

EMF Dangers: “The Evidence Today Is Overwhelming And Indisputable”

Interview with EMF-biophysicist Dr. Dimitris J. Panagopoulos

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Years after writing “The Non-Tinfoil Guide to EMFs”, where I argued that our current use of human-made EMFs (cell phones, Wi-Fi, Bluetooth, cell towers, etc.) is reckless, irresponsible and one of the very likely root causes of the modern epidemic of chronic disease... I still find myself regularly arguing with “skeptics” who tell me that:

- There are no credible scientific studies showing that human-made EMFs cause harm
- Anyone who argues that EMFs might be dangerous should wear a tinfoil hat and is delusional or paranoid
- There are *zero* known mechanisms that could explain how “low levels” of EMFs can cause harm
- Human-made EMFs from phones, Wi-Fi or Bluetooth gadgets are “non-ionizing”, and therefore cannot possibly damage your DNA or cause any kind of harm
- Sunshine exposes you to an incredible amount of radiation, which demonstrates that cell phones could not possibly harm you at such low levels of power

I see one form or another of the arguments above being used by PhDs in physics, medical doctors, professional “skeptics”, science writers, and of course, electrical engineers.

Instead of arguing with them – Hey, I’m just a citizen journalist trying my best to figure things out after all! – I decided to ask one of the most recognized scientists in the field of the biological and health effects of EMFs what *he* thinks.

Are human-made EMFs safe or dangerous? Are there mechanisms that could explain EMF damage? Have I lost my mind? Was Elon Musk right after all?

I sent several questions to **EMF-biophysicist Dr. Dimitris J. Panagopoulos**. Here’s what he had to say.

EMF-biophysicist Dr. Dimitris J. Panagopoulos works at the Choremeion Research Laboratory, Medical School, National Kapodistrian University of Athens, Greece. His experiments were among the first that showed damaging effects of microwaves and other types of man-made EMFs on DNA and reproduction. His theory on the biophysical mechanism of action of EMFs on cells also known as “ion forced-oscillation mechanism” is considered the most plausible. He has explained why man-made polarized EMFs are much more damaging than natural unpolarized EMFs, and why highly varying Real exposures from mobile phones and other microwave devices are much more damaging than simulated exposures with invariable parameters.¹

Definitions:

- WC: Wireless Communication (mobile/smart phones, Wi-Fi, Bluetooth, cell towers, etc.)

- EMFs: Electromagnetic Fields
- RF: Radio-Frequency radiation (mobile/smart phones, Wi-Fi, Bluetooth, cell towers, etc.)
- VGICs: Voltage-Gated Ion Channels
- mV: Millivolts
- ROS: Reactive Oxygen Species
- OS: Oxidative Stress
- EHS: Electro-hypersensitivity
- AC: Alternating Current
- Anthropogenic EMFs: Human-made electromagnetic fields (including Wireless Communication, but also other types like dirty electricity, AC electric fields, AC magnetic fields, power line electric and magnetic fields, etc.)
- MT: Mobile Telephony (mobile/“smart” phones)
- km: Kilometers

1) Your recent paper “Mobile telephony radiation exerts genotoxic action and significantly enhances the effects of gamma radiation in human cells” showed that radiofrequency radiation enhanced the genotoxic action of gamma radiation.

Considering that planes are now filled with Wi-Fi (radiofrequency) emissions, what are the implications of this study on pilots or flight attendants, or passengers?

The experiments described in this paper showed that wireless communication (WC) electromagnetic fields (EMFs)/radiation act synergistically with ionizing (gamma) radiation. Similarly, previous experiments (Panagopoulos 2020)³ have shown that they also act synergistically with caffeine. **This means that combined exposure to various stressors induces significantly more biological damage than the exposure to the separate stressors.**

And, in fact, more than that: The combined exposure in both cases (with gamma or caffeine) induced more aberrations than the sum of the aberrations induced by the separate exposures. Today, people are exposed daily not only to WC EMFs, but also to a variety of other stressors like chemicals, pharmaceuticals, psychological stress, etc.

On airplanes during flights, people are exposed to increased levels of ionizing radiation of cosmic and solar origin. Every form of ionizing radiation is significantly more genotoxic and carcinogenic than man-made EMFs. The use of “smart” phones, tablets, and other devices connecting wirelessly to the Internet during flights makes all people exposed in the plane even more vulnerable to the increased ionizing radiation.

Moreover, the electromagnetic radiation from the WC devices gets trapped and increased within the metallic cage of the plane which acts like a “Faraday cage” exposing every passenger and crew member to significant EMF levels. **If authorities were to protect public health, the use of WC devices should be strictly prohibited not only in airplanes but also in all public transport vehicles (trains, buses, etc.).**

I should also say that all types of WC EMFs (from mobile/cordless phones, Wi-Fi, etc.) are not simply radiofrequency (RF) emissions. They consist of modulated RF (300 kHz-300 GHz) EMFs emitted in the form of on/off pulses repeated at various Extremely Low Frequency (ELF: 0-3000 Hz) rates, and displaying intense variability in intensity, frequency and other parameters, mainly in the Ultra Low Frequency (0-3 Hz) band. In other words they are a combination of high and low (RF/ELF/ULF) frequency emissions.

2) It has been claimed recently that “power level is irrelevant” when it comes to the biological effects of man-made electromagnetic radiation.

The argument included, for example, the idea that “It takes little or no power to interfere with life” and that “low power can be more harmful than high power”.

Do you agree with these statements?

No, I do not agree.

The effects of all anthropogenic EMFs, including WC, are dose-dependent and increasing with increasing power density (intensity) levels in the vast majority of the cases. **But they are not always increasing linearly (doubling the exposure level does not necessarily double the effect).** Occasionally, so-called “window” effects have been reported in the literature – where an effect can become maximal within certain values of the exposure parameters and be diminished for both lower and higher values. Several scientists including myself have reported such effects (Panagopoulos et al. 2010).⁴

The “window” effects are due to the fact that living tissue does not always respond linearly to an applied stressor/EMF. For example, the voltage-gated ion channels (VGICs) which are the natural EMF-sensors in all animal and plant cell membranes do not respond to any voltage change in the membrane, but only to membrane voltage changes of approximately between 30 and 100 millivolts (mV).

For greater voltage changes, the ion flow through the channel saturates. This is an energy saving mechanism which acts as a natural protection for the cell. I have argued that the explanation behind the “window” effects reported for a long time in the literature is actually the existence of this corresponding window (30-100 mV) in the gating (opening/closing) of the VGICs (Panagopoulos et al 2021)⁵, and possibly also other biological “windows” or resonance phenomena that have not been yet discovered or are not yet understood.

In conclusion, the existence of non-linear effects in biology is a fact, but this does not justify statements that the power level is irrelevant.

If the power level was irrelevant, that would mean that whether you are exposed to a cellular base station antenna at a distance of 1 kilometer (km) or at a few meters would make no difference. That would also mean that keeping a mobile phone at a distance by using the speakerphone function or air-tube headsets during calls makes no difference compared to using the mobile phone close to the head/body, which is a totally misleading and dangerous idea.

That also would justify the current absence of any precaution in the use of WC devices, and the current practice of installing antennas anywhere close to houses and workplaces without keeping a safe distance of at least several hundred meters – depending on the emitting power.

3) In 2021, you published a landmark paper⁶ where you demonstrated to have arrived at a “complete picture [...] of how human-made EMF exposure may indeed lead to DNA damage and related pathologies, including cancer.”

Can you please explain, in layman terms, how these human-made EMF exposures (including WC/wireless communications) impact human cells?

This paper addresses the biophysical mechanism of action of EMFs on cells. It explains how polarized and coherent (human-made) EMFs, including WC EMFs, can cause dysfunction of voltage-gated ion channels (VGICs). The VGICs (the natural EMF sensors in living organisms) are the most abundant class of ion channels in all animals (and plants), which demonstrates that all living organisms are basically electromagnetic in nature.

All processes in cells are initiated and mediated by ion flows (endogenous electric currents) through cells, tissues, and cell membrane ion channels. Irregular opening and closing (dysfunction) of VGICs as shown by this mechanism alters ionic concentrations in cells, triggering the (over)production of reactive oxygen species (ROS) by specific enzymes in the cells which normally produce ROS for physiological purposes, as e.g. protection from infectious microorganisms.

These enzymes are activated by alterations in the concentrations of various ions in the cells, like calcium, potassium, sodium, or proton ions. Prolonged overproduction of ROS in the cells is a condition of irritation/inflammation called oxidative stress (OS) which may easily result in various pathologies.

A relatively mild such “pathology” is what is called Electro hypersensitivity (EHS) at its first stages. Actually, in my view, this is not a pathology but a healthy reaction to an unnatural exposure which is the totally polarized and coherent (man-made) EMFs. If the person does not minimize the exposure at the early stages of EHS occurrence, the initial healthy reaction may become a serious pathology with unbearable symptoms. Continuing OS/ROS overproduction due to continuing exposure is connected with DNA damage induced by certain ROS which are particularly damaging, like the hydroxyl free radical or the peroxynitrite⁷.

Those ROS can easily damage DNA and any other critical biomolecule. Irreparable DNA damage can lead to cell death or mutations, which in turn may lead to reproductive problems, organic diseases and cancer. Therefore, the biophysical mechanism initiates a cascade of biochemical events resulting in oxidative stress (OS) in the cells and the various pathologies reported in the literature. The OS was long ago reported to be induced by anthropogenic EMF exposure, and this paper explained why and how this occurs.

The same biophysical mechanism explains most if not all reported EMF bioeffects, including the “window” effects. It has also explained the ability of sensitive individuals to sense upcoming thunderstorms (Panagopoulos and Balmori 2017)⁸ and the ability of certain animals to sense upcoming earthquakes (Panagopoulos et al 2020)⁹ – through the action of the natural EMFs associated with these phenomena.

Lately, the same mechanism has explained one of the most known scientific problems: How migrating animals orient and navigate over thousands of kilometers (km) on Earth, finding exact locations by sensing the intensity and the direction of the geomagnetic field. Unfortunately, my coworkers and I have had problems publishing this paper – just like we had problems publishing other papers before (papers that have now become widely accepted and cited by hundreds of other studies).

Sadly, conflicts of interest and corruption in science have not left many of the major science journals unaffected. Certain people do not want this mechanism to be widely known and established. Instead, they favor other theories which are complicated and impossible, leading science nowhere. In fact, the adverse biological and health effects of human-made EMFs can now be thoroughly explained and confirmed, but they do not want this fact to be widely accepted – even though every true expert admits it.

They prefer to seed confusion, doubt, and ignorance in the public. Many scientists also promote this confusion in various ways whether they know it or not, by supporting, for example, impossible theories that lead nowhere.

4) I keep coming across statements like “non-ionizing radiation cannot possibly cause DNA damage” (from PhDs in physics), even though you and many of your colleagues have proven this to be completely false decades ago.

How do you think we’ll be able to pierce this veil of ignorance?

Such erroneous statements are made because some physicists and engineers confuse living tissue with inanimate matter. Living tissue does not respond to EMFs and other stressors like inanimate matter. It is far more complicated than that. A relevant statement would be “non-ionizing radiation cannot *directly* cause DNA damage”. But it can do that *indirectly* in living cells by causing VGIC dysfunction, which alters ionic concentrations in the cells – triggering the production of ROS as I explained above.

Then, the ROS can readily damage DNA and other critical biological molecules, as shown by many experimental studies where animals and cells were exposed to man-made EMFs. **Actually, Wireless Communication (WC) EMFs from mobile phones and other devices/antennas cause oxidative stress (OS) and DNA damage within minutes.** This in turn explains epidemiological studies that have connected man-made EMF exposure with cancer. [Nick’s note: For example, this 2018 review from Miller et al. shows that radiofrequency radiation should be re-classified as a Class 1 Definite carcinogen]¹⁰

The above provides a full explanation of the biological mechanisms, but furthermore, the confidence of some people/scientists who claim that anthropogenic EMFs, at frequencies below those of infrared radiation, cannot cause ionization (break chemical bonds), comes from the erroneous and misleading assumption of modern quantum physics that any EMF consists of photons, regardless of how it is generated.

Based on this assumption, microwaves and other forms of anthropogenic EMFs, which have lower frequencies than infrared and visible light, “do not possess enough energy in their photons” to produce ionization. But **anthropogenic EMFs do not consist of photons**, as I have argued before (Panagopoulos 2018).¹¹

They consist of continuous waves like those described by classical electromagnetism, not quantum physics. Continuous waves are not instantaneous emissions (photons). They can have durations that are trillions of times longer, and therefore, they may possess much greater energy than that of a photon, even when their frequency is much lower.

5) In your 2019 paper “Comparing DNA damage induced by mobile telephony and other types of man-made electromagnetic fields”¹², you confirmed your previous work that real mobile telephony (MT) devices cause more DNA damage than other types of man-made EMFs (ELF 50/60 Hz magnetic or electric fields).

Can you explain why these tests were conducted on Drosophila (fruit flies), and how applicable these results are to human beings?

These experiments were conducted on fruit flies because this insect is one of the best-studied and one of the most common laboratory animals in biology. They are small, clean and easy to keep in the lab, with a very good timing of developmental processes under controlled conditions, and a lifetime of about a month – which allows us to observe systemic (whole body) effects much faster than in humans or other animals, on top of many other advantages.

Most importantly, their cells – like in all insects – are essentially the same as mammalian (including human) cells. **They have identical types of cell membranes, proteins, ion channels, intracellular organelles, nuclei, DNA, and the same ions controlling all cellular processes.**

Considering that all biological and health effects are initiated within the cells, an effect found in Drosophila is absolutely expected to be found in mammals, including humans, and vice-versa. Even though its lifetime is too short to develop cancer, this animal is used for cancer research due to its genetic similarities with mammals and humans.

In my experiments, DNA damage was found in both fruit fly and human cells, to a similar degree, after they were exposed to mobile phone radiation or other types of human-made EMFs. As you noted, it was shown that mobile phone EMFs cause more damage than power line EMFs [Nick’s note: AC electric and magnetic fields], which have been linked to cancer for a long time.¹³

6) Many EMF scientists have faced systematic attacks throughout their career.¹⁴

Considering that you co-authored and edited the most thorough book¹⁵ ever written on the biological and health effects of human-made EMFs in 2023, do you feel that things are changing, now that the published literature is becoming harder and harder to ignore?

Indeed, some of the pioneer scientists who first reported DNA damage and other important biological effects in the 1990s and early 2000s after exposing biological samples to anthropogenic EMFs were unethically attacked by hired “scientists”. They were even accused that they had falsified their data!

Today, hundreds of peer reviewed published studies have confirmed these effects. Sadly, as far as I know, those who accused them did not face legal consequences and the harm made to the scientists was not restored. **The evidence today is overwhelming and indisputable, and, as you said, it is becoming harder and harder to ignore.**

The recent book is an evidence-based source of knowledge for all those who want to know the truth in this highly battled scientific field, those who want to understand the science, and protect themselves, their people, and the environment. I very strongly recommend it to everyone.

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