

WHO RISK ASSESSMENT



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Risk Assessment

International Scientific Reviews

Purpose

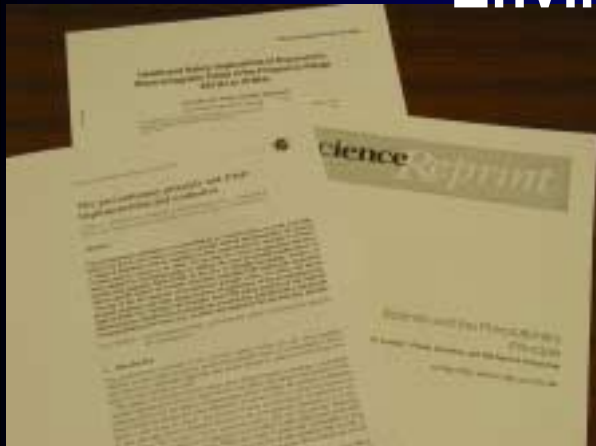
- Provide a **status report** on current knowledge related to possible health effects of EMF
- Identify **gaps in knowledge** that need further research leading to better health risk assessments



Risk Assessment International Scientific Reviews

Outputs

- Health status reports in peer-reviewed journals
- Proceedings of the meetings
 - Fact Sheets for the general public
 - Environmental Health Criteria



IARC Monographs

- **Initiated in 1969**
- **Criteria established in 1971, last update 1992**
- **Limited largely to the first step in risk assessment**
- **“Carcinogen”**: exposure that is capable of increasing the incidence of malignant neoplasms (at any stage of the carcinogenesis)
- **No recommendation is given with regard to regulation of legislation, as they are the responsibility of governments or other international organizations**
- **EMF - Volume #80**
- **800+ agents have been evaluated**



IARC Criteria

- For each type of cancer, classify human and animal data separately as:

- **Sufficient**
- **Limited**
- **Inadequate**
- **Lack of effect**

Group 1: Is carcinogenic to humans

Group 2A: Probably is carcinogenic

Group 2B: Possibly is carcinogenic

Group 3: Not classifiable

Group 4: Is probably not carcinogenic



Limited Evidence of Carcinogenicity

A positive association has been observed between exposure to the agent, mixture or exposure circumstance and cancer for which a causal interpretation is considered by the Working Group to be credible, but chance, bias or confounding could not be ruled out with reasonable confidence.



Agents Classified by IARC

(834)

IARC

Classification	Examples
Carcinogenic to humans (75) <i>(usually based on strong evidence of carcinogenicity in humans)</i>	Asbestos Mustard gas Tobacco (smoked and smokeless) Gamma radiation
Probably carcinogenic to humans (59) <i>(usually based on strong evidence of carcinogenicity in animals)</i>	Diesel engine exhaust Sun lamps UV radiation Formaldehyde
Possibly carcinogenic to humans (225) <i>(usually based on evidence in humans which is considered credible, but for which other explanations could not be ruled out)</i>	Coffee Styrene Gasoline engine exhaust Welding fumes



The Working Group

Tasks

- Ascertain that all appropriate data have been collected
- Select data based on scientific merit
- Prepare accurate summary to enable reader to follow the reasoning
- Evaluate results of epidemiologic and experimental studies
- Evaluate data relevant to mechanisms of action
- Make overall evaluation of carcinogenicity to humans



The Working Group

Membership

- 23 participants
- Expertise: epidemiology, toxicology, biology, biophysics, statistics, risk assessment, exposure assessment
- 11 countries

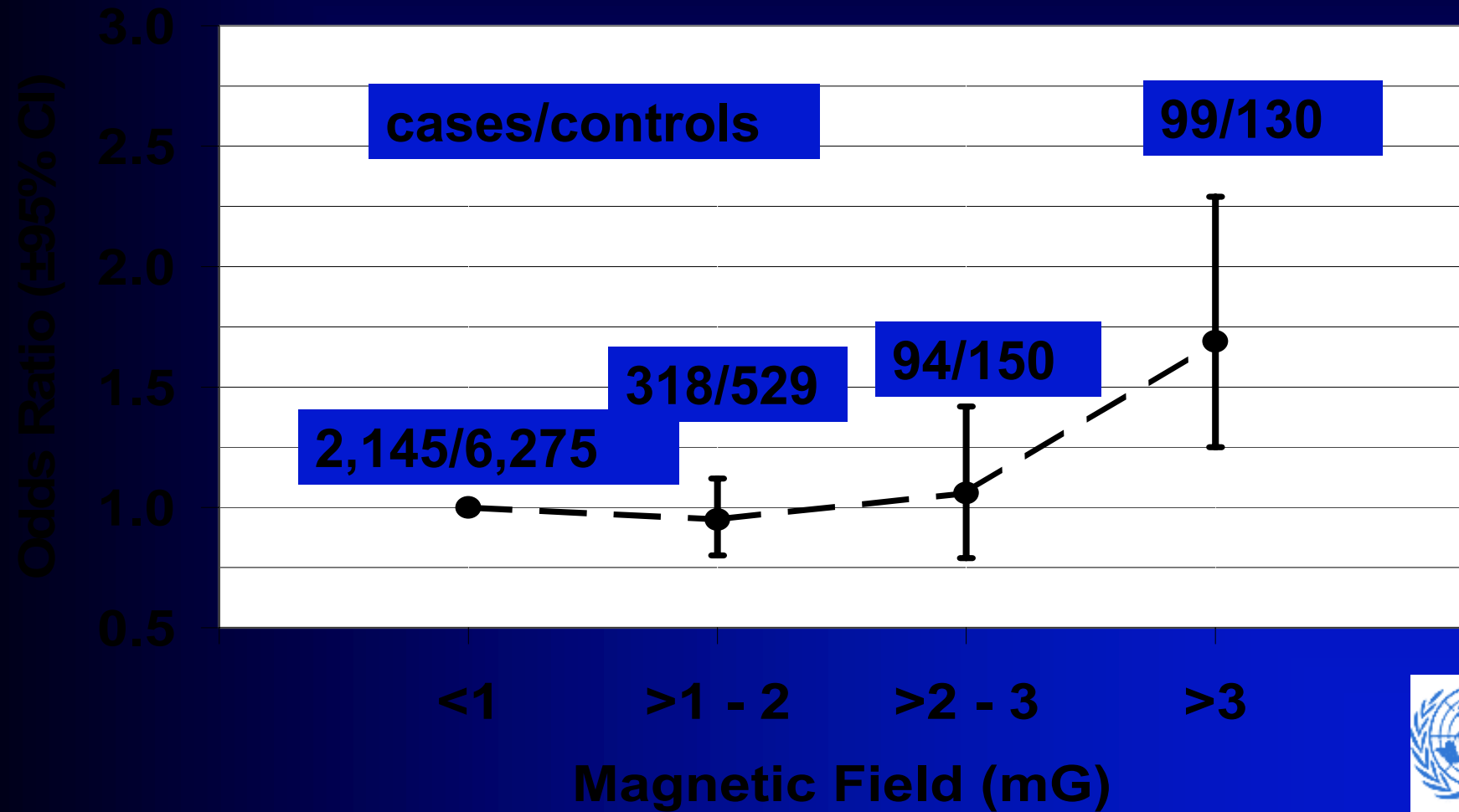


Pooled Analyses of Childhood Leukemia

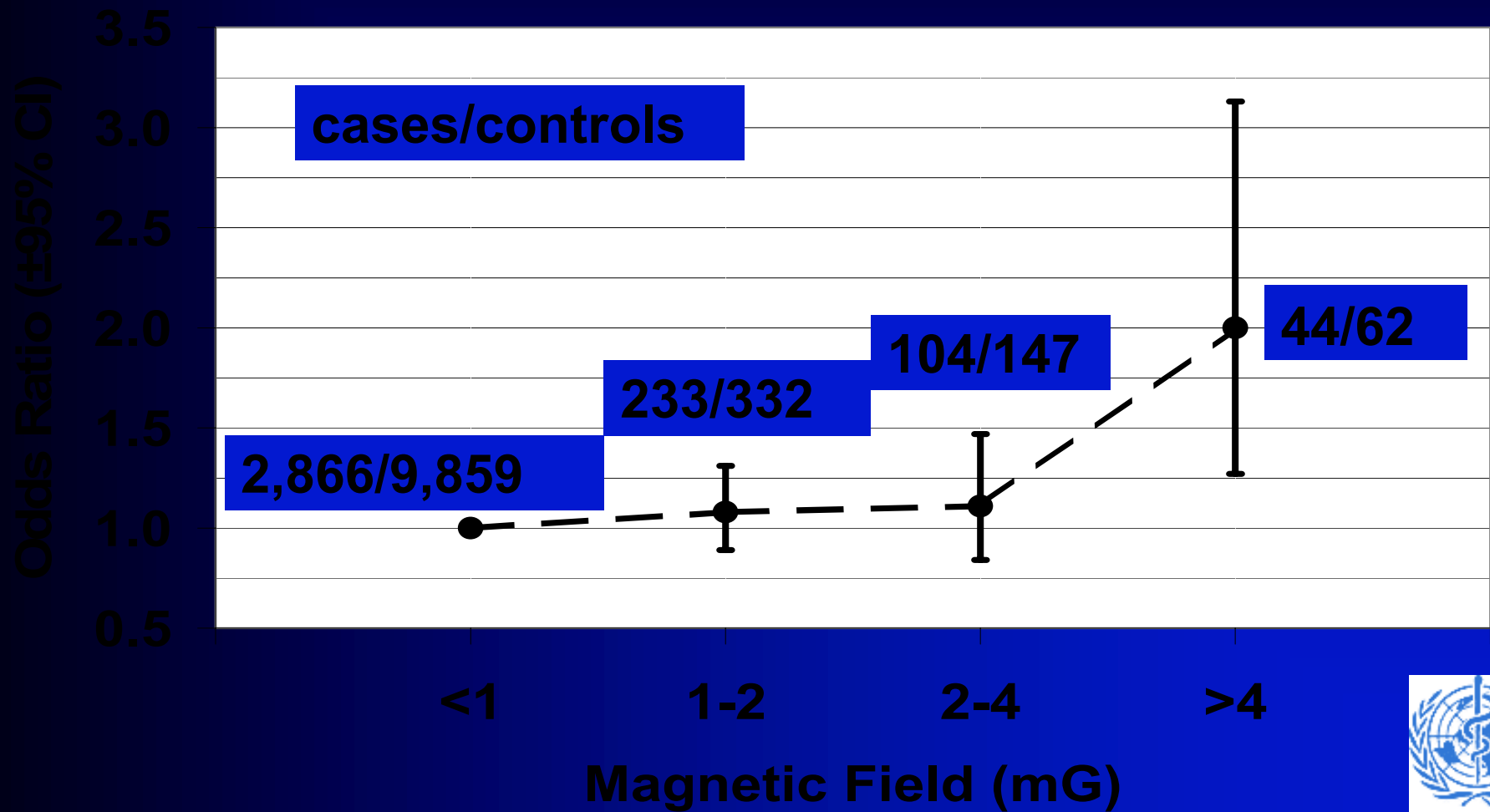
- Greenland et al., *Epidemiology*, 2000
 - 12 studies with fields; 4 with wire codes
 - Not including UK study
 - Field studies: 2,656 cases; 7,084 controls
 - Metric of choice: time-weighted average
- Ahlbom et al., *British J. Cancer*, 2000
 - 9 studies with fields; 2 with wire codes
 - Including UK study
 - Field studies: 3,247 cases; 10,400 controls
 - Metric of choice: geometric mean



Results: Greenland et al., 2000



Results: Ahlbom et al., 2000



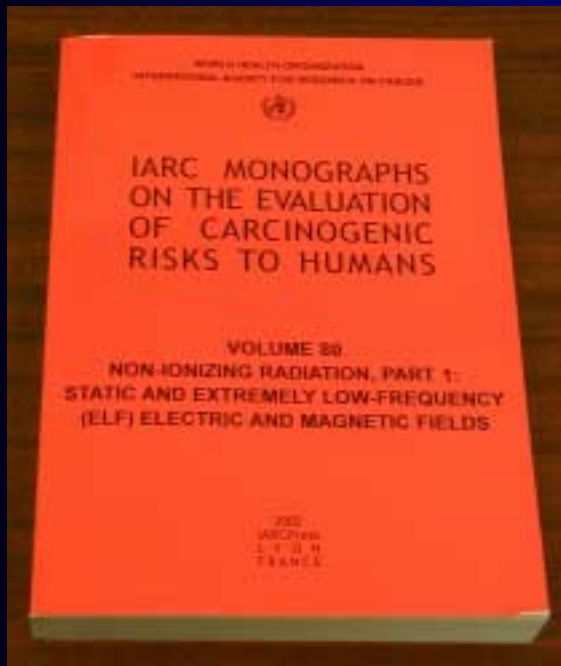
Conclusions - Pooled Analysis

- \approx 2-fold increase in risk above 0.3 - 0.4 μT
- Association more consistent with measured fields than with wire codes
- Attributable fraction estimate \approx 3%
- No confounding evident
- Selection bias may be a partial explanation
- Unlikely to be due to random variability



IARC Evaluation

Extremely Low Frequencies (ELF)



- IARC evaluation completed in June 2001
- ELF magnetic fields classified as
- **Group 2B “Possible Carcinogenic”**
 - based on epidemiologic studies of childhood leukemia
 - animal data inadequate
- Other exposures and outcomes considered “inadequate to classify”

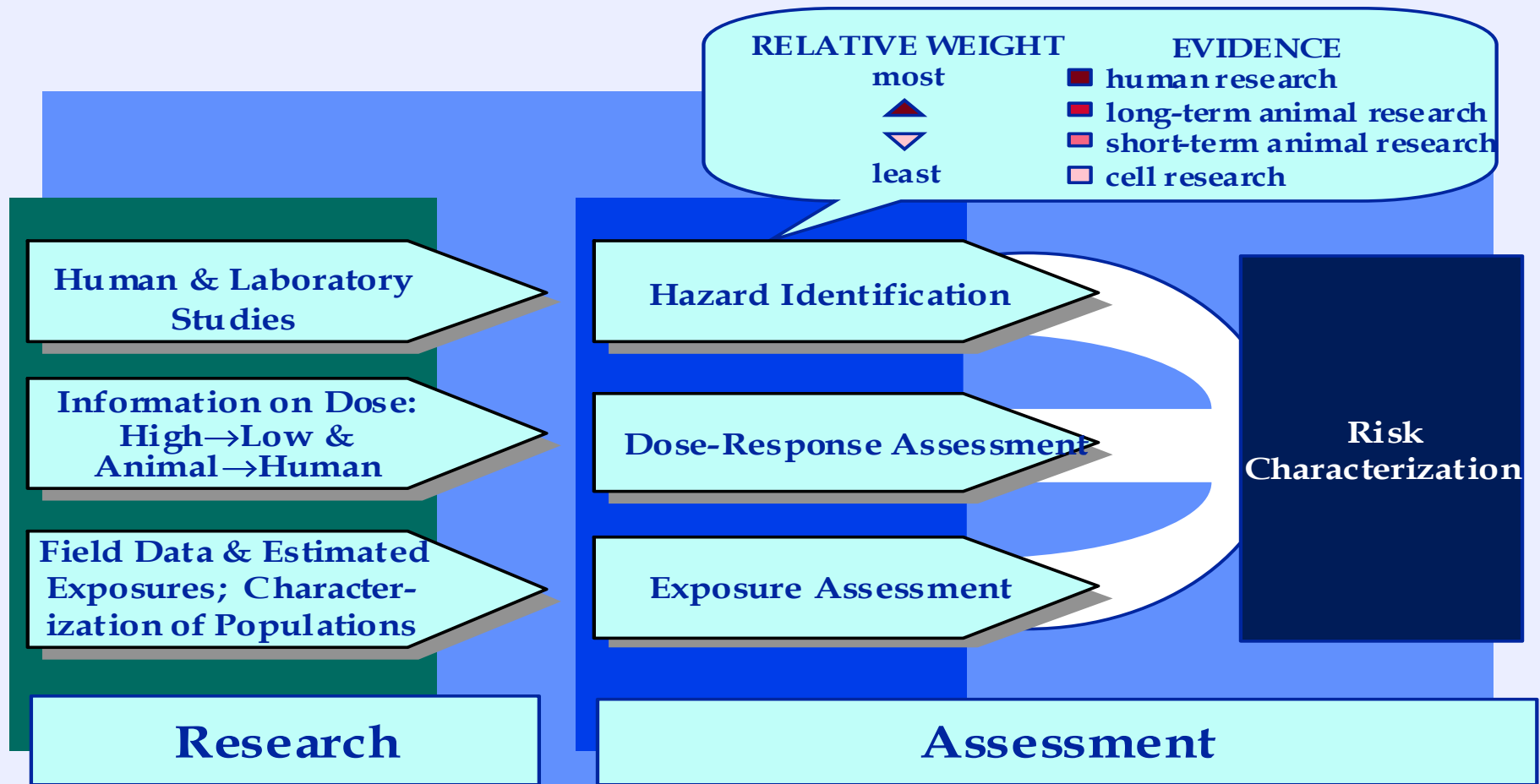


WHO Environmental Health Criteria 2002 - 2003

- **Health Effects from Cancer to Behavioural**
- **Evaluation of Dose-Response**
- **Evaluation of Human Health Risks**
- **Consideration of Protective Measures**



Risk Assessment



WHO Environmental Health Criteria

- In depth **weight-of-evidence** critical review and evaluation of the EMF research world wide
- A two-step process:
 - IARC hazard identification and classification of possible carcinogens using cancer studies (*Monographs*)
 - EMF Project assessment of all studies (*Environmental Health Criteria*)



WHO Environmental Health Criteria



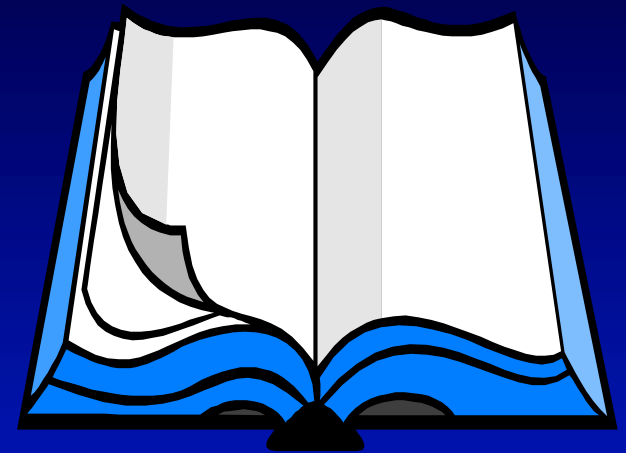
Static and ELF	RF
<p data-bbox="464 773 963 829">IARC 2001-2002</p> <p data-bbox="464 865 963 922">EHC 2002-2003</p> 	<p data-bbox="1102 773 1434 829">IARC 2005</p> <p data-bbox="1102 865 1434 922">EHC 2006</p> 



Table of Contents

- Summary
- Introduction
- Sources of exposure and Measurement
- Environmental levels and human exposure
- Internal Dosimetry
- Effects on laboratory mammals and in vitro test systems
- Effects on humans
 - ⇒ Cancer
 - ⇒ Reproduction
 - ⇒ Cardiovascular
 - ⇒ Neurodegenerative
 - ⇒ Behavioural
 - ⇒ Hypersensitivity
- Methodological Issues in ELF Health Risk Assessment
- Evaluation of Dose-Response
- Evaluation of human health risks
- Protective measures (including Precautionary Approach)
- Conclusions & recommendations for protection of the human health and the environment
- Further research



Process

- IARC Review for Cancer
- ICNIRP Reviews:
 - ⇒ Epidemiology
 - ⇒ Biology
 - ⇒ Physics and Dosimetry
- Work Groups on Selected Topics
- Chapters developed and peer-reviewed prior to the meeting
- EHC Finalised at Task Group Meeting



Proposed Working Groups *

- **Topical**

- ⇒ Reproductive
- ⇒ Neurodegenerative
- ⇒ Cardiovascular
- ⇒ Behavioural
- ⇒ Static Fields
- ⇒ Hypersensitivity

- **Methodologic**

- ⇒ World-wide Exposure Distribution
- ⇒ Relevance and Weight of Biophysical Arguments
- ⇒ Animal Studies (power, exposure relevance and magnitude, models used)
- ⇒ Epidemiologic studies (what do they tell us, exposure misclassification, uncertainties)

- **Policy**

- ⇒ Developing Precautionary Principle framework, linkage of PP to Risk Assessment, considerations of trade-offs, cost-benefit analysis



* *might need to reduce the number, depending on funding*

Task Group

- **Membership approved by Executive Director
(Sustainable Development and Healthy Environments)**
- **Considerations: speciality, range of views, gender and geographical distribution**
- **Representatives of Working Groups**
- **7-10 day meeting to review, revise and finalise EHC Monograph and policy recommendations**



EHC Monograph on ELF and Static Fields

- **Not just another review**
- **Exposure Distribution, Risk Function and if and how to combine them**
- **Policy Option**
- **Blueprint for future EHC on RF**



Schedule

	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	
Organization	Yellow	Yellow																		
Collect Literature	Yellow	Yellow	Yellow	Yellow																
Draft preparation						Orange	Yellow	Orange	Orange	Yellow	Orange	Yellow								
Work Group Meetings						Blue	Blue	Blue	Blue	Blue	Blue	Blue								
Task Group Meeting							Yellow	Yellow					Blue	Yellow	Yellow	Yellow				
Communicate Results																	Yellow			
Monograph																	Yellow	Yellow	Yellow	

- Internal work
- External work
- Meetings

