

# A comparison of the precautionary approach to exposure to Air Pollution and to Power Frequency Magnetic Fields

## Introduction

This summary sheet, produced by Professor Denis Henshaw for the UK SAGE group workshop on 23 November 2004, compares and contrasts the differing approaches to precaution from exposure to air pollution and to power frequency magnetic fields. It takes its material principally from the PowerPoint presentation of Professor Michael Kundi at the CHILDREN with LEUKAEMIA Scientific Conference last September. See [www.leukaemiaconference.org](http://www.leukaemiaconference.org)

As an introduction, consider the report of the UK Expert Panel on Air Quality Standards concerning exposure to polycyclic aromatic hydrocarbons or PAHs. In that report, epidemiological evidence is presented that exposure to the principal PAH, benzo[ $\alpha$ ]pyrene or BaP, at airborne concentrations of 0.25  $\mu\text{g}/\text{m}^3$  (250  $\text{ng}/\text{m}^3$ ) leads to increased risk of lung cancer. Accordingly, the Expert Panel recommends an exposure standard not exceeding 1000 times lower i.e. of 0.25  $\text{ng}/\text{m}^3$ . In the case of chronic exposure to magnetic fields, pooled analyses of epidemiological studies suggest a doubling of risk above 0.4 microtesla ( $\mu\text{T}$ ), and yet the ICNIRP suggested limit for exposure is set 250 times higher at 100  $\mu\text{T}$ .

## Key extracts from Michael Kundi's presentation (website access to be advised)

The differing philosophies in the approaches to precaution against exposure to air pollution and magnetic fields are well illustrated in Professor Kundi's paper. Here are some key extracts.

### Slide 13:

Precautionary approach for air pollution	Approach by ICNIRP, IEEE, NRPB... for EMF
Select the most sensitive endpoint from peer-reviewed scientific reports	Select established effects that allow for a generalised approach

"...only established effects were used as the basis for the proposed exposure restrictions" (ICNIRP 1998, p.496)

### Slide 14:

Precautionary approach for air pollution	Approach by ICNIRP, IEEE, NRPB, ...for EMF
Assume the worst: If there are alternative explanations for an observed effect assume the one that leads to the highest level of protection	If there are alternative interpretations assume that the effects have not been caused by exposure to EMF but are due to confounding

"From the available evidence, it cannot be conclusively established whether a threshold with regard to carcinogenicity in the action of TCE may be assumed. Therefore, linear extrapolation from the animal tumour data is used, providing a conservative approach for estimating human cancer risk."  
(WHO Air Quality Guidelines, 2000)

"In spite of the large number data base, some uncertainty remains as to whether magnetic field exposure or some other factor(s) might have accounted for the increased leukaemia incidence."  
(WHO International EMF Project, Fact Sheet 263, 2001)

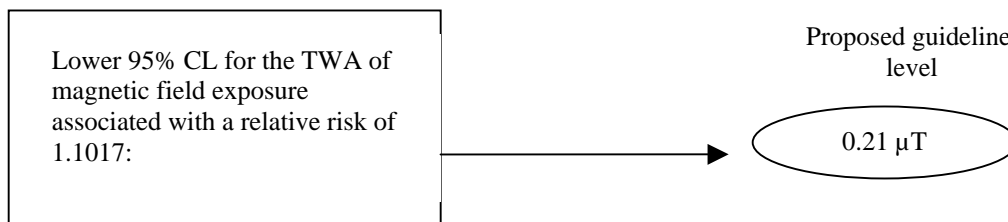
## Slide 18: Basis for limiting exposure of power-frequency fields (according to ICNIRP 1998)

“It is the view of the ICNIRP that the results from the epidemiological research on EMF field exposure and cancer, including childhood leukaemia, are not strong enough in the absence of support from experimental research to form a scientific basis for setting exposure guidelines.” (ICNIRP 1998, p.499)

“Neuroendocrine alterations (e.g., suppression of nocturnal melatonin synthesis) have been reported in response to ... induced current densities of approximately  $2\text{mA m}^{-2}$  or less... However, there is no clear evidence that these biological interactions of low-frequency fields lead to adverse health effects.” (ICNIRP 1998, p.501)

## Slide 25: Alternative derivation based on a precautionary approach

Based on the analyses published by Ahlbom et al. (2000) and Greenland et al. (2000) the excess cumulative risk (below age 20) was estimated as a function of TWA magnetic field exposure. Background cumulative incidence was assumed to be approximately  $60 \cdot 10^{-5}$ .



## Slide 32: Summary

- There is evidence of an increased leukaemia risk in children
- There is some support from long-term animal studies
- There is some support from in vitro studies and a plausible and testable mechanistic hypothesis
- **A precautionary procedure as applied for air pollutants would result in a recommended exposure standard of 0.2  $\mu\text{T}$**

The above extracts well illustrate the very different approaches to precaution currently adopted for air pollution and EMF. In addition to Professor Kundi's talk, the talk by David Gee arising from his book "Late Lessons from Early Warnings" is also of interest (details below).

## References

1. Expert Panel on Air Quality Standards – Polycyclic Aromatic Hydrocarbons  
The two following papers were presented on Day 5 at the CHILDREN with LEUKAEMIA Scientific Conference, London, 6-10<sup>th</sup> September 2004. Speaker abstracts may be accessed online at [www.leukaemiaconference.org](http://www.leukaemiaconference.org) via the Programme for individual days. The website address for the full presentations to be advised.
  - i. Professor Michael Kundi, Precaution: Comparing Air and EMF Pollution, paper S5-3
  - ii. David Gee, Observations on the need for precautionary approach, paper S5-1