EMR and Health

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Wireless radiation and cell chemistry

A new study shows how wireless radiation can bring about changes in the body.

We know that radiofrequency (RF/ wireless) radiation is associated with damaging effects on the body. But just how could it bring them about?

The authors of a recent study have suggested an answer and it has to do with metals, spin and chemical reactions.

They describe it like this.

'This involves a complex chain of events, starting with the physics of electromagnetic fields modifying the orientation of nuclear or electronic spins. These modifications can then influence chemical reaction rates, which in turn affect the concentrations of important signaling molecules. These molecular changes can further impact the structure of proteins and DNA, ultimately leading to health effects.'

The authors wanted to explore how wireless signals changed the chemical parameters typical of oxidative stress. Oxidative stress occurs when there are more reactive oxygen species (types of free radicals) than the body's antioxidant defence system can handle. 'Excessive ROS generation can lead to cellular damage, including lipid peroxidation, protein oxidation, and DNA damage, ultimately impacting the cellular function and contributing to the development of numerous diseases,' the authors said.

In their experiment, they exposed two strains of human cells to a range of wireless radiation frequencies and observed the effects. The cell lines they investigated were:

- fibroblast cells – found in connective tissues such and are involved in healing and
- fibrosarcoma cells – cancerous tumours of connective cells.

The researchers found that exposure caused changes in mitochondria, which they describe as 'the powerhouses of the cell', which are involved in metabolism and producing energy. Exposure caused a significant increase in the mitochondrial mass of fibrosarcoma cells but a less pronounced increase in fibroblast cells.

(Continued on page 8)

In This Issue

Publisher EMR Australia Pty Ltd
ABN 82 104 370 658
PO Box 4721,
Sylvania Waters NSW 2224
Tel: 02 9576 1772
Web: www.emraustralia.com.au

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Doctors recommend radiation-free tech

The Santa Clara County Medical Association (SSCMA) in the US has called for precautions to protect students and staff from the harmful effects of wireless technology in schools.

'[T]he SCCMA supports reducing exposures to radiofrequency radiation from wireless devices and encourages establishing safer school technology policies with regard to digital devices and infrastructure in order to promote the physical health, mental health and well-being of students and staff. Healthier children translate into healthier communities and a healthier society,' the Association says in its 'Recommendations for Best Practices for Safe Technology in Schools'. The document points out a range of problems associated with the use of wireless technologies. These include:

Effects on health
'Scientific literature indicates that the mechanisms of harm include oxidative injury to critical molecules such as DNA/lipids/ proteins, membrane disruption, blood brain barrier disruption, and mitochondrial injury with much of the resultant cellular injury occurring at non-thermal levels which are well below current standards'.

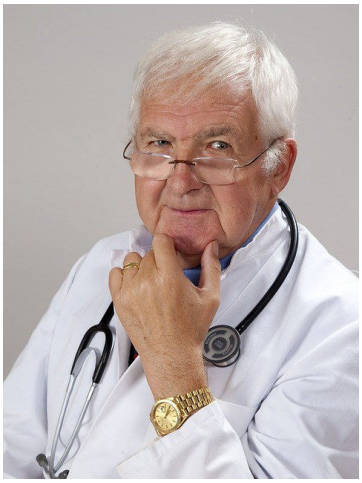
Effects on eyes
'There are also emerging scientific concerns with regards to eye damage and circadian rhythm disruption from blue light emitted from digital devices'.

Social media effects
'[T]he excessive use of digital technology and social media in children can have adverse mental health effects including internet addiction, cyberbullying, deficient social skills, depression and lack of exercise.'

Effects on privacy
Many aps require the sharing of children's personal information with third parties.

The Association recommends improving health, safety and the learning environment for students by:

- educating students and staff about the risks of wireless devices and how to reduce them
- educating the school nurse about potential health effects of radiofrequency radiation (RFR)
- developing mobile phone-free school policies
- having tech free breaks during classes
- reducing blue light from devices
- using hard-wired rather than wireless connections
- reducing RF radiation in schools
- establishing phone-free zones in schools
- 'using books instead of computers or tablets whenever possible for improved learning and less distraction'
- keeping wireless devices away from the body
- not installing smart meters on school properties
- not allowing mobile phone towers on school property.



'We have become especially concerned with the dramatic increase in the use of this technology in schools resulting in exponentially higher levels of non-ionizing radiofrequency electromagnetic radiation (EMR) emitted by these wireless devices. This results in increased long-term exposures in children who spend much of their formative years in school environments,' the SSCMA wrote. 'Recommendations for Best Practices for Safe Technology in Schools', Santa Clara County Medical Association Environmental Health Committee Feb 14, 2023.

Wireless radiation and the brain

Researchers from Korea have published a review of the science on wireless radiation and the brain and have come up with some valuable recommendations.

'Humans are swimming … in a vast ocean of different radiations in this environment, resulting in frequent exposure,' the authors wrote. This radiation is known to affect biological systems from microbes to animals and humans and how it affects them depends on the characteristics of the signal, such as frequency, power and length of exposure.

In some cases, the effects can be therapeutic, the authors pointed out. For example, some very high frequency millimetre waves (such as 101 GHz) have been used to successfully treat various diseases, including cancer.

However, in many cases, the effects can be harmful. For example, wireless radiation has been found to have harmful effects on the male reproductive system, including:

- inflammation
- testicular impairment
- sperm
- testosterone
- and DNA fragmentation.

However, it's the central nervous system (CNS) that's most affected by exposure, especially the hippocampus. 'Specifically, microwaves can damage the brain (one of the two key components of the human CNS), particularly affecting the neurotransmitters which play an important role in passing signals inside the body,' the authors wrote. 'Accordingly, microwave-induced injury to neurotransmitters can cause a delay in the signaling process, which has critical implications for body function.' Among the harmful effects on the CNS that the authors identified were:

- DNA damage
- oxidative stress
- effects on structure of hippocampus causing behavioural changes (eg anxiety)
- reduced memory and learning
- changes to calcium influx
- changed antioxidant enzymes
- and possibly CNS diseases such as Alzheimers.

While pointing out that not all radiofrequency signals are harmful, the authors nevertheless recommend that protective techniques be developed to overcome 'the potentially harmful effects of ever-increasing doses of radiation'. '[M]icrowave radiation can modulate responses in the CNS, where higher doses can produce ROS, oxidative stress, and neuroinflammation. Treatment with natural products is, thus, necessary to reduce these harmful effects, they say.

One of these is the use of flavonoids, beneficial compounds that are found in fruits and vegetables. 'Flavonoids represent one such group of plant-derived compounds displaying important radioprotective and neuroprotective properties while reducing DNA damage and inflammation within the CNS; thus, flavonoid treatment may be an important and promising therapeutic alternative for avoiding radiotherapy-induced pathophysiological alterations in the brain, as well as cognitive impairment.' It's food for thought.

Mumtaz, S.; Rana, J.N.; Choi, E.H.; Han, I. Microwave Radiation and the Brain: Mechanisms, Current Status, and Future Prospects. *Int. J. Mol. Sci.* 2022, *23*, 9288. https://doi.org/10.3390/ijms23169288

Smart phones and tumours

We've all heard about the link between mobile phone radiation and brain tumours. But can mobile phone radiation cause tumours in other parts of the body?

An interesting case study from Italy suggests that it may.

The 40-year-old man sought medical help after he developed a painful lump in a thigh muscle that grew in size over a six-month period. Doctors identified a 'spindle-shaped mass' inside the tensor fasciae latae muscle that was subsequently diagnosed as an intramuscular schwannoma.

The authors explain that '[i]ntramuscular schwannomas are benign neurogenic tumors that originate from Schwann cells, which are responsible for the formation of peripheral nervous system myelin.' They are relatively rare.

On questioning the patient, the doctors learnt that the man had kept his smart mobile phone in the left pocket of his trousers for approximately eight hours a day. This location 'intriguingly aligns with the intramuscular mass's location and the phone's SIM card position,' the authors said.

'...the man had kept his smart mobile phone in the left pocket of his trousers for approximately eight hours a day. This location 'intriguingly aligns with the intramuscular mass's location and the phone's SIM card position..'

Further, the man kept the WiFi function of his phone turned off while it was stored in his pocket. This means that the SIM card processed all transmissions – data, emails, messages, social media and calls.

The authors of the study were circumspect about their observations. 'While we cannot conclusively link the patient's intramuscular schwannoma to his practice of storing his smartphone in that specific location, we hypothesize that this habitual placement could potentially have served as a risk or contributing factor.'

They pointed out that the International Agency for Research on Cancer classified radiofrequency radiation, emitted by mobile phones, as a Class 2B (possible) carcinogen and referred to studies showing that mobile phone radiation has been linked with reduced sperm quality.

They say that 'it is of utmost importance to investigate smartphone carrying habits and explore potential associations with neoplasms or other health issues related to RFR'.

Where do you keep your smart phone?

Piercarlo Minoretti, Abdelilah Lahmar, Enzo Emanuele, 'Where is your smartphone? An unusual mass within the tensor fasciae latae muscle,' Radiology Case Reports, Volume 18, Issue 11, 2023, Pages 3984-3987, ISSN 1930-0433, https://doi.org/10.1016/j.radcr.2023.08.079.

https://www.sciencedirect.com/science/article/pii/S1930043323005927

You can read what 'Microwave News' says about this study here.

Calling on the EU

The European Union has an obligation to protect the population. But it's not fulfilling it when it comes to electromagnetic radiation, say scientists. In a review published recently, the authors ask why the EU is ignoring scientists, medical practitioners and thousands of peer-reviewed studies in favour of science that has been shown to be outdated and flawed.

Since 2017 seven appeals, endorsed by scientists and medical doctors, have been sent to the EU urging them to protect humans and the environment from exposure to wireless radiation. Yet no adequate response has been forthcoming. 'Since 2017, the world has not seen any evidence of the EU prioritizing human health protection over economics,' the authors say.

Instead, the EU continues to rely on radiation guidelines produced by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which are widely recognised as being flawed. Among the problems with the ICNIRP Guidelines, the authors note that:

- they only address the heating (thermal) effects of exposure but studies show many harmful effects on the body not caused by heating
- they are based on flawed assumptions
- courts have recognised that exposure caused harm at levels that comply with ICNIRP's Guidelines
- they don't address the complex combinations of signals present in real-world exposures
- they only consider exposures averaged out over 6 or *30* minutes in a mould of a plastic (adult male) head.

'ICNIRP exposure guidelines are a million times too high to protect children and our most vulnerable. By following the ICNIRP guidelines, the EU has effectively prioritized economics [over health],' the authors write. Further, the authors point to the limitations of the committee that developed them.

'ICNIRP is a self-selected, industry supportive body comprised of only 14 persons with limited biophysics or medical training, and no industry-independent views. Its members elect like-minded colleagues ensuring the perpetuation of the wireless industry's need for maximum exposure.'

Not only does the use of wireless technologies affect human and animal health, but the authors point out that it uses huge amounts of electricity, which impacts on the environment. '…one Google search uses as much electricity as a lightbulb left on for 35 min,' they explain. Moreover, there are better alternatives to wireless technology, such as Passive Optical Networks (which are faster and use less energy) and wired technologies.

'As a result of the increased consumption of energy, the harm to people and the environment, and the potential misuse of data, we consider current EU policy to grossly infringe EU primary law and citizens' and children's fundamental rights,' the authors say. 'The EU's current course of action is in direct conflict with the foundations on which the EU was built. By maintaining its course to support the industry-led rollout of 5G, 6G and smart meters, the EU is violating the EU Convention on Human Rights, the EU Charter of Fundamental Rights, the EU Treaty, and EU Case law, which all agree that: The protection of health and the environment takes precedence over economic considerations.'

Australia's Dr Julie McCredden, one of the authors of the paper, is concerned that many governments, including Australia's, are 'following the EU example, prioritising economic interests over human and planetary health. This means that everyday citizens are not being warned about the potential harm to themselves and their children.' This has important implications for the users of wireless technologies. Dr McCredden says, 'people need to educate themselves on how to use healthy practices with their devices and how to take protective measures for their children.

Nyberg, Rainer, McCredden, Julie and Hardell, Lennart. "The European Union assessments of radiofrequency radiation health risks – another hard nut to crack (Review)" Reviews on Environmental Health, 2023. https://doi.org/10.1515/reveh-

Scientists weigh in on Italy's radiation standard

Scientists from around the globe have appealed to the Italian Government not to increase the exposure limits in its radiation standard.

'The news that the Government is considering the possibility of increasing the attention value by 6 V/m for the living areas where people stay more than 4 hours is the cause for great concern,' the scientists wrote in their 'Appeal of the Scientists for Electromagnetic Safety', sent 4 August 2023.

Associate Professor Olle Johansson, one of the signatories to the Appeal, said that 'the so-called natural background may be regarded as a (relatively) safe exposure level, and 6 V/m (at 1,800 MHz) is still 10,000,000 times (or more!) that level'.

The Appeal has so far been signed by 68 scientists working in the field, whose extensive publications are listed in the document, as well as biologists, physicists, engineers and medical practitioners. The Appeal states that 'Radiofrequency has been associated with several health problems including:

- cancer (RF was classified by IARC as a "possibly carcinogenic for Man" in 2011, but subsequent studies concluded that radiofrequency falls within the parameters of Class 2A,1 that is to say "probable carcinogen", and of Class 1 that is to say "certain carcinogen");
- neurodegenerative diseases, such as Alzheimer's;
- male and female infertility;
- increased oxidative stress (related to many chronic diseases);
- neurobehavioral changes in children born to mothers who used the mobile phone in pregnancy;
- immune dysfunction;
- alterations of insulin metabolism;
- increased cerebral permeability and alterations of cerebral metabolism.'

'We are already paying for the social and health costs of having released into the environment levels of artificial radiofrequency radiation which are not entirely compatible with life. A further increase of the exposure to radiofrequency in the population is ethically unacceptable and not even economically viable,' the Appeal states. 'Rather, measures are needed to protect public health and the environment. Plants and animals, in fact, are affected by the chronic exposure to radiofrequency, with significant damages mostly to birds and bees populations.'

The Appeal points out serious deficiencies in the international limits recommended by ICNIRP (International Commission on Non Ionizing Radiation Protection), on which Australia's radiation standard is based.

- '[T]hey only protect against acute thermal effects for high-intensity and short-term exposure duration (30 minutes);
- they are not applicable to long-term and low-intensity exposures, such as it actually occurs in everyday life contexts;
- they are based on outdated information;
- they do not protect against the 5G radiation, which has strong characteristics of polarization, and it is very different from previous generations of mobile telephony, so they would require further studies.'

The Appeal requests that, rather than increasing exposure limits, the government decreases them to 0.6 V/m, as recommended by the Council of Europe. It also asks the government to introduce legislation that requires experts expressing their views in public to declare their links with industry.

After receiving the Appeal, the Government cancelled a planned discussion about increasing the country's radiation limits. However, it is expected to defer discussion to a future date. The Appeal can be seen in full here.

Kids at risk?

Last year scientists published a study claiming that young people's mobile phone use did not increase their risks of brain tumours but new evidence shows that that's not necessarily true.

In a paper published in September, Drs Lennart Hardell and Joel M Moskowitz analysed the MOBI-Kids study that was published in 2022 and concluded that the results it reported can't be relied upon.

The MOBI-kids study reported no increased risk of brain tumours overall and published data suggesting that mobile phone use actually gave a slightly protective effect against brain tumours.

However, Hardell and Moskowitz say that 'The MOBI-Kids results are not biologically plausible and indicate that the study was flawed.'

Among their criticisms of the paper were that:

- the authors failed to consider brain tumours in some (middle brain) locations
- the authors included some mobile phone users in the unexposed group
- there were opportunities for bias
- four authors had conflicts of interest that were not declared.

'In our opinion, the results as reported in the MOBI-Kids paper seem uninterpretable and should be dismissed,' the authors wrote.

They recommended that the data for this study should be made publicly available so that it can be properly analysed in the future.

Hardell, Lennart and Moskowitz, Joel M. "A critical analysis of the MOBI-Kids study of wireless phone use in childhood and adolescence and brain tumor risk" Reviews on Environmental Health, vol. 38, no. 3, 2023, pp. 409-421. https://doi.org/10.1515/reveh-2022-0040

iPhones woes

Apple's iPhones have been the subject of some HOT debate recently.

In September, the French government banned sales of the iPhone 12 after testing showed that it emitted higher levels than allowed by the country's radiation standard when tested close to the body.

Not all countries test mobile phones in this way.

Subsequently, the Wall Street Journal published an article claiming that users of the iPhone 15 are experiencing problems with overheating. 'The new iPhone 15 Pro may be too hot for some to handle. Literally.' the headline says.

https://www.reuters.com/technology/why-has-france-banned-sales-apples-iphone-12-2023-09-13/ ; https://www.wsj.com/tech/personal-tech/apple-new-iphone-15-overheat-dbd5171a

(Continued from page 1)

They also found changes in cell growth, which is a sign of cell health and functionality. Effects differed at different frequencies.

'These findings underscore the impact of RF fields on oxidative stress, mitochondrial mass, and cell growth rates in both fibrosarcoma and fibroblast cells,' the authors said.

These findings help to paint a picture of just how wireless radiation could be affecting the human body.

'This research advances the argument that metalloproteins within the electron transport chain of mitochondria play a crucial role in interacting with externally applied static and RF magnetic fields. These electron transport proteins contain transition metal ions, such as iron. Iron and other ferromagnetic materials have the ability to generate and maintain a magnetic field. Due to the presence of unpaired electrons, these metal ions possess a magnetic moment. Unpaired electrons maintain a magnetic moment approximately 600-fold greater than the magnetic moment of a proton. The higher the number of unpaired electrons in an atom, the greater the potential for these electrons to align their spins with externally applied magnetic fields. In particular, the presence of unpaired electrons within iron sulphur clusters, with their hyperfine resonances ranging from 1 MHz to 10 MHz, makes them viable candidates for interacting with externally applied RF fields.'

The study has important implications for a society in the grip of wireless-device addiction.

'By unraveling the intricate mechanisms underlying these effects, we can enhance our understanding of the potential risks associated with RF fields and explore strategies to mitigate their adverse consequences on cellular health,' the authors concluded.

Gurhan, H.; Bajtoš, M.; Barnes, F.Weak Radiofrequency Field Effects on Chemical Parameters That Characterize Oxidative Stress in Human Fibrosarcoma and Fibroblast Cells. Biomolecules 2023, 13, 1112. https://doi.org/10.3390/biom13071112

More powerlines for Australia

The Australian Energy Market Operator has said more than 10,000km of new transmission lines are needed to meet our renewable energy targets. This means new transmission towers across regional Australia.

Magnetic from powerlines have been associated with increased rates of childhood leukemia in a number of peer-reviewed studies.

You can see a *Cosmos Country* podcast discussing some of the issues here.

'metalloproteins within the electron transport chain of mitochondria play a crucial role in interacting with externally applied static and RF magnetic fields'