



From the lab to the law



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Overview

- Society
- Legal framework for protection against NIR in Switzerland
- Research on EMF
- Evaluation of research results
- Conclusions



Federal Office for the Environment

Non ionizing radiation protection:

- Risk assessment (customer of research results)
- Policy preparation (translation between research and society)
- Support of regional authorities



Terms

- Low dose: below the exposure limit values of ICNIRP
 - RF radiation: non thermal
 - ELF fields: non stimulation
- Type 1 error:
Report an effect where in fact there is none.
- Type 2 error:
Report absence of an effect where in fact there is one.



Society

- Is it safe or not?
→ simple question, simple answer wanted (!?)
- Reversal of the burden of proof (we do not want to be the guinea pigs)
- In case of scientific uncertainty: rather err on the safe side. No type 2 errors !
- Tendency to fear the worst
- High attention if children might be affected or if cancer is at stake
- More concern about infrastructure installations than about mobile equipment



Legal framework in Switzerland

- Stationary installations in the environment:
Law on environmental protection:
 - Exposures which endanger persons or seriously disturb the well-being of the population are prohibited. The basis is the current scientific knowledge or the experience. Particularly sensitive groups have to be taken into account.
 - Potentially harmful exposures shall be limited as far as technology and operational conditions allow provided this is economically acceptable (precautionary principle).
- Mobile equipment:
No particular legal provisions. Internationally harmonized standards.



Implementation of the legal framework

- Dose metric
- Thresholds for hazard and disturbance of the well-being (exposure limit values)
- Precise specification of the extent of precautionary limitation
- Calculation and measurement methods



Research on EMF effects (1)

- Few hazardous effects scientifically established:
 - Thermal effects of RF radiation
 - Stimulation effects on nerve and muscle cells by ELF electric and magnetic fields
 - Acute effects
 - Mechanism understood
- Other effects are reported:
 - Partially below current safety limits
 - Various degree of evidence
 - Various health significance
 - Acute or long term effects
 - Mechanism not understood



Research on EMF effects (2)

- The scientific method tends to avoid type 1 errors. Type 2 errors are rather accepted (contrary to the priorities of society).
- Issues of credibility
 - Inconsistent results
 - Influence of funding bodies ? (past experience with the tobacco research)
 - Scientific misconduct ?



Evaluation: what does a reported effect mean for health and well-being?

- Degree of evidence: how sure are we that the effect is real?
- Significance for health or well-being
- Dose effect relationship

This evaluation is not an objective process but subject to value judgments.

→ Scientific bodies draw different conclusions concerning risks based on the same published scientific literature.



Examples of evaluations

Consensus positions

- WHO
- ICNIRP
- etc

Minority positions

- Bioinitiative (2007)
- International Commission on Electromagnetic Safety (ICEMS): Venice resolution 2008
- Pittsburgh cancer center 2008
- etc



Evaluation by the Federal Office for the Environment (1)

- Provided by the University of Basel
- Evaluation of individual human studies accessible under www.elmar.unibas.ch (in German)
- Evaluation of cellular and animal studies in preparation
- Latest evaluation report 2007: www.elektrosmog-schweiz.ch > Publikationen > Gesundheitsauswirkungen und Forschung



Evaluation by the Federal Office for the Environment (2)

Degree of evidence

- **Established:** An effect is regarded as established if it meets stringent scientific criteria, i.e. is replicated several times in independent investigations, if a plausible interaction model exists and the effect is not in contradiction with other results.
- **Probable:** An effect is classified as probable if it has been found repeatedly and with relative consistency in independent studies. The studies concerned must be of a sufficiently high quality to exclude other factors with a large degree of certainty. No plausible interaction mechanism is known.
- **Possible:** Effects are regarded as possible where they occur sporadically in the studies. However, the results are not entirely consistent and could be attributable to methodological weaknesses. The scientific evidence is corroborated by case reports.



Evaluation by the Federal Office for the Environment (3)

- **Improbable:** There are no indications of an association, but multiple indications of its absence. No theoretically plausible interaction model exists.
- **Not assessable:** The scientific basis is too limited for an assessment to be made. While isolated evidence exists, this is often contradictory. The methodology of the studies concerned is regarded as insufficient to permit conclusions to be drawn.

Important:

- Degree of evidence is not just the result of counting positive versus negative studies
- Each publication needs to be checked for
 - Methodology
 - Statistical power
 - Statistical significance



Evaluation by the Federal Office for the Environment (4)

Significance for health and well-being

- **Diseases and mortality:** The effect causes serious health problems that lead to a drastic reduction in the quality of life. It constitutes a threat to life and reduces life expectancy. This category includes all cancerous diseases, stillbirths and deformities in infants, and increased mortality.
- **Reduced well-being:** While the effect does not represent a direct threat to life, it significantly curtails the quality of life and/or well-being. This category includes non-specific health symptoms such as headaches, insomnia, mental symptoms, electromagnetic hypersensitivity and microwave hearing.
- **Physiological changes:** The effects are physiologically measurable and lie within the normal variability range of healthy individuals. Such effects do not represent a risk to health *per se*, and since they are normally not perceived, do not lead to a reduction in the quality of life. It is not known whether they represent a risk to health in the long term. This group includes fluctuations in the hormone, immune and cardiovascular systems, genotoxic effects, variability in EEG readings and changes in the perception and processing of stimuli.



Conclusions 2007 for low dose RF radiation (1)

	Health relevance	Diseases and mortality	Reduced well-being	Physiological changes
Evidence				
Established				
Probable				
Possible				
Improbable				
Not assessable				

Intensity of shading indicates number of effects



Conclusions 2007 for low dose RF radiation (2)

- No low dose effects „established“
- Only two effects classified as „probable“:
 - Non specific symptoms (headache, fatigue etc) by mobile telephones (reduced well-being)
 - Changes of brain activity and sleep phases by mobile telephones („physiological changes“)
- The majority of reported effects is only rated as „possible“ or „not assessable“. Their health significance is unclear („physiological changes“).



So what ?

- Goethe: „Da steh ich nun ich armer Tor, und bin so klug als wie zuvor“.
- Science can at present not provide a satisfactory answer about the risk of low dose exposure. Health risks can neither be confirmed nor excluded.
- As a surrogate the application of the precautionary principle is indicated.
- But: precaution should be replaced by science based protection limits.
- This may take a long time and a lot of effort.