regular user'
  - Person making one call per week for 6 months!
  - Misleading definition leading to a conclusion that 'regular' users health is not and will never be affected
- Exposure evaluation
  - Based on memory of subjects – causes recall bias
  - Minutes of use per day
- Result
  - All three studies showing increased risk of developing brain cancer in avid users

Danish Cohort

- Exposure data - the length of the mobile phone subscription with the operator
- Corporate subscribers 'ended' as unexposed controls
- cut-off time of the exposure set for 1995 but the analysis of the cancer induction is based on the 2007 cancer registry data = cancer patients using cell phone for over 10 years 'ended' as unexposed cancer cases

Million Women study

- Exposure data – ‘never’, ‘less than once a day’, ‘every day’; and ‘For how long have you used one?’
- Cell phone users talking on the phone for few minutes or for few hours per week were analyzed together
- Primary goal - examining the effects of hormone replacement therapy in women over 50 years of age = does not represent population at large

Trend data studies

- Trend-data - Little et al. 2012: slow rise of brain cancer cases in USA
  - trend is similar to Interphone "prediction" but not Hardell "prediction" but…
  - trend data is useless for cancer predictions of a single "carcinogen" because of simultaneous impact on population of other cancer-causing/preventing measures

All epidemiology studies have unreliable exposure data

- Length of calls or length of phone subscription with service provider or saying whether you ever or never used cell phone, does not inform about the real exposure of the cell phone user
- Using the above ”exposure data”, persons with very different radiation exposures are placed in the same exposed group for statistical evaluation
- This leads to underestimation of the possible risk
- Bad exposure data are continued to be collected – the ongoing COSMOS cohort study collects exposure data as length of calls!
- An inexpensive way to collect real exposure data is by designing apps for smart phones (e.g. Quanta by Cellraid, Ltd, in Finland)

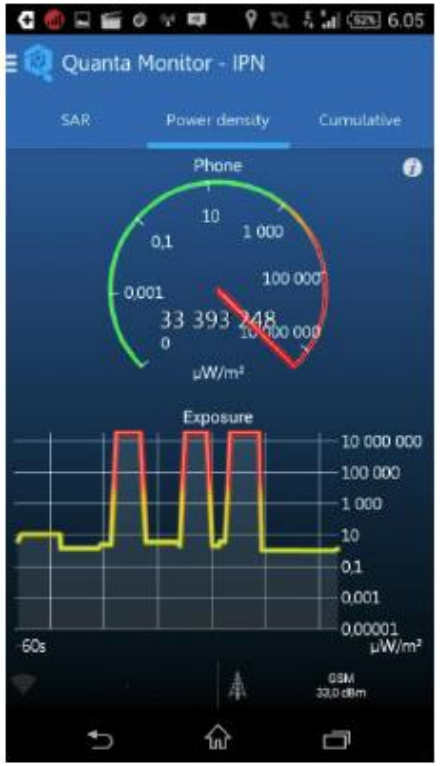
by Cellraid in Finland
cellraid.com

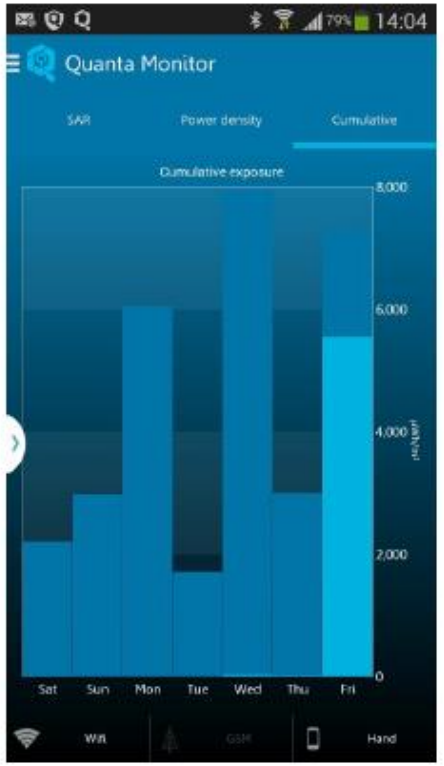
- Cell phone app - runs on any commercial Android phone
- Measures RF emission exposure from cell phone, cell tower and wi-fi
- Accurate algorithm to estimate total RF emission

Cellraid

Quanta Monitor

RF EXPOSURE MONITOR





Game changers published after 2011 IARC, strengthening the health risk evidence

Game changers after 2011 IARC

strengthening the evidence for carcinogenicity of cell phone radiation

- Epidemiology – CERENAT study
  - Coureau G, et al. Mobile phone use and brain tumours in the CERENAT case-control study. Occup Environ Med. 2014; 71: 514-522
- Animal studies – Lerchl's group replication of Tillman et al study
  - Lerchl A, et al. Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans. BBRC 2015; 459: 585-590
- Dosimetry – reevaluation of in vitro dosimetry by Schmid & Kuster
  - Schmid G & Kuster N. The discrepancy between maximum in vitro exposure levels and realistic conservative exposure levels of mobile phones operating at 900/1800 MHz. Bioelectromagnetics. 2015; 36:133-148

Game changers after 2011 IARC

G. Coureau et al. Mobile phone use and brain tumours in the CERENAT case-control study.

- No association with brain tumours was observed when comparing regular mobile phone users with non-users
- The positive association was statistically significant in the heaviest users when considering life-long cumulative duration
- Risks were higher for gliomas, temporal tumours, occupational and urban mobile phone use.
- These additional data support previous findings concerning a possible association between heavy mobile phone use and brain tumours.

Game changers after 2011 IARC

Lerchl A, et al. Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans.

- Numbers of tumors of the lungs and livers in exposed animals were significantly higher than in sham-exposed controls.
- Lymphomas were also found to be significantly elevated by exposure.
- A clear dose-response effect is absent.
- Tumor-promoting effects may be caused by metabolic changes due to exposure.
- Findings may help to understand the repeatedly reported increased incidences of brain tumors in heavy users of mobile phones.

Game changers after 2011 IARC

G. Schmid & N. Kuster. The Discrepancy Between Maximum In Vitro Exposure Levels and Realistic Conservative Exposure Levels of Mobile Phones Operating at 900/1800 MHz

- Exposure of skin, blood, and muscle tissues may well exceed 40 W/kg at the cell level.
- In vitro studies reporting minimal or no effects in response to maximum exposure of 2 W/kg or less averaged over the cell media, which includes the cells, may be of only limited value for analyzing risk from realistic mobile phone exposure.
- Future in vitro experiments use specific absorption rate levels that reflect maximum exposures and that additional temperature control groups be included to account for sample heating.

"In my opinion, the currently available scientific evidence is sufficient to upgrade the carcinogenicity of cell phone radiation from the possible carcinogen (Group 2B) to the probable carcinogen (Group 2A)"

Dariusz Leszczynski

Interpretation of the Scientific Evidence (examples)

SCIENCE COMMITS SUICIDE WHEN IT ADOPTS A CREED

THOMAS HENRY HUXLEY

THE CREED on cell phone radiation and health

It is an entirely false claim, not based on any evidence:

"There is consensus among the scientists that cell phone radiation has no proven health effects and that the effects seem unlikely"

"A FORMAL THEORY OF SOCIAL POWER"

J. R. P. FRENCH in PSYCHOLOGICAL REVIEW, 63, 1956, 181–194

"…The attitudes of less powerful individuals shift toward the attitudes of their more powerful social contacts at a rate proportional to the discrepancy between their attitudes. Because social influence is presumed to occur simultaneously throughout a social system, this model predicts eventual consensus…"

INTERPHONE conclusions (*from the abstract*)

- Overall, no increase risk of glioma or meningioma was observed with use of mobile phones.
- There were suggestions of an increased risk of glioma at the highest exposure levels, but biases and error prevent a causal interpretation.
- The possible effects of long-term heavy use of mobile phones require further investigation.

INTERPHONE comment from J. Samet

Chair of the 2011 IARC Working Group

INTERNATIONAL JOURNAL OF EPIDEMIOLOGY 2010;39:695–698

"…[this statement] is both elegant and oracular. Similar to any oracle it tolerates diametrically opposite readings. If more weight is given to the first sentence, a conclusion is reached in favour of an increased risk, albeit not definitively manifest yet, from intensive use of mobile phones. Giving more weight to the second sentence leads to the conclusion that there are enough sources of errors in the study to dismiss the apparent elevated risks as not real. With equal weight to the two sentences, any conclusion hangs in the balance…"

INTERPHONE – "the funny business"

…when the scientists cannot agree…they publish two studies…instead of one large as they were supposed to do, and… nobody cares to correct it…

- American Journal of Epidemiology (AJE) article based on the INTERPHONE data from: Denmark, Finland, Germany, Italy, Norway, Sweden, and Southeast England
- The AJE study is negative: "…*Our results do not support the hypothesis of gliomas among mobile phone users being preferentially located in the parts of the brain with the highest radio-frequency exposure*…".
- Occupational and Environmental Medicine (OEM) based on INTERPHONE data from: Australia, Canada, France, Israel and New Zealand.
- The OEM study is weakly positive: "…*Overall, there was weak evidence of stronger associations of glioma and meningioma when a comprehensive estimate of RF dose rather than just mobile phone use was used in the case-control analysis*…".

Specifics of the bioelectromagnetics

- Bioelectromagnetics is a narrow research area. Unavoidably, all science is done, evaluated and presented to the general public and decision-makers by a small group of "*influential players*".

- Large research consortia, appointed committees and self-appointed committees consist of the same "*influential players*". The same applies to the narrow field of "*influential*" peer-reviewers of new research projects and of articles published in peer-reviewed journals.

Examples of the scientific problems in the bioelectromagnetics committees

- Selectiveness in collecting/admissing evidence
  - All evidence listed but not considered in practice (ICNIRP)
  - Selection of predominantly supportive evidence (BioInitiative)
- Single scientist making judgement/writing opinion paper
  - BioInitiative
  - SCENIHR
- Committees do not want to talk to each other
  - Call for the round-table to resolve differences was flatly rejected by ICNIRP, BioInitiative and MMF/GSMA

WHO EMF Project is front for ICNIRP opinions

- ICNIRP members play a lead role in preparation of the WHO's Environmental Health Criteria on RF-EMF (e.g. cell phone radiation) that will determine the future of the wireless technologies
- ICNIRP members sit on numerous national committees = opinions dominant in national safety agencies
- ICNIRP, the self-appointing NGO, has no accountability at all – nobody controls its activites (not for CoI disclosures, not for errorenous decisions)
- Can ''private club'', ICNIRP, be fully trusted with the EHC task that is certainly lobbied by the telecom?

Scientific evidence justifies invoking the Precautionary Principle

- Scientific information is insufficient, inconclusive, or uncertain
  - IARC classification as possible carcinogen (Group 2B)
- There are indications that the possible effects on human health may be potentially dangerous
  - epidemiological studies from Interphone, Hardell and CERENAT show an increased risk of brain cancer in long-term avid users
- Inconsistent with the chosen level of protection
  - epidemiological studies, showing increased risk in long-term avid users, were generated in populations using regular cell phones, meeting current safety standards = current safety standards are insufficient to protect users

The impact of implementing the Precautionary Principle

- **Precaution** does not equal **Prevention**
- Strong opposition from telecom industry
  - Technology providers can be made responsible to prove their product is safe
  - Requirement of making more efficient (less radiation emissions) technology
  - Limiting current rampant and uncontrolled deployment of wireless networks
- Will create new knowledge through research
- Will create new jobs in research and technology

CONCLUSIONS

- The currently available scientific data does not prove conclusively that exposures to cell phone radiation causes cancer
- The currently available scientific data shows that health risk is not only possible but even probable
- The scientific data pointing towards probable health risk was strengthened since 2011 IARC classification of cell phone radiation as a possible carcinogen
- The currently available 'inconclusive' scientific evidence does not mean that the possibility or probability of health risk is negligible
- It is false and misleading to claim that there is no health risk associated with the use of wireless technology because of the inadequate science
- It is likely that a sub-population of users of the wireless technology will develop some kind of health problems caused by radiation exposure – the sensitive sub-population