

Impacts of 5G on life

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As you may already know, the telecom companies of the world are in the process of deploying a new technology for wireless communication, called 5th generation, or **5G**, using a higher band in the electromagnetic (EM) frequency spectrum than previous technologies. The frequency spectrum of 5G corresponds to the millimeter waves, as opposed to centimeter waves currently used in our cell phones, and promises to revolutionize our technological landscape with self-driving cars, artificial intelligence, satellite internet and more.

What you might not be aware of is that world-leading scientists in the field of radiation and medicine are writing letters of concern about this new technology (e.g. [D. Carpenter](#), [O. Johansson](#), [P. Héroux](#)). One noteworthy example is the Deputy Chairman of the Scientific Council on Radiobiology of the Russian Academy of Sciences and President of the Russian National Committee of Non-Ionizing Radiation Protection (RNCNIRP), Prof. [Yuri Grigorievich Grigoriev](#):

"For 50 years I have been working on evaluating the hazards of the biological action of ionizing and non-ionizing radiation. I am very concerned with the increasing electrosmog from wireless communication and its impact on mankind, especially on children."

What is causing world-leading experts in this topic all over the world to engage in this topic, in spite of the governments telling us this is safe technology?

Background

Humans are intimately linked to electromagnetic (EM) waves both biologically and technologically. For example, visible light is comprised of EM waves emitted with a wavelength in the nanometer range. EM waves can either be represented as tiny packets of energy emitted from a radiating source, called *photons*, or a wave that is continuous in space, a dichotomy called the *wave-particle duality*. It was the famous physicist Max Plank who first came up with the idea that energy is radiated in discrete quanta of light, with energy proportional to the frequency of the oscillation of the photon. The frequency is measured as the amount of cycles a wave can make in a second, i.e. cycles per second or Hertz (Hz). The wavelength is defined as the distance in space between the beginning and end of such a cycle. Furthermore, because all electromagnetic waves travel at the speed of light the product of frequency and wavelength will always equal the same value, the speed of light. This means that a higher frequency photon will have a smaller wavelength.

In addition to a frequency and wavelength, the photons also create an electric and magnetic field in a direction perpendicular to the direction it travels, the the magnetic field perpendicular to the electric field (Figure 1). The electric field direction is called the *polarization* of the wave. If a source of radiation produces photons with the same electric field direction, it is called *polarized*. This is the type of radiation emitted from an antenna for wireless communication purposes. On the other hand, our sun which radiates a large spectrum of frequencies emits *un-polarized* light, meaning that each photon has a unique and different EM field direction. The effect of this randomization of field direction is that the macroscopic EM field sums to zero. For wireless communication however, individual photon fields do not sum to zero, but rather add

together to create a macroscopic EM field, which is why it is able to create EM fields inside the human body [Vriens, 2008], unlike the sun.

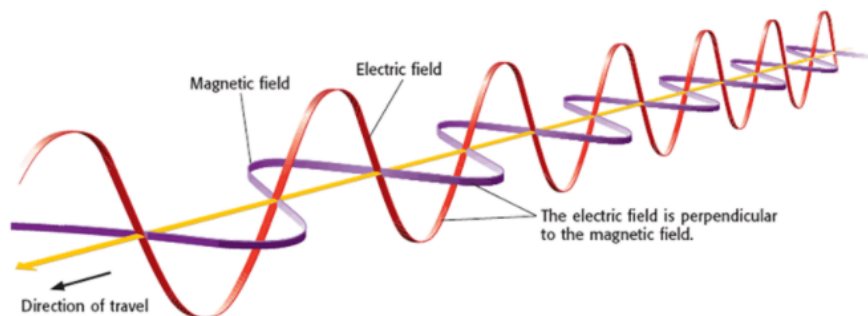


Figure 1: Electromagnetic waves are they travel through space. The direction of polarization is defined as the same as the direction of the electric field direction, here in the vertical direction. source: <https://blog.daum.net/kmozzart/11316>

Additionally, when antennas emit EM signals they induce different EM field characteristics near and far from the antenna. Near the antenna, a more complex EM field forms without a fixed ratio between the electric and the magnetic field strengths, while in the far-field, a fixed ratio between the fields form ¹. Due to the complex fields characteristics in the near-field, interactions can occur with biological systems different in nature from the far field. For example, the photon paradigm breaks down in the near field, with negligible EM *radiation*. Instead, the near-field *reacts* with nearby electromagnetic objects like the human body. In other words, individual photon energy is not a relevant concept for the purposes of biological investigations in the near-field, only in the far-field. In the context of biological organisms the near EM fields can induce currents, resonant interactions, and absorption of the artificial field.

The transition between the near and far-field gradually happens between one and two wavelengths of the signal², so for a typical 4G cellphone at 1Ghz this distance is 30-60 centimeters. For a high power electricity line sending alternating current at 60 Hz this distance is 5000km. For radio antennas the distance is anything from 1m to 10 kilometers, depending on the frequency. The *power* of the signal can be measured as the strength of the electric field at a particular location. The tell-tale sign that a signal is perceived in the far-field of an antenna is that the power of the signal drops by the square of the distance, e.g. doubling the distance leads to decrease in power by a factor of 4. An power dissipation less than the square of the distance indicates near-field behaviour, as shown for cell phones in the 10 cm range (see e.g. fig. 9 in Wall et al. [2019]).

Our sun is only interacting with us in its far-field, and so we are only concerned with the frequency of the photons coming toward us. High enough photon frequencies and corresponding energies have the potential to interact with the bonds between electrons and molecules since these bonds have the same energy as the photon, thus releasing the electron from its molecule in a process called *ionizing* radiation. It is called ionizing because it creates two *ions* with opposite electric charge, with the electron having a negative charge and the molecule having a positive charge. This type of radiation is different from *non-ionizing* radiation on the basis that the frequency of the photons are different, but as suggested above, this ionization/non-ionization dichotomy falls short in predicting a complete set of biological reactions due to near-field interactions but also due to other bioelectric systems' susceptibility to EM radiation (e.g. in phenomena across molecules in human cells and through complex scattering of incident radiation).

In the last hundred years, human activity has increased background electromagnetic radiation exposure by a tremendous amount. The frequencies we use for communication do not naturally occur in significant

¹https://en.wikipedia.org/wiki/Electromagnetic_radiation

²https://en.wikipedia.org/wiki/Near_and_far_field

amounts naturally, and so in some frequency bands we are artificially exposed to intensities that are 18 orders of magnitude greater than the natural background.

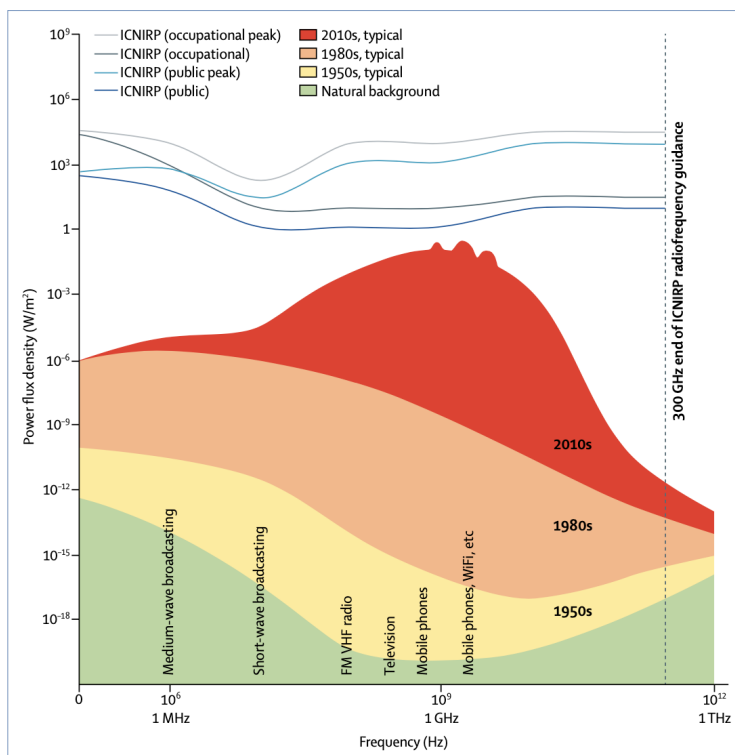


Figure 2: Figure adapted from Bandara and Carpenter [2018]: Typical maximum daily exposure to radiofrequency electromagnetic radiation from man-made and natural power flux densities in comparison with International Commission on Non-Ionizing Radiation Protection (ICNIRP) safety guideline. These exposure levels are frequently experienced daily by people using various wireless devices. The levels are instantaneous and not time-averaged over 6 minutes as specified by International Commission on Non-Ionizing Radiation Protection for thermal reasons.

Wireless Communication

Wireless communication uses EM wavelengths mostly in what is called the *radio frequency* (RF) spectrum, defined as in the range 3 kilohertz to 300 gigahertz, and thus not in the ionizing regime. To send information the signal from wireless communication cannot be a pure sinusoidal wave, but a combination of waves of different frequencies transferred through *pulsation*, i.e. a short change of intensity, and *modulation*, i.e. the combination of waves of different frequencies. These pulsations and modulations can *encode* information that can be received by a cell phone or computer, like pictures etc.

We also use the higher end of this RF spectrum to heat our foods and do crowd control using the [Active Denial System](#), both of which exploit the fact that water molecules are heated when exposed to these waves. This thermal effect happens when the electromagnetic waves interacts with the water molecules to stimulate movement directly related to our [concept of heat](#). But are there other effects than thermal at play here? Not if you ask the commission that writes the guidelines for this, the International Commission for Non-Ionizing Radiation Protection (ICNIRP). They write the guidelines that are followed by regulation agencies all over the world, e.g. the Federal Communications Commission (FCC). ICNIRP wrote one report in [2010](#), and a revised report in [2020](#), stating that the radiation limits “are based on additional knowledge [from 2010] of

the relation between the primary effect of exposure (e.g., heating) and health effect (e.g., pain), to provide an operational level with which to derive restriction values in order to attain an appropriate level of protection”.

Now, since the ICNIRP is not convinced that non-thermal effects on the body are substantiated by sufficient evidence, their 2020 report relegates the discussion of non-thermal effects to Appendix B of their report along with a literature review of the various possible receptive systems of the human body. We will discuss some of these biological system.

Brain physiology and function

The first category of biological systems the ICNIRP considers is the brain physiology and function. Of effects on cognitive function associated with radiofrequency exposure they report that *“there is limited epidemiological research on higher cognitive function. There have been reports of subtle changes to performance measures with radiofrequency EMFs, but findings have been contradictory, as there is no evidence that the reported changes are related to radiofrequency EMF exposure and alternative explanations for observed effects are plausible.”.*

No reference is given to the contradictory findings unfortunately. On well-being and neuropsychiatric effects the ICNIRP report states *“Overall, the epidemiological research does not provide evidence of a causal effect of radiofrequency EMF exposure on symptoms or well-being.”* In the well-being category, only two papers are cited as supporting their conclusions, one paper which received funding from the telecommunications industry [Eltiti et al., 2018], and the other where one of the ICNIRP members was a co-author [Verrender et al., 2018]. But their conclusion directly contradicts other findings from the literature regarding sleep disturbance, loss of appetite and general well-being (e.g. Thomée et al. [2011], Söderqvist et al. [2008], Oberfeld et al. [2004], Schüz et al. [2009]). As M. Pall discusses in his 2016 paper in the Journal of Chemical Neuroanatomy [Pall, 2016]:

“Two U.S. government reports from the 1970s to 1980s provide evidence for many neuropsychiatric effects of non-thermal microwave EMFs, based on occupational exposure studies. 18 more recent epidemiological studies, provide substantial evidence that microwave EMFs [electromagnetic frequencies] from cell/mobile phone base stations, excessive cell/mobile phone usage and from wireless smart meters can each produce similar patterns of neuropsychiatric effects, with several of these studies showing clear dose-response relationships. Lesser evidence from 6 additional studies suggests that short wave, radio station, occupational and digital TV antenna exposures may produce similar neuropsychiatric effects. Among the more commonly reported changes are sleep disturbance/insomnia, headache, depression/depressive symptoms, fatigue/tiredness, dysesthesia, concentration/attention dysfunction, memory changes, dizziness, irritability, loss of appetite/body weight, restlessness/anxiety, nausea, skin burning/tingling/dermographism and EEG changes. In summary, [...] the impact of non-thermal EMFs on the brain, extensive epidemiological studies performed over the past 50 years, and five criteria testing for causality, all collectively show that various non-thermal microwave EMF exposures produce diverse neuropsychiatric effects.”.

Other findings that have been omitted in this part of the ICNIRP report are cell phone’s effect on cerebral blood flow [Aalto et al., 2006], slowed performance [Regel et al., 2007] or decreased accuracy Leung et al. [2011] on cognitive tasks.

One study is cited on the effect of EM fields on cell permeability and blood-brain barrier leakage, but conclude that *“due to methodological limitations of the studies and failed attempts to independently verify the results, there remains no evidence of an effect”.* In this blanket statement they completely disregard all research that has been done on this field, including the work of Allan H Frey, who pioneered the research on the blood-brain barrier (BBB) in the 70s in his research for the Office of Naval Research and the American army. He found that low-intensity EM radiation causes breakdown of the blood-brain barrier in rats [Frey et al., 1975], by injecting a fluorescent dye into the bloodstream only to see that it showed up in the brain a few minutes later.

This discovery was surrounded by controversy as shortly after Frey’s study that came out, a set of oral presentations were made by J.H. Merrit over a 2-year period stating that he replicated Frey’s experiment but could not find an effect on the BBB. When Merrit submitted his findings for publication, the editor and

reviewers found that upon statistical reanalysis of Merrit’s data, the conclusion that no effect was seen on the BBB was wrong and that the data did in fact support Frey’s original conclusion. Merrit subsequently retracted his paper [Frey, 1998].

A similar story was seen when over another 2 year period when A.W. Guy made oral presentations reporting that he had replicated Frey’s experiment but found no effect on the BBB, but did not make available his methods and statistical analysis. When details were finally obtained, it turned out that the dye had been injected into the intestines instead of the bloodstream so by the time the rat was sacrificed and prepared for dissecting, the dye did not have time to reach the brain [Frey, 1998]. Since this controversy, the effect of EM radiation on the blood-brain barrier has been corroborated by many others [Oscar and Hawkins, 1977, Aalto et al., 2006].

It is not just blood-brain barrier which undergoes changes in cell permeability. It has been known for many decades that EM fields can perforate cell membranes [Coster, 1965, Kinoshita and Tsong, 1977], and also merge cell membranes from different cells [Sowers, 1985]. The study of perforating cells with EM fields is now quite well established, and is called *electroporation* [Jordan et al., 2013]. This property of cells can be used in various biological processes like inject foreign DNA or other “large” molecules into cells, with obvious industrial applications like gene modification. It was Chang and Reese [1990] who showed that through the then-novel technique known as *rapid-freezing electron microscopy* one could observe the perforation of the cell membrane at distinct volcano-shaped holes which takes place around 3ms after exposure. So in light of this field of study, and Frey’s findings, it is no surprise that cell phones exposure can cause a leaky blood brain barrier.

Fertility, Reproduction and Childhood development

In a similar act of sweeping authority the ICNIRP report states that “*some epidemiological studies reported associations between radiofrequency EMFs and sperm quality or male infertility, but, taken together, the available studies do not provide evidence for an association with radiofrequency EMF exposure as they all suffer from limitations in study design or exposure assessment*”.

In the discussion on this topic, there is again no paper cited that exemplifies this “limitation in study design or exposure assessment”. However, there is one paper cited that shows no effects on reproduction mice due to EM radiation [Sommer et al., 2009]. But if we look closer at the list of co-authors we find that A. Lerchl, who was recently found guilty of a smear campaign against the authors of a large study finding DNA damage as a result of EM radiation [Slesin, 2021a]. Lerchl also has strong financial ties with ICNIRP [Slesin, 2021b].

The ICNIRP report omits referring to the vast body of work that shows effects in fertility, reproduction and childhood development and leaves the reader with the conclusion that the poorly conducted studies are not even worth citing. But the number studies showing an effect on reproduction and fertility is currently quite large. For example, as Kesari et al. [2018] conclude regarding male fertility in their review paper in *Reproductive Biology and Endocrinology*: “From currently available studies it is clear that radiofrequency electromagnetic fields (RF-EMF) have deleterious effects on sperm parameters (like sperm count, morphology, motility), affects the role of kinases in cellular metabolism and the endocrine system, and produces genotoxicity, genomic instability and oxidative stress.”

One example of a study that found an association between cell phone usage and male fertility is from Agarwal et al. [2008] who studied the sperm quality at males who were struggling to get their partners pregnant. They found that males who use cell phones more than 4 hours per day had approximately 50% lower sperm count, motility and viability compared with people who had no use of the cell phone. This observation was strengthened by a dose-response effect where the sperm quality decreased as the number of hours of cell-phone use increased. However, this study had certain limitations, for example by not including covariates like occupation history, and so a number of follow up studies have been conducted confirming the effect of EM radiation on cell phone usage, [Pandey et al., 2017, Zalata et al., 2015, Odacı and Özyilmaz, 2015, Gorpichenko et al., 2014].

The follow up studies are not only epidemiological, where observations are made on a subset of the population to look for the presence or absence of factors that influence a disease outcome. In order to prove

a causal relationship between two variables, one also must study the mechanisms that could be influencing such a relationship, either in the living organisms themselves, *in vivo*, or isolated outside the organism *in vitro*. If both of these types of studies show an effect in addition to an association by observing the population at large, one can conclude the causal nature of the two variables. All of these studies have been done and are listed for example on the webpage for Americans for Responsible Technology (ART) ³, showing a total of 25 studies to date that show an effect of EM radiation on male fertility. But why might EM radiation impact male fertility?

Oxidative mechanisms

One of the central molecules in the body is the water molecule, composed of one oxygen atom and two hydrogen atoms. The hydrogen atoms have one electron and seeks a second electron in order to complete its first electron shell. Oxygen can provide hydrogen with what it seeks by sharing one of its two free electrons. When both of the free electrons from the oxygen atom are shared with one hydrogen atom each, the resultant molecule, H_2O , is in an energetically favorable state. This molecule has an electric dipole, meaning that along a certain axis of this molecule there is a change in the electric potential, from positive to negative charge. This dipole can interact with other dipoles and form a variety of *intermolecular* interactions.

One of these interactions are called hydrogen bonds, where one hydrogen atom from one water molecule is attracted to an oxygen atom from another water molecule, effectively connecting multiple water molecules together. Hydrogen bonds along with other multi-molecule effects increase the structure and symmetry of water and leads to facinating properties of water like its density maximum at $4^{\circ}C$, while from $4^{\circ}C$ to $0^{\circ}C$ water expands until it freezes and then expands even more. The theoretical development of macroscopic water properties is still an active area of research, and only recently have we been able to accurately calculate the melting point of water to within 1 degree Celcius from first principles [Morawietz et al., 2016]. These recent developments instill a sense of humility about our current understanding of life's most basic molecule.

Another fascinating discovery about water is its possibility of forming a crystalline state, different from the three common states: solid, liquid and gaseous, an idea that has been developed over the course of the last century by central figures like Gilbert Ling who did the initial work at the University of Chicago in about 50 years ago and later by Pollack [2013], Ho [2008], Pollack et al. [2006] (see e.g. Ling [2001, 2004]). This crystalline state is a highly ordered state where the hydrogen bonds align to form a crystalline lattice, and can be seen near hydrophilic surfaces and molecules, where a layer of this crystalline lattice form called the *exclusion zone*. It is called the exclusion zone because it is free of almost any impurities due to its highly ordered nature. Next to the exclusion zone is a normal liquid state of water, called *bulk water*. The lattice that forms is negatively charged with respect to its nearby bulk water which has an excess of positive hydrogen ions, i.e. hydrogen without their electron atom, implying a charge potential across the region of water's phase transition. We will not discuss the wide consequences of this induced electric potential has for all of cell biology here, but rather focus on the fact that water is contained in a structured form within the cell.

Given the electric nature of the crystalline water lattice, it is quite possible that this crystal lattice of intracellular water is disturbed by electromagnetic fields and/or radiation. When disturbing the lattice, the water molecules are split from their neighbors as well as from the individual atoms in the molecule, forming water derivatives like H_2O_2 , H^+ , $OH^{\cdot}$, etc. These molecules are called *reactive oxygen species* and are sometimes part of natural processes, but if too abundant can cause a wide variety of harm though e.g. DNA damage, blood homeostasis and ion transport.

Yakymenko et al. [2016] published an excellent review article of all the currently known mechanisms through which low-intensity electromagnetic radiation can induce oxidative damage in biological activity. They reviewed 100 currently available peer-reviewed studies on the topic and found that 93 of them confirms that EM radiation induces these damaging effects. In light of these findings, it may not be so surprising that male fertility is affected by EM radiation which is heavily affected by oxidative stress [Aitken et al., 2012].

³See for section IX at <https://www.americansforresponsibletech.org/scientific-studies>

What is surprising is that none of these studies are discussed in the ICNIRP report, at least if you expect ICNIRP to be a truth-seeking institution.

Another way to study cellular stress affected by EM radiation, is to look at different stress proteins we know respond to DNA damage, which was explored in detail by [late M. Blank](#) [Blank and Goodman, 2009], who also happened to be an avid advocate for decreasing the safe limits of EM field exposure. He even wrote a book about it and participated in a global initiative of academics and scientists, called the [BioInitiative](#), to spread awareness about the health concerns around wireless communication⁴. The initiative has compiled a large body of studies⁵ all showing adverse effects from EM waves below the safety limits given by ICNIRP.

In a string of papers co-authored by L. Soo, they found that electromagnetic radiation also affects cellular processes like the charge homeostasis [Blank and Soo, 1996], the mitochondrial electron transport chain [Blank and Soo, 1998]. Mitochondrial activity is what regulates the metabolism of the food we eat. An incomplete metabolism of fat molecules for example would result in the fat to be expelled back out into the bloodstream, only to be deposited as a plaque on the inside walls of blood vessels. An inability of process carbohydrates will result in a build-up of glucose in the bloodstream which will be expelled in the urine if the body cannot process it properly, which also happens to incomplete metabolism of proteins.

Summary of the ICNIRP report

There are a number of other disease categories discussed in the ICNIRP report that we will not discuss here in the interest to limit the scope of this paper. A more detailed discussion on the ICNIRP report is given in Butler [2021]. On the topic of cancer and electromagnetic waves the reader is referred to Hardell and Carlberg [2021].

Regarding the literature review and citations in the ICNIRP report, out of the approximately 110 citations that are concerned with health effects of EM radiation, 82 of these have an ICNIRP member as a co-author and 89 had co-authors that collaborated with an ICNIRP member. That leaves 21 studies without a clear connection with the group that sets the guidelines for our radiation safety levels. In contrast, according to the [Bioinitiative report](#) references more than 1500 papers, where about one quarter of these show no effect from EM radiation. But counting up the number of no-effect studies and comparing with studies that show an effect does not do justice to the content and quality of the studies. Furthermore, Huss et al. [2007] showed that about three quarters of the studies that show no effect were funded by the telecom industry.

Connection to 5G

So how does the novel 5G technology fit into the picture?

With 5G, the amount of data transferred wirelessly is unprecedented. Each iota of data transfer corresponds to an electromagnetic pulse flying from one location to another. And as the frequency of these pulses increases to accommodate for the data demand, the biological system will be further stressed. Details on pulsed electromagnetic waves in cell processes can be seen e.g. in [Azarov et al. \(2019\)](#), [Hristov et al \(2018\)](#) and [Vernier et al \(2008\)](#). These cited studies are all concerned with the [voltage gated calcium channel \(VGCC\)](#), a fundamentally important structure in the body that maintains homeostasis of ions in the cell. Dysfunction of the VGCC is associated with a slew of devastating conditions, e.g. [Timothy syndrome](#), autism and developmental abnormalities, as outlined by [Barrett and Sien \(2007\)](#). So for a technology that promises over 20 Gb/s transfer rates ([Wu, T. et al. \(2015\)](#)), more than 100 times more data than 4G technology, adverse biological effects should be a cause for concern.

Another way the 5G technology is different, is the utilization of the millimeter wave range, lower wavelengths than previous technology, typically in the 1-100Ghz frequency band. Non-thermal effects in the millimeter wavelengths were shown at least as early as in 1973, as discussed by , [Chukova \(2011\)](#), in a paper

⁴The book is called overpowered: <https://www.goodreads.com/book/show/17834883-overpowered>

⁵<https://bioinitiative.org/wp-content/uploads/pdfs/BioInitiativeReport-RF-Color-Charts.pdf>

aply titled *"Doubts about Nonthermal Effects of Millimeter [MM] Radiation Have no Scientific Foundations"*. In fact, a whole field spawned in the latter half of the 1900s called *millimeter electromagnetobiology*, with most of the work done in the Eastern European regions. Unsurprisingly, a significant amount of research amassed investigating the immuno-stimulating potential of low-intensity millimeter waves, as discussed by [Betskii and Levadeva \(2000\)](#) and the references therein. It is then incomprehensible to see that ICNIRP deem any physical effects of non-thermal character insignificant.

Unfortunately, telecom companies have a completely different goal than to produce immuno-stimulating effects in our bodies. The waves used for wireless communication will be on all day and night, incoherent and pulsed, transmitting digital information.

Since 5G is a new technology with new frequencies, there are less studies done on its effects on our biology, but studies are starting to surface already. Le Pogam et al. [2019] found that EM radiation in the 5G range affect cell permeability and metabolic profiles. One particularly ominous study by [Kostoff et al. 2020](#) argue that 5G technology has the potential to not only damage specific parts of the body like the eyes and kidneys, but can also contribute to adverse systemic effects as well. [Hardell and Nyberg \(2020\)](#) have written a scathing warning about 5G technology to international regulators:

"Inaction is a cost to society and is not an option anymore... we unanimously acknowledge this serious hazard to public health...that major primary prevention measures are adopted and prioritized, to face this worldwide pan-epidemic in perspective"

So as it seems 5G has the potential to be much more disruptive to our beloved planet and its inhabitants, is anyone doing anything about it?

Yes, many groups all over the world are standing up against the roll-out of 5G. At the time of this writing, [600 cities in Italy](#) have stopped 5G roll-out, [60 mayors and officials in France](#) call for a moratorium on 5G, the Dutch are in the process of [suing their government over 5G](#) along with [a number of other lawsuits and actions](#). There are at least three international appeals made by scientists and citizens to stop 5G ([1](#), [2](#) and [3](#)). A call to assess the global electromagnetic pollution by Bandara and Carpenter [2018] was recently published in the Lancet, a leading medical journal.

It is also quite noteworthy that The Children's Health Defense (CHD) and Robert F Kennedy Jr. are suing the Federal Communications Commission (FCC) in the US over 5G⁶. Robert F Kennedy Jr recently won a case against Monsanto with regards to their glyphosate-based herbicide⁷. Other noteworthy events are

1. [A hunger strike in Italy](#).
2. An [international appeal](#) by scientists and doctors.
3. Another [international appeal](#) by scientists.
4. Another [international appeal against 5G](#) on earth and in space.
5. [A letter signed by 400 doctors](#) to the Federal Communications Commision (FCC).
6. [A petition in Italian](#) is out to put a moratorium on 5G.
7. The health council of the Netherlands has published [a report recommending not to use 5G](#).
8. [A 5G moratorium in Corsica](#)
9. [Over 60 mayors and officials in France](#) call for a moratorium on 5G.
10. [Alliance of Nurses for healthy environments letter to the FCC](#). [Physicians of Turin](#). [Lawsuits in France](#).

⁶<https://childrenshealthdefense.org/seeking-justice/legal/chd-v-federal-communication-commission-fcc/>

⁷<https://trofire.com/2019/03/04/ring-of-fires-rfk-jr-wins-award-for-monsanto-trial/>

A number of individual scientists have also engaged themselves substantially, e.g. Joel Moskowitz, PhD., Late Prof. Yuri Grigorievich Grigoriev, David Carpenter, M.D., Prof. Olle Johansson, Prof. Emeritus Martin Pall. For a more complete list see the [Environmental Health Trust's website](#).

A lot of this information is not available in popular media because of conflict of interest. The New York Times has a [partnership with Verizon](#) for example. How can we expect the truth from organizations that are financially invested in a particular outcome? I urge people all over the world to educate themselves on this topic, it will have massive effects on the future of this planet. Robert Becker, an orthopedic surgeon who did some early work on how the body interacts with electricity and has written a fascinating book on the topic [Becker et al., 1985]. Arthur Firstenberg has also written a [groundbreaking book](#) on the history of electricity in our society. If we don't do something, the telecom companies, internet companies, and other entities will inundate us with more electromagnetic waves from earth and [from space](#). So in the spirit of action, I leave you with a quote from Former US President Eisenhower:

"In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist. We must never let the weight of this combination endanger our liberties or democratic processes. We should take nothing for granted. Only an alert and knowledgeable citizenry can compel the proper meshing of the huge industrial and military machinery of defense with our peaceful methods and goals, so that security and liberty may prosper together." – D. Eisenhower⁸

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⁸<http://mcadams.posc.mu.edu/ike.htm>

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