

**WHO/ICNIRP Conference on EMF Biological Effects and
WHO Standards Harmonization for the African Region and
WHO RF Research Coordination Meeting**
Cape Town, South African
4-7 December 2001

Meeting report

Welcome from SA Department of Health

Mr Seppoe Olivier, whose area has overall responsibility for protection against all non-nuclear radiation, welcomed all delegates to Cape Town.

Welcome from ICNIRP

Dr Alastair McKinlay, ICNIRP Chairman welcomed delegates and observed that all sectors i.e. Governments, industry and academia were being represented at the meeting.

Welcome from WHO

Dr Michael Repacholi, WHO Coordinator for Occupational and Environmental Health, welcomed all participants and provided an overview of topics to be covered by the meeting.

Major aim was to engage the people from the region in dialogue on the EMF issue, gain awareness of current knowledge of biological and health effects of EMF exposure. Participate in discussions on harmonisation of guidelines and finally a review of where the research has got to and is going and if there remained gaps in the research agenda.

Conference outputs:

- Papers presented at the meeting
- Networking of African Region scientists with international scientists and WHO's project

- **Input to Standards Harmonization Framework**
- Summary report for web site

International EMF Project achievements:

- Risk perception user friendly handbook to be published in 2001/2002. It will be available on website as well as being subsequently published as a monograph.
- Scientific research database on website.
- International Agency for Research on Cancer (IARC) assessed ELF as a possible human carcinogen in June 2001. Will look at RF in 2003.
- WHO will do the non-cancer risk assessment of ELF and make management policy recommendations over coming 18 months.

Dr Repacholi also discussed the difference between Biological and Health Effects (hazards). WHO defines health as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity.

Biological effects are measurable responses to EMF exposurenot necessarily hazardous
Health hazard is a biological effect producing consequences outside the body's normal range of physiological compensation and is detrimental to health or well-being

Problem: the public and media do not discern between biological and health effects

Some questions and answers followed.

Q What is harmonisation about?

A Will provide framework, but will not necessarily be used by ICNIRP.

Q Health risk assessment, will that include social questions?

A Health risk assessment is purely science, no social or economic inputs. Will look at the extent to which the population is exposed and determine a relative risk for that population so leading to a choice of policy options for that country.

Q What is good for developed countries, could be just as good for developing countries. Universal standards are good so that global trade can benefit. Some countries may not have standards but will need to have international standards that can be applied.

EMF Fields - Characteristics and mechanisms of action.

Dr Colin Roy, WHO, Switzerland

Major points:

- Sources – in covering frequency range of 0-300 GHz – sources ranges from MRI, Maglev transportation through powerlines and electrical appliances and communications, broadcasting, mobile phones and radars
- Field characteristics for static and ELF discussed in detail.
- RF discussion of near and far field and propagation of energy in the form of electromagnetic waves.
- Discussed the six established mechanisms of RF bioeffects arising from direct exposure
 - electro-stimulation of nerve and muscle (3 kHz-10 MHz);
 - whole body heating (100 kHz-6 GHz);
 - localised heating in the limbs (100 kHz-6 GHz);
 - localised heating in the head and torso (100 kHz-6 GHz);
 - microwave hearing effect (300 MHz-6 GHz); and
 - surface heating of the body (6-300 GHz).

The role of Dosimetry in EMF and Human Health

Dr Alastair McKinlay, NRPB, UK

NRPB has been involved with NIR since 1974 when the 1970 Act was extended by Order. NRPB is a

WHO collaborating centre for both ionising and non-ionising radiation.

Why is dosimetry so important in human health? There is much discussion about the precautionary principle(PP). Dosimetry has key role in deciding whether to invoke PP and how you might apply the PP and what measures should be taken.

Dosimetry is:

- fundamental to assessing adverse effects;
- essential for epidemiologists;
- forms the basis for exposures and risk assessment;
- used in development of guidelines and technical standards; and
- link between internal effects and external applied fields

Fields and Interactions: What are challenges?

There are a large number of new applications that may not result in high exposures but worry the public. Need to know levels and possible effects. All frequencies will need to be considered. Some are adventitious, others are deliberate emitters, some are long range radiators. Need to be careful at very low levels, but also at points near guideline levels.

Computational dosimetry started with assumed shapes but have now moved onto anatomically accurate phantoms with multiple realistic component types. Developed NORMAN.

ELF E causes peaks in ankles, knee and urine in bladder.

RF at 120 MHz get real heating in ankles, knees and neck.

Epidemiology

UK Childhood Cancer Study with validation (gold standard) study and RF Occupational Feasibility study. Exposure greater than 200 nT would give greater risk than exposures less than 100 nT in year before diagnosis. Had done pilot to get surrogate relationships between logging instruments and spot and time measurements in the home. For top 10% of exposures would need more definitive assessments. Also got data from utilities on load. Designed some check sources for use before and after field measurement. Trained interviewers and validated measurements using 116 children. These were followed for a full year keeping diaries and all surrogates as in main study.

UK Study of Occupational Exposure to RF Fields

Occupational Feasibility study. Working with IOH in Birmingham. Need to monitor and log exposures for extended periods and decide whether there is a metric that could be transferred across industries. Basis was ESM 20 Radman 1-40 GHz for E, data logger developed by NRPB. Can store up to 3 hours of data. Now about halfway through pilot study.

Hazard assessment process, if above reference levels, then need to do further calculations. Mobile phones tend to get superficial heating only. At 1800 MHz ratio from ear to ear is about 500:1.

Heating in ear is less than one sixth of degree and less than one tenth in brain.

Database of exposures developed over years. If looking at precautionary approaches, need to look at what people are really exposed to.

Challenges

New technologies will continue to arrive. These will lead to demands from public, media and politicians. Workplaces will also change. Will need to continue developing exposure metrics for epidemiological studies. Technical standards will need to reflect realities.

Animal Studies

Dr Colin Roy, WHO, Switzerland

Prime interest is interaction of EMF with human. But it is more convenient to use animals for lifetime exposures, can also do high exposure experiments. Difficulties arise from translating results to humans. Other differences arise from lifetimes, physiology, DNA repair mechanisms and proliferative capacity of different tissues.

Carcinogenetic studies are lifetime studies which can be of several years duration for rodents. Studies can use different dose rates as well as varied exposures. Large numbers of animals may be needed to get the required statistical power. Still do not know what signal type should be used i.e. CW, transients etc. Promotion may be equally or more important than initiation.

Static fields

For static fields get pretty well no effects up to 2T but in primates get some effect on learned tasks at 5T.

Extremely low frequency fields

ELF - large body of data. Many of the effects are on neurological system. Tend to be showing altered behaviour, bone growth, immune system and reproductive changes.

With regard to human carcinogens 84% of known (30) and possible (14) carcinogens are also carcinogenic to animals. From EMFs we do not have the common model with rodents, so are tending to use the mammary tumour. NTP study in 1998. Overall finding was that promotional ability was weak.

Skin cancer and leukaemias were also studied. Melatonin production may lead to increases in circulating oestrogen and progesterone which may affect male breast cancer. Look at seasonal breeders ie hamsters and Suffolk sheep. Most results were equivocal or negative.

Look at incidence and growth of tumours, some found no change in tumour, but change in melatonin secretion. Others found increase in tumours, but no change in melatonin.

Radiofrequency fields

RF - is there a mechanism whereby RF energy can be absorbed that may not manifest itself in an increase temperature, but can cause bio-effects?

Difficulties in identifying low level effects:

- Some effects that may appear to be athermal (based on the average SAR value) but localised temperature rises may be significant; and
- There may be design problems whereby across an experiment there is a difference in SAR exposure varying between 3- 15 times.

Experimental points of note:

- Low level pulsed exposures seem not to produce a real effect. Results with human volunteers have been mixed;
- Learning and memory studies -some experiments may have been compromised because of rodents perceiving the field by auditory sensations. May get effects from whole body exposures of 2.3 Wkg^{-1} ;
- Melatonin studies have been varied and inconclusive in animals. May be better to study directly in humans;
- High powered peak pulsed fields may lead to ocular effects at $<100 \text{ kWkg}^{-1}$;
- If SARs can lead to temperature rise less than one degree, do get some changes in gene expression, but does not seem to be an athermal effect;
- Blood Brain barrier work by Salford, Sweden. Gets some positive effects at low level exposures, but overall results are mixed and inconsistent and contradictory;
- DNA damage comes from Lai and Singh work, not replicated and not supported by *in vitro* studies.
- Only Repacholi study showed some promotional effect. Being replicated in Adelaide (Australia) and Italy. No other studies have found this sort of endpoint. Adelaide group are using four exposure levels, 0.25, 1, 2 and 4 Wkg^{-1} . Each mouse will be exposed individually in an exposure tube.

Core temperature is measured and does not change even in highest exposure group. Right up to final statistical analysis, the work has been done blind and pathology has been audited in USA and Germany. Publication of the Adelaide study is expected in 2002.

Effects of 50 Hz H fields on BALB/c and AKR mice

Prof Linda de Jager, Bloemfontein, Free State

Particularly concerned about long-term effects. Tried to simulate real exposures. In the 1980s exposed seven generations to 10 kVm^{-1} . Measured a large number of biological parameters, did not see any long-term adverse effect on well being, but showed long-term stress in males and shortened life span.

Then simulated magnetic field exposures from 0.5 to $77 \mu\text{T}$. Used a scaling factor of 11 for mice. Used two sets of four square coils as sources. Does magnetic field influence the same parameters as shown in E field study? Looked at cancer insensitive and sensitive strains. Wanted to look at

melatonin changes as well. Life expectancies between two groups were compared. Mice were allowed to breed naturally and kept naturally. Magnetic field showed no change in tumours or life expectancy (die at one year) in AKR strain. No differences in melatonin in either group of mice or sham exposed. Non-serious illness led to mice dying at earlier age. Suggest that immune systems were compromised and led to early death. Now studying ageing and immune system *in vitro*. Short (one week) and long (14 weeks and one year) exposures for new work. Think this may be showing effects that are similar to Alzheimer's in humans. After 14 week exposures got some differences in sham and exposed cell populations. Got same tendency with one year exposures. Short-term exposure gave no statistically significant changes.

Immunity may involve more than one mechanism and therefore long-term studies are needed as the effects seem to be cumulative. Other environmental stressors may act together with EMFs.

Exposures and measurement

Professor Barney de Villiers, University of Stellenbosch, South Africa

Occupational and environmental situations are extremely complex, with switching transients etc. People can actually influence the measurements made either by shielding or reflections or retransmission (secondary radiators).

McKinlay referred to problems in intermediate frequencies where effects tail off either way - 100 kHz to 10 MHz. Difficult frequency area to define exposed people.

Practical measurements - then answer question about safety using reference levels. Now looking at them not quite as a limit but something getting close to it.

ESKOM (electrical utility company) used reference levels in enquiry responses. Doesn't like removal of short-term exposure limit by ICNIRP. Exceed that near conductors but limits are whole body.

Comments from participants:

- Arwell Barrett described UK live line working and how regulations work.
- RSA Department of Health just started using ICNIRP in industrial environment but are still gaining experience.
- Peter Zollman, unless you have a protocol for doing the investigation you only get half the story. Need to know how to do the calculations. Need to do repeatable measurements in the field.
- Vitas Anderson - Australia uses ICNIRP and believe that reference levels are useful. However there are gaps eg for averaging times for applying instantaneous limits or how to do spatial averaging.

Whole range of dosimetry areas that are not yet covered. WHO meeting for end of March 2002 which should look at thermal questions. Harmonisation process is about approaching things in a harmonised way not a single set of numbers. ICNIRP will look again at ELF after WHO evaluation of health risk is completed.

Reference levels - where does precautionary approach fit in? If we are going to apply PP there are social imperatives, but should still be based upon the science.

RF Dosimetry Research in RSA

Frans Meyer, EM Software and Systems, Stellenbosch, South Africa

Did early work for navy, using method of moments techniques. History is in antenna design and placement. Worked with Maria Stuchly in Canada to gain experience. 1993 man-pack antenna problem started with a crude approximation, get some idea of absorption within the body. Also

did work on contact currents validated with spot measurements giving pretty good agreement. Method of Moments (MoM) system is about sources rather than fields. Gives you surface currents, etc and then can calculate fields within dielectric body. Start off with canonical structures before going to realistic.

The 900 MHz phones generally have an helical antenna with inverted F for 1800 MHz phones. The hand significantly interferes, both with transmissions and absorption in the head. Have real problem with computing power to get answers for people in fields from base stations. Therefore have decided to hybridise MoM and finite element technique. Means that computer time grows linearly rather than quadratically. Have compared various base station measurements with the predicted and get agreement. Reference levels were shown to be conservative compared to the basic restrictions.

Epidemiological Studies

Anders Ahlbom, Karolinska Institute (ICNIRP), Sweden

Only discipline that looks at health effects and diseases in real people. Look at powerlines (ELF) and RF as two parts.

ELF epidemiology

The Wertheimer and Leeper (1979) powerline study was the first. Followed by adult cancer in 1982 and also occupational EMF exposure and cancer. Introduced concept of electrical occupations. Greatly expanded since then. Now there is a whole list of cancers, particularly hormonal cancers, and other diseases that have been studied. Strongest evidence from all this was for childhood leukaemia and residential exposure. Look at how good this evidence is. Exposure assessment methods attract lot of discussion. Started with wire codes; then looked at distance from line to house; other studies looked to spot measurements. Calculation techniques came in to improve on the wire line codes. The most recent techniques are the 24/48 hour measurements by logging devices and these were followed by personal meters. Need to look carefully at confounding factors in case these are also leukaemia causes. Selection bias due to non-response or design features may lead to problems. Other random variables may be influencing results.

The nine best studies were meta-analysed using the primary data that included measurements over 24 or 48 hours or calculated exposures. Exposure assessments were standardised. Looked particularly at highest exposure levels $0.4 \mu\text{T}$. Got some 3000 cases and controls.

Was there an association?

If so, is it affected by adjustment for potential confounders?

Is there evidence of the wire code paradox?

Seemed to get a slight dose-response relationship which leads to relative risk (RR) of 2 at exposures above $0.4 \mu\text{T}$. Looked to see what selection bias might have been of influencing results. Excluded US results and then Canadian results. RR did not change very much.

Concluded that the association is too strong to be chance and that selection bias does not explain the result. Then Advisory Group on non-Ionizing Radiation (AGNIR) review and followed by IARC classification as 2(b) – possible carcinogen.

Work by the ICNIRP Standing Committee on Epidemiology also seemed to find an association between ALS and occupational EMF exposures.

RF Epidemiology

Studies include occupational, residential and military looking at cancer. Many industrial studies (aircraft and the large Motorola study), military and the study of US embassy personnel in Moscow showed no excess risk.

Two studies showed positive association:

- Polish military study (1988 and 1996) showed fairly high RR.
- US Air Force study by Grayson saw small brain tumour risk.

Individual residential studies have been generally negative, but lead to serious questions about design. Typically based on aggregated data and really may be considered as post hoc studies of alleged clusters.

Mobile phone studies - six of them so far.

- First was Rothman in 1996 looking at total mortality in 1994 RR was 0.9.
- Dreyer similar small numbers of cases with short follow up.
- Hardell, 1999 in Sweden, gave RR of 1. Looked at laterality but was very crude as lost most of the cases since they did not know in which hand they held the phone.
- Inskip 2000 but had relatively small numbers again.
- Muscat 2000, hospital based again, mean duration of phone use was 2-3 years.
- Danish retrospective study Johansen 2001, only 44% had more than one year of phone use. RR was 0.95 with other outcomes giving similar results.

None of these provide evidence of a link but note they are not strongly against such a link. Need to wait before coming to a final conclusion.

Research under CRADA (Co-operative Research and Development Agreement of the CTIA)
Jo-Anne Basile, CTIA, Washington, USA

Started with 1993 law case about brain cancer and industry then said that they would fund research. Try to learn the lessons of the WTR work over 5-6 years. Sees this as a partnership for doing research with Government. FDA directs the science which is conducted by independent researchers while industry provides funding. Three phases to work:

- micronucleus study (Micronucleus results should be published soon. Found increase in production with exposures of 5 to 20 Wkg¹);
- epidemiology; and
- global assessment of future research needs..

Also need to follow up on Muscat study.

Policy makers need to know that research will give the answers that they need to formulate and review policy.

The FDA decide what the research agenda is and who will carry out the research – industry has no input apart from the financial support. Phase 1 began in August 2000. FDA decided 3 questions needed answering:

- In-vitro studies to determine the reproducibility of the WTR results;
- was temperature an influence?
- Is there an *in vivo* increase in micronucleus in production.

Three contractors were selected, North Carolina again and then two in Europe, Fraunhofer Institute in Hannover and Inter-University Centre on Interaction between EMF and Biosystems, Naples.

Ownership retained by researchers and overseen by FDA. FDA has access to all data, results have to be published in peer reviewed journals. FDA could make it public if necessary.

Mice studies will take about two years.

Discussion

Q - will there be a meta-analysis of RF studies described.

A - Not sure but Interphone study is designed to permit this.

Q - will there be anything on base stations or stay with handsets?

A - probably just near fields.

Q - will there be extension beyond WTR work?

A - phase 3 means that there could be.

Q - IARC (Interphone) study - what is procedure for combining results from 15 different institutions?

A - All have different experiences, different populations and different access to registries etc. IARC is determined to collect together. Will have to wait for last or most studies to be completed. Individual studies report when they are ready. There will probably be other collaborative results published.

Q - How accurate do you think the questionnaires are in describing exposure?

A - Trying to validate data. UK are trying to check against recall with operators records. Manufacturers have supplied phones to IARC that record time and frequency of use. These will be circulated to each research group. Other phones will measure position and orientation.

Q - What about walkie talkie use?

A - UK RF occupational study may show up some use, similarly UKABTS may show it.

A - Canadian study saw some use and association with lung cancer, but not detailed study. Motorola study also had a lot of walkie talkie use as well as phones. All got was a healthy worker result.

IARC really want this data before they come to do their RF cancer risk assessment.

Namibia concerned that nobody will say safe or dangerous always qualified with a "but". Developing countries are getting more poorer people using mobile phones because the telecoms companies will not provide land lines.

Maybe there are subtle effects, but there has been research into RF effects since the 1950s. If there is an effect, then it is likely to be very small and subtle, for instance it may be associated with the modulation technique.

Evaluation of RF and Telecommunications

Dr Michael Repacholi, WHO, Geneva, Switzerland

African region is seeing huge increase in numbers of mobile telephones as the copper wire and optical fibre infrastructures are too expensive and currently sparse. 3G will increase numbers of base stations. Handsets include an antenna that locally irradiates the head far more than any other technology. Temperature in the head will increase slightly, about 0.1°C.

Could the interaction with health be by another mechanism, ie because of the pulse mechanism? Perhaps this is causing an increase in epilepsy? Flashing lights at about 12 to 15 Hz can increase seizure incidence. Mobile phones and driving is a real risk to people's safety. Perception is part of the problem.

When reviewing the literature, must consider the weight of the evidence and not be over influenced by single papers. Should really reflect the weight overall from the three strands of evidence. Cannot ever prove a negative, can only gather data that indicates that something is not happening so far as we know at that point.

If SAR >4 Wkg⁻¹ start to see effects (behavioural changes, reduced endurance, avoidance) due to heating, ie >1°C. These behavioural changes are the threshold basis for the international guidelines. Effects not established include: cancer, memory loss, reaction time changes, blood pressure, BBB etc.

No other mechanisms have been shown to cause adverse health effects, cannot get exposures high enough to cause the other effects.

IEGMP (Independent Expert Group on Mobile Phones) report listed effects that needed further research, including reaction times studies (one shortened reaction time could indicate an interaction). Driving while using a phone is positively dangerous.

WHO wants psycho-social effects to be taken into account as well eg sleep changes, skin rashes, etc

Electromagnetic hypersensitivity (EHS) is one of a number of collections of symptoms, not a syndrome in itself. Cannot positively link effect with EMFs in challenge tests. Perhaps this is a sensitive subset of the population and we have not yet got the tests right to isolate them. Sufferers appear to reject other potential causes of their symptoms. Fatigue, nervous system, prickling, burning sensations, sleep disturbances are all reported. Symptoms are real and should be treated by their doctors. May need to evaluate environment in case there are other changes in the lives that may have caused the symptoms. IEGMP recommended further research; brain function, pulsed signals, dosimetry improvements; cellular changes, psychological and social studies to help reduce public concerns, volunteer studies and look at children who may be more susceptible to interaction.

Should restrict use of phones in hospitals as they can interfere with sensitive electronic equipment.

Children: may be more vulnerable as CNS is still developing, more of head has temperature rises, exposure duration long term could end up being increased. Should only use phones for essential calls. Phones should not be marketed to children.

Industry and Governments should be involved in the research programmes. Public information is essential. UK leaflets on phones, base stations and use while driving.

IEGMP were not convinced of the effectiveness of the use of shields or other devices fitted to the phones. Hands-free kits will allow the phones to be moved away from the body. IEGMP wants to see testing and a kite mark on compliance.

WHO fact sheet concludes no RF effects from phones or base stations. There are gaps in knowledge still need research, but much of it is underway.

Governments should adopt science-based guidelines, if populations demand precaution, do not undermine the science as all it does is increase public concern. Add a layer of voluntary measures that people can choose to use if they wish. Manufacturers need to ensure that they can provide information to customers so they make informed choices.

Avoid causing interference; discourage drivers using phones; fence off base stations from public access; no need for shields on phones; siting decisions need to consider public sensitivities; Effective communications between all stakeholders.

IARC and other Evaluations of ELF

Dr Leeka Kheifets, WHO, Geneva, Switzerland

Risk assessment process, hazard identification, exposure (dose) assessment, provide weight to the data human highest, and cellular lowest with long-term animal studies in between. This gives risk characterisation.

The major research reviews and Evaluations in 2001 include:

- NRPB AGNIR March 2001;
- IARC, June 2001,
- California Department of Health Sciences draft; and
- NRPB AGNIR neurodegenerative diseases report.

AGNIR found a small risk of leukaemia in children, but lack of other strands of data. Hence the possibility of causing cancer cannot be dismissed.

IARC monographs criteria first published in 1971 and updated 1992. Does not suggest ways to regulate, only classifies (so far 800 agents). Available data is classified for animals and humans and then brought together with the cellular data. IARC definition of limited evidence is specific. Causation is considered credible, but other answers cannot be ruled out.

The IARC process of data gathering and selection was explained.

Conclusion was that animal data was inadequate for magnetic fields and cancer; and other exposures and outcomes were considered “inadequate to classify”.

WHO will go forward with health effects other than cancer evaluation, look at dose response relationships; evaluation of human health risks consideration of protective measures.

Q - Evaluation Criteria, how were they decided?

A - Not just IARC. Many other groups have used a similar system.

Precautionary Principle

Dr Leeka Kheifets, WHO, Geneva, Switzerland

Every day range of choices and actions; decisions are based upon many parameters. Main gradients are severity of harm and uncertainty. Low uncertainty and high severity then ban, the other way round perhaps we do nothing. Usually we are somewhere in between these two extremes.

WHO tries to stay with science, but 1999 London meeting was pushed towards more rigorous application of precautionary principle. The Treaty of Maastricht Defined

The Precautionary Principle (PP)

“Take prudent action when there is sufficient scientific evidence (but not necessarily absolute proof) that inaction could lead to harm and where action can be justified on reasonable judgments of cost-effectiveness.”

“...the precautionary principle is neither a politicisation of science [nor] the acceptance of zero-risk but that it provides a basis for action when science is unable to give a clear answer... the precautionary principle is not a justification for ignoring scientific evidence and taking protectionist decisions.”

There are various strengths to the stages:

Strength of evidence - possible cause; no conclusive scientific proof; sufficient evidence

Requirement to act - consider taking action; take cost-effective action; prevent or eliminate exposure.

Burden of Proof - on who proponents or opponents, impossible to prove a negative.

Prudent avoidance is another principle applied, Granger Morgan advocated the taking of simple low cost steps. This has been adopted in various US states and other countries. California says less than 4% of project budget in constructing new lines. Sweden says if measures to reduce exposures can be taken at reasonable cost with reasonable prospect of being effective without causing other problems then they should be taken.

Uncertainty - small risks to many versus large risks to few. Do not know what sort of exposure may cause effects. Some actions may therefore increase risk to population. How do you balance protection against clear benefits to health and business and society?

Application of PP:

- Look at existing exposure levels as benchmark.
- Distinguish between new and existing facilities. (problem with old schools in poor area....)
- Distinguish between voluntary and involuntary sources of exposures.
- Distinguish between children and adult exposures.

There are criticisms from both sides, setting precedent, slippery slope (ratchet); too utilitarian; lack of environmental justice. The whole thing is complex.

There have to be trade-offs all through this. Benefits may be to one group while another has to pay cost. Who is making decisions - individuals or industry or society?

Setting between public and occupational or medical will vary.

Need to use one set of terminology to avoid confusion.

Need to have means to reduce uncertainty.

Need to have ways to monitor and revisit decisions.

Based upon Science and Judgement - need the best of both.

Discussion

Q - Has there been measurements of fields inside cars?

A- Eriksson, need a little more power in a car, but phones are declared at maximum power.

A- Motorola, trying to multitask is problem, not RF.

Q - transfer of effects to new coding and ergonomics of 3G etc?

A - continual problem. Have to look at fundamental mechanisms, eg pulsing regimes. Look at all mechanisms and then decide what powers would be needed to make those mechanisms come into effect.

Q - what was driver behind fears for children?

A - Biologists took hold in IEGMP. Their development was key concern. Preece work was still pretty new. If these effects are real, then indicate that there may be an effect on CNS, therefore enhanced effect could happen. However, children, sick, old, infirm are all taken into account with guidelines.

Q - EC definition of PP: But has this even been applied by rigorous analysis?

A - No, it is in the future. Looking to have a meeting to discuss this as part of the risk assessment process.

Q - WHO risk assessment process, dose response assessment is still going to be a problem.

A - hazard identification will be the first step of the evaluation.

Q - in the past WHO have said that PP does not really apply to EMF.

A - If you apply the EC paper, then the criteria are not met by consideration of EMF.

Voluntary approaches are offered in fact sheets, but not rigidly suggested. Now have to go from bare advice into developing a policy that WHO can use both for this and other agents.