

EMR and Health

Electromagnetic radiation,
health and well-being

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Acoustic neuroma risks

Long-term use of mobile and cordless phones dramatically increases the risk of acoustic neuromas.

An eightfold increase in the rate of acoustic neuromas has been found in a study published in July in the International Journal of Oncology.

Acoustic neuromas are benign, slow-growing brain tumours that develop in the canal between the brain and the inner ear—close to the position of a mobile phone.

The study, conducted by Lennart Hardell from University Hospital in Örebro, Sweden, looked at the relationship between mobile phone use and the incidence of this tumour in men and women diagnosed in two time periods: 1997 to 2003 and 2007 to 2009. It included 316 cases and over 3,500 controls.

Hardell found that people who used analog mobile phones had nearly three times the incidence of acoustic neuromas but those who had started using the phones more than 20 years before had nearly eight times the incidence.

Similarly, users of digital (2G) mobile phones had one and a half times the incidence of acoustic neuromas but this increased to nearly double the rate among those who had begun using the phones more than 15 years previously.

'When Hardell considered people who had used any type of digital phone—whether 2G, 3G or cordless phone—for more than 20 years, the rate of acoustic neuromas was over eight times that of controls.'

Users of cordless phones also had one and a half times the rate of acoustic neuromas and this increased to six and a half times the rate for those who started using the technology more than 20 years before.

When Hardell considered people who had used any type of digital phone—whether 2G, 3G or cordless phone—for more than 20 years, the rate of acoustic neuromas was over eight times that of controls.

The Hardell team is not the only one to report an increased risk of acoustic neuromas among mobile phone users. In 2011 the 13-country Interphone Study reported a doubling of the rate of acoustic neuromas in people who had the highest cumulative use of mobile phones and a

(Continued on page 10)

RF Toolkit

Canada publishes a Radiofrequency Toolkit for Environmental Health practitioners.

Canadian authorities have released a major new report on wireless radiation, funded by the Public Health Agency of Canada. The 360+ page document was prepared by the BC Centre for Disease Control and National Collaborating Centre for Environmental Health over a two-year period.

The purpose of the Toolkit is to provide information for medical and environmental health officers to help them provide advice 'to the concerned public.'

The document provides a background on the characteristics of wireless radiation, information about health studies, international standards and methods for reducing exposure.

In considering the results of cell studies on RF exposure, the report states that there is 'no convincing' evidence that RF causes some types of damage. However, it says that there are 'mixed or contradictory results' on cell proliferation, the production of free radicals, cell death and the release of heat shock proteins.

The report does not accept evidence of harmful effects on animals or industrial workers.

Regarding evidence of brain tumours, it says, 'many of the literature reviews using meta-analyses found increased risks of specific heat tumours with longer-term use of mobile phones (typically, at least 10 years since first use)'. It refers to the 2011 decision of the International Agency for Research on Cancer to classify RF radiation as a class 2B carcinogen.

The Toolkit reports evidence for effects on male fertility. 'The epidemiological studies of men assessed for infertility were consistent in demonstrating decreased sperm motility associated with the use of mobile phones,' it said and added that this could occur as result of oxidative

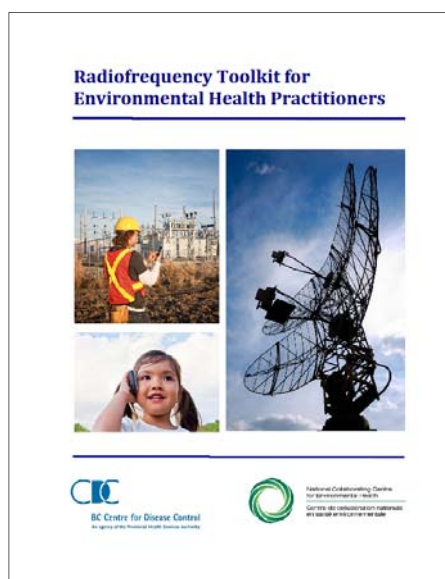
stress. As a result, it recommends that men keep their mobile phones away from their groins.

The report refers to reviews which have not found that RF affects cognitive performance. However, 'there is some consistency of an effect on brain activity,' the report says, referring to studies showing changes to alpha brain waves.

The Toolkit outlines radiofrequency standards in different countries. While most countries follow the limits of the International Commission on Nonionizing Radiation Protection (ICNIRP), some have introduced more stringent standards in line with the precautionary principle.

The Toolkit includes options for reducing exposure to radiofrequency radiation. Although it does not describe these as necessary, it says, 'mitigation strategies do provide an option for the concerned public to reduce personal exposures.'

The RF Toolkit can be found at: http://www.bccdc.ca/NR/rdonlyres/9AE4404B-67FF-411E-81B1-4DB75846BF2F/0/RadiofrequencyToolkit_v4_06132013.pdf



Public recognises phone risks

The majority of Australians believe that mobile phone radiation is a risk for cancer—but they are not so sure about the radiation from other wireless technologies.

These are some of the findings of a national online survey conducted by Australian Opinion Research in June-July this year.

Participants were asked to respond to two statements to elicit their opinions about the safety of wireless technology.

The first was: 'Heavy use of mobile phones and other technology relying on high frequency radio waves has now been found to cause cancer in humans - particularly the brain.'

The survey found that:

- ◆ 51.5% of Australians believe this statement
- ◆ 26.9 % don't believe it
- ◆ 4.9% don't want to know
- ◆ 16.8 % don't know or don't understand.

The second statement to which participants were asked to respond was: 'Wireless computers, routers and other devices have been found to produce dangerously high levels of radiation which may have a serious effect on us.'

The survey showed that:

- ◆ 24.9% of Australians believe this statement
- ◆ 48.9% don't believe it
- ◆ 5.8% don't want to know
- ◆ 20.4% don't know or don't understand.

A full report on the survey will be available from the website:

checkmateanalytics.com

EMR Australia would like to thank Mr Rick Wilson for the data for this article.

EME Report

Australia's new EME Report has been launched.

On 2 August, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) published the updated version of its EME Report format.

The EME Report stipulates the information that carriers are required to provide for each mobile phone base station they construct to ensure that emissions comply with the Australian standard. The Mobile Phone Base Station Deployment Code—an industry code that is binding on all carriers—ensures that EME Reports are available to the public when carriers undertake consultation for new infrastructure.

The current version of the EME

Report has several advantages over the previous version: Firstly, text is clear and easy-to understand. More importantly, the report provides radiation levels not just as a percentage of the Australian standard, but measurements—both in Volts per metre and milliWatts per square metre. This means that, for the first time, members of the public will be able to see their actual exposures.

The Report now contains a table of the limits of the ARPANSA RF Standard for the different mobile phone frequencies for reference.

The need to improve the EME Report was suggested by Ian Gray of No

Towers Near Schools. The revision process was undertaken by a subcommittee of the EME Reference Group which contained several community representatives.

The modifications have been accepted by ARPANSA and the new report format is now available on the Agency's website. It will be adopted by mobile phone carriers after a phase-in period and the date from which it will apply will be on ARPANSA's website when it has been ascertained. The report form is available on ARPANSA's website at <http://www.arpansa.gov.au/emereports/reports.cfm>

'Smart' meter law suit

Legal action is planned to stop the rollout of smart meters in Victoria.

Victorians concerned about the rollout of 'smart' electricity meters are preparing for legal action.

Stop Smart Meters Australia (SSMA) is inviting public participation in legal action to halt the rollout of smart meters in Victoria, and to remove smart meters which have already been installed.

The Victorian government mandated Victoria's privatized power distributors to use their best endeavours to install a smart meter in every home and small business by the end of 2013. SSMA is an association formed by concerned citizens to oppose the forced rollout. Its members object to smart meters on the grounds of health, privacy, security, safety, cost and believe the forced rollout to be a serious breach

of democratic and human rights.

The controversial smart meter program has been marred by cost blowouts, claims that the benefits are heavily weighted in favour of the foreign-owned power distributors and a growing number of people who have documented medical evidence showing that they are suffering as a result of exposure from the pulsed microwave radiofrequencies deployed in the Victorian rollout.

Australians living outside of Victoria have so far been exempted from a forced rollout of smart meters.

The proposed legal action has the support of prominent overseas medical experts.

More information is available from SSMA at www.stopsmartmeters.com.au.

Phone-free classrooms

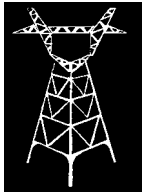
Teachers in Ontario, Canada have voted against the use of mobile phones in classrooms.

On 15 August, the Elementary Teachers Federation voted that children should have their phones turned off during school hours unless they have special permission to have them on.

Health concerns were among the reasons given for proposing the motion. (*Yaboo Finance*, 15.8.13.)



Research Updates



ELF fields (from electrical sources)

Living in high magnetic fields increases the risk of childhood leukemia, say researchers from France. C Sermage-Faure and colleagues investigated all cases of acute childhood leukemia diagnosed between 2002 and 2007 and found that children who lived within 50m of a high voltage power line had 70% more risk of developing leukemia. The finding is consistent with other studies on powerlines and leukemia. (Sermage-Faure, C et al, *Br J Cancer* 108 (9):1899-906, 2013.)



Chinese researchers conducted a meta-analysis of 23 studies on the relationship between EMF and breast cancer. They concluded that exposure might contribute to an increased risk of breast cancer for premenopausal women and women who were estrogen-receptor-positive. (Chen, Q et al, *PLoS One* 8(7):2013.)



Flickering light may damage vision. Y Di and colleagues raised 36 young guinea pigs in a flickering light and others in a steady light. After 12 weeks of exposure to flickering light, the guinea pigs had more evidence of myopic vision (nearsightedness) than controls. (Di, Y et al, *Curr Eye Res*, Jul 10, 2013.)



Very low magnetic fields caused cancer cells to lose chromosomes and interfere with the ability of mitochondria to produce energy. The fields altered the structure of water and prevented the flow of protons in ATPS channels. (Li, Y and Heroux, P, *Electromagn Biol Med*, Aug 5, 2013.)



Why do people respond to weak magnetic fields? A Liboff says it's because humans are sensitive to weak geomagnetic fields caused by the sun which affect the biological clock. Because of this, he speculates that man-made fields may also affect the biological clock. (Liboff, AR, *Electromagn Biol Med* Aug 5, 2013.)

Other studies showing effects from ELF exposure

- ◆ Long-term exposure of rats to very high magnetic fields was associated with cell death. (Akdag, MZ, *Int J Radiat Biol*, Jul 15, 2013.)
- ◆ Children who attended school near a high voltage powerline performed worse on neurobehaviour tests than children living further away. (Huang, J et al, *PLoS One*, 8(7), 2013.)



Radiofrequency radiation (from telecommunications sources)

How does mobile phone radiation affect the brain? To help answer this question, Egyptian researchers exposed adult rats to a mobile phone signal of 1800 MHz daily for one to four months. They found that exposure caused changes in the concentrations of neurotransmitters such as dopamine, serotonin and norepinephrine in four areas of the animals' brains. These changes might account for the symptoms—including memory problems, learning problems and stress—reported by many people following exposure. (Aboul Ezz, HS et al, *Eur Rev Med Pharmacol Sci* 17 (13):1782-8, 2013.)



To determine how mobile phone radiation affects the kidneys, Turkish researchers exposed rats to a mobile phone signal for eight hours a day for 20 days. Exposure caused various types of damage to the animals' kidneys as a result of which the authors recommended that 'high-risk individuals should take protective measures.' (Koca, O et al, *Urol* 10(2):886-91, 2013.)



Being exposed to RF radiation may interfere with performance, according to research from Switzerland. C Lustenberger and colleagues exposed 16 men to a pulsed signal of 900 MHz at night. They found that exposure increased slow wave activity and interfered with their performance in several tests. (Lustenberger, C et al, *Brain Stimul*, Feb 4, 2013.)



Mobile phone use may increase the risk of meningioma brain tumours. M Carlberg and team studied people diagnosed with these brain tumours between 2007 and 2009 and found increased rates of the tumour for patients with the highest phone use. (Carlberg, M et al, *Environ Health* 12 (1):60, 2013.)



Mobile phone radiation may have implications for diabetes, according to research from Saudi Arabia. S Meo and K Rubeaan exposed male rats to mobile phone radiation for 15 or more minutes a day for three months. They found that rats exposed for more than 15 minutes a day had higher levels of fasting blood glucose

and serum insulin than non-exposed rats. (Meo, SA and Rubeaan, KA, *Int J Occup Med Environ Health* 26(2):235-41, 2013.)



To investigate the effects of radiation from mobile phone base stations, four researchers from Iran conducted a study on people living near these transmitters. From a questionnaire sent to 250 randomly chosen people, they found that people living within 300 metres of a base station had more symptoms than those living further away. Symptoms included nausea, headache, dizziness, irritability, discomfort, nervousness, depression, sleep disturbance, memory loss and reduced libido. (Shahbazi-Gahrouei, D et al, *Electromagn Biol Med*, Jun 19, 2013.)



Could mobile phone use affect children's hearing? In the first study of this important relationship, a US team looked at data on over 50,000 children enrolled in the Danish National Birth Cohort (an ongoing study monitoring the progress of children born c 1996-2002). They found a weak correlation between mobile phone use and hearing loss which was insufficient to draw conclusions but which indicated a need for further research. (Sudan, M et al, *Paediatr Perinat Epidemiol* 27(3):247-57, 2013.)



If mobile phone radiation affects the body, it probably does so through the central nervous system, say researchers from France. In this experiment, D Moretti exposed cultures to a GSM mobile phone signal of 1800 MHz and found reversible changes to the electrical activity of neurons. (Moretti, D et al, *Bioelectromagnetics* 1 Aug 2013.)

Other studies showing effects from RF exposure

- ◆ Rat bone marrow cells exposed to ELF increased proliferation and the technique may be useful for bone re-

generation. (Liu, C et al, *Bioelectromagnetics* 34(6):453-64, 2013.)

- ◆ Mice exposed to 50Hz magnetic fields had reversible DNA strand breaks. (Villarini, M et al, *Int J Radiat Biol* 89(7):562-70, 2013.)
- ◆ Rats given manganese and exposed to ELF had higher levels of manganese in the kidney, liver and brain than rats given manganese alone. (Celik, MS et al, *Toxicol Ind Health*, 2013.)
- ◆ High and long-term mobile phone use decreased survival times of people with glioma brain tumours. (Hardell, L and Carlberg, M, *Neuroepidemiology* 40(2):101-8, 2013.)



Studies showing no Effects

- ◆ Maternal use of a mobile phone when pregnant did not increase behavioural problems in offspring. (Guxens, M et al, *J Epidemiol Community Health* 67(5):432-8, 2013.)
- ◆ No effects were observed from a 32-minute exposure to a 60 Hz magnetic field. (Kim, SK et al, *Environ Health* May 24, 2013.)
- ◆ Mobile phone users had little increased risk of skin cancer. (Poulsen, AH et al, *Am J Epidemiol* 178(2):190-7, 2013.)
- ◆ Signals from smart meters did not interfere with pacemakers and implantable cardiac defibrillators. (Ostiguy, G et al, *Pacing Clin Electrophysiol* 22 July, 2013.)
- ◆ Mobile phone radiation did not change brain waves of adolescents. (Loughran, SP et al, *Clin Neurophysiology* 124(7):1303-8, 2013.)



Electromagnetic hypersensitivity

Two Turkish researchers investigated the symptoms of electromagnetic hypersensitivity on a group of 350 people aged nine and above. Nermin Küçer and Tuğba Pamukçu collated information from a survey designed to elicit both symptoms and daily use of mobile phones and computers.

They found that people who used mobile phones for more than 16 minutes a day had more headaches, hearing problems and joint and bone pain than people who used mobiles for shorter periods of time.

Similarly, people who used computers for more than 16 minutes a day had more headaches, vertigo/dizziness and tension-anxiety than those who used them for less time.

Women reported more headaches, vertigo/dizziness, fatigue, forgetfulness and tension-anxiety than did men in the survey. (Küçer, N and Pamukçu, T, *Electromagn Biol Med* Jun 3, 2013.)

Abbreviations

RF	radiofrequency radiation (including mobile technology)
ELF	extra-low frequency radiation (including electrical sources)
EMF	electromagnetic fields (often used alternatively for ELF)
mG	milliGauss (measurement of magnetic field)
T	Tesla - alternative measurement of magnetic field; also millitesla (mT) and microTesla (µT)
◆	0.1 mT = 1000 mG
◆	0.01 mT = 100 mG
◆	1 µT = 10 mG
Hz	Hertz - a measure of frequency (cycles per second).
◆	Megahertz (MHz) - million Hz
◆	GigaHertz (GHz) thousand million hertz.

Updates from around the globe



EHS Inquiry

On 18 July the Supreme Court in Israel ordered the Israeli government to conduct an investigation into the incidence of electromagnetic hypersensitivity (EHS) in children. The report must be submitted to the Court by 16 November, together with an affidavit supporting the authenticity of the findings.

This follows a brief submitted to the Court in June by attorney Dafna Tachover—who suffers from EHS—maintaining that EHS is a proven condition. (Dachna Tachover, email correspondence)

Smart meter ban

The governing Council of the Osoyoos Indian Band (a Canadian first nation people) has issued a ban on the installation of smart meters on homes and businesses in the Osoyoos Indian Reserve.

In announcing the ban, Chief Clarence Louie referred to evidence that pulsed signals may be 'harmful to all living things' and said that a precautionary approach was appropriate to protect future generations.

'Having been presented with science-based evidence, the Band council and I are convinced that Fortis' proposed wireless smart meters in meshed-grid networks have the potential to harm our children and our environment. No scientist on the planet has been able to verify the safety of these extremely dangerous devices that emit microwave radiation 24/7 in perpetuity and which cannot be turned off,' he said. (Press release, Osoyoos Indian Band, 13.06.13.)

Smart meter law suit

Two US law firms have joined forces to sue electricity companies for health problems caused by smart

meters.

On 25 July, the lawyers, David Kyle and Paul Overett, filed a suit against Edison and PG&E for negligence, fraud and deceit, product liability and intentional infliction of emotional distress.

The 16 plaintiffs involved in the case claim they have suffered health problems including headaches, loss of sleep, tinnitus, heart attack, cancer and medical implant interference.

David Kyle, whose wife experienced health problems from smart meter radiation, won a legal battle against Edison to become the first Edison customer to opt out of the smart meter program at no cost.

The suit alleges that electricity companies failed to disclose the risks of the meters or the SAR levels of the radiation and refers to peer-reviewed studies that have found harmful effects of low levels or radiation.

(Press release, The Peoples Initiative, 13.06.13 and Case no: BC 510577, First Amended Complaint for Damages, Superior Court of the State of California, Country of Los Angeles, Central District.)

Phone safety advice

The Department of Telecommunications in India is planning to produce an advisory booklet for mobile phone users. In the June announcement, officials advised they will produce a booklet giving do's and don'ts of mobile phone use. The booklet will be printed in both Hindi and English and will be available to people who purchase new mobile phones at point of sale. (*Mumbai Mirror*, 05.06.13.)

Noida moves phone towers

The city of Noida in India will relocate mobile phone towers away

from residential areas because of the health risks to residents. The Noida Authority plans to move more than 300 towers, following a High Court decision that they should not be located in residential areas. The Authority also plans to remove towers from hospitals and to prevent towers being located in residential areas in the future. (*The Pioneer* 14.06.13.)

Experts warn of phone risks

International speakers presented evidence of dangers of mobile phone radiation at a conference in Samsun, Turkey on 17 June. Dr Devra Davis, from the Environmental Health Trust, warned people to keep mobile phones away from the head and to protect children who are more vulnerable to the radiation. (<http://www.trtturk.com.tr/haber/cep-telefonu-ile-araniza-mesafe-koyun.html>)

Following the conference, the Governor of Samsun, Aksoy Huseyin, launched an information campaign about the risks of mobile phone radiation, especially to children and pregnant women. (*Huffington Post*, 07.07.13.)

Panel advises caution

In late June a panel of scientists explained the risks of mobile phone radiation for children at the La Grua Center in Stonington US. Dr Hugh Taylor warned about the effects of mobile phone exposure on the foetus, following a study in which he found ADHD-like effects on mice exposed in utero. Dr Martin Blank said that mobile phone radiation can damage DNA and Dr David Carpenter said that radiation correlates with irritability, depression and concentration problems. Dr Devra Davis told the

audience that mobile phone radiation may contribute to male infertility. (*The Westerly Sun* 28.06.13.)

Sleep disorders

Australian researcher Professor Shantha Rajaratnam says that light from electronic communications devices is contributing to sleep disorders. This light, and particularly the blue wavelengths, is sufficient to disrupt the user's circadian rhythms and suppress production of the hormone melatonin, a free radical scavenger.

Professor Rajaratnam recommends not using the devices for at least two hours before bed. (*ABC News*, 01.07.13.)

Doctors' advice

Three medical doctors from the United Kingdom have warned against the risks of mobile phone and WiFi radiation. In an open letter, the doctors wrote, 'There is growing concern that chronic (long-term) exposure to radiofrequency/microwave radiation from wireless technologies causes damage, particularly genetic damage, cognitive damage, cancer and decreased fertility. There is now substantial evidence of a link between mobile phone use and brain cancer.'

The doctors referred to an increase in patients presenting with symptoms related to wireless exposure and urged health agencies to immediately reduce public exposure.

'Children should not use mobile phones except in an emergency, and WiFi should be replaced with wired alternatives in schools and other settings where children spend considerable time,' they said. (<http://www.ssita.org.uk/British%20doctors%20letter%20wifi%2010%20July%202013.pdf>)

No to smart meters

A global petition is underway aimed at stopping the rollout of smart meters. The petition can be found at: http://www.avaaz.org/en/petition/Stop_US_and_Worldwide_Smart_Grid/?eHHJhfb

Gro speaks about EHS

Former Prime Minister of Norway and former Director of the World Health Organisation, Dr Gro Harlem Brundtland, is arguably the world's most well-known sufferer of electromagnetic hypersensitivity. In late June she spoke about her condition for the first time since 2002.

In a statement to *Eve* magazine, Brundtland's press adviser commented that the doctor used a fixed line for her work and a mobile phone for emails, but she avoids using a mobile phone for talking, though she has done so on a number of occasions.

The statement followed an interview in *Eve Magazine* a few days before with Health Minister Jonas Gahr Store, who had worked closely with Gro at the WHO. Store told the magazine that Gro was active online,

casting doubts on the credibility of her claims that she reacted to EMR.

He also said that the Norwegian radiation authority did not believe that radiation from mobile phones, towers or wireless networks could cause health problems.

At the time when Gro announced her sensitivity to mobile phone radiation, she was heavily criticized. Among the critics was Dr Michael Repacholi who ran the WHO's EMF project. Ironically, a study by Repacholi conducted in 1997 showed that transgenic mice exposed to mobile phone radiation developed a higher rate of lymphomas than controls.

Aftenbladet, 28.06.13; 30.06.13; Repacholi, MH et al, *Radiat Res* 147(5):631-40, 1997.

What's wrong with EMF science?

Scientists are using the wrong method to measure EMF exposure in their experiments, say three experienced EMF researchers in a paper published in June.

Currently EMF studies and standards are based on calculations of how much radiation is absorbed in a certain amount of tissue (Specific Absorption Rate, or SAR). However, SAR is not an appropriate form of measurement, say Dimitris Panagopoulos, Olle Johansson and George Carlo.

Firstly, they say, SAR is impossible to measure in live biological tissue and is difficult to calculate accurately.

Next, it is really only relevant for the heating effects of electromagnetic fields. Yet the everyday exposures we receive from mobile phones, WiFi networks, base stations and so on don't cause heating—so another system of measurement is needed, the authors say.

Moreover, SAR measurements don't take into account some of the characteristics of signals that are relevant to EMF research—such as frequency, modulation and whether a signal is pulsed or

continuous. Yet it is these characteristics, rather than SAR, that are responsible for the biological changes that take place in an organism. For example, studies have found that signals with the same SAR but different frequencies produced different effects on the same specimen.

'When SAR is used as an exposure metric in research studies, the imprecision means that studies which show 'no effect' are likely 'false negatives' and studies that show an effect are likely under-reporting the true risk,' said co-author Olle Johansson.

Instead of using SAR measurements, scientists should use radiation meters to measure the field to which a subject is being exposed. 'Radiation/field intensity can be readily and more accurately measured than SAR can ever be estimated,' the authors say.

Panagopoulos, DJ et al, 'Evaluation of Specific Absorption Rate as a Dosimetric Quantity for Electromagnetic Field Bioeffects', *PLoS One* 8(6):2013; correspondence



Scientists from around the world presented their latest findings at BioEM2013.

Blue skies, summer temperatures and Mediterranean beaches were not the only attraction in the Greek city of Thessalonika this winter. In mid-June the city played host to the first combined meeting of The Bioelectromagnetics Society (BEMS) and the European BioElectromagnetics Association (EBEA).

The program covered a range of topics on electromagnetic fields, including therapeutic applications and clinical anti-cancer applications. Below are some of the interesting presentations from the meeting.

RF exposure

Following a 2009 decision by the French government, the COMOP program was established to identify people's exposure to base station radiation, with a view to decreasing it. The project involved taking measurements in 16 French communities that reflected different geographical and urban design characteristics. The measurements were twice as high outside buildings as inside. Traditional windows did not reduce exposure inside, but those treated with mineral deposits did. Excluding mobile phones and towers, the highest sources of exposure were cordless phones, WiFi and, in some places, FM radio. (Rene De Seze and team)

Prenatal influences

It has been suggested that mobile phone radiation could be harmful to young children and fetuses. To test this, Turkish researchers conducted an experiment on pregnant rats and their offspring. They wanted to see whether exposure affected granule cells in the dentate gyrus which could lead to cognitive and behaviour problems in offspring. These cells are particularly vulnerable to prenatal influences as they are produced both during and for some weeks after birth.

In their study the scientists exposed pregnant rats to mobile phone radiation of 900 MHz for an hour a day throughout pregnancy. When they examined the granule cells in the dentate gyrus of the animals, they found that exposed rats had significantly less cells than unexposed rats and different morphology in these cells. They suggested that mobile phone radiation may have contributed to the death of these cells. (Ersan Odaci and team)

Children's risks

Children are more vulnerable to mobile phone radiation for a variety of reasons. Those most commonly given are: smaller skull size, more conductive tissue, the vulnerability of their nervous system and a potential lifetime of exposure.

However, there are more compelling reasons than these to consider them more vulnerable than adults to this radiation, said Doctoral student Mary Redmayne.

Ms Redmayne investigated the physiological differences in children and adults and the implications of these

changes for mobile phone exposure. She showed that children have:

- ◆ more ions in their tissues—increasing the amount of radiation they absorb;
- ◆ more extra-cellular water—increasing conductivity in their organs;
- ◆ thinner skulls—increasing penetration of radiation;
- ◆ softer cartilage in their ear—increasing radiation absorption;
- ◆ lower weight—increasing radiation absorption in the body;
- ◆ shorter size—contributing to resonance with RF frequencies. (Mary Redmayne)

Brain tumours

US researchers investigated the incidence of brain tumours in the US, using registry data for the period 1992 to 2009. They found that there was a decrease in the incidence of astrocytomas, glioblastomas and oligodendrogliomas among men and women during that period and a slight decrease in all malignant brain tumours. However, there was an increased incidence of malignant tumours in the parts of the brain closest to the position of mobile



phones—of the temporal and frontal lobes and the brain stem and some victims were very young people. They concluded that this is likely to be due to an environmental exposure. (Devra Davis and team)

CNS effects

Swiss researchers conducted a cohort study on the link between exposure to radiofrequency radiation and childhood cancer. They followed all Swiss children who were under 15 years of age in December 2000 until December 2008 (more than a million children) and calculated the exposure of each child. They found that children with highest exposures—over 0.2 Volts per metre) - did not have an increased risk of leukemia, but did have a 50% higher rate of central nervous system tumours. (Dimitri Hauri and team)

Breast Cancer

Three women who carried their mobile phones in their bras developed breast cancer in a case study presented by a US team.

Patient A had no genetic or environmental risk factors for breast cancer and was in one of the lowest risk categories. She developed three tumours in a pattern that matched the configuration of her phones' antennas. Similarly, patient B had no genetic or environmental risk factors for breast cancer and her tumours occurred in the area where she carried her phone. Patient C developed tumours next to where she had positioned her phone for 12 hours a day, six days a week for six years.

The authors recommended checking whether breast cancer patients carry their phones in their bras and that further research be conducted on this association. (Robert Nagourney and team)

Foetus and newborns

Turkish researchers presented results of a study on the effect of mobile phone radiation on pregnant rabbits and their offspring. Both were exposed or non-exposed to mobile phone radiation of 1800 MHz for 15 minutes a day for a week. Rabbits who were exposed to mobile phone radiation had evidence of oxidative damage to their livers. (Arin Tomruk and team)

Workers' risks

To determine how occupational exposure to power frequency magnetic fields affected workers, Dutch researchers conducted a study of over 120,000 workers and followed them for 10—17 years. They found that exposure to magnetic fields did not appear to increase the risk of cardiovascular mortality, lung, brain or breast cancer or non-Hodgkins lymphoma. However, it did increase the risk of acute myeloid leukemia and follicular lymphomas in men. (Tom Koeman and team)

Mobile phones and children

Lloyd Morgan, from the Environmental Health Trust, discussed the effects of mobile phone radiation on children. He referred to studies showing that:

- ◆ children's brains absorb more radiation from mobile phones than adults' brains;
- ◆ teens who used mobile phones had four times the rate of brain tumours;
- ◆ brain cancer has a latency of 30+ years;
- ◆ Their smaller size creates hotspots of radiation.

He said that the current method of determining SAR (radiation absorption rates) for mobile phones 'is incapable of determining either how much radiation a child absorbs or how much radiation is absorbed by vulnerable tissues in adults such as breasts, eyes, testes, thyroid and parotid glands. (L Lloyd Morgan)

School exposures

To find out how much exposure to radiofrequency radiation school students receive, Swiss researchers are conducting the HERMES (Health Effects Related to mobile PhonE use in adolescentS) study. This is a cohort study in which the 441 7th and 8th grade students will be monitored over time for cognitive performance, behaviour and health problems.

These results will be compared to radiation exposures that will be assessed by calculating home exposures from nearby transmitters,

phone records from operators' measurements in schools and, in some cases, individual measurements.

Measurements already conducted in schools show that schools with W-LAN networks had higher exposure (0.145 V/m) than those which did not (0.126).

Results will be ongoing. (Katharina Roser and team)

WiFi routers

WiFi routers are commonly used in homes, schools and workplaces. In the first test of the effects of the radiation they emit, Greek researchers exposed three-month old mice to a router emitting 2440-80 MHz for 14 hours a day. After two months of exposure, there were clear differences between the exposed and unexposed mice in one of the behavioural tasks tested. Exposed mice showed more anxiety-related behaviours—but no changes to mobility, co-ordination or short-term memory. (Adamantia Fragopoulou and team)

Effects on blood

The hematopoietic system involves organs involved in the production of blood—such as the bone marrow, spleen, tonsils, and lymph nodes. To determine whether power-frequency magnetic fields affect this system, two German scientists exposed different strains of

(Continued on page 11)



Dr Devra Davis, from the Environmental Health Trust, co-author of several papers at the meeting.

Watt's the Buzz?

Shock tactics

What price might gamers pay for success?

A gaming headset, now available from the internet, contains four electrodes that apply an electrical current to the front of the brain—similar to a method used to treat depression.

The technique, called Direct Current Stimulation, aims to increase a user's reaction times while playing.

Critics say the uncontrolled stimulation of the brain in this way is potentially dangerous. (*Sun-Herald*, 30.06.13.)

Let me entertain you

It's no longer all about communication.

Digital devices are being increasingly used for entertainment, giving television a run for its money. According to the Deloitte State of the Media survey, 78% of Australians aged 14-29 use their smart phones for entertainment. Over 25% own a laptop, a tablet and a smartphone; and nearly half the population is updating its status on a daily basis. (*Australian* 13.06.13)

Phone etiquette

Melbourne businesses are increasingly asking customers not to talk on their mobile phones. Retailers say the phones are proving a distraction to other clients and some businesses are concerned that patrons could use their phones to photograph intellectual property. (*Herald-Sun* 15.07.13.)

Fair play

Several US casinos have issued bans on the wearing of Google Glasses at their gambling tables. The glasses, which can be used to take

photos and film, or access the internet, have the potential to be used for high-tech cheating. (*Herald-Sun* 07.06.13.)

High tech customs

On the topic of high tech devices, the government of Bolivia is equipping customs agents with a smart pen that can be used to record voices and take photos. This means that customs officials who used the pens can be monitored as they work. The aim of the project is to help reduce corruption. (*Coffee News* 24.06.13.)

A stimulating idea

Some savants are born with their incredible gifts. They might be able to perform complex mathematical operations mentally, learn a new language in a week, play a musical masterpiece after hearing it once or memorise a phone book. In other cases, people become savants after an injury to the left hemisphere of the brain.

Sydney University neuropsychologist Dr Allan Snyder theorises that savant abilities can be unlocked in ordinary people by applying electrical currents to their brains. In his experiments he is using transcranial direct current stimulation to dampen the left brain and increase the activity of the right brain. (*SMH*, 08.07.13.)

Ach nein!

The German government has decided not to follow the advice of the European Union to install smart meters in 80% of homes by 2020. This is because the costs of the rollout would outweigh the savings made by using the technology, according to the Economy Ministry. (*Electric Lights and Power* 01.08.13.)

Breast cancer risk

Magnetic fields from electrical sources and radiofrequency radiation may contribute to breast cancer in men, according to a study from China.

Scientists from the School of Public Health at the University of Science and Technology in Wuhan conducted the first meta-analysis on this topic. Their study involved 18 studies of men exposed between 1970 and 2002 to sources including radio and TV transmitters, 50 Hz fields at home or work.

They found that exposed men had a 30% higher rate of breast cancer and concluded that exposure 'may be associated with the increased risk of male breast cancer'. (Sun, JW et al, *Asian Pac J Cancer Prev* 14(1):523-8, 2013.)

(Continued from page 1)

Japanese study found a similar risk for people who used mobile phones for more than 20 minutes a day.

1. Hardell, L et al, 'Pooled analysis of case-control studies on acoustic neuroma diagnosed 1997-2003 and 2007-2009 and use of mobile and cordless phones', *Int J Oncol* July 22, 2013.
2. Interphone Study Group, 'Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study', *Cancer Epidemiology* 2011 Oct;35(5):453-64
3. Sato, Y et al, 'A case-case study of mobile phone use and acoustic neuroma risk in Japan', *Bioelectromagnetics*, 32 (2):85-93 2011.

(Continued from page 9)

rats to a 50 Hz field for 14 days. They found that exposure affected the proliferation of lymphocytes and effects were different for different strains of rats, different sexes and different intensities of exposure.

The changes the scientists observed in the ratio between neutrophils and lymphocytes were indicative of stress and inflammation and a marker for diseases including cancer. (Maren Fedrowitz and Wolfgang Loscher)

Effects of DECT and WiFi

Greek researchers investigated the effects of radiation from DECT cordless phones and WiFi routers on learning and memory. They chose as their subjects young adult fruit flies because their olfactory nervous system is similar to that of mammals. The researchers exposed the flies to the radiation from the DECT phone or WiFi router before a learning process. They found that exposure to both impaired learning and memory and increased reactive oxygen species (which include free radicals), which have harmful effects on the body and contribute to neurodegenerative processes. (Lukas Margaritis and team)

Melatonin effects

Melatonin is a hormone produced by the pineal gland that plays an important role in sleep and in combating free radicals. To find out whether it is affected by wireless signals, Korean scientists exposed rats to a 915 MHz RFID signal for eight hours a night for five

nights a week for two weeks. They found that exposure inhibited the production of enzymes that are important for producing melatonin. (Young Hwan Ahn and team)

Reproduction

Mobile phone radiation has previously been shown to have effects on sperm consistent with infertility.

In this study, Indian scientists exposed male rats to a 3G mobile phone signal for two hours a day, six days a week for sixty days and examined the effects on their reproductive system. They found that, unlike unexposed controls, exposed animals had decreased sperm count, reduction in seminiferous tubules and testicular weight. Their sperm cells showed lipid peroxidation and DNA damage. According to the authors, these changes could reduce fertility. (Sanjay Kumar and team)

Protection against microwaves

Kangfuling (KFL) is a traditional Chinese medicine often used to treat neural problems caused by microwave radiation. To evaluate the effectiveness of this treatment, Chinese researchers exposed rats to microwave radiation for 15 minutes a day for 14 days and then administered KFL. They found that KFL reversed memory loss and biological changes caused by exposure and protected against oxidative stress in the hippocampus. (Rui-yun Peng and team)

RF exposure

To find out about people's expo-

sure, Swiss researchers conducted two studies to assess levels of radiofrequency radiation in different locations and over a two-year period in the city of Basel.

Not surprisingly, they found that overall exposure had increased over the two-year period—up to 48% in one of the studies. Radiation from mobile phone base stations increased between 13% and 51% and exposure from mobile phone handsets increased by up to 47%. The highest exposure levels were found inside trains from mobile phone use. The authors recommended that radiation exposures be regularly measured. (Damiano Urbinello and Martin Roosli)

Other presentations

- ◆ Russian research shows that short exposures to non-thermal levels of electromagnetic radiation should be regarded as an irritant to the central nervous system. (Svetlana Lukyanova and team)
- ◆ Swiss workers exposed long-term to power frequency magnetic fields had an increased rate of death from ALS. (Anke Huss and team)
- ◆ Weak static and radiofrequency fields were shown to modify the function of energy-producing mitochondria. (Pablo Castello and team)



Wireless exposure

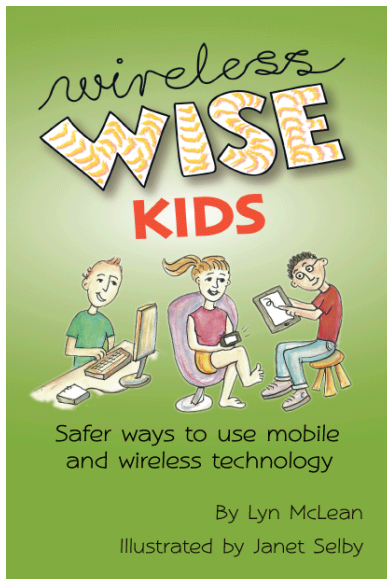
Have you ever wondered how much radiation you're exposed to from your cordless phone, your wireless modem, your ipad, laptop or baby monitor?

Or perhaps, if you're electromagnetically hypersensitive, you would like to find out how much radiation is present in a particular location before you spend time in it.

Now EMR Australia has an affordable meter for measuring these wireless signals.

The Acousticom 2 is a light, hand-held meter that detects signals in the frequencies used by most communications systems (200MHz to 8GHz). It can be used to identify 'hot spots' and 'safe' zones for beds or workstations

It displays measurements in units of Volts per metre and by coloured LED lights; it has an audio function and a light-weight vinyl carry case. Available from: http://emraustralia.com.au/acousticom_2_meters.html.



A book every family needs
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Smart meter lawsuits

Opposition to the rollout of smart meters in the US has been vigorous and vocal. A number of legal actions opposing the meters have been undertaken—some of them successful, others not.

A summary of the outcomes of these cases can be found at: <http://smartmeterlawsuits.blogspot.fr/>.

Mobiles & pregnancy

Could exposing a foetus to mobile phone radiation have consequences for later life?

To test this possibility, scientists in Iran exposed a group of rats to a mobile phone signal of 900 MHz for six hours a day throughout their pregnancy. When they tested the offspring, the researchers found changes to the animals' Purkinje neurons—brain cells which are involved in motor coordination. (Haghani, M et al, *Neuroscience*, 29 July, 2013.)

Previous research has shown that prenatal exposure of mice caused behavioural problems similar to ADHD. (Aldad TS et al, *Sci Rep* 2:312, 2012.)

The social cost of mobiles

Mobile phone addiction in South Korea is such a problem that the government will establish country-wide counselling programs for youngsters to deal with the problem. During the last year, children's use of smart phones has tripled and addiction rates have increased to nearly one in five. Addicts are using their mobile phones for more than seven hours a day and experience withdrawal symptoms if separated from them.

Such intensive dependence on technology is having a detrimental effect on children's face-to-face communication skills. They are not learning to read facial expressions, says Setsuko Tamuru, a professor of psychology, and are distracted from their school work.

Moreover, heavy use of phones can interfere with the development of the brain, which is still occurring during teens. Dr Byron Gi-won says that phone use develops the left side of the brain at the expense of the right side of the brain, whose functions—including concentration, memory and attention—can be diminished.

Deterioration of mental functions in young people is increasing in the country. (Korea Joongang Daily, 24.06.13; *Wall Street Journal* 23.07.13.)

Mr Alan Mason is now the Head of the Non-Ionizing Radiation section of ARPANSA (Australian Radiation Protection and Nuclear Safety Agency) following the retirement of Dr Lindsay Martin from full-time employment.



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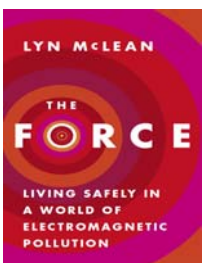
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Fabrics and liquid paints that shield over 99% of radiation—from base stations and other communications equipment.

'The Force:

Living safely in a world of electromagnetic

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