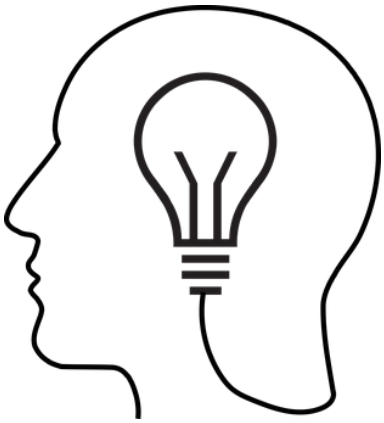
EMR and Health

Report on electromagnetic radiation, health and well-being Vol 18 No 1 Feb 2022

New insights: the problem field



Important new research from Greece shows how electromagnetic fields damage the body

A new study by Dr Dimitris J. Panagopoulos sheds light on how electromagnetic fields (EMFs) affect health and raises questions about whether researchers have been looking for answers in the right places all this time.

We are surrounded by electromagnetic fields from an increasing range of devices. These include the low-frequency electric and magnetic fields—also called ELF (extremely-low frequency) fields—emitted by powerlines, substations, wiring, meter boxes, appliances and so on. They also include the high-frequency fields – also known as radiofrequency (RF) radiation – from mobile phones, phone towers, modems, tablets, and other communications devices

However, keep in mind that all wireless communication high-frequency fields include low frequency fields as well.

Decades of research show that exposure to both these fields is associated with health problems and the International Agency for Research on Cancer (IARC) has classified both as Class 2B (possible) carcinogens. Low-frequency fields have been particularly linked with childhood leukemia. High-frequency fields have been linked with brain tumours and skin cancer. Both have been linked with cancer, genetic damage, infertility and symptoms, such as headaches, fatigue, sleep problems, often known as electromagnetic hypersensitivity.

It is not only humans that are affected by exposure. Studies have found effects on animals (mammals, birds, insects) as well.

In the paper, Dr Panagopoulos, a biophysicist from the National Centre for Scientific Research in Athens, and his team reveal how these effects occur.

The authors say that the extensive research on EMFs 'point towards the same direction, ie, that human-made EMF exposure causes OS [oxidative stress] and DNA damage that may lead to cancer, reproductive declines and related diseases.' As well as cancer, DNA damage can cause neurodegenerative

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In This Issue

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The Nordic Appeal

On 16 December 2021, eleven organisation from four Nordic countries issued a joint appeal—the Nordic Appeal—calling for protection from the harmful effects of electromagnetic radiation. The Appeal states:

In recent years, human exposure to pulsed microwave radiation from wireless technology has increased exponentially. The increase is mainly a result of the expansion of 4G + and 5G as well as an increased amount of consumer products based on technology that emits microwave radiation. In addition to more base stations, millions of so-called smart electricity meters are being installed, which also contribute to the overall increase in microwave radiation in our outdoor and indoor environment.

In parallel with this exploding radiation exposure, regulations and so-called safety limits applicable to the permitted radiation are based on a severely outdated approach from the 1950s. These 'safety limits' (or guidelines) only protect people against harmful effects that occur as a result of acute heating. This means that humans are completely unprotected against a whole range of harmful effects, such as cancer, DNA damage, oxidative stress and neurological effects, which scientific research has repeatedly shown to occur at levels well below these safety limits. Current safety limits give no protection at all against harmful effects of radiation on biodiversity.

We represent organizations that have been involved in research and /or followed the research in this field for many years. We constantly receive new testimonies from people who have suffered from ill health after base stations for 4G, 5G or smart electricity meters have been installed in their immediate environment. We are deeply concerned about these developments and demand that the following measures be taken as soon as possible:

1 New safety limits must be established that protect against the evident health and environmental risks at levels that are far below current guidelines. This must be done by experts who are free from any ties to the industry concerned, and with participation by researchers within the research community, who consider the risks to be considerable even at levels well below the current guidelines.

2 Before further deployment, a risk assessment of 5G systems must be carried out, also in this instance by experts who are free from ties to the industry concerned, and with participation by researchers within the research community who point to evidence that the risks are considerable.

3 To prevent injuries, education about the risks must be carried out at all levels of society, for example in healthcare, schools, and the general public.

4 The best possible technology should be used to protect human health and the environment. Wired technology that minimizes harmful radiation must be a priority.

Background— Measurements show massively increased radiation

Measurements carried out in the spring of 2021 … showed that radiation in cities has increased sharply with peak values (pulses) that can amount to between 200,000 and over 1 million microwatts per square meter. These are levels that far exceed the levels that have been known already for 50 years to cause harmful effects on human health, which was initially called the microwave syndrome. At the same time, there is a lack of research that shows that these levels do not cause ill health ...

Abundant evidence of harmful effects

The ongoing massive increase in human exposure to microwave radiation from wireless technology is expected to lead to serious consequences in the form of deteriorating public health and harmful effects on plants, insects, birds and other animals. Research shows increasing and clear evidence that this radiation is harmful both to humans and to

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diseases such as Alzheimer's and Parkinson's, autoimmune problems and aging. It can also lead to mutations in offspring.

Significantly, this damage occurs at levels of exposure significantly below those permitted by Australian and international standards.

Panagopoulos and his team were interested to find out just how EMFs cause this damage. 'There must be a unique property of the human-made EMFs that makes them capable of inducing adverse biological/health effects and ionization, in contrast to natural infrared and visible light,' they said.

Their findings show that these fields are polarized and coherent and that polarization/coherence allows them to exert parallel and coherent forces on electrically charged molecules in the body. And change their behaviour.

'This evidence shows that ELF electric fields penetrate enough to induce effects into living tissue, even at very low field intensities '

Some of these electrically charged molecules include the voltage gated channels that allow calcium, sodium, potassium and other critically important ions to pass through the cell membranes in or out of the cells. You can think of these channels as boom gates that allow certain vehicles to pass. If there's a problem with the way it operates, some cars and trucks will pass and others won't, potentially creating traffic problems or food shortages downstream.

Similarly, if there is a problem with the passage of sodium, calcium or potassium through these channels, there will be biological problems within our cells and bodies. This can include the oxidative stress and DNA damage, as discussed earlier, and other biological damage as well.

Importantly, the authors say that they have identified the field that causes this damage. The culprit, they say, is the low-frequency electric field. '…it is the direct ELF electric fields …, not the magnetic, neither the radiofrequency fields themselves that are the bioactive components, in contrast to what has been considered before by health agencies.'

'This evidence shows that ELF electric fields penetrate enough to induce effects into living tissue, even at very low field intensities,' the paper says.

Yet the low frequency electric field has been ignored in most research. It is the low-frequency magnetic fields and the radiofrequency fields that have generally been measured in epidemiological studies.

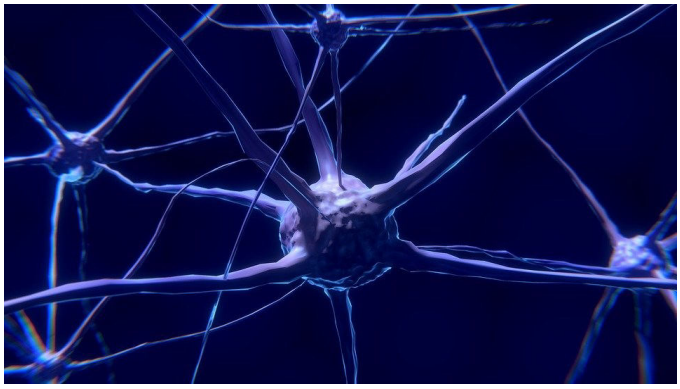
Low-frequency electric fields are emitted by wiring and electrical equipment, as we saw earlier. They are also present with radiofrequency signals because ELF signals can exist as part of the modulated transmission. In other words, the electric fields are the part of the signal that carry the information to be transmitted.

'To the best of our knowledge, the present study provides for the first time a complete and precise biophysical/biochemical picture to explain the great number of experimental and epidemiological findings connecting human-made EMF exposure with DNA damage and related pathologies such as cancer, infertility, and neurodegenerative diseases,' the paper concludes.

The study has great importance for our understanding and measurement of electromagnetic fields in the future.

Panagopoulos DJ, Karabarbounis A, Yakymenko I, and Chrousos GP: 'Human□made electromagnetic fields: Ion forced□oscillation and voltage□gated ion channel dysfunction, oxidative stress and DNA damage (Review)'. Int J Oncol 59: 92, 2021; https://www.spandidos-publications.com/ijo/59/5/92

Mobile phones and the brain



Mobile phone radiation affects the brain and has been linked with memory loss, attention problems, cognitive and learning difficulties, irritability, sleep problems, stress, seizures, emotional and behavioural problems, inattention and fatigue.

But just how are these problems caused?

To answer this question, researchers from China investigated the effects of radiation on neurons of the hippocampus—the part of the brain that relates to memory and learning. They did this by exposing hippocampal neurons from rats to a mobile phone signal of 1800 MHz for 24, 48 or 72 hours.

They found that neurons exposed for 48 hours had changes in neurite outgrowth. This is the process in which neurons produce new projections as they grow and is important for developing new networks of neurons in childhood or after disease or trauma. Unusual neurite outgrowth can cause neurodegenerative diseases. The exposed cells had changes to the length and number of branches of neurons.

The researchers also found changes to a protein called Rap1 which is important for cell proliferation, differentiation, migration, signalling and survival.

They postulated that exposure reduced the activity of this protein, causing downstream changes that impaired neurite outgrowth and thus caused changes to the function of the hippocampus.

'Due to the developmental sensitivity of infants and adolescents, the neuronal impairment induced by 1800 MHz RF-EMR [radiofrequency electromagnetic radiation] can interrupt programmatic neural development and cause abnormal neuronal behavior and diseases.' The authors said. 'The influence of RF-EMR exposure on the developing brain requires greater attention.'

Li Yanqi et al, '1,800 MHz Radiofrequency Electromagnetic Irradiation Impairs Neurite Outgrowth With a Decrease in Rap1-GTP in Primary Mouse Hippocampal Neurons and Neuro2a Cells', Frontiers in Public Health, Vol 9, 2021, https://www.frontiersin.org/article/10.3389/fpubh.2021.771508

Electromagnetic fields and the gut

Do electromagnetic fields affect the gastrointestinal system?

To answer that question, researchers from Poland conducted a small study in which they exposed 40 rats to either power-frequency or mobile phone radiation or both for a month.

They found that rats exposed to the power-frequency fields had the highest concentration of prooxidants—that is, chemicals that cause oxidative stress—in the salivary glands, oesophagus and small intestines.

',,,electromagnetic fields of a low-frequency caused the most significant disturbances of oxidative stress in the rat gastrointestinal tract. Chronic exposure to such electromagnetic fields should be listed as a potential risk factor for gastrointestinal tract pathologies,' the authors wrote.

Sieroń K, Knapik K, Onik G, Romuk E, Birkner E, Kwiatek S, Sieroń A. Electromagnetic Fields Modify Redox Balance in the Rat Gastrointestinal Tract. Front Public Health. 2021 Sep 13;9:710484. doi: 10.3389/fpubh.2021.710484. PMID: 34589462; PMCID: PMC8473753; https://www.frontiersin.org/articles/10.3389/fpubh.2021.710484/full

Magnetic fields and the brain

Electromagnetic fields are known to cause oxidative stress and oxidative stress can be harmful to the brain.

To explore this connection, Iranian researchers exposed rats to a 50Hz field for four hours a day for 60 days and investigated the effects on the substantia nigra in the brain.

They found that exposure caused an increase in malondialdehyde—which indicates oxidative stress—and a decrease in superoxide dismutase—which reduces oxidative stress. They also found changes in cell membranes, cell nuclei and the myelin sheath of the substantia nigra cells.

They also found that vitamin E, which is a potent antioxidant, could counteract this damage. They observed that exposed rats who were given vitamin E had far less signs of the observed signs of neural damage.

Shabani Z, Mohammad Nejad D, Ghadiri T, Karimipour M. Evaluation of the neuroprotective effects of Vitamin E on the rat substantia nigra neural cells exposed to electromagnetic field: An ultrastructural study. Electromagn Biol Med. 2021 Jul 3;40 (3):428-437. doi: 10.1080/15368378.2021.1907404. Epub 2021 Apr 2. PMID: 33794719; https://www.tandfonline.com/doi/abs/10.1080/15368378.2021.1907404?journalCode=iebm20

Mobile phone radiation and the brain

It's not just vitamins that can protect against electromagnetic fields.

In a study from Turkey, researchers exposed groups of pregnant rats to mobile phone radiation of 900 MHz for an hour a day for 21 days. Three groups of the rats were given antioxidant herbs—Garcinia kola, Momordica charantia or thymoquinone—while the fourth received no supplementation.

Four weeks after the rats gave birth, their pups were examined to determine the effects of the prenatal exposures.

The researchers found that the brains of exposed pups had less pyramidal neurons– thought to be important for cognition.

They also found that supplementing the diet with all three herbs reduced the damaging effects of exposure, with greatest benefits being from supplementation with Momordica charantia.

Ömür Gülsüm Deniz and Süleyman Kaplan, 'The effects of different herbals on the rat hippocampus exposed to electromagnetic field for one hour during the prenatal period,' Journal of Chemical Neuroanatomy, Volume 119, Jan 2022, 102043, https://doi.org/10.1016/j.jchemneu.2021.

Digital devices and eye problems

Children who spend long periods of time on digital devices may be at risk of eye damage, according to a study published recently in *Optometry and Vision Science.*

Investigators from Turkey studies 200 healthy children aged 10 to 18 years. They correlated the amount of time they spent on digital devices with their ocular health.

They found that over 65 percent of the children had 'mild-to-severe' ocular surface symptoms—ie damage to the surface of the eye. This can result in pain, redness and poor vision.

Kazancı, Burcu MD; Eroglu, Fatma Corak MD The Effects of Daily Digital Device Use on the Ocular Surface in Healthy Children, Optometry and Vision Science: December 9, 2021 - Volume - Issue - doi: 10.1097/OPX.0000000000001840; https://journals.lww.com/optvissci/Abstract/9000/The_Effects_of_Daily_Digital_Device_Use_on_the.97857.aspx

Smartphones & the pandemic

What does the Covid-19 pandemic have to do with people's use of smart phones?

Perhaps you've guessed. Not only did people's use of smart phones increase during covid lockdowns, but so did their problematic use of smart phones.

New research from Germany shows a link between people's problematic smart phone use during the pandemic and low sense of control, fear of missing out and repetitive negative thinking.

The research was conducted by Julia Brailovskala from the Mental Health Research and Treatment Center at Ruhr University. She and her colleagues conducted an online survey of 516 smart phone users aged 18 and over during April and May of 2021. The results were published in December.

The study found that problematic smart phone use was strongly linked to a low sense of control and fear of missing out. They wrote, '...individuals who experience loss of control of important life events could be at risk for enhanced levels of FoMO [fear of missing out]. To reduce this negative emotional state, they could consequently engage with their smartphones. The gratification experienced by this behavior could contribute to habit formation of prolonged smartphone use. In the longer-term, this might foster impulsive use and the development of PSU [problematic smartphone use].'

The good news is that this pattern can be changed. The study found that people who engaged in meaningful leisure activities, including sport, during the pandemic had a greater sense of control and this resulted in a lower fear of missing out and less problematic smartphone use.

The study also found a link between problematic smartphone use and repetitive negative thinking. The authors suggested that 'worry and rumination … could foster the negative mood and thoughts involved with FoMO [fear of missing out], and therefore contribute to PSE [problematic smartphone use].

To counteract the pattern of repetitive negative thinking, the authors suggested the practice of mindfulness—paying attention to the present moment. They pointed out that previous research showed that 'mindfulness can contribute to the reduction of the negative impact of intensive social media use on mental health and on work performance, and it can also reduce problematic social media use.'

The research casts light on how smart phone users can better engage with mobile phone technology.

'Thus, activities—for instance physical and mindfulness exercises … - that allow positive experiences in the offline world and thus contribute to the increase of sense of control, reduction of RNT and FoMO might foster less PSU.'

'From low sense of control to problematic smartphone use severity during Covid-19 outbreak: The mediating role of fear of missing out and the moderating role of repetitive negative thinking', PLoS ONE, Dec 22, 2021, http://dx.doi.org/10.1371/journal.pone.0261023, https://www.eurekalert.org/news-releases/938098

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other biological life at levels that are far below the levels approved by the responsible Nordic authorities. The radiation is pulsed, which is especially serious with regard to negative biological effects.

As early as 2011, the WHO's cancer research institute IARC classified microwave radiation/radio frequency radiation as "possibly carcinogenic", Group 2B, for humans, based on research that had repeatedly shown increased risk of tumours in the brain and auditory nerves among people with long-term use of cordless/cellular phones...

Since 2011, the evidence that this radiation causes and promotes cancer development has increased. Research on cells, animals and humans today clearly shows that radiation increases the risk of cancer in humans, not only brain tumours but also other types.

A Swiss government expert group has found that the majority of research shows that radiation causes oxidative stress, which in turn can cause various diseases. Consequently, a new evaluation at the IARC would most likely tighten the classification and lead to the radiation being judged to be "probably carcinogenic to humans", Group 2A, or "carcinogenic to humans" Group 1, if it is done by independent experts.

A research inquiry under the European Parliament has found that radiation from 5G and other wireless technologies can cause cancer, and that this radiation damages men's fertility and possibly also women's reproductive ability. An investigation by The National Academies of Sciences in the USA concludes that pulsed microwaves have caused a large number of diplomats' ill health and corresponds to the symptoms that have been reported for 50 years as a result of exposure to microwave radiation.

Research shows that microwave radiation can damage foetal development, the thyroid gland and other hormone-regulating organs, the eye and impairs mental and physical health in general. Statistics from the Nordic countries show that diseases linked to the observed ailments increase, in some cases very sharply, such as mental illness, sleep disturbances or insomnia, certain cancers, eye diseases and degenerative neurological diseases.

Medical doctors, researchers and elected officials have appealed for better protection

In 2017, the 5G Appeal was launched (www.5Gappeal.eu). The appeal, which is currently signed by more than 400 doctors and scientists from around the world, demand that decision-makers stop the 5G expansion until potential hazards for human health and the environment have been fully investigated by scientists independent from industry, due to the risk of serious consequences for human health.

The EMF Scientist Appeal was launched in 2015 (www.emfscientist.org), and is today signed by 255 scientists, all of whom are active in the field. They demand that people must be better protected against risks from this form of radiation exposure by strengthening the current guidelines for permitted radiation and that the general public and the medical profession, particularly doctors, should be informed about the risks.

In 2011, the Parliamentary Assembly of the Council of Europe recommended that member states should strive to generally keep the microwave radiation levels in socie-

(Continued on page 8)

Mobile phone protection

Wavewall mobile phone cases protect the head , body and the phone

Airtube headsets—no wire to conduct radiation into the head

''the majority of research shows that radiation causes oxidative stress, which in turn can cause various diseases

US legal action

Community organisation is the United States have embarked on new legal action demanding accountability from two government agencies.

In the first, the Environmental Health Trust, has called on the Federal Communications Commission (FCC) to promptly respond to last year's court order to re-examine the evidence regarding its 25-year-old wireless radiation safety limits. The new filing by Environmental Health Trust on November 30, 2021 requests the FCC re-open its official proceedings to allow the submission of new scientific research studies on the official record.

'We can no longer rely on 25-year-old science for today's technology. Our nation cannot take a shortcut when it comes to public and environmental health. Now is the time for our nation's regulatory bodies to ensure safety standards are based on the latest research, said Dr Linda Birnbaum former director of the National Institute of Environmental Science and the National Toxicology Program.

In the second action, Americans for Responsible Technology, Consumers for Safe Cell Phones, and others, petitioned the U.S. Department of Health and Human Services to correct the false safety assurances made by the Food and Drug Administration (FDA) about wireless safety standards.

https://ehtrust.org/experts-call-on-fcc-to-promptly-review-the-most-recent-science-on-wireless-radiation-to-ensure-protective-safety-limits/

(Continued from page 7)

ty as low as possible, as well as to lower the safety limits for permissible radiation to 100 microwatts per square meter. Children and others particularly vulnerable groups should be especially protected. Governments are also urged to ensure that the public is widely informed about the known risks.

The authorities ignore the risks and the need for better protection

The responsible authorities continue to ignore the increasingly clear evidence of risks, despite the research and the repeated appeals from the qualified research community, the medical profession as well as elected representatives. They even claim that the risks shown do not exist and that the current, severely outdated safety limits, are sufficient as protection. In support of their positions, the authorities rely on a small group of experts, who are not representative of the scientific community at large, and the majority of whom are shown to have ties to the telecommunications companies.

https://www.stralskyddsstiftelsen.se/2021/12/16/nordic-appeal-from-11-ngos-calling-for-better-protection-against-wireless-technology/

'Now is the time for our nation's regulatory bodies to ensure safety standards are based on the latest research'