



Unsicherheit in der EMF-Forschung

Science Brunch der Forschungsstiftung Mobilkommunikation (FSM)

5. April 2011

Prof. Dr. Peter Wiedemann, ITAS, KIT

Übersicht

- Risiko und Unsicherheit
- EMF-Risikoabschätzung
- Quellen von Unsicherheit
- Kontroverse um EMF Risikoabschätzungen
- Ausblick

Übersicht

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“.... facts are like cows. If you look them in the face hard enough they generally run away.”

Dorothy L. Sayers

Unsicherheit



Risiko

Risiko

Vier grundlegende Fragestellungen sind zu bedenken:

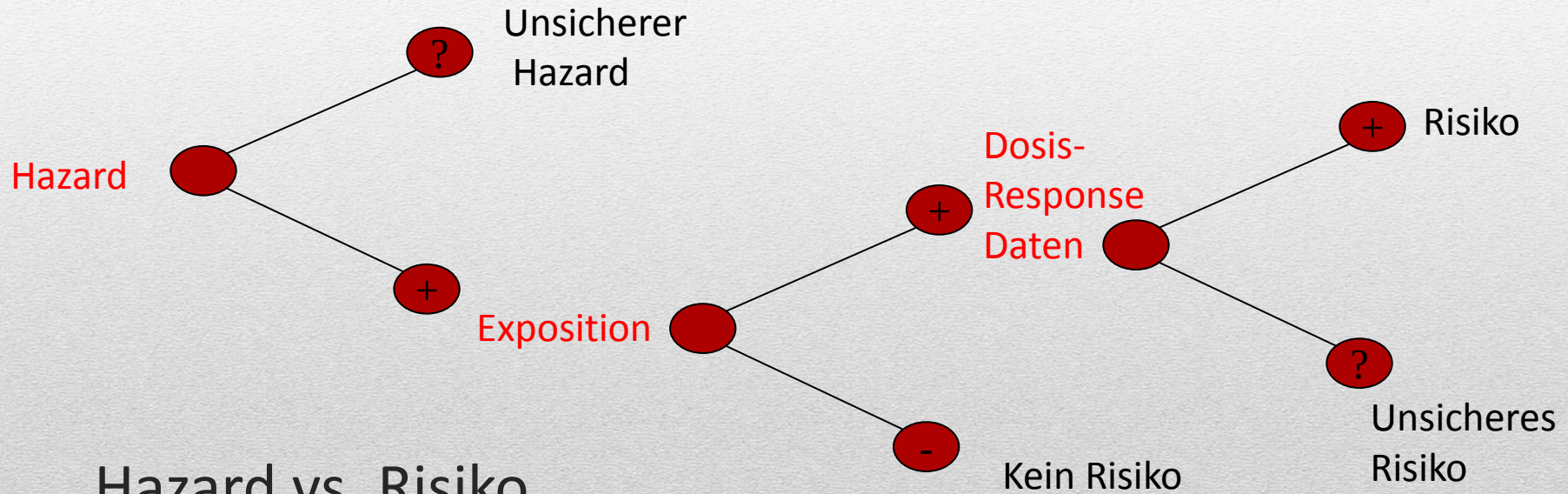
- Was kann passieren?
- Wie schlimm ist das?
- Wie wahrscheinlich ist das?
- Wie umfassend sind die Kenntnisse darüber?

Hazard

- Das einem Agens oder einer Situation inhärente Potenzial, einen adversen Effekt zu verursachen, wenn ein Organismus, System oder eine (Sub)population diesem Agens ausgesetzt ist.

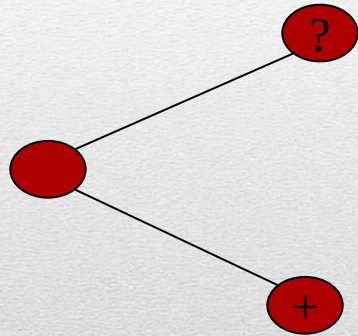
Risiko

- Die Wahrscheinlichkeit eines adversen Effekts in einem Organismus, System oder einer (Sub)population bei Exposition mit einem Agens unter spezifizierten Bedingungen.

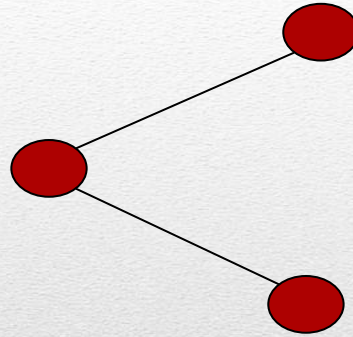


Hazard vs. Risiko

Hazard



Unsicherer
Hazard



Effekt nicht
nachgewiesen

Adversität
unklar

Varianten unsicherer Hazards

Unsicherheit ist das täglich Brot der Risikoabschätzung

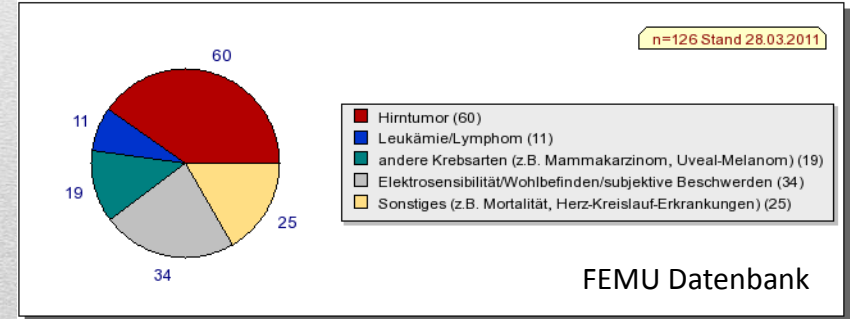
IARC Klassifikation potentiell kanzerogener Agenzien			
<i>Group</i>	<i>Classification</i>	<i>N</i>	<i>%</i>
1	Carcinogenic to humans	105	11
2A	Probably carcinogenic to humans	66	7
2B	Possibly carcinogenic to humans	248	27
3	Not classifiable as to its carcinogenicity to humans	515	55
4	Probably not carcinogenic to humans	1	0
		935	100

Um was geht es bei der HF EMF?

Bislang geht es um die Frage, ob HF EMF ein Hazard ist oder nicht.

Epidemiologische Arbeiten im Mobilfunk-Bereich

Klicken Sie auf die Diagramm- oder Legendenfläche, um sich die Artikel eines Endpunktes anzeigen zu lassen. Bitte beachten Sie, dass eine Publikation mehreren Endpunkten zugeordnet sein kann, d.h. die Summe der Publikationen aus den einzelnen 'Kuchenstücken' ist größer der Gesamtsumme.



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Evidenzbewertung

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graph LR; EB[Evidenzbewertung] --- ES[Epidemiologische Studien]; EB --- TV[Tierversuche]; EB --- MS[Mechanistische Studien]; EB --- SF[Studien mit Freiwilligen];
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Epidemiologische
Studien

Tierversuche

Mechanistische
Studien

Studien mit
Freiwilligen

Epidemiologie

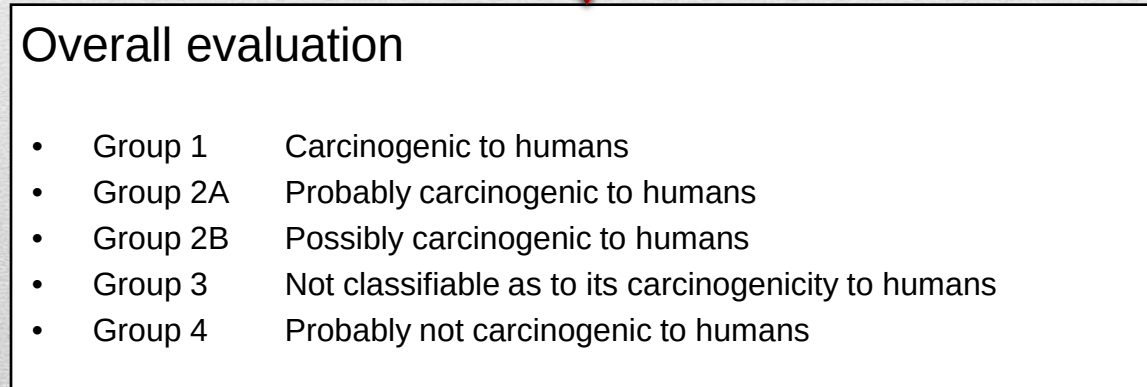
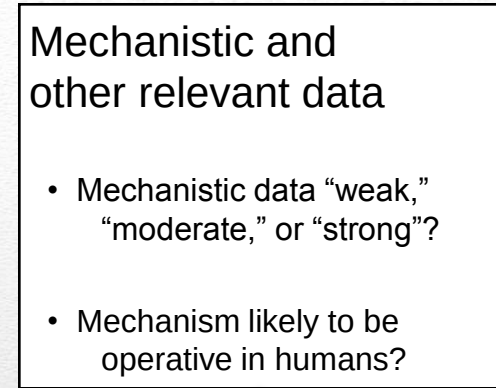
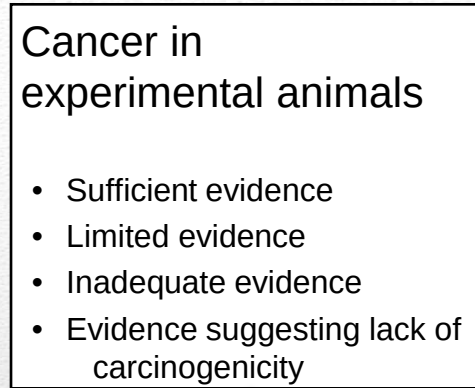
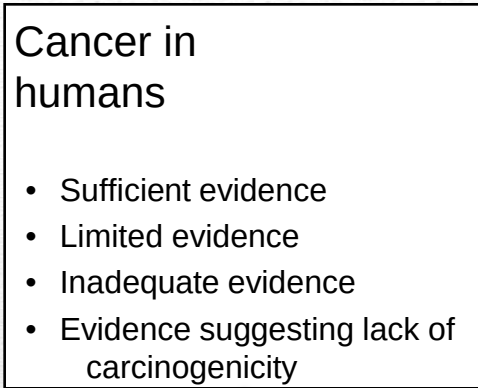
- Kausale Beziehung nicht prüfbar
- Aber Näherung möglich, Auseinandersetzung mit Fehlerquellen
 - Bias
 - Confounder
 - Zufall

Tierversuche

- Kausale Beziehung prüfbar, weil Experimente durchgeführt werden können
- Problem: Extrapolation auf den Menschen – ist das gewählte Tiermodell angemessen?
- Tierschutzproblematik – ethische Bedenken

Versuche mit Zellen

- Experimente durchführbar
- Problem: Systemgrenzen – Extrapolation auf Organismus schwierig
- Wichtig für die Identifikation von Wirkmechanismen



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Unsicherheit bezieht sich auf quantitative Aussagen zu einer zu prüfenden Kausalitätsbeziehung

- Validität (Gültigkeit)
- Reliabilität (Messfehler)
- Objektivität (Urteils-Übereinstimmung)

Prenatal and Postnatal Exposure to Cell Phone Use and Behavioral Problems in Children

Hozefa A. Divan,^a Leeka Kheifets,^a Carsten Obel,^b and Jørn Olsen^a

Background: The World Health Organization has emphasized the need for research into the possible effects of radiofrequency fields in children. We examined the association between prenatal and postnatal exposure to cell phones and behavioral problems in young children.

Methods: Mothers were recruited to the Danish National Birth Cohort early in pregnancy. When the children of those pregnancies reached 7 years of age in 2005 and 2006, mothers were asked to complete a questionnaire regarding the current health and behavioral status of children, as well as past exposure to cell phone use. Mothers evaluated the child's behavior problems using the Strength and Difficulties Questionnaire.

Results: Mothers of 13,159 children completed the follow-up questionnaire reporting their use of cell phones during pregnancy as well as current cell phone use by the child. Greater odds ratios for behavioral problems were observed for children who had possible prenatal or postnatal exposure to cell phone use. After adjustment for potential confounders, the odds ratio for a higher overall behavioral problems score was 1.80 (95% confidence interval = 1.45–2.23) in children with both prenatal and postnatal exposure to cell phones.

Conclusions: Exposure to cell phones prenatally—and, to a lesser degree, postnatally—was associated with behavioral difficulties such as emotional and hyperactivity problems around the age of school entry. These associations may be noncausal and may be due to unmeasured confounding. If real, they would be of public health concern given the widespread use of this technology.

(*Epidemiology* 2008;19: 000–000)

Exposure to radiofrequency fields is increasingly common, but the potential influence on health has not been thoroughly investigated, especially in children. Between 2003 and 2008, there were more than 900 million new cell phone subscribers worldwide, with a total of more than 2 billion subscribers.¹ Fetuses and children may be more vulnerable than adults to external exposures in general.² In 2000, the Stewart Report recommended a precautionary approach to the use of cell phones until more detailed and scientifically robust information became available, especially for children.³ Numerous reviews, including 1 by the World Health Organization,⁴ stress the need for studies in children and on cognitive effects, because of the importance of cognitive abilities and learning in early development.

Most epidemiologic studies of exposure to radiofrequency fields have focused on brain and acoustic cancers as outcomes^{5–11} or on subjective symptoms such as headaches.^{12,13} A number of laboratory studies have examined physiologic effects after short-term exposure,^{14–18} but a variety of other outcomes are yet to be investigated, and none has included potentially susceptible populations such as fetuses and very young children.

Children are potentially exposed during fetal life by maternal use of cell phones and then later in childhood when they themselves become users of cell phones. Exposures early in life may have particular importance because this is during vulnerable stages of brain development.

There is limited information on the association between

Validität

Modell-Unsicherheit

THEME: CANCER

Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study

The INTERPHONE Study Group*

Corresponding author: Elisabeth Cardis, CREAL, Doctor Aiguader 88, 08003 Barcelona, Spain. E-mail: ecardis@creal.cat

*List of members of this study group is available in the Appendix.

Accepted 8 March 2010

Background The rapid increase in mobile telephone use has generated concern about possible health risks related to radiofrequency electromagnetic fields from this technology.

Methods An interview-based case-control study with 2708 glioma and 2409 meningioma cases and matched controls was conducted in 13 countries using a common protocol.

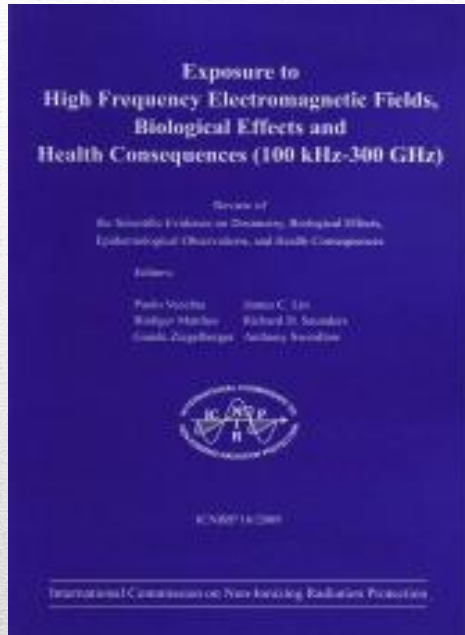
Results A reduced odds ratio (OR) related to ever having been a regular mobile phone user was seen for glioma [OR 0.81; 95% confidence interval (CI) 0.70–0.94] and meningioma (OR 0.79; 95% CI 0.68–0.91), possibly reflecting participation bias or other methodological limitations. No elevated OR was observed ≥ 10 years after first phone use (glioma: OR 0.98; 95% CI 0.76–1.26; meningioma: OR 0.83; 95% CI 0.61–1.14). ORs were <1.0 for all deciles of lifetime number of phone calls and nine deciles of cumulative call time. In the 10th decile of recalled cumulative call time, ≥ 1640 h, the OR was 1.40 (95% CI 1.03–1.89) for glioma, and 1.15 (95% CI 0.81–1.62) for meningioma; but there are implausible values of reported use in this group. ORs for glioma tended to be greater in the temporal lobe than in other lobes of the brain, but the CIs around the lobe-specific estimates were wide. ORs for glioma tended to be greater in subjects who reported usual phone use on the same side of the head as their tumour than on the opposite side.

Conclusions Overall, no increase in 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.

Keywords Brain tumours, mobile phones, radiofrequency fields

Reliabilität

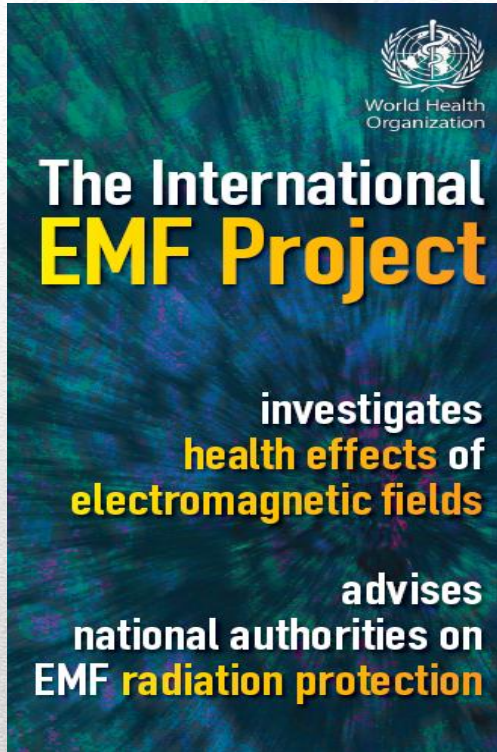
Angaben zur Handy-Nutzung



Inter-Urteiler-Übereinstimmung

..., it is the opinion of ICNIRP that the scientific literature published since the 1998 guidelines has provided no evidence of any adverse effects below the basic restrictions....

ICNIRP 2009



Inter-Urteiler-Übereinstimmung

No major public health risks have emerged from several decades of EMF research, but uncertainties remain.



Inter-Urteiler-Übereinstimmung

The report concludes the existing standards for public safety are inadequate to protect public health.

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Auch Experten beurteilen EMF-Risiken verschieden.

Warum unterscheiden sich Experten?

- Bewusste Fälschung
- Manipulativer Gebrauch
- Interpretation im Lichte einer A-priori-Hypothese (motiviertes Schließen)

in Anlehnung an MacCoun, 1998

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Auftakt-Workshop am
11.4.2011 in der BBAW,
Berlin

09.02.2011

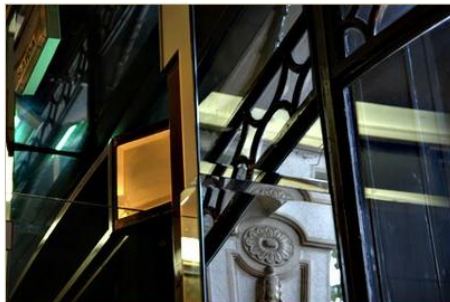
Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition

07.02.2011

Sie sind hier: [Startseite](#)

Wissenschaftsforum EMF (WF-EMF)

Willkommen



Das Wissenschaftsforum EMF will eine Plattform für gute Gespräche und kluge Gedanken sein. Das Forum will helfen, die verschiedenen Perspektiven auf die Risikobewertung von elektromagnetischen Feldern (EMF) zu ergünden. Es dient auch dazu, das Beziehungsgeflecht von Wissenschaft, Öffentlichkeit und Politik zu reflektieren.

Sind Sie ein Wissenschaftsjournalist ,
der Risikofragen oder anderen
komplexen Sachverhalten nachgeht?



Vielen Dank für die Aufmerksamkeit!
