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Mobile technologies and health

What is electromagnetic energy (EME)?

- EME is a form of naturally occurring energy that exists across a range of different 'frequencies' in the electromagnetic spectrum.
- The electromagnetic spectrum is divided into 'ionising' and 'non-ionising' energy. Only very high frequency ionising energy (e.g. ultra-violet energy, x-rays and gamma rays) has sufficient intrinsic energy to break chemical bonds and directly affect the DNA of cells.
- At one end of the spectrum are the low frequencies associated with power lines and at the other end are the very high frequencies of x-rays and gamma rays. Intermediate frequency ranges are used by television and radio broadcasters, mobile telephony and satellite providers, i.e. 'radio frequencies', as well as constituting visible light.

Thermal and non-thermal effects of EME

- **Thermal effects** refer to the effects linked with the heating that occurs when sufficient radio energy is absorbed by the body. It is well established that mild heating of the body occurs in many natural and man-made circumstances and can be dealt with by natural body mechanisms. However, excessive heating can stress the body and can cause other adverse effects.
- Therefore, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) has established stringent guidelines, with substantial safety factors, that limit the exposure of people to emissions from radio devices including mobile handsets and base stations. These guidelines ensure that no known adverse health effects can occur at power levels used by mobile handsets and that the general public cannot unknowingly enter areas close to antennas where exposure may exceed the guidelines.
- There is some evidence of **non-thermal or athermal** biological effects arising from the absorption of radio energy at levels where no increase in body temperature is detected. It is vital to understand that a biological effect, which may have been observed in isolated cells, is not necessarily evidence of an adverse health effect.

- Some studies that claim to have found biological effects are reported by the media. Very often other scientists do not obtain the same results when they attempt to confirm the experiments. Expert groups have generally concluded that reported non-thermal effects do not form a reliable basis for standards setting.

Nevertheless, bodies such as the World Health Organisation (WHO) and ICNIRP have considered the results of these experiments. The ICNIRP guidelines offer protection against all identified health hazards resulting from exposure to radio energy.

Current state of research – World Health Organisation (<http://www.who.int/peh-emf/>)

- In 1996, the WHO launched its International Electromagnetic Fields (EMF) Project, which is due to be completed in 2005. The Project is assessing possible 'health and environmental effects of exposure to static and time-varying electric and magnetic fields in the frequency range 0 – 300 GHz.
- Mobile technology is specifically mentioned as one source of exposure that will be investigated, but the Project is much broader and includes other areas such as electric power generation, radar, and radio and television broadcast antennas.
- A large epidemiology study is being co-ordinated in over 14 countries by the International Agency for Research on Cancer (IARC) to identify whether there are links between the use of mobile phones and head and neck tumours.



Current World Health Organisation advice

(<http://www.who.int/inf-fs/en/fact193.html>)

- Whilst the EMF Project and EME research are continuing, the WHO has issued a fact sheet no 193 – (revised in June 2000) to give advice to those who might be concerned about possible health effects arising from the use of mobile technology. Its principal conclusion is that:

“None of the recent reviews have concluded that exposure to the RF fields from mobile phones or their base stations causes any adverse health consequence. However, there are gaps in knowledge that have been identified for further research to better assess health risks.”

- The WHO recommends strict adherence to international guidelines, but warns against individual regulatory authorities introducing additional precautionary measures that *“...undermine the science base of the guidelines by incorporating arbitrary additional safety factors into the exposure limits.”*
- In relation to reported non-thermal effects, the fact sheet states, *“While RF energy can interact with body tissues at levels too low to cause any significant heating, no study has shown adverse health effects at exposure levels below international guideline limits.”*

Independent expert scientific reviews

- Over recent years a number of expert groups in various countries have conducted reviews of existing research into alleged adverse health effects resulting from exposure to radio energy.
- These groups have had a remit to consider a very wide range of studies and are therefore able to assess the weight of expert evidence and provide a broad and balanced overview. By reviewing the totality of available evidence, they have been able to ensure that their conclusions and recommendations do not give any single study undue significance or prominence.

- All of the groups have consistently come to the same broad conclusions, namely that for exposures to radio energy up to the defined maximum limits for humans, there is no substantive or convincing evidence of biological effects that could harm a person's health. Therefore, they have concluded that compliance with existing standards is sufficient to protect public health, but there is still a need for further research to investigate areas of current uncertainty.

- The more recent of these independent expert groups include the following:

- The Royal Society of Canada (RSC), 1999 and 2001 (www.rsc.ca/english/Rfreport.html)
- UK Independent Expert Group on Mobile Phones (IEGMP – Stewart Report), 2000 (www.iegmp.org.uk)
- Health Council of the Netherlands, 2000 (www.gr.nl/engels/welcome/frameset.htm)
- Swedish Council for Work Life Research (RALF), 2000 (www.ralf.se/ralf/index2.asp)
- French Expert Group (Zmirou), 2001 (www.sante.gouv.fr/html/dossiers/telephon_mobil/intro.htm)
- German Commission for Radiation Protection (SSK), 2001 (www.ssk.de/2001/ssk0102e.pdf)
- Spanish Expert Group (www.msc.es/salud/ondas.htm)

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