

# EMR and Health

Quarterly report on electromagnetic radiation, health and well-being

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## Mobiles and sperm

Once again, mobile phone radiation has been found to have harmful effects on sperm.

The latest finding comes from a review of 27 studies on wireless radiation and the male reproductive system, conducted by researchers from the University of Newcastle in Australia.

The review showed that 21 of the 27 studies considered showed harmful effects on sperm. Eleven of 15 studies showed a decline in sperm motility and four out of five showed that wireless radiation led to DNA damage. Six out of six showed that exposure reduced antioxidant levels and seven out of seven showed that exposure increased free radical activity. All three studies investigating antioxidant supplementation showed that adding antioxidants to the diet reduced the amount of damage.

The authors suggest that the sperm damage reported in the studies they considered may be caused by free radical activity.

Co-authors Brendan Houston and Dr Geoff De Luliis told *EMR and Health*, 'We believe if RF-EMR is capable of influencing biology that it may act through the mitochondria. This cellular organelle is involved in the generation of energy and while doing so, produces by-products such as reactive oxygen species. Considering that many studies have highlighted that RF-EMR induces changes to the generation of reactive oxygen species, the effects of RF-EMR on the way charged species move through sperm mitochondria, may offer



some insights.'

In their paper, the authors call for more research, saying 'A focus on the male reproductive system is justified given the potentially elevated levels of exposure this system may experience as consequences of the personal storage of mobile devices, the unique vulnerability of the highly specialised sperm cell, and the future health burden that may be created if conception proceeds with defective, DNA-damaged spermatozoa.'

The Newcastle team has two further sperm studies planned: 'the first where sperm cells are directly exposed and the second where sperm cells are exposed while they are still within the reproductive tissues, modelling their natural environment. We are utilising both models to assess the responses of the spermatozoa in order to identify common hallmarks which will allow us to improve our understanding of the pathways stimulated by this radiation,' Mr Houston and Dr Geoff De Luliis said.

(Houston, B, 'The effects of radiofrequency electromagnetic radiation on sperm function', *Reproduction* 2016 Sep 6. pii: REP-16-0126)

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# Mobiles and DNA damage

Mobile phone radiation caused DNA breaks in the brains of exposed animals in one of the best-conducted, most reliable animal studies to date.

The study was conducted by the US National Toxicology Program (NTP), a \$25 million project that exposed rats to mobile phone radiation, before and after birth, for a period of two years.

The initial results, released in May this year, and reported in the June issue of 'EMR and Health', showed increased rates of malignant gliomas of the brain and schwannomas of the heart among exposed animals.

The results of a second study, yet to be published, show that exposed rats had elevated rates of DNA damage in their brains. The results are summarised in the table below, presented by Dr Michael Wyde at the BioEM2016 Meeting in Belgium earlier this year. It shows that there was a statistically significant increase in DNA damage in the frontal cortex of exposed male rats and mice. This is the area of the brain in which humans, exposed to mobile phone radiation, have developed tumours. Male rats also had more DNA damage in the hippocampus, liver and blood.

As in the tumour studies, female rodents exhibited less damage than males.

Radiofrequency radiation has been linked with DNA damage in previous studies. In 1995 Drs Lai and Singh published the results of a study showing that this radiation caused single-strand DNA breaks in rat brain cells—for which they came under intensive industry attack. Since then, many studies have shown single- and double-strand DNA breaks in the brain and testes.

'The NTP does the best animal bioassays in the world,' said Dr Christopher Portier, retired head of the NTP. 'Their reputation is stellar. So if they are telling us this was positive in this study, that's a concern.'

The complete results from all the NTP's rat and mice studies will be available for peer review and public comment by the end of 2017.

*'There was a statistically significant increase in DNA damage in the frontal cortex of exposed male rats and mice.'*



## Comet assay summary for rats and mice

		MALE					FEMALE				
RATS	CDMA	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood
	GSM	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood
MICE	CDMA	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood
	GSM	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood	Frontal Cortex	Cerebellum	Hippocamp	Liver	Blood

- Yellow Statistically significant trend *and* pairwise SAR-dependent increase
- Blue Statistically significant trend *or* a pairwise increase
- Green Not significantly different, but increased in 2 or more treatment groups

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Lai, H and Singh, NP, 'Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells', *Bioelectromagnetics*, 16(3), 1995.

<http://ntp.niehs.nih.gov/results/areas/cellphones/index.html>

[https://betweenrockandhardplace.wordpress.com/2016/06/09/bioem2016-the-ntp-study-part-2/;](https://betweenrockandhardplace.wordpress.com/2016/06/09/bioem2016-the-ntp-study-part-2/)

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# Magnetite, radiation and health

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A team of scientists from the UK has discovered that a highly magnetic pollutant can enter the brain, potentially causing health problems.

The scientists discovered nanoparticles of an artificial form of magnetite—an extremely magnetic mineral—that differs from naturally occurring magnetite found in human and animals brains. ‘Our results indicate that magnetite nanoparticles in the atmosphere can enter the human brain, where they might pose a risk to human health, including conditions such as Alzheimer’s disease,’ said Professor Barbara Maher from Lancaster Environment Centre, who helped identify the particles.

The researchers found the toxic magnetite nanoparticles in brain tissue of 37 people living in the UK and Mexico.

They believe that the nanoparticles enter the brain through the olfactory system. Inside the body, they can cause free radicals, which are linked with neurodegenerative diseases.

‘The amazing thing is that the discovered particles have almost the same shape and surface texture of magnetic particles formed during high-temperature combustion of fossil fuels used in car engines, power stations, or even in the smelting industry’, said Dr Imad Ahmen, lead experimenter from Oxford University’s Department of Earth Sciences.

Naturally-occurring magnetic fields have been found in the brains of humans and many species of animals, including migratory birds and are thought to be involved in orienting to the earth’s magnetic fields.

How artificial magnetite might respond to external magnetic fields from electrical and wireless sources is not yet clear but the researcher’s findings may provide an important clue as to why many people report uncomfortable symptoms from exposure.

(Maher, BA et al, ‘Magnetite pollution nanoparticles in the human brain’, *Proc Natl Acad Sci U S A*, 2016 Sep 6. pii: 201605941)

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# Berkeley phone label fight

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The US City of Berkeley is once again embroiled in a legal contest with the mobile phone industry.

In May 2015, Berkeley introduced an ordinance requiring information about mobile phone radiation to be made available at point of sale. The notices advise that carrying a phone against the body can result in radiation exposures that exceed the federal standards—information which is available from, if obscure in, many manufacturers’ user manuals. The notice also included a reference to children being at greater risk from exposure (*EMR and Health*, June 2015).

Late last year the CTIA Wireless Association took legal action against Berkeley, claiming that its notices violated the First Amendment— but that action was defeated in the Californian District Court , which ruled that the Berkeley could proceed with a modified ordinance, that omitted risk to children (*EMR and Health*, December 2015.)

Now Berkeley and the CTIA are back in court once again, debating the City’s right to mandate mobile phone information.

In September, a three-judge panel heard evidence from both sides of the debate—and its judgement is still to be announced.

However, there are concerns about the impartiality of one of the judges involved in the hearing.

‘Judge Michelle Friedland’s possible links to the wireless industry should have been disclosed,’ said Ellie Marks of the California Brain Tumor Association. Judge Friedland’s husband, Daniel Kelly is a senior engineer with Tarana Wireless, which has associations with the CTIA.

We asked the Court for the Ninth Circuit whether it believed this represented a conflict of interest for Judge Friedland and whether the Court had considered the potential conflict of interest before the appeal.

The Court’s reply was a definitive, ‘ It is the policy of the court to not comment on pending cases.’

*Newsweek*, 03.11.16; California Brain Tumor Association, Press release, 27.09.16.

# RESEARCH UPDATES

## ELF fields (from electrical sources)

### Cell death

Power-frequency magnetic fields can cause cell death in normal and cancer cells, say researchers from Iran, after conducting a meta-analysis of 8 relevant studies. (Mansourian, M et al, *Adv Biomed Res* 5:141, 2016.)

### Proteins

The p21 protein is involved in DNA damage and cell cycle activity. Finnish researchers found that exposing human neuroblastoma cells to a power-frequency magnetic field decreased the levels of this protein. They concluded that the p21 protein 'may be involved in early responses to MF [magnetic field] exposure.' (Luukkonen, J et al, *Int J Radiat Biol* 1-27, 2016.)

## RF/wireless radiation

### Spine

Mobile phone radiation could have adverse effects on the spine, according to a study from Turkey. To see how regular mobile phone exposure affects adolescents, researchers exposed young rats to mobile phone radiation of 900 MHz for one hour a day for 38 days. Exposed rats had morphological damage in the lumbar area of the spinal cord, including shrunken and dark stained cytoplasm of neurons and cell death. (Kerimoğlu, G et al, *J Chem Neuroanat* 78:125-130, 2016.)

### Alzheimer's Disease

A review has found that wireless radiation could increase the risk of Alzheimer's Disease and cause other neurological damage. The authors say 'we can

conclude that the current exposure to microwaves during the use of cell phones is not safe for long-term exposure, despite the current scientific opinion.' They suggest exposure could injure the hippocampus, cause breaches of the blood-brain-barrier and impair cognitive function. (Zhang, X et al, *Exp Ther Med* 12(4):1969-197, 2016.)

### Sperm

A study from India has provided more evidence that wireless radiation damages sperm. The scientists exposed mice to a 900 MHz signal for 4 or 8 hours a day for 35 days. Exposed animals had oxidative stress and DNA damage which results in lower sperm count. (Pandey, N et al, *Toxicol Ind Health*, Oct 13, 2016.)

### Incubators

How much radiation are infants exposed to in incubators? Spanish researchers measured fields of 0.8 to 1.58 V/m in incubators in a neonatal unit. (Calvente, I et al, *Environ Res*, 152:66-72, 2016). These levels are considerably higher than the 0.1 V/m level at which many sensitive people react to wireless radiation.

### Brain

How does mobile phone radiation affect the brain? To answer this question, Indian scientists exposed mice to mobile phone radiation of 900 to 1800 MHz for 48 minutes a day for up to 180 days. They found that exposed mice had decreased density and diameter of neurons in some parts of the hippocampus. (Mugunthan, N et al, *J Clin Diagn Res* 10(8): 2016.)

### Brain development

Another Indian team exposed pregnant mice to a microwave signal of 10GHz and investigated the effects on their offspring. They found that infants exposed in utero had reduced brain and body weights, biochemical changes and changes to the hippocampus and cerebellum. (Sharma, A et al, *Gen Physiol Biophys*, Oct 27, 2016.)



*'Mobile phone exposure could...injure the hippocampus, cause breaches of the blood-brain-barrier and impair cognitive function.'*

## 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

## Seizures

Mobile phone radiation could increase the risk of seizures, according to researchers from Iran. The team exposed mice to mobile phone radiation either chronically (over 30 days) or acutely (once) and were given a drug to induce seizures. The mice chronically exposed to mobile phone radiation had lower threshold for seizures. The authors concluded that chronic mobile phone radiation "might increase the risk of seizure attacks and should be limited." (Kouchaki, E et al, *Iran J Basic Med Sci* 19(7):800-3, 2016.)

## Plants

Wireless radiation can have harmful effects on plants, according to a recent Australian study. M Halgamuge analysed data from 45 peer-reviewed studies describing 169 studies on 29 species of plants. She found that almost 90% of the studies showed that exposure to radiofrequency radiation produced physiological and/or morphological effects on plants. Some species, such as maize, tomato, onions and mung beans, were affected more than others and some frequencies produces more effects than others. (Halgamuge, MN, *Electromagn Biol Med* 1-23, Sept 2016.)

## Tree damage

Radiofrequency radiation from mobile phone towers adversely affects trees, according to a study from Germany. Researchers detected damaged trees in two German cities and measured exposure in those locations. They also measured exposure at a height of 1.5 metres in different locations in parks. They found that the sides of trees facing base stations showed more damage than the opposite sides of the trees. Parts of trees with highest exposures had most damage and trees in low radiation areas showed no damage. 'Statistical analysis demonstrated that electromagnetic radiation from mobile phone masts is harmful for trees,' the authors concluded. (Waldmann-Selsam, C et al, *Sci Total Environ*, 20 Aug, 2016.)

## Prenatal exposure

To see how wireless radiation affects the growing foetus and infant, Greek researchers exposed pregnant rats and their offspring to a DECT signal of 1880—1900 MHz. They

found that exposure increased the heart rate of the foetuses and changed body measurements, including those of the hippocampus. (Stasinopoulou M et al, *Reprod Toxicol* 65:248-62, 2016.)

## Other studies showing effects from RF radiation

- Exposing mice to radiofrequency radiation resulted in oxidative stress in hippocampal cells. (Kim, JY et al, *Int J Radiat Biol* 1-22, Sept 2016.)
- People who made more mobile phone calls had more severe headaches than less heavy users. (Cho, YM et al, *Environ Health Toxicol*, Oct 26, 2016.)
- Australian children in kindergartens were exposed to more radiation from environmental sources than from use of personal devices. (Bhatt, CR et al, *J Expo Sci Environ Epidemiol* Oct 19, 2015.)

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# ELF and RF

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## Disease

An innovative study from Swiss and US researchers investigated the links between disease and electromagnetic fields. The researchers considered data on genes and pathways of effects from studies on ELF and RF exposure. 'Our analysis supports a linkage between ELF EMF and cancer, chemical dependency, metabolic dysfunction, and neurological disorders', they wrote. (Parham, F et al, *Frontiers in Public Health*, 7 Sept 2016.)

## Reproduction

Scientists from Iran conducted a review on the effects of electromagnetic fields (low and high frequency) on reproduction. They found that exposure has adverse effects on sex hormones, gonadal function, foetal development, and pregnancy. They conclude, 'people must be aware of the negative effects of EMFs' and advised keeping a distance from sources of exposure. They also found that antioxidants helped ameliorate the harmful effects of exposure. (Asghari, A et al, *Electron Physician*, 8(7), 2655–2662, 2016.)

*'Our analysis supports a linkage between ELF EMF and cancer, chemical dependency, metabolic dysfunction, and neurological disorders.'*



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*'Electromagnetic radiation from mobile phone masts is harmful for trees'*

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## Screen-based devices and sleep

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Do screen-based devices have a negative impact on children's sleep? To answer this question, researchers from three continents conducted one of the most edifying studies on the topic to date.

Led by researchers from King's College, London, the investigators reviewed 20 studies involving more than 125,000 children aged six to 19 years.

They found that children who used digital devices, such as smart phones and tablets, at bedtime had more than twice as many sleep problems as children without access to them. Even the presence of a digital device in the bedroom increased the risk of sleep problems and researchers suggested this is because children are constantly engaged with their technologies, even when not actually using them.

'The deleterious association between screen-based media use and sleep in children and adolescents is a major public health concern,' the authors concluded.

Screen-based devices may impair sleep quality by delaying or interrupting sleep time, stimulating the brain and by affecting sleep cycles, physiology and alertness.

Disturbed sleep can negatively impact children's health, with effects including poor diet, obesity, sedative behaviour, reduced immune function, stunted growth and possibly mental health problems.

'Our study provides further proof of the detrimental effect of media devices on both sleep duration and quality, said Dr Ben Carter. 'Sleep is an often undervalued but important part of children's development, with a regular lack of sleep causing a variety of health problems. With the ever growing popularity of portable media devices and their use in schools as a replacement for textbooks, the problem of poor sleep amongst children is likely to get worse.'

The researchers recommended intervention to reduce children's use of screen-based devices at bedtime. 'It is imperative that teachers, health care professionals, parents, and children are educated about the damaging influence of device use on sleep,' the authors wrote.

Carter, B et al, 'Association between portable screen-based media device access or use and sleep outcomes', *JAMA Pediatrics*, 2016.

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*'The deleterious association between screen-based media use and sleep in children and adolescents is a major public health concern'*

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## Measuring very low frequencies (VLF)

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Do you know what you're exposed to from CFL globes, inverters or induction cooktops?

Now it's possible to obtain a clearer picture than ever.

Whereas most magnetic field meters measure the ELF (extremely low frequency) range of frequencies, the new Pocket Power Frequencies Meter (PF5) also measures fields from the VLF (Very Low Frequency) range of the spectrum. CFL globes, solar inverters, induction cooktops and some LED lights emit these frequencies.

Identifying fields in the VLF part of the spectrum is important because these frequencies can produce much greater currents in the body than ELF fields. For example, equipment operating at 25 kHz (VLF) induces 500 times more current in your body than the same field from a 50 Hz source.

The new PF5 meter measures both magnetic and electric fields from the ELF and VLF parts of the electromagnetic spectrum. It's an easy-to-use meter, with press-button operation and a series of coloured lights to indicate precautionary exposure levels.

More information is available from [www.emraustralia.com.au](http://www.emraustralia.com.au).

# UPDATES FROM AROUND THE WORLD

## USA

The Job Accommodation Network, an agency of the Office of Disability Employment Policy in the US, has released a string of suggestions for accommodating workers with electromagnetic hypersensitivity. Suggestions include: reducing use of or shielding the computer; keeping the body away from sources of EMF; changing shifts to avoid exposure to other people's devices; moving workstations; allowing work at home; providing wired phones and internet and shielding equipment. (<http://askjan.org/soar/other/electrical.html>)

## France

On 1 January, legislation will come into effect in France to protect the health and safety of workers from electromagnetic fields. The Decree, enacted on 3 August this year, follows a Directive of the European Parliament on protecting workers from EMF. The Decree provides guidance for employers assessing whether workers' exposure complies with the country's standard and for reducing workers' exposure.

It states that 'The Employer shall ensure the implementation of measures and additional prevention measures to guarantee the health and safety of workers.'

For pregnant women, the Decree states, 'When the pregnant woman is exposed to electromagnetic fields in a job, exposure is kept as low as reasonably achievable taking into account the recommendations of existing good practice...' (French Official Gazette No 0182, 06.08.16, <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000032974358&dateTexte=&categorieLien=id>)

## Europe

On 1 September, the European Defence

Agency launched a research program to determine the effects of electromagnetic fields. The project, known as RFBIO, is being conducted by the Karolinska Institute in Sweden and Bundeswehr Institute of Radiobiology in Germany. Other countries are expected to join over the five-year lifetime of the project. (<https://www.eda.europa.eu/info-hub/press-centre/latest-news/2016/09/06/eda-project-launched-to-assess-biological-effects-of-military-rf-signals>)

## Krakow

The city of Krakow in Poland is taking action to protect people from electromagnetic fields. Krakow President Jacek Majchrowski has announced plans to purchase a spectrum analyser to measure radiofrequency electromagnetic fields in different locations and to make the information available to the public. The city also plans to conduct meetings and provide lectures as part of its efforts to reduce people's exposure. (*Dziennik Polski*, 30.09.16.)

## New Jersey

In September the New Jersey Education Association published guidelines entitled 'Minimize health risks from electronic devices'.

'At their worst, they threaten the physical and mental health of teachers, paraeducators, secretaries, librarians and other school staff members and students who spend numerous hours using the devices,' the authors wrote in the Association's journal.

Recommendations included using wired rather than wireless connections for all wireless devices, including smart boards; texting rather than calling; using airplane mode; using speakerphone; keeping conversations short and keeping devices away from the body and the bedroom. (New Jersey Education Association, <http://www.njea.org/issues-and-political-action/>

[health-and-safety/reporter-articles/minimize\\_health\\_risks\\_from\\_electronic\\_devices](#))

## US pediatricians

The American Academy of Pediatricians (AAP) has updated the advice on its website about mobile phone radiation, following the results of the National Toxicology Program studies (p2). It says, 'The AAP reinforces its existing recommendations on limiting cell phone use for children and teenagers. The AAP also reminds parents that cell phones are not toys, and are not recommended for infants and toddlers to play with.' It provides a list of suggestions for reducing exposure to mobile phone radiation, including holding phones away from the head and not carrying them against the body. (<https://www.healthychildren.org/English/safety-prevention/all-around/Pages/Cell-Phone-Radiation-Childrens-Health.aspx>)

## ACEBR update

The Australian Centre for Electromagnetic Bioeffects Research (ACEBR) has published an update of its research in *Int J Environ Res Public Health* 2016, 13(10), 967, available online at: <http://www.mdpi.com/1660-4601/13/10/967/htm>.

## San Francisco

A legal victory has validated the right of the City of San Francisco to regulate wireless facilities that are planned to be added to light and electricity poles in public rights-of-way that are based on the appearance of the infrastructure.

The 15 September decision in the First District of the California Court of Appeal represented a victory over telco T-Mobile and sets a precedent that may influence other local governments. (<http://www.courts.ca.gov/opinions/documents/A144252.PDF>)

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# The disappearing bees

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By Melissa van Herk

Bees have just been added to the list of endangered species. They have been the subject of concern for some time now, due to a rapid decline in population. This decline seems to be due to either a decrease in the overall hive health and normal behaviour, or colony collapse disorder (CCD). CCD is a phenomenon where the majority of the worker bees will abandon the hive, queen and eggs for seemingly no reason.

As bees pollinate around one third of all the food humans and wildlife eat, their survival is of huge ecological significance. Research has clearly shown that bees are sensitive to Electromagnetic radiation (EMR) and many scientists are concerned that human produced Radiofrequencies (RFs) may be the primary cause of decline.

RF EMR is produced by natural and artificial sources, natural sources include the sun, earth and ionosphere. Artificial sources include our TVs, mobile phones, Wi-Fi, radio, satellite communications, microwaves, radar and many other forms of technology. The combined use of this technology has created a constant 'electro smog' or electro-noise which appears to interfere with bees and other wildlife, who are naturally sensitive to EMRs, particularly for navigation.

Current science shows that bees navigate by using solar and magnetic receptors known as cryptochromes<sup>1</sup> and biomagnetites<sup>2</sup>. Cryptochromes are light receptors and biomagnetites are materials in the body which are magnetic, or are affected by magnetic fields. Both of these receptors are found in many animals, plants and bacteria and orientate to natural EMR, including sunlight, moonlight and the electromagnetic field of the earth. This input of natural EMR is used by bees to communicate with each other and return home. It provides them spatial data which is used to describe the exact location of food, including the distance and position in respect to the sun and, once there, how to find their way back to the hive. The importance of this natural sensitivity has led many studies to be conducted in order to find any impact by human produced RF EMR.

In many of these studies, hives of bees which are exposed to cell phone radiation are compared to hives that were not exposed. It was found that in hives exposed to cell phone radiation:

- There was a significant decline in colony strength and the egg laying rate of the queen and caused there to be no honey or pollen in the exposed colonies at the end of the experiment<sup>3</sup>.
- The 'worker piping signal' was induced which, in normal conditions, announces the swarming process of the colony or indicates hive distress<sup>4</sup>.
- After ten days of ten minutes of exposure, none of the worker bees returned exposed to the hives<sup>2</sup>.

These findings are all symptoms currently being observed in the declining bee population. They are a very small example of many peer-reviewed, research articles which indicate that human-produced RFs have an enormous effect on bees. This should have a huge impact on how we think about where we are going with our use of technology. Dr Sainudeen Sahib S points out that insects, bees and other small animals are naturally more sensitive to increasing ambient radiation due to their smaller body mass, or less tissue to be penetrated by exposure<sup>2</sup>. This is important because biomagnetites have been found in the tissues of many birds, fish, whales, dolphins and even in human brains<sup>5</sup>.

What can we do?

Bee keepers can make sure their cell phones and other devices are off when visiting hives. It is possible to measure human-made EMRs around your hive and attempt to reduce where it is coming from or shield your hive. We, as individuals, can turn off any devices not in use to reduce electro smog. As for wild hives and for bees outside the hives, it seems incredibly important for there to be new conditions put in place for the protection of wildlife. At the very least, precautionary measures need to be taken, not only for their sake, but for our own.

1. Dr. Andrew Goldsworthy, The Birds, the Bees and Electromagnetic Pollution: '*How electromagnetic fields can disrupt both solar and magnetic bee navigation and reduce immunity to disease all in one go*', May 2009.

2. Sainudeen Sahib.S, '*Electromagnetic Radiation (EMR) Clashes with Honey Bees*' International Journal of Environmental Sciences, volume 1, no 5, pp 201.

3. '*Changes in honeybee behaviour and biology under the influence of cell phone radiations*' Current Science volume 98, no 10, pp 1376 – 1378.

4. '*Mobile phone induced honeybee worker piping*' Apidologie (2011) volume 42, issue 3, pp 270-279.

5. Kirschvink J.L. *et al*, '*Magnetite biomineralization in the human brain*', Proc Natl Acad Sci U S A 1992; volume 89, no 16, pp 7683-7687.



## Thyroid cancer link?

Could mobile phone radiation contribute to thyroid cancers?

It's a possibility that deserves attention, according to researchers from Sweden in a paper published in the journal *BMC Cancer*.

Professor Lennart Hardell, well-known for his studies on mobile phone radiation and brain tumours, investigated the incidence of thyroid cancer in Nordic countries from 1970 to 2013. He and his team found that the incidence of these cancers increased in both men and women, with a steep increase occurring from 2001 for women and from 2005 for men. Between 2013 and 2014, the incidence increased by 12.1% for men and 11.2% for women.

The authors observed a significant increase in papillary thyroid cancers in Sweden and this is consistent with increased rates of papillary thyroid cancer in countries such as Brazil, the Netherlands, Canada, USA and South Korea.

Because papillary thyroid cancers are generally induced by radiation, the authors considered the potential for both ionising and nonionising radiation to contribute to this dramatic increase.

For nonionizing radiation, the authors noted two factors of potential relevance. The first is the dramatic explosion of mobile phone use since the 1990s. The second is the emergence of the smart phone.

'Smartphones potentially provide higher RF-EMF exposure. Smartphones can connect to several networks: they come with built-in communication protocols for 2G, 3G, 4G long-term evolution (LTE), WiFi and Bluetooth for short distance and near field communications (NFC),' the authors wrote.

Additionally, they observed that the antennas of smart phones are positioned at the bottom of the phone, close to the position of the thyroid gland.

Mobile phone radiation has been shown to have harmful effects on the thyroid. The authors cited studies showing that this radiation:

- changed the morphology of the thyroid gland
- caused 'pathological' changes to the thyroid
- increased proliferation of thyrocytes (potentially causing cancer)
- and changed levels of thyroid stimulating hormone (TSF).

While the authors said their study does not prove that mobile phone radiation causes thyroid cancer, they nevertheless believe that their evidence is sufficient to warrant further study.

(Carlberg, M et al, 'Increasing incidence of thyroid cancer in the Nordic countries with main focus on Swedish data', *BMC Cancer* 16:426, 2016.)



## Detox help

Many people with environmental sensitivities—including sensitivity to electromagnetic radiation—suffer from chemical, heavy metal, bacterial or viral toxicity. When they reduce this toxicity, they often report that they suffer less from exposure to electromagnetic radiation.



We are pleased to make available a high quality, certified organic zeolite product—Zeo Natural Zeolite Powder—that can help in the process of detoxifying these harmful environmental pollutants.

Zeolites are naturally-occurring, crystalline compounds that perform detoxifying functions by capturing ions and molecules in their cavities.

Zeolite powder can be a useful aid to detoxification, particularly when as a bath, applied to the skin and as a mouth wash. It can be added to the washing, to garbage bins and other areas where bacteria are present.

You can see more about this product at [www.emraustralia.com.au](http://www.emraustralia.com.au).

# WATT'S THE BUZZ?

## More radiation

The new Apple iPhone 7 provides more ways of being irradiated than ever.

The new phone has no jacks for the headsets that allow users to keep the phone away from their heads during calls.

It will also have wireless in-ear headphones which bring the radiation even closer to the brain. (*Daily Mail Australia*, 08.09.16.)

## Phones and driving

Playing games on your mobile phone while driving can have unfortunate consequences. A Baltimore man would, no doubt, be the first to agree. While playing 'Pokemon Go', he not only crashed his car, but rammed into a police vehicle.

At least he didn't have to wait long for the police to arrive. (*Huffington Post Australia*, 21.07.16.)

## Computer rage

A 20-year old man from Moorebank, Sydney, has been charged with murdering his father by inflicting multiple stab wounds. Daniel Chapman murdered his father, allegedly after a long-standing argument about excessive computer use. The argument appears to have erupted after the father asked Daniel to leave his computer and come to the table to eat dinner. (*Australian*, 04.10.16.)

## Smart phones & bacteria

Could using a wireless device contribute to acne?

In an unpublished study, Professor SMJ Mortazavi and colleagues exposed a strain of bacteria—*Staphylococcus aureus* (involved in skin disorders such as acne)—to the blue light of a smart phone and tablet. They found that the bacteria exposed to both of these devices increased more than the bacteria left

unexposed and recommended further studies be conducted to clarify the link. (<https://www.linkedin.com/pulse/exposure-visible-light-emitted-from-smartphones-aureus-smj-mortazavi>)

## Education

Intensive screen viewing can impair educational performance, according to the results of a study by the Irish Educational Research Centre on 8000 primary school students. The Centre found that students in second class who did not own a mobile phone performed better in reading and maths than those who did. They also found that students who did not have TVs in their bedroom performed better than those who did. (*The Journal*, 29.09.16.)

## Free radiation

Victoria's state government has announced that free WiFi will be rolled out

(Continued on page 12)

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## Brain tumour risk

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More evidence linking mobile phone radiation with glioma brain tumours comes from a study published on 3 November which looked at the position of glioma brain tumours in relation to the position in which the phone was usually held against the head.<sup>1</sup>

The researchers considered data from 792 mobile phone users who were involved in the 2010 Interphone study and diagnosed with a glioma brain tumour in the period 2000 to 2004. They found that the people who had the highest risk of gliomas had the smallest distance between the phone and the position of the tumour. Risks were highest in the people who used mobile phones for the longest period of time, the greatest number of hours and the maximum number of calls.

The authors reported, 'our results suggest that ever using a mobile phone regularly is associated with glioma localization in the sense that more gliomas occurred closer to the ear on the side of the head where the mobile phone was reported to have been used the most.'

Commenting on the study, Professor Lennart Hardell said, 'the risk was highest for glioma closer to the ear as would be expected based on the exposure to RF radiation.'<sup>2</sup>

The 2010 Interphone study, involving participation by 13 countries, found increased risks of gliomas and acoustic neuromas for mobile phone use.<sup>3</sup>

1. Grell, K et al, 'The Intracranial Distribution of Gliomas in Relation to Exposure From Mobile Phones: Analyses From the INTERPHONE Study', *Am J Epidemiol* Nov 3, 2016.
- 2 <https://lennarthardellenglish.wordpress.com/2016/11/08/new-results-from-interphone-confirm-glioma-risk-associated-with-use-of-mobile-phones/>
3. Interphone Study Group, *Int J Epidemiol* 39(3), 675-94, 2010 and *Cancer Epidemiol*35(5):453-64, 2011.

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## Electromagnetic us

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Birds do it; bees do it; wolves do it. Maybe humans do it, too.

Just like many animals, humans may well possess a magnetic sense that influences their social interactions and behaviours. This fascinating possibility has been suggested by Dr Abraham Liboff, a research professor of physics at Oakland University in the US, writing in the October issue of the journal *Electromagnetic Biology and Medicine*.

According to Liboff, people are known to respond to magnetic fields as low as 40 Nano-tesla (0.4 mG), sometimes reacting even to the very small variations in the Earth's magnetic field. This, he says, suggests that they could react to the electromagnetic field generated by the brain of a person in their immediate vicinity.

Liboff hypothesises that, not only is the transfer of magnetic field information from one person to another entirely possible, but it could explain the bonding between members of a family. It could also explain the 'emotional contagion' of crowd behaviour often observed at sporting events, concerts and other group gatherings.

The existence of an electromagnetic sense is consistent with observations in nature. Liboff says that sharks possess *ampullae of lorenzini* which enable them to detect electric field changes. On land, magnetic fields are more effective than electric fields at carrying information and it's possible that predatory animals and their prey utilise such signals.

'The magnetic sense is merely one more addition to the well-known sensory armory that includes the visual, olfactory, touch, acoustic, and taste components,' Liboff says.

Liboff also speculates that these insights may help the understanding of electromagnetic hypersensitivity. He says, 'It is conceivable that EHS can be considered as a manifestation of sensory overload, similar to the problems encountered when any of the senses is subject to long-term gross exposure to, for example, bright lights or loud sounds.'

Liboff, AR, 'The electromagnetic basis of social interactions', *Electromagn Biol Med*, Oct 27:1-5, 2016.

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## Screens in schools

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How useful are electronic devices for children's education?

Not as useful as we've been led to believe, according to Dr Nicholas Kardaras, author of the new book, 'Glow Kids: How Screen Addiction is Hijacking Our Kids—and How to Break the Trance'.

Rather than increasing children's academic performance, technology use at school reduces it, says Dr Kardaras. He refers to various experts and expert organisations who have concluded that tech-based learning produces worse results and interferes with the development of children's motor skills and logical thinking. Moreover, it may be reducing children's likelihood of reading for pleasure which develops important skills, including critical thinking and vocabulary. It's also reducing children's attention rates, requiring them to be ever-more stimulated in order to stay focused. A Canadian study found that students prefer 'ordinary' lessons to tech-based learning.

Further, engaging in high-tech activities can actually be harmful. Kardaras says, 'students who have been raised on a high-tech diet not only appear to struggle more with attention and focus, but also seem to suffer from an adolescent malaise that appears to be a direct byproduct of their digital immersion.' He adds, that heavy tech users have been found to suffer from ADHD, screen addiction, aggression, depression, anxiety and psychosis.

Why are schools investing so heavily in digital learning, we might ask?

It's the result of successful marketing by big business who are raking in huge profits by transforming education, Kardaras suggests.

'Screens in schools are a \$50 Billion Hoax', *Time*, 31.08.16, <http://time.com/4474496/screens-schools-hoax/>

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(Continued from page 10)

in Melbourne's CBD as part of the largest free WiFi project in Australia. A map of WiFi locations can be found at: <http://www.theage.com.au/victoria/free-wifi-to-be-rolled-out-across-melbournes-cbd-20160929-grr1dq.html> (Age 29.09.16.)

### Catalyst

Premier Australian science program, 'Catalyst' is in for a shake up, with changes proposed that may herald its demise. Catalyst reporters will lose their jobs and the weekly ABC program will be replaced by 17 one-hour science specials by independent production teams—should funding permit. The changes are likely to be implemented in 2017, following a management review of the program. (*The Guardian*, 31.10.16.)

Among the reporters who will lose their jobs is Dr Maryanne Demasi, who came under intense fire for her excellent program on wireless radiation, 'Wi-Fried?' earlier this year.

### NBN: Copper rules

Australia's NBN (National Broadband Network) has been trialling the use of copper cables for delivering high speed broadband. The September trials showed that twisted-pair copper transmitted 8 Gbps of data across a distance of 30m 900 times faster than normal. The technology could potentially be used to link homes to the NBN network through existing copper wires, making it a safer alternative than wireless connections. (<http://www.gizmodo.com.au/2016/10/forget-fibre-nbn-is-just-making-copper-faster-instead/>)



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