PENGENALAN KEPADA MEDAN ELEKTROMAGNET DAN KESIHATAN

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UNIVERSITY OF MALAYA
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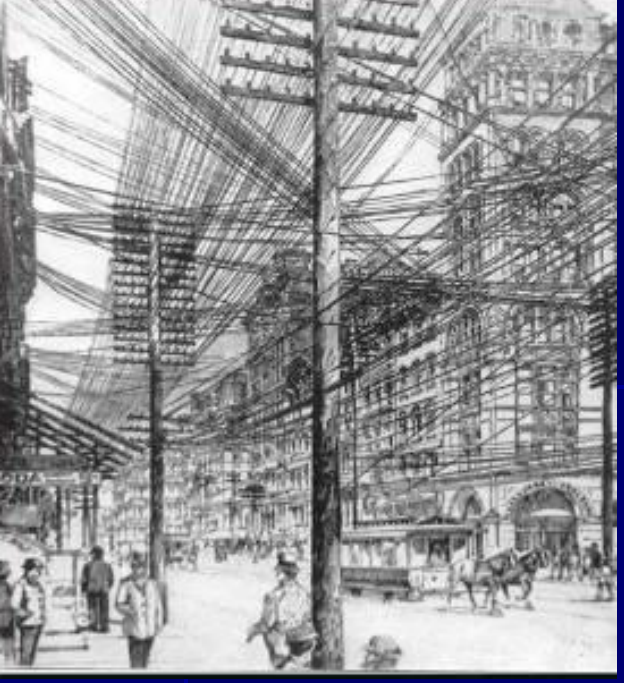

It is generally recognized that extremely low frequency electromagnetic fields ELF-EMF) are present in the environment as a result of the generation, transmission, distribution and use of electricity in modern society.

http://www.uh.edu/engines/nycandwires.jpg

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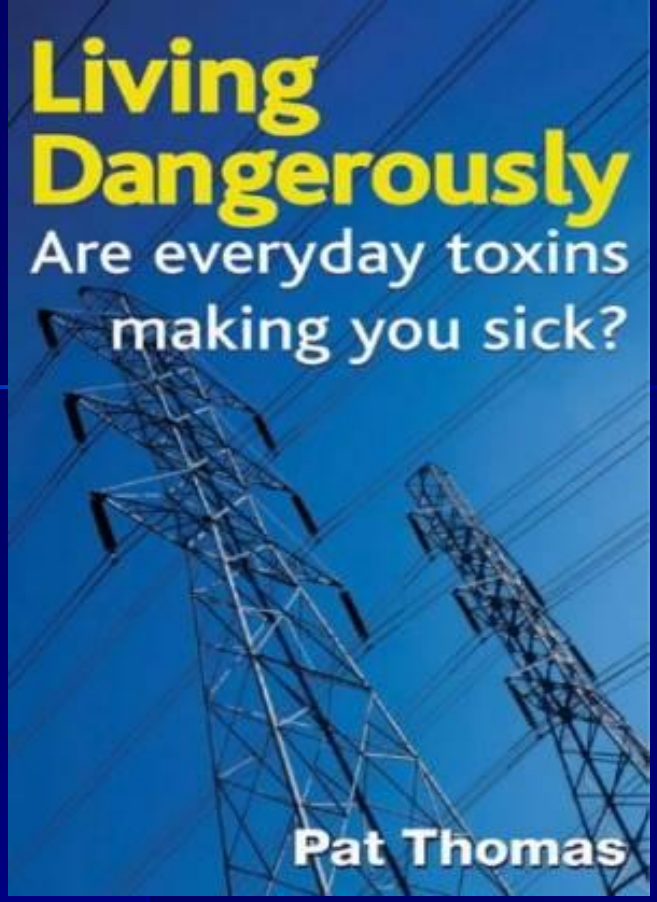


SUNDAY 25 July 2004 NST FitForLife

Health At Large

Cancer cluster links are often elusive

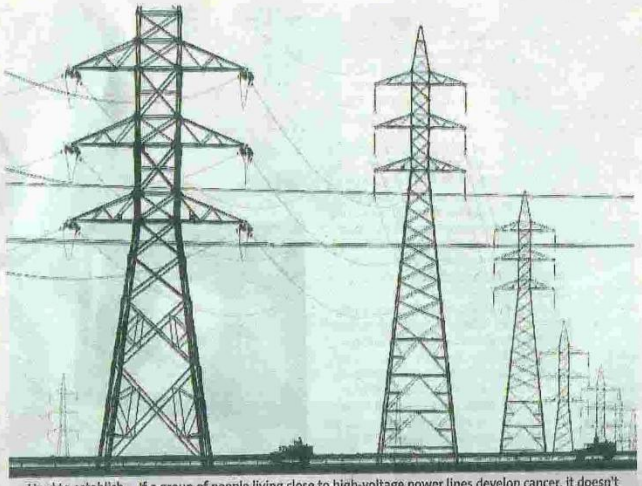
When cancer strikes a greater than expected number of cases among people who work together or live within a certain geographic area, it is often difficult to find a common link, writes ERIKA NIEDOWSKI.

MORE than a hundred Long Island women living close to high-voltage power lines develop breast cancer. Sixteen children from a Nevada county are stricken with leukaemia. Fifteen employees of a Philadelphia chemical company are diagnosed with brain tumours.

Is it coincidence? Cause and effect? Too hard to tell? For scientists who study these so-called "clusters" of disease, the answers all too often are frustratingly vague.

"These situations are typically very challenging and unsatisfying to everyone involved," said Dr Michael J. Thun, head of epidemiologic research at the American Cancer Society.

"Because, first of all, the affected people are ill, so irrespective of what caused it, they're dealing with the disease. And, secondly, the level of scientific certainty



Hard to establish ... If a group of people living close to high-voltage power lines develop cancer, it doesn't necessarily mean that the power lines are the culprits.

dren with leukaemia in Woburn, Massachusetts. In the movie version of the book *Civil Action*, John Travolta played the crusading attorney who spent years trying to prove a link between the illnesses and contaminated well water. The case was settled out of court.

"It's really detective work," said Julie Buring, professor of epidemiology at the Harvard School of Public Health, who years ago investigated a handful of brain cancer cases that turned out to be linked to a chemical exposure.

Cases are more likely to be part of a cluster, experts say, if they involve a single type of cancer, a rare type or one that isn't typically found in the age group in question. But, in science, hard and fast rules don't always apply.

"What I think helps keep the hypothesis open that there may be an association between work and cancer is what we call 'biologic plausibility,'" said Dr Melissa A. McDiarmid, director of the occupational health programme at the University of Maryland School of Medicine.

"Wearing spectacles frames with metallic parts can focus electromagnetic force from toasters, TVs, and bedside lamps into your eyes. This may cause retina damage."

October, 2003

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FREE EYE SHADOW
NOVEMBER 2000
marie claire
What's new for you
25 Hair & makeup easy how-tos
sex tips to get what you want from men
Men reveal
The sexiest thing you can wear
BREAST CANCER REPORT:
ARE YOU AT RISK?
Does my butt look big in this?
Honest answers
(QUICK) SECRETS TO A SEXY BODY
Women who only date rich/shorter/younger men...
Do sinners have more fun?
By Elizabeth Hurley


marie claire HEALTH SPECIAL
What is the link between BREAST CANCER and the environment?
Why do some areas have a much higher incidence of the disease? How much are electromagnetic fields, air pollution and products such as pesticides and plastics to blame? Stacie Stukin reports on the facts you need to know

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Electromagnetic Field (EMF)

Introduction

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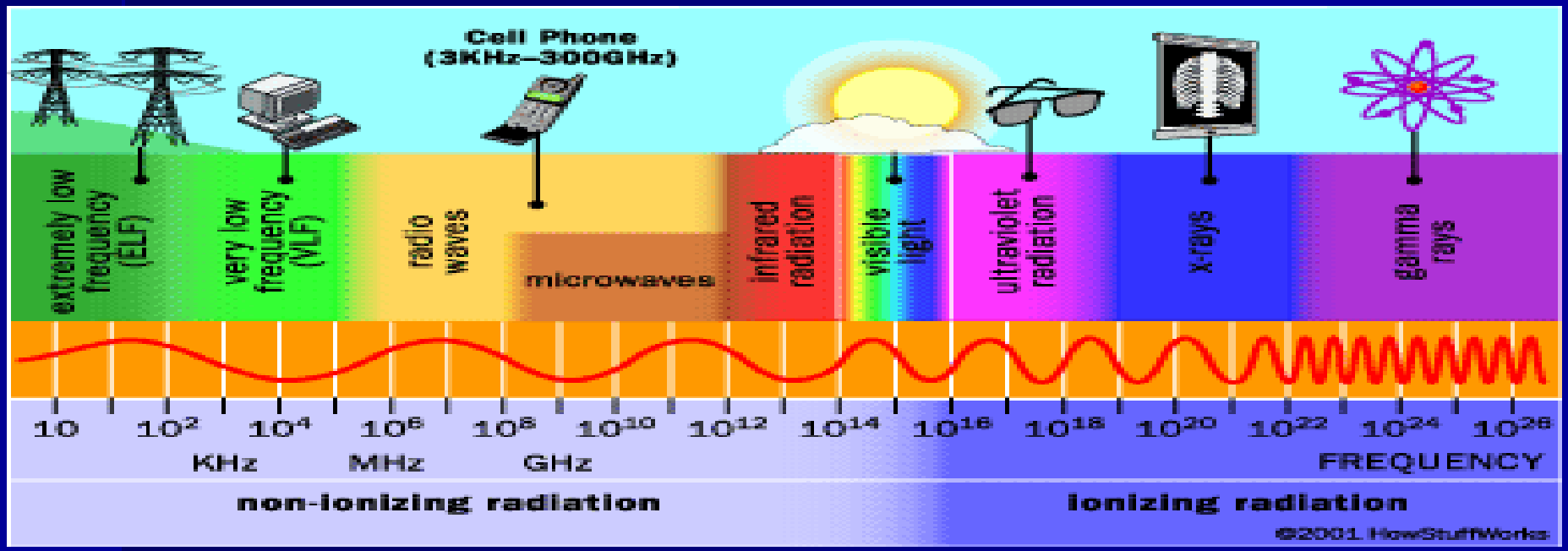
What are extremely low frequency (ELF) fields?

The electromagnetic spectrum covers an enormous range of frequencies. Electric power (50 Hz in Malaysia) is in the extremely low frequency (ELF) range which includes frequencies below 300 Hz.



EMF spectrum

- Static electric and magnetic fields, 0 Hz
- Extremely low frequency (ELF) fields, >0 Hz to 300 Hz
- Radiofrequency (RF) and microwave (MW) radiation, 300 Hz to 300 GHz

- Optical radiations:

infrared (IR) 760 - 10^6 nm
visible 400 - 760 nm
ultraviolet (UV) 100 - 400 nm

EMF:

- ✓ **Sources**

missions & Exposures

biological Effects

Sources Electromagnetic Fields

EHF UHF VHF HF

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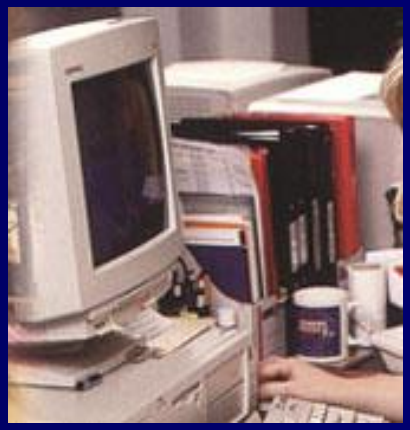
Sources Electromagnetic Fields



LF

ELF

Static

Unconventional sources of NIR

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ELF:

- Emissions & Exposures

Electric and Magnetic Fields Units

- Electric field strength: Volt per metre (Vm^{-1})
- Magnetic field strength: Tesla (T)
- Older unit:

  1 Tesla = 10,000 gauss

  (1 mgauss = 0.1 μT)

Fridge magnet
50,000 μT (50 Gauss)

Earth magnetic field
50 μT (0.5 Gauss)

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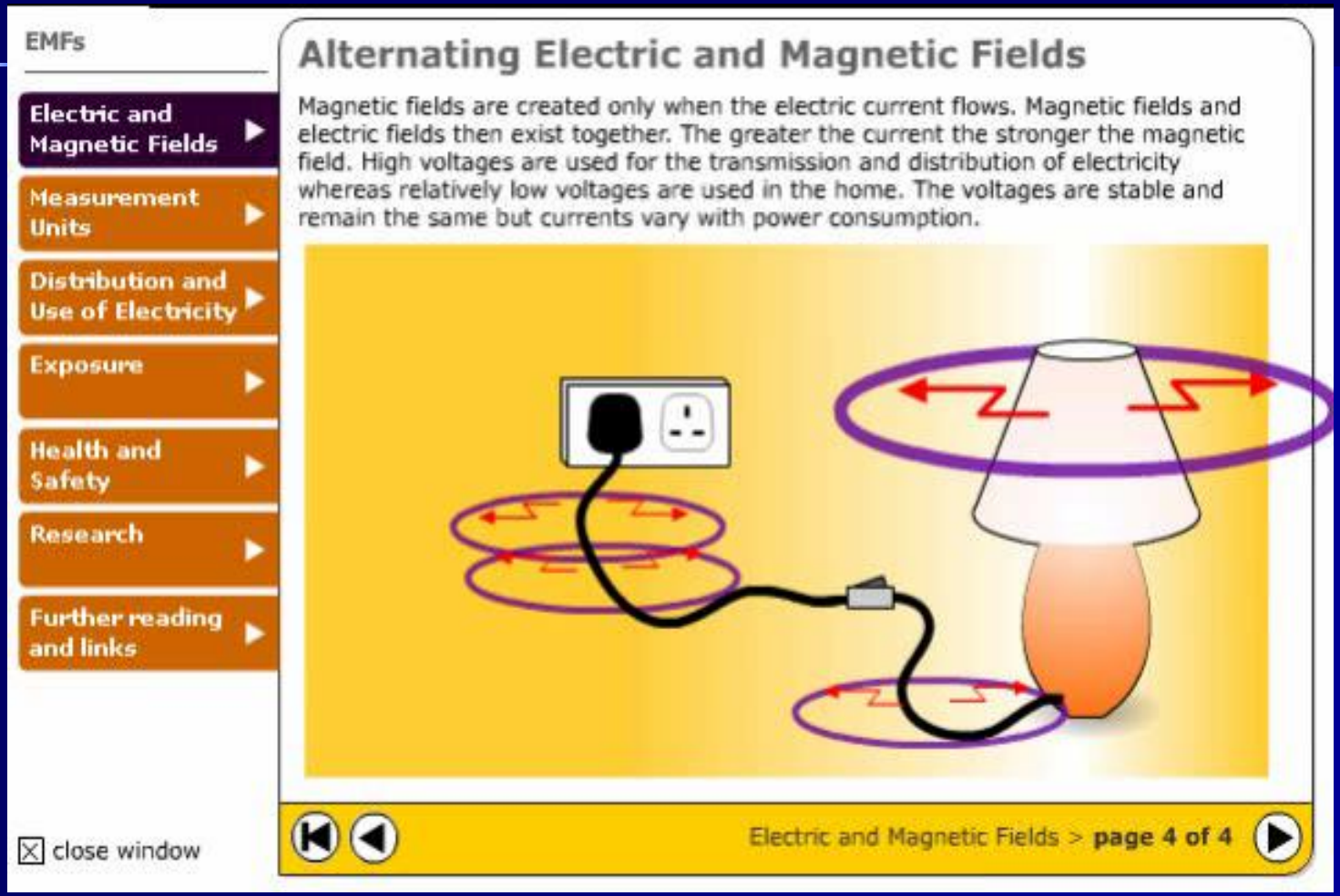
Alternating Electric and Magnetic Fields



Courtesy of NRPB

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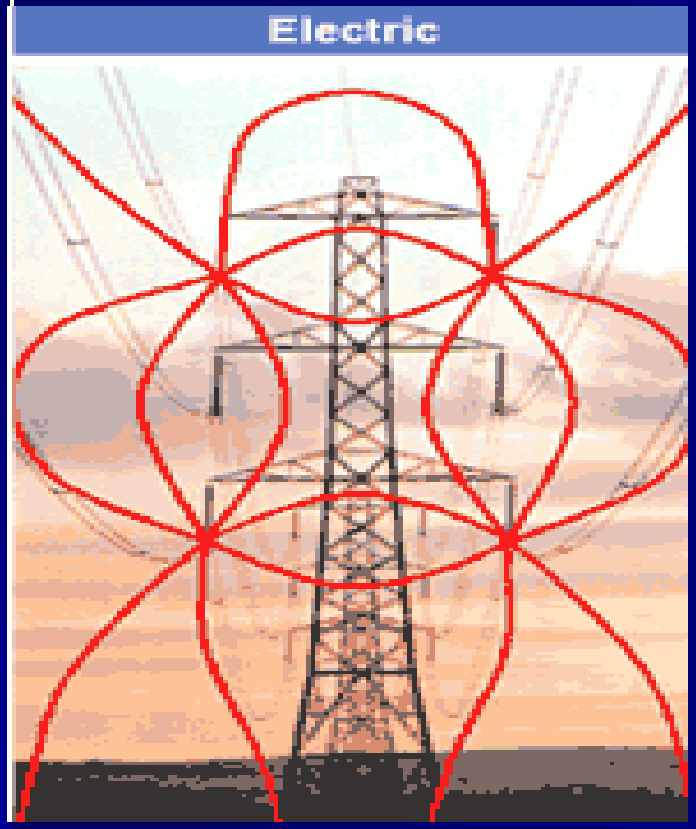
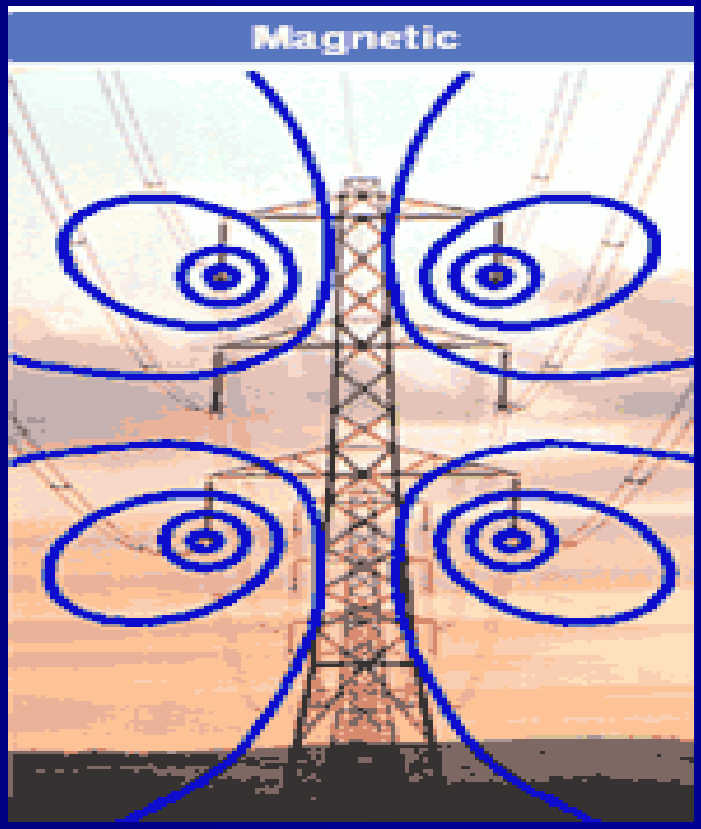
Field lines produced by transmission lines





URL: ///www.emfs.info

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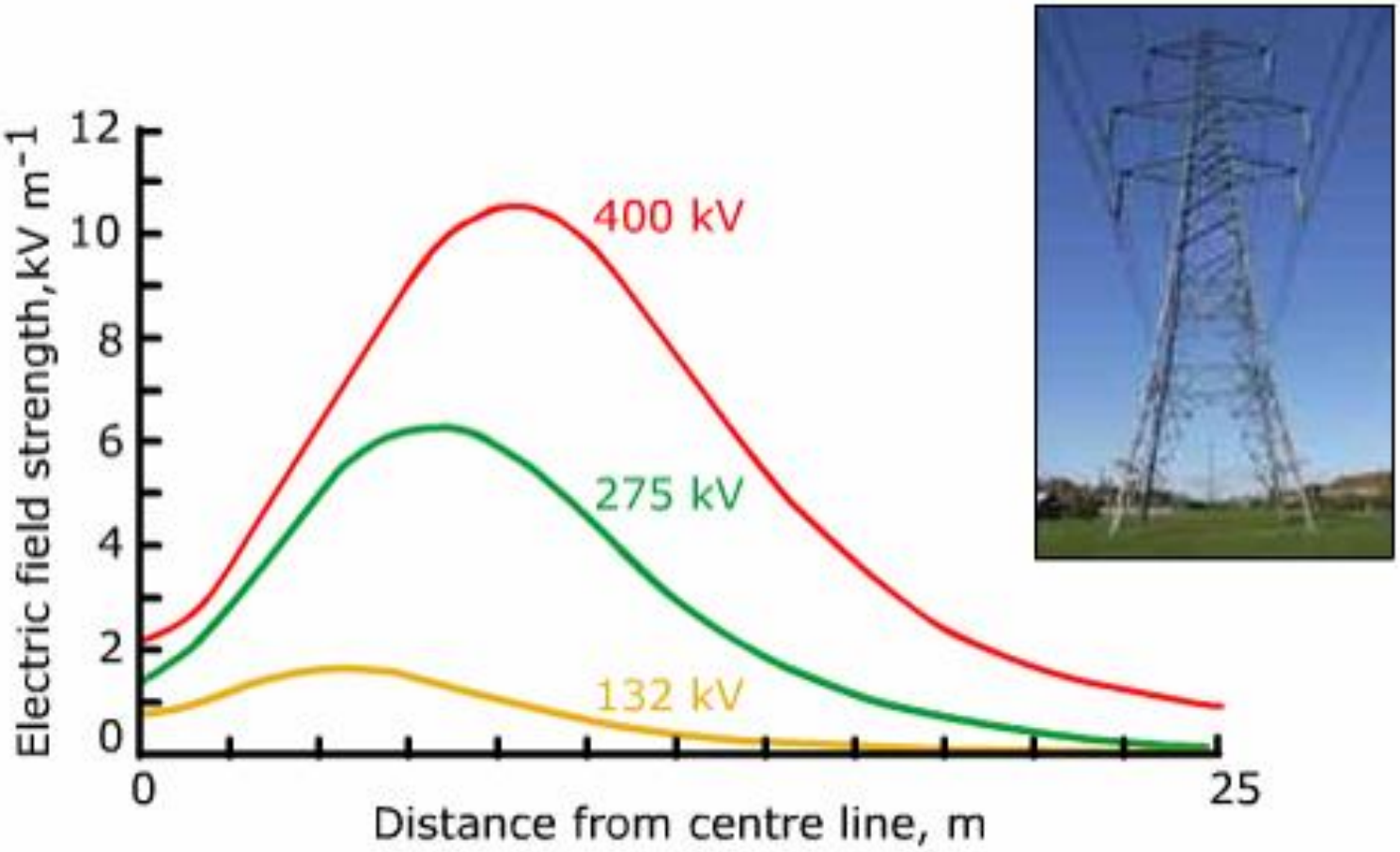
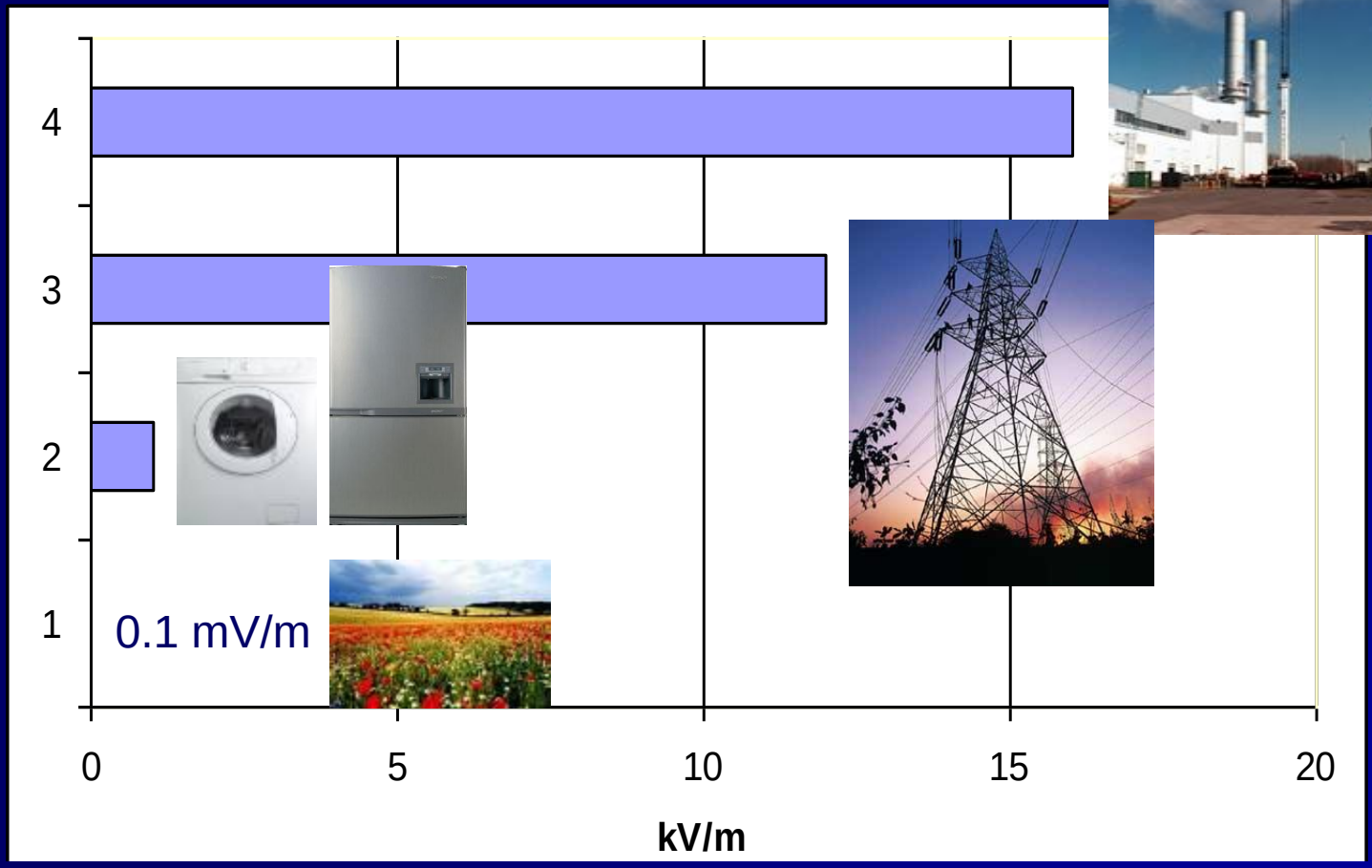
The Electric Field changes with distance from the centre line of the overhead power line



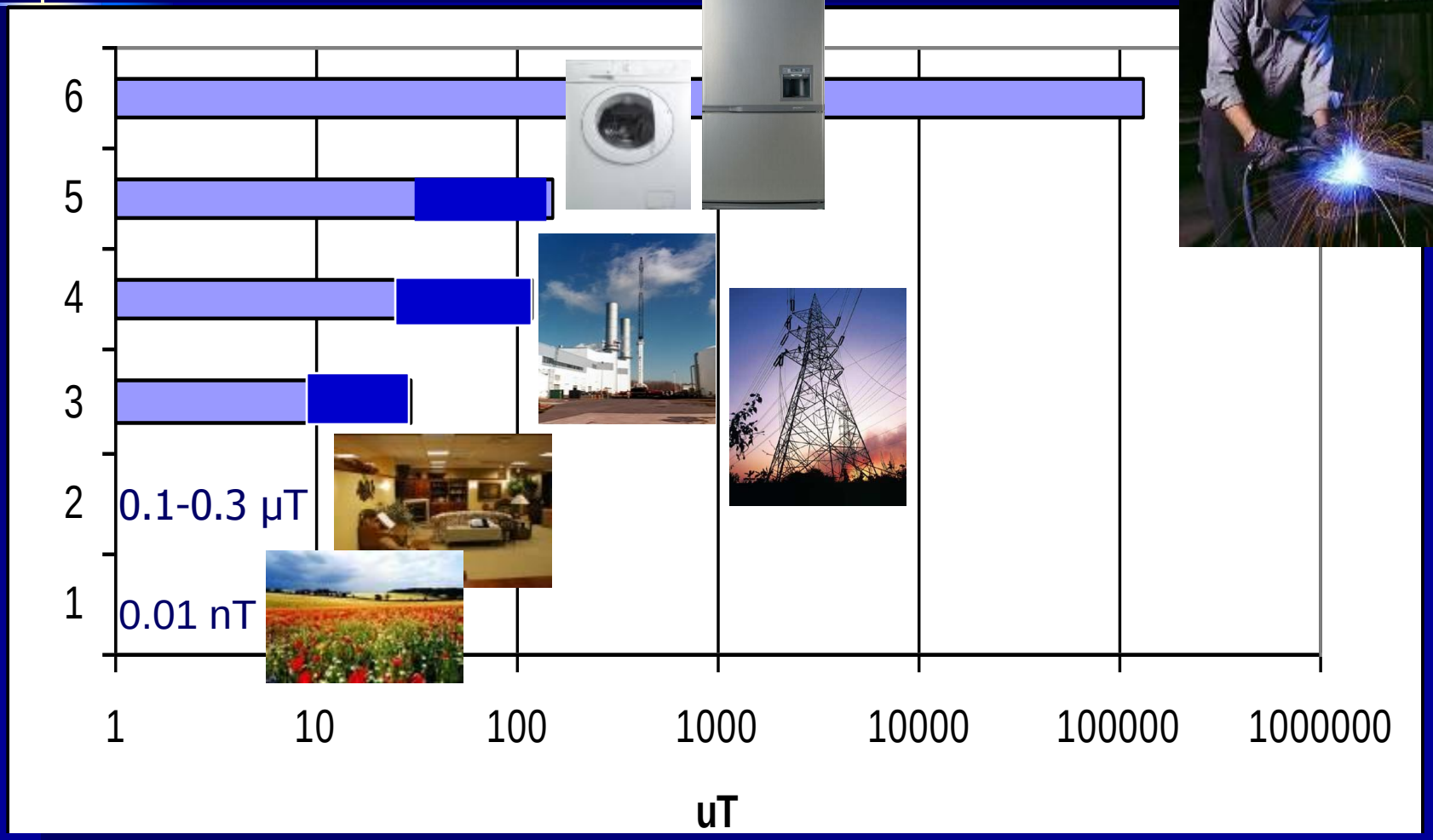
Sources of exposures to ELF fields

Typical electric fields



Sources of exposures to ELF fields

Typical magnetic fields



We need exposure limits

Limits to exposures are set to avoid adverse effects on health arising from excessive exposures to EMFs.

The public needs to be protected.

Guidelines for EMF Exposure

International Commission on Non-Ionizing Radiation Protection (ICNIRP)

Exposure - 50/60 Hz	Electric Field	Magnetic Field
Occupational		
Whole working day	10 kV/m	500 µT (5 G)
Short-term*	30 kV/m	5,000 µT (50 G)
Limbs	-	25,000 µT (250 G)
General Public		
Up to 24 hours per day	5 kV/m	100 µT (1 G)
Few hours per day	10 kV/m	1,000 µT (10 G)

*For electric fields of 10-30 kV/m, field strength (kV/m) multiplied by hours of exposure should not exceed 80 for the whole working day. Whole-body exposure to magnetic fields up to 2 hours per day should not exceed 5,000 µT

Source: ICNIRP 1998

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International Guidelines on Exposure Limits

- **International standards are based on scientific knowledge**
- **Limit values based on conservative reduction or safety factors from the threshold level for adverse health effects (÷10 for occupational limits)**
- **Reduction factor for the public is larger**

(÷ 50) to allow for possibility of greater EMF sensitivity among different age groups such as children and elderly and exposure 24-7

- **Allow for a lot of uncertainty**

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EMF:

- **Biological Effects**

What is Biological Effect

A biological effect occurs when a change can be measured in a biological system after the introduction of some type of stimuli.

ICNIRP Health Physics 74: 494-520, 1990

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What is Biological Effect

It could be:

physiological,

biochemical or

behavioural changes

induced in an organism, tissue or cell.

ICNIRP Health Physics 74: 494-520, 1990

Adverse Health Effect

However, the observation of a biological effect, in and of itself, does not necessarily suggest the existence of a biological hazard.

A biological effect only becomes a safety hazard when it "causes detectable impairment of the health of the individual or of his or her offspring"

ICNIRP Health Physics 74: 494-520, 1990

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Biological Effects

Biological Effect :

Contraction and dilation of pupil

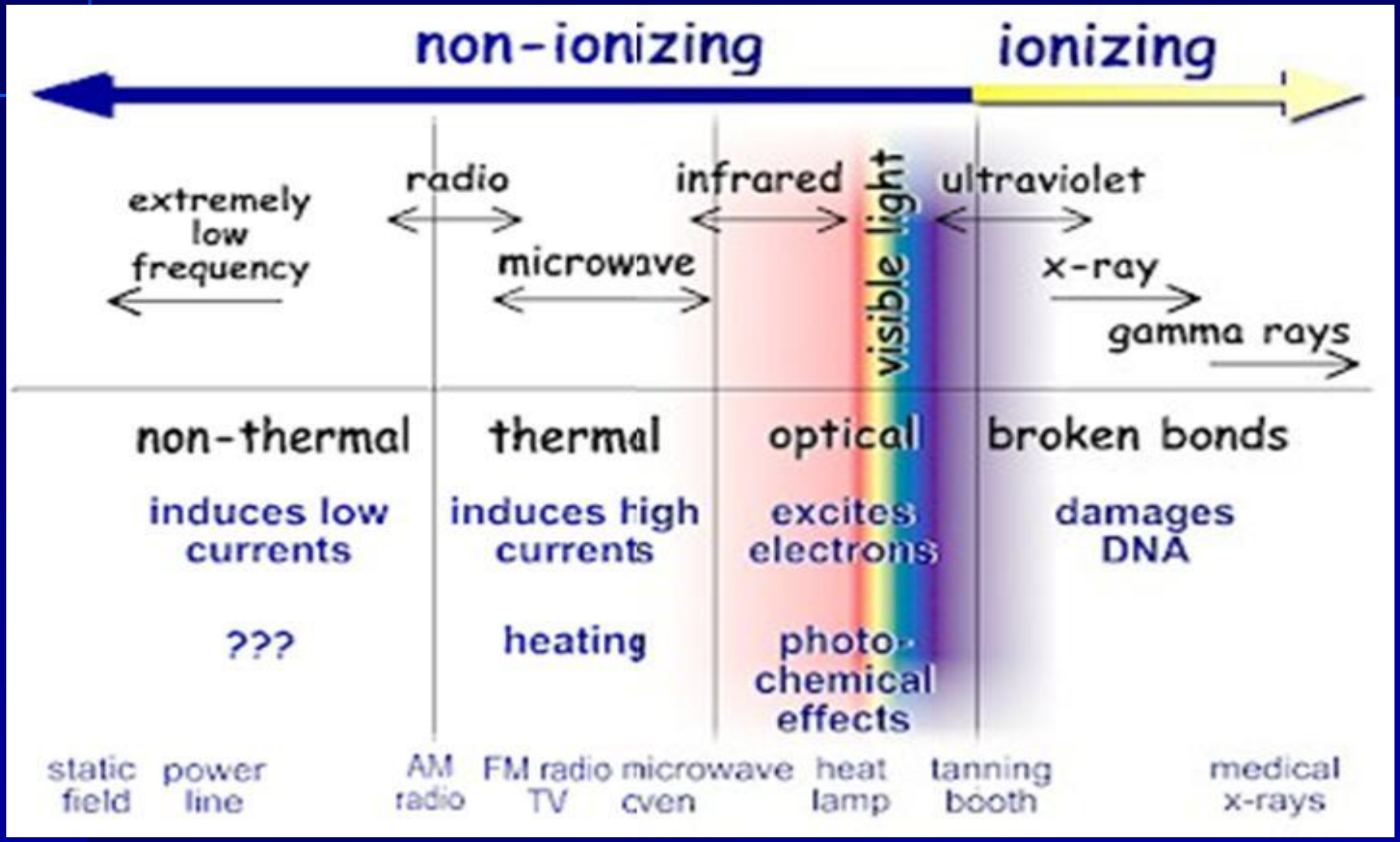
Physiological Response to light

Adverse Health Effect:

Cataract

Caused by excessive exposure to UV

Biological Effects of NIR



www.epa.gov/docs/rpdweb00/

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Very important to understand:

Biological effect does not necessarily lead to health effect

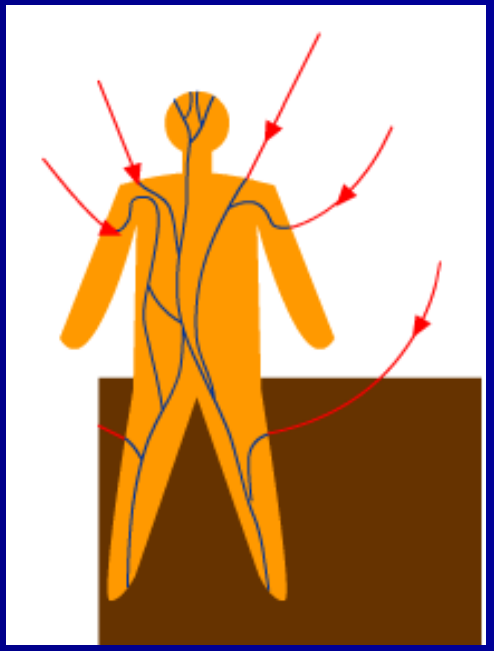
(Disease or injury)

ELF:

- Sources
- Emissions & Exposures
- Biological Effects
- ✓ Interaction Mechanisms

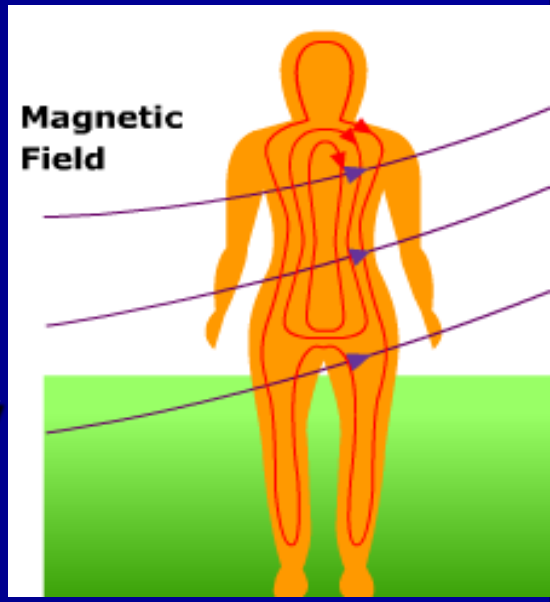
ELF electric fields

- Induce an electric charge that varies continuously and regularly in time on the surface of exposed humans
- In turn, this constant flow of surface charge will give rise to oscillating internal electric fields and currents
- However, these effects depend on frequency and are very small for ELF range
- Typically, induced electric field are more than one million times weaker than the external field



ELF magnetic fields

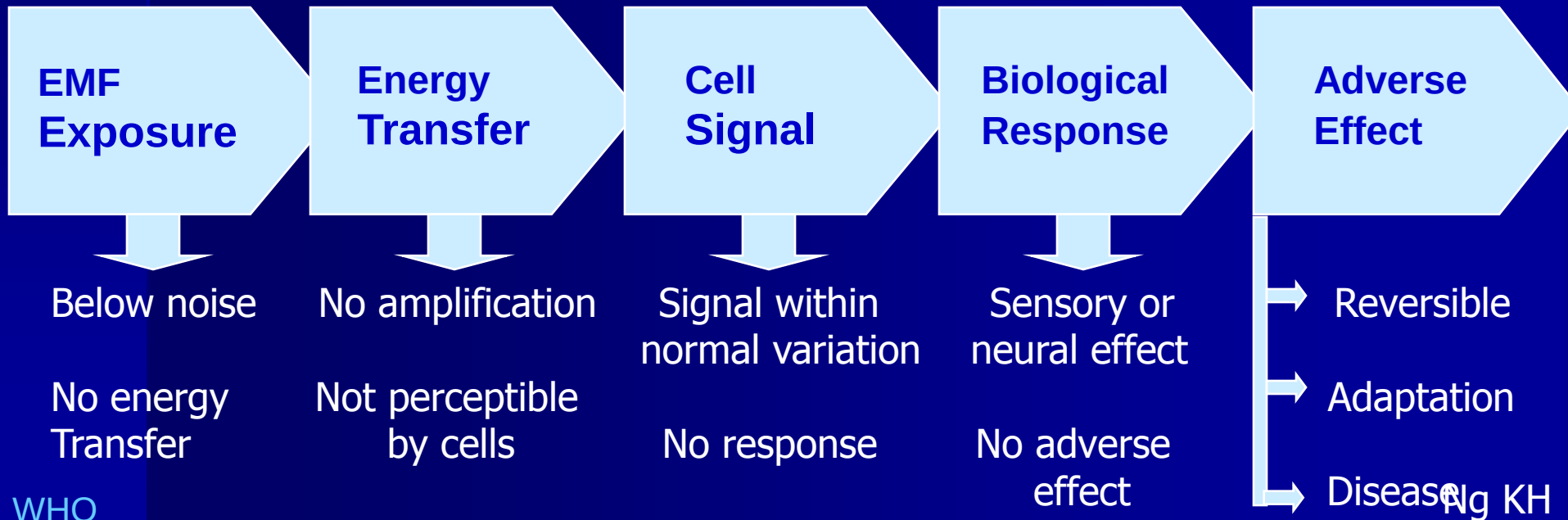
- Oscillating magnetic fields can also induce electric fields and currents, but mostly in the superficial tissues
- These effects are also dependent on frequency and are small for ELF
- In contrast, the transient magnetic fields that are produced during switching can induce strong electric fields and currents, but only for very short time periods



Theoretical Principles

- For electric or magnetic fields to cause health effects they must first interact with biological molecules or structures and induce a change by transferring energy

- Then, this must generate a signal that can be sensed and Amplified by cells to produce a subsequent response of The organism… that may be harmful or not



WHO

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How do scientists study possible health effects of EMF radiation on people?

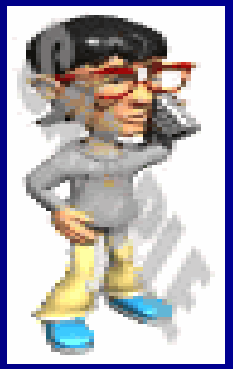
Possible health effects of exposure to EMF radiation studied for over 50 years. Several different types of study have been carried out.

Research

- **Epidemiological studies**, health of users vs. non-users - exposure rate among 'cases' vs. 'controls'
- **Experimental biology**, animal studies - long term exposure
- **Cell studies** - short term exposure, but aimed at uncovering a 'mechanism of interaction'
- **Volunteer studies** - memory, reaction rates
- **Dosimetry** – measurement of radiation

Epidemiology

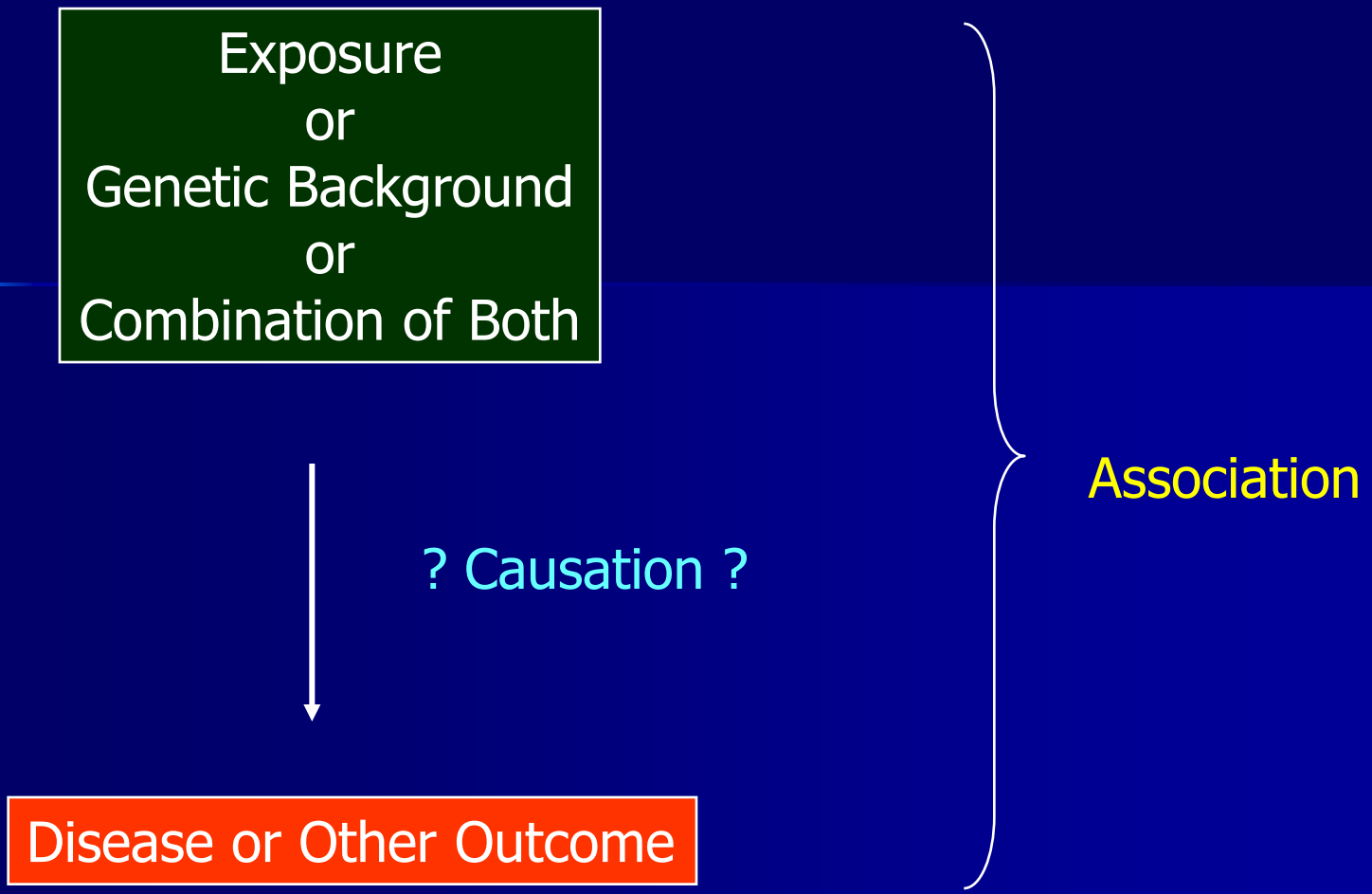
Epidemiological studies are long-term observational studies that look at the relationships between exposures to agents (such as chemicals and radiation) and health outcomes in the exposed group of people.



Association and Causation

In epidemiology, a positive "association" between an exposure (such as EMF) and a disease is not necessarily proof that the exposure *caused* the disease.

However, the more often the exposure and disease occur together, the stronger the association, and the stronger the suspicion that the exposure increases the risk of the disease.



Suppose we determine that an exposure is associated with disease.

How do we know if the observed association reflects a causal relationship?

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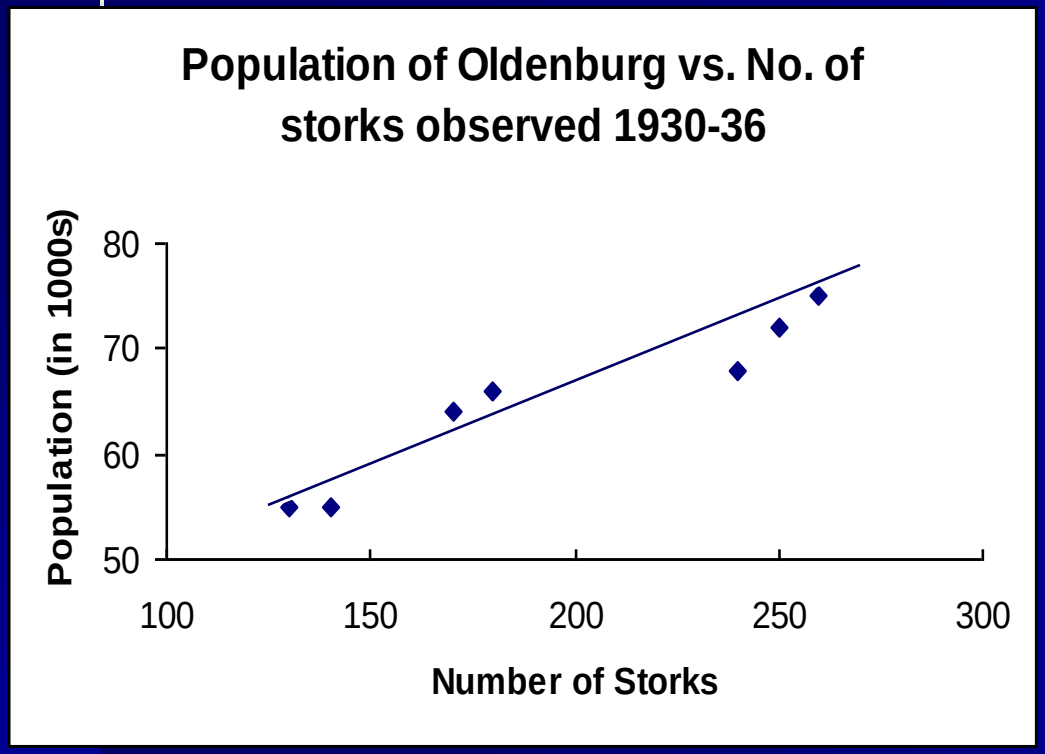
Strong association (statistical significance) but leads to fallacy



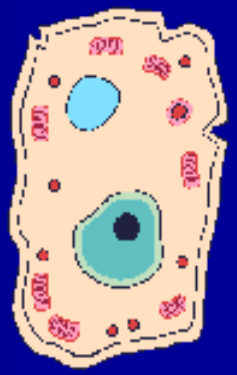
Animal Studies

Short and long term animal studies have been carried out to investigate whether EMF affects risk of developing cancer, learning and other biological end points.

Cellular Studies

Cellular studies look at the effects of EMF on isolated cell or tissue culture.

Investigate whether EMF radiation might influence the progression of cancer, inhibit physiological function, or affect the way cells send signal to each other.



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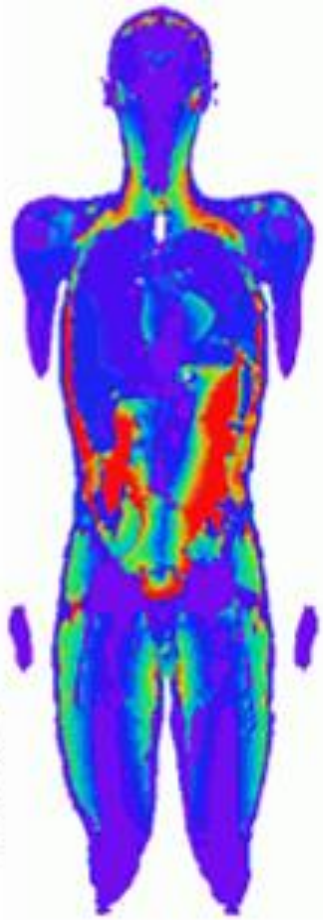
Theoretical Modelling



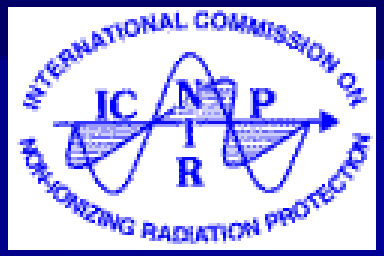
Current density arising from exposure to a magnetic field

Human phantom

Research on biological effects of EMF

- Nervous systems
- Cardiovascular systems
- Endocrine and immune systems
- Reproduction and development
- Genetics
- Cancer
- Auditory perception
- Ocular effects

What are the findings of recent reviews from some of these international organizations?



- Scientific evidence till today does not suggest adverse health hazards below guidelines/ exposure limits

- Need for further research

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Controversy on Power Lines and Leukemia

NRPB Statement by Sir Richard Doll 2001

- It concludes that, “based on the many epidemiological studies of adults exposed to EMF at home or at work, there is no reason to believe that EMF exposure plays any role in adult leukaemia or brain cancer”.

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Controversy on Power Lines and Leukemia

NRPB Statement by Sir Richard Doll 2001

- There is “some evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukaemia in children … the scientific evidence is inconclusive and is not strong enough to justify any firm conclusion that such fields cause leukaemia in children”.

KH Ng

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Fact Sheet 8

The Controversy Over Electromagnetic Fields and Possible Adverse Health Effects

Sources

There is a general perception amongst many in the community that there are health risks resulting from exposure to electromagnetic fields (EMF) from power lines. All alternat
tric and magnetic
(sometimes, inco
radiation). The e
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Electric fields ca
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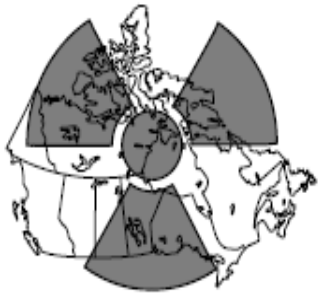
fields is to increa
ticularly for fields

Power lines inclu
large steel tower
concrete or wood

Transmission lin
and strong magn
weak electric fiel
fields.

Health Effects?

Human studies have consistently shown that there is no evidence that prolonged exposure to weak electric fields (such as those found in the home or



HEALTH EFFECTS AND EXPOSURE GUIDELINES RELATED TO EXTREMELY LOW FREQUENCY ELECTRIC AND MAGNETIC FIELDS - AN OVERVIEW

Prepared by

The ELF Working Group

of

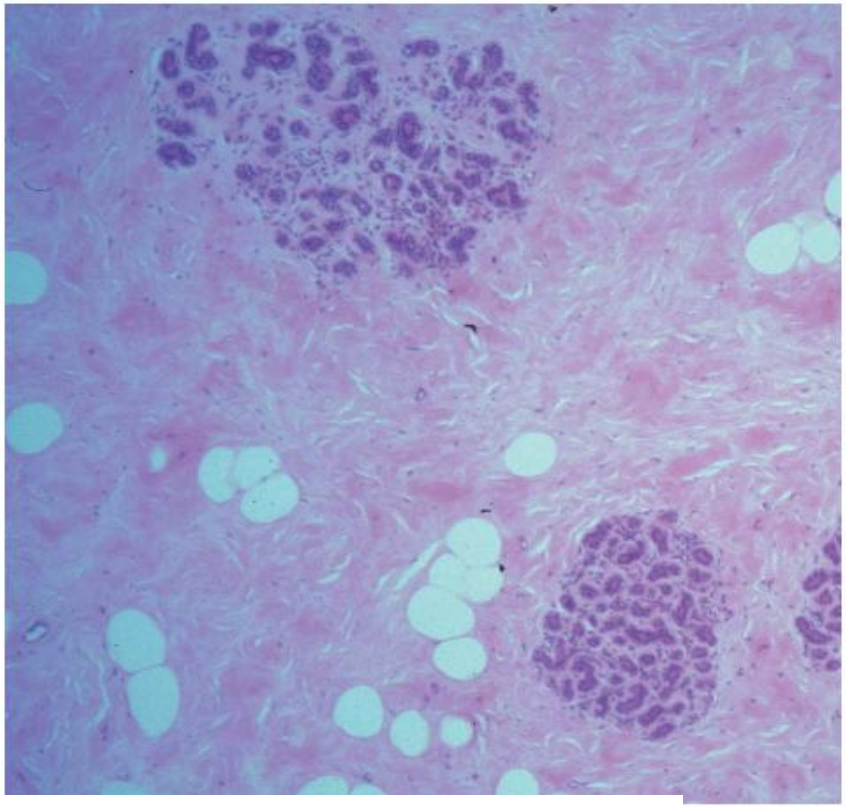
The Federal-Provincial-Territorial Radiation Protection Committee - Canada

January 2005

Health Protection Agency

Power Frequency Electromagnetic Fields, Melatonin and the Risk of Breast Cancer

Report of an independent Advisory Group on Non-ionising Radiation



Documents of the Health Protection Agency
Series B: Radiation, Chemical and Environmental Hazards
February 2006

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http://www.who.int/peh-emf/en/

Electromagnetic fields (EMF)

Electromagnetic fields

Electromagnetic fields of all frequencies represent one of the most common and fastest growing environmental influences, about which anxiety and speculation are spreading. All populations are now exposed to varying degrees of EMF, and the levels will continue to increase as technology advances.

As part of its Charter to protect public health and in response to public concern, the World Health Organization (WHO) established the International EMF Project in 1996 to assess the scientific evidence of possible health effects of EMF in the frequency range from 0 to 300 GHz.

Quick links

– About us
– Publications
– Contact us

Participating countries & entities in EMF Project

WHO Recommendations

- All reviews conducted so far have indicated that exposures below the limits recommended in the ICNIRP (1998) EMF guidelines, covering 0-300 GHz, do not produce any known adverse health effect.
- More research is needed.

WHO Recommendations

- Adopt mandatory health-based EMF exposure limits to protect public health
- Adopt, as needed, voluntary precautionary measures that reduce unnecessary EMF exposure to address public concern

WHO Fact Sheets 193, 205, 263

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