

# 5G: a health and environmental hazard

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## In brief:

- There is clear evidence to show that existing mobile radiation is harmful to health and is linked with cancer, particularly heart and brain tumours
- An overwhelming body of evidence in peer-reviewed studies shows harmful bioeffects from wireless radiation
- The current government and telecoms safety assurances about wireless radiation are out of date and inadequate
- Studies show that 5G can penetrate the skin and interfere with cell-to-cell communication, that it can promote the resilience of superbugs, and that it is harmful to all living things
- 5G is toxic to the environment and has a high carbon footprint
- 5G has not been safety-tested
- 5G is being mandatorily rolled out without public consent
- 5G means blanket coverage and particularly high densities of antennas in urban areas

## What is 5G?

- 5G, like 4G, 3G and WiFi, is a mobile network which uses radio waves at the microwave end of the radio wave spectrum.
- 4G, 3G and WiFi work on frequencies of 6GHz (gigahertz) and below. A gigahertz is a measurement of electromagnetic wave frequency equivalent to one thousand million cycles per second. 5G is being rolled out initially at lower frequencies but will use much higher frequency radio waves of up to 100GHz and beyond.
- 24GHz - 100GHz waves as used for 5G are known as millimetre microwaves (MMWs).
- When discussing health issues wireless radiation is described as 'non-ionising radiation' and is separate from the type of radiation used for nuclear power.
- 5G was originally developed by the military for use with the ADS (Active Denial System) which uses 95GHz waves to disperse crowds, since aiming the beam causes intense heating of the skin. 6G technology and above is currently being developed for specific uses such as holograms.
- 5G is being rolled out all over the UK in such a way that every person, particularly in cities, will be mandatorily exposed to it at all times. 5G will be transmitted across the countryside from large masts and across towns by urban masts. Because high-frequency waves do not travel far, 5G radiation will also be transmitted at the level of every house and street by the use of antennas (some the size of small refrigerators) placed every few houses on every lamppost along with powerful LED lighting. This can already be seen in operation at some parts of the Downs in Bristol and in Gateshead, Newcastle where there have been local protests. 5G antennas are also being placed under every manhole to beam up into the street (TBC).

The cumulative effect of thousands of "small" antennas transmitting microwaves simultaneously is unknown. Safety standards and testing do not appear to be being applied.

*Questions still to answer: How much do the masts emit? How far does this travel? How much do the antennas emit?*

It was reported in March of this year that ICNIRP are due to vote on relaxing their guidelines around radio frequency emissions so as to accommodate 5G.

## **Satellites**

With Elon Musk's advertised launch of 12 5G satellites into the atmosphere and a further 8K from three other private companies (including one based at Goonhilly in Cornwall - tbc), if this occurs there will be nowhere left on the planet without 5G radiation (to answer: how intense will this be?). Currently several international appeals from scientists, doctors and environmentalists are underway to stop this enterprise. Astronomers and weather forecasters are also calling for a ban to Musk's 'Starlink' plan as it will interfere with their work and create 'space junk' in Earth's orbit as well as obstructing stargazing.

## **What is 5G for?**

The Internet of Things, faster downloads, automated factories, more manufacturing, more virtual gaming, larger data transfer capacity  
Driverless cars, remote surgery are some of the more attractive purported benefits

These outcomes will be accompanied by:

Job losses from automated factories and services

Mining for minerals

Possible destruction of natural resources caused by more manufacture

There may be more addiction to virtual gaming and other forms of online entertainment - already considered to be a major mental health issue

According to Tom Wheeler, head of the FCC in the USA and one of the main drivers of 5G, the outcomes are, as yet, unknown, but will be highly lucrative.

According to Professor William Webb, former director of Ofcom and the author of the book *The 5G Myth*, the advertised benefits of 5G are in reality unrealisable. Webb recommends better 4G connectivity in rural areas instead. [Note that Webb is not concerned with the health and environmental aspects of 5G or 4G; his opinion relates to the actual uses of 5G only].

## **5G (and existing wireless radiation) and the environment**

5G may have been advertised as 'green tech' for unsubstantiated reasons. Further research needed into any actual benefits which may exist? Driverless cars will only be greener if they are electric, which can be achieved without being driverless; driverlessness requires the deployment of tens of thousands of antennas.

## **Bees and other insects**

Insects such as bees use magnetic fields to navigate. Existing wireless radiation has been found in studies to interfere with bee navigation and health and is theorised to be an important factor behind reduced bee populations:

Behavioural effects (Kumar 2011, Favre 2011)

Disrupted navigation (Goldsworthy 2009, Sainudeen 2011, Kimmel et al 2007)

Decreased egg laying (Sharma and Kumar, 2010)

Reduced colony strength (Sharma and Kumar, 2010, Harst et al, 2006)

Insect decimation & 75% decline in protected areas (Hallmann, Sorg and Jongejans, 2017) full article at: [https://www.researchgate.net/publication/320474864\\_More\\_than\\_75\\_percent\\_decline\\_over\\_27\\_years\\_in\\_total\\_flying\\_insect\\_biomass\\_in\\_protected\\_areas](https://www.researchgate.net/publication/320474864_More_than_75_percent_decline_over_27_years_in_total_flying_insect_biomass_in_protected_areas)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3052591/>

Exposure to cell phone radiations produces biochemical changes in worker honey bees. Cell phone usage is a major public health concern because of potential risk of chronic exposure to low level of radiofrequency and microwave radiation that pulse off the phone antennae in close proximity to the head.[1] These concerns have induced a large body of research, both epidemiological and experimental, in humans and animals. Honeybees are reliable indicators of environmental status and possess several important ecological, ethological, and morphological characteristics. They are the best experimental animals to study the effect of electromagnetic waves because they possess in their abdomen magnetite granules which help the bees in their orientation flight. Moreover, the integument of bees has semiconductor functions.

Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz

Arno Thielens, Duncan Bell, David B. Mortimore, Mark K. Greco, Luc Martens & Wout Joseph Scientific Reports 8, Article number: 3924 (2018)

A shift of 10% of the incident power density to frequencies above 6 GHz would lead to an increase in absorbed power between 3–370%. This could lead to changes in insect behaviour, physiology, and morphology over time due to an increase in body temperatures, from dielectric heating. The studied insects that are smaller than 1 cm show a peak in absorption at frequencies (above 6 GHz), which are currently not often used for telecommunication, but are planned to be used in the next generation of wireless telecommunication systems

## **Birds**

There have been a great many anecdotal reports of mass bird deaths at 5G masts. These reports have supposedly been debunked as 'fake news.' However, we have had a first-hand report of such an event from an eyewitness which seems to warrant further investigation. This is particularly so given that the hearts of animals and birds function electromagnetically and that heart palpitations are also an anecdotally-recorded symptom of electrosensitivity, a condition not yet acknowledged by the medical establishment but which has found in studies to be cause for further investigation (see Joel Moskowitz, below, and anecdotal reports under Reference (1)) and which is being reported in increasingly-large numbers by those who believe that they suffer from it (please see the evidence-based work of Dr Erica Mallory-Blythe for further information).

## **Trees**

A study of 100 trees over a nine-year period has found that the side of trees facing an antenna sustains damage (Waldmann-Selsam, 2016)

Pine needles and watercress have been demonstrated to age quickly and die when in proximity to very low frequency radio waves.

### 5G and trees

Trees partially block 5G radiation pathways. Reports of unprecedented amounts of tree-felling have been made during the last year around urban areas where 5G infrastructures are being established. These reports are unsubstantiated but numerous and may warrant further investigation. Council websites state that trees may be cut down if they are dead, diseased, or for 'planning purposes.'

## **Carbon footprint: data use increases**

An update to a 2016 study from a Huawei analyst: [https://www.researchgate.net/publication/320225452\\_Total\\_Consumer\\_Power\\_Consumption\\_Forecast](https://www.researchgate.net/publication/320225452_Total_Consumer_Power_Consumption_Forecast)

John Vidal's article on the report, 'A Tsunami of Data', contains these key points:

- By 2025 the ICT industry could be using up to 20% of the world's electricity, hampering global attempts to meet climate change targets.
- 5G will result in vastly increased data transfer which requires huge fuel use.
- Global computing power demand from the projected billions of devices is increasing 20% a year, consuming roughly 3-5% of the world's electricity in 2015.
- The report's author expects industry power demand to increase from 2-300Twh (Terawatts) of electricity a year now, to 1,200 or even 3,000Twh by 2025.
- Data centres on their own could produce 1.9Gt (or 3.2% of the global total) carbon emissions.
- John Vidal quotes the researcher: The situation is alarming. We have a tsunami of data approaching. Everything which can be is being digitalised. It is a perfect storm.
- Vidal: US researchers expect power consumption to triple in the next five years as one billion more people come online in developing countries, and the "internet of things", driverless cars, robots, video surveillance and artificial intelligence grows exponentially in rich countries.
- "There will be 8.4bn connected things in 2017, setting the stage for 20.4bn internet of things (IoT) devices to be deployed by 2020," says leading internet analyst firm Gartner.
- The industry has encouraged the idea that the digital transformation of economies and large scale energy efficiencies will slash global emissions by 20% or more, but the scale and speed of the revolution has been a surprise.
- A 2016 Berkeley laboratory report for the US government estimated the country's data centres, which held about 350 million terabytes of data in 2015, could together need over 100TWh of electricity a year by 2020. This is the equivalent of about 10 large nuclear power stations. Greenpeace IT analyst Gary Cook says only about 20% of the electricity used in the world's data centres is so far renewable. "The good news is that some companies have certainly embraced their responsibility [to use renewables], and are moving quite aggressively to meet their rapid growth with renewable energy. Others are just growing aggressively."
- Architect David Hughes, who has challenged Apple's new centre in Ireland, says the government should not be taken in by the promises. "Using renewable energy sounds good but no-one else benefits from what will be generated, and it skews national attempts to reduce emissions. Data centres... have eaten into any progress we made to achieving Ireland's 40% carbon emissions reduction target. They are just adding to demand and reducing our percentage. They are getting a free ride at the Irish citizens' expense," says Hughes.
- Eirgrid estimates indicate that by 2025, one in every 3kWh generated in Ireland could be going to a data centre, he added. "We have sleepwalked our way into a 10% increase in electricity consumption." Fossil fuel plants may have to be kept open longer to power other parts of the country and the costs will fall on the consumer, he says. "We will have to upgrade our grid and build more power generation both wind and backup generation for when the wind isn't there and this all goes onto people's bills."
- Satellites require huge amounts of rocket fuel to launch (*confirm amount - each rocket uses the equivalent to one million cars for a year?*) and Musk's satellites plus those from other private companies totalling around 20K satellites in total would need to be relaunched every five years due to expiry. Requires further research. Some speculative information from a public health journalist is available from this website which claims that satellites also deplete the ozone layer: <https://greenworldwarriors.com/2019/02/12/20-000-satellites-for-5g-to-be-launched-sending-beams-of-intense-microwave-radiation-over-the-entire-earth/>

## Overall harm to wildlife

The US group [Physicians for Safe Technology](#) state that 'there is convincing emerging scientific evidence causing great concern for the environment, with harm to mammals, insects and bacteria...5G technology will also consume significant amounts of energy, contrary to global climate goals.'

[EMF Scientist Appeal](#): Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life.

## **Environmental pollution**

Wireless radiation is being increasingly recognised as an environmental pollutant. <https://www.sciencedirect.com/science/article/pii/S0013935118300161?via%3Dihub>

## **Microbes**

Published study 'Effect of Mobile Tower Radiation on Microbial Diversity in Soil and Antibiotic Resistance.' Soil samples from base stations and from far away from stations: antibiotic resistance found in microbes near base stations. Conclusion: 'Mobile tower radiations can significantly alter the vital systems in microbes and turn them multi drug resistance which is a most important current threat to public health.'

## **5G and human health**

According to increasing numbers of scientists and health experts, 5G poses a serious, if not existential, threat to humans as well as the wider biosphere. The type of radio waves used in 5G (millimetre microwaves or MMWs) have not been tested on human populations and their health effects over long periods of time are not known; however, there is research to show potentially profound damage to biological organisms.

## **Halts**

Rollouts have been frozen in Brussels, parts of Geneva, parts of Rome, and parts of the US due to safety concerns/legal action. Legal action is being increasingly taken in the US and Australia and there are vigorous protests in Switzerland. The Prime Minister of Poland is reported to have signed the international appeal to ban 5G, the 5G Space Appeal (to be confirmed; there are no reports of a ban in Poland just yet).

Councillors in Glastonbury have called a halt to the rollout and demanded safety testing by independent scientists. 5G is currently being vigorously challenged at council levels on the Isle of Wight.

David Drew MP for Stroud is now questioning health concerns around 5G.

## **Evidence of bioeffects from existing WiFi, 3G and 4G wireless radiation**

According to some researchers (see more, below), current guidelines from public health bodies such as Public Health England are based on information which requires updating, particularly in the light of recent studies.

### Early studies 'mixed' due to bias:

The World Health Organisation's Interphone Study of 2010 found 'suggestions of an increased risk of glioma [a type of aggressive brain tumour] at the highest exposure levels', and, after correcting for bias, an eighty per cent higher likelihood of having a brain glioma for heavy users. The study found no overall link between mobile phone use and cancer, but note that the study included several studies, some of which did show a link with tumours, which may disguise the overall result (2, 3). The study authors wrote that the overall finding was 'possibly reflecting participation bias or

other methodological limitations.’ Clearly further research was required, yet the study is widely used by the telecoms industry to claim safety, despite the finding for gliomas.

#### Industry-funded studies confound the result:

Research has shown that industry-funded studies are less likely than independent studies to show a link with wireless radiation and health problems (4, 5).

Prasad et al (2017) write: “In our review of the literature and meta-analysis of case–control studies, we found evidence linking mobile phone use and risk of brain tumours especially in long-term users (greater than 10 years). We also found a significantly positive correlation between study quality and outcome in the form of risk of brain tumour associated with use of mobile phones. Higher quality studies show a statistically significant association between mobile phone use and risk of brain tumour. Even the source of funding was found to affect the quality of results produced by the studies.” (6)

#### A ‘probable carcinogen’?

Mobile phone radiation was classified a class 2B ‘possible carcinogen’ by the WHO in 2011 after advice from the International Agency for Research on Cancer (IARC), along with advice to ban children from using mobile phones. But in the light of two studies on rats (below), researchers have called for the classification to be upgraded to ‘probable carcinogen’ (Group 2A) or ‘carcinogenic to humans’ (Group 1).

#### **New research - three large recent studies:**

##### Tumours in rats:

The US Department of Health National Toxicology Program study (2018) showed a ‘clear link’ between mobile radiation and cancer. When 7000 rats and mice were exposed to mobile radiation for nine hours a day, DNA strands were damaged in brain cells and male rats developed more tumours on the heart muscles and, again in males only, incidences of brain tumours were three per cent higher. There were also lower birth rates and higher rates of infant mortality. The study was reviewed for accuracy by fifteen external physicians who confirmed the conclusion that mobile radiation causes cancer. It should be noted that although three per cent is a relatively small amount proportionally, in real numbers of humans this could translate to millions or even tens of millions of people globally. (7)

Critics are quick to point out that overall, statistically the exposed rats lived longer than the control group, since there seemed to be fewer incidences of kidney problems for reasons which are not clear from the study report. However, this does not detract from the result clearly linking mobile radiation and cancer.

The Director of the Food and Drug Administration, Jeffrey Shuren, stated immediately: ‘We deny the conclusions of the report,’ based on the fact that everyday exposure of mobile radiation to humans is lower than in the tests. However, independently and at the same time, using verifiable strict standards of laboratory science, cancer researcher Fiorella Belpoggi of Bologna studied 2000 rats exposed to the equivalent amount of radio frequency radiation as humans are over a lifetime and obtained similar results. (8)

In a 2015 study in Germany, rats grew more tumours when exposed to mobile phone radiation ‘well below exposure limits for users of mobile phones.’ (9)

##### Humans and tumours

A Swedish study led by Lennart Hardell suggested that young people who use mobile phones for making phone calls have a five times higher risk of developing glioma than those who do not; those who use cordless phones have a four times higher risk. They were also five times more likely to

develop acoustic neuromas, benign tumours which cause deafness. After the age of twenty, when the brain is fully developed, the risk reduced significantly. Hardell recommended that young people only use mobile phones for phone calls in emergencies and that they text rather than calling. He added that most tumours develop decades after the exposure period, and that as mobile phones are relatively new, it could take many years for the problem to show. (10,11)

In a 2017 article in the International Journal of Oncology, Hardell states: In spite of this, in most countries little or nothing has been done to reduce exposure and educate people on health hazards from RF radiation. On the contrary ambient levels have increased. (12)

Rats and humans: rats have almost identical disease patterns to humans, according to the Human Genome Project research (13)

**Since these two studies**, the ICNIRP (see below for more on this group) has declined to update their guidelines. Professor Ronald Melnick of the National Toxicology Program study has spoken against the ICNIRP refusal to reassess cell phone radiation exposure guidelines, now 20 years old, after the US National Toxicology Program's 'clear evidence of cancer in experimental animals.' He has refuted every point of the ICNIRP document claiming that it has 'numerous false and misleading statements.' His paper in the peer-reviewed journal Environmental Research documents the 'unfounded criticisms' of the National Toxicology Program paper. Dr Belpoggi has also posted comments to say that no bias affected the NTP results or her own Ramazzini Institute results. 'We are scientists, our role is to produce solid evidence for hazard and risk assessment. Underestimating the evidence from carcinogen bioassays and delays in regulation have already proven many times to have severe consequences, as in the case of asbestos, smoking and vinyl chloride.' (Ramazzini Institute Statement on ICNIRP Note). (Critique of the ICNIRP Note of Sept 4, 2018 Regarding Recent Animal Carcinogenesis Studies.)

#### New study: glioma rates have doubled in England

Studies of brain tumour incidence have hitherto shown mixed results. However, a large new study reveals that rates of Glioblastoma Multiforme (GBM), the specific type of brain tumour associated with mobile radiation, have doubled. Researchers analysed 79,241 malignant brain tumours over 21 years and found that cases of GBM in England have increased from 1,250 per year in 1995 to just under 3,000. This is the first study to analyse in detail the different types of tumours; scientists at the Physicians' Health Initiative for Radiation and Environment (PHIRE) say that the increase of GMB has until now been masked by the overall fall in incidence of other types of brain tumour, which could explain the lack of an apparent spike in brain tumours. The researchers concluded that the increasing rate of tumours in the frontal temporal lobe 'raises the suspicion that mobile and cordless phone use may be promoting gliomas.' Professor Denis Henshaw said 'Our findings illustrate the need to look more carefully at, and try to explain the mechanisms behind, these cancer trends, instead of brushing the causal factors under the carpet and focusing only on cures.' (14)

Epidemiologist and Professor Emeritus Anthony Miller says that link with cancer 'can no longer be ignored':

An expert cancer researcher and advisor to the World Health Organization International Agency for Research on Cancer (WHO/IARC) (International Agency for Research on Cancer) has issued his scientific opinion that radiofrequency (RF) radiation from any source – such as the signals emitted by cell phones, other wireless and cordless and sensor devices, and wireless networks – fully meets criteria to be classified as a "Group 1 carcinogenic to humans" agent, based on scientific evidence associating RF exposure to cancer development and cancer promotion.

'The evidence indicating wireless is carcinogenic has increased and can no longer be ignored.' His opinion includes recent scientific publications which include the 2017 re-analysis of data from the Interphone study, the 2014 French National CERENAT Study, several new publications on Swedish cancer data, and the 2016 results of the National Toxicology Program.

Dr. Lennart Hardell and Michael Carlberg have published several epidemiological studies that found increased brain cancer associated with long-term cell phone use and conclude that "RF radiation should be regarded as a human carcinogen causing glioma." A review of epidemiological studies by Hardell and Carlsberg (Int. J. Environ. Res. Public Health 2014) shows persons diagnosed with brain cancer had decreased survival rates associated with higher wireless phone use. Abstract states: Due to the relationship with survival the classification of IARC is strengthened and RF-EMF should be regarded as human carcinogen requiring urgent revision of current exposure guidelines.

#### Sperm damage and brain development:

Environmental Health Trust online lists studies including:

Dr. Devra Davis has shown that wireless radiation results in sperm damage and alters brain development.

Dr. Marc Arazi presented data released by the cell phone radiation test program of the Government of France, which found that when cell phones are tested in body contact positions, RF radiation exposure exceeds regulatory limits.

#### Damage to the blood-brain barrier

It is commonly claimed that wireless radiation does not penetrate the blood-brain barrier, which is key to protecting the brain from damage. However, a Swedish study from 1997 showed that this is not the case (15).

"Neuronal damage may not have immediately demonstrable consequences, even if repeated. It may, however, in the long run, result in reduced brain reserve capacity that might be unveiled by other later neuronal disease or even the wear and tear of ageing. We cannot exclude that after some decades of (often), daily use, a whole generation of users, may suffer negative effects such as autoimmune and neurodegenerative diseases maybe already in their middle age". Dr. Salford, Dr. Nittby, and Dr. Persson in 'Effects of Electromagnetic Fields From Wireless Communication upon the Blood Brain Barrier' The Bioinitiative Report 2012

#### Electrosensitivity

This is a condition not yet recognised by the medical establishment; however numbers of people reporting symptoms anecdotally are growing and at least one study has suggested that this is a real health condition rather than a psychosomatic one (see Joel Moskowitz' reference and also (16)). To be confirmed: the telecoms industry claims that studies exist showing the condition to be psychosomatic. Anecdotally: I have seen ES sufferers and their symptoms correspond with measurements taken using a Cornet device. Dr Erica Mallory-Blythe is a doctor and 5G campaigner who raises awareness about ES. Please see her PHIRE leaflet.

#### SAR levels

Official US advice on the SAR (Specific Absorption Rate) of phones is that this should be 1.6 watts or less per kg of body weight or 2 w/kg in Europe. SAR levels are not independently tested; industries can self-report. Moreover, in hot spots 'realistic mobile phone exposure' SAR levels can reach 40 watts per kilo. (17)

### **Martin Pall**

Professor Emeritus of Biochemistry Dr Martin Pall has extensively studied the way in which existing wireless radiation has a detrimental impact on health, including DNA damage and oxidative stress. New research shows mechanisms by which damage from non-ionising radiation occurs involving calcium channels in cells. The US Federal Communications Commission standard is based on the thermal effect - how much it heats tissue - but the regulations are 20 years old. Pall



shows how safety studies are based only on thermal effects but that non-thermal effects are extensively documented and essential to recognise.

### Martin Pall

Professor Emeritus of Biochemistry at Washington State University Martin Pall (widely quoted as saying '5G is the stupidest idea in the history of the world') lists four main dangers to humans: 1) an extraordinary number of antennae are required, 2) high outputs are needed for penetration, 3) pulsation levels will be very high, and 4) 5G will have an impact on the human body's cellular electrical field [more about this]. He warns that pulsed radiation used by 5G satellites is biologically active and can produce radiation effects deep within human bodies. The voltage sensors within human cells are sensitive to radiation, and when cells are exposed to radiation, excessively charged ions flow into the cell. Side-effects may include lowered fertility, neurological damage, cell apoptosis, DNA damage, free radical damage, hormonal effects, excessive intracellular calcium, and cancer.

Pall's paper looking at 23 controlled, scientific studies:

'Wi-Fi is an important threat to human health.' Environmental Research, Volume 164, July 2018, Pages 405-416 <https://www.sciencedirect.com/science/article/pii/S0013935118300355>

ABSTRACT: Repeated Wi-Fi studies show that Wi-Fi causes: oxidative stress, sperm/testicular damage, neuropsychiatric effects including EEG changes, apoptosis, cellular DNA damage, endocrine changes, and calcium overload. Each of these effects are also caused by exposures to other microwave frequency EMFs, with each such effect being documented in from 10 to 16 reviews. Therefore, each of these seven EMF effects are established effects of Wi-Fi and of other microwave frequency EMFs. Each of these seven is also produced by downstream effects of the main action of such EMFs, voltage-gated calcium channel (VGCC) activation. While VGCC activation via EMF interaction with the VGCC voltage sensor seems to be the predominant mechanism of action of EMFs, other mechanisms appear to have minor roles. Minor roles include activation of other voltage-gated ion channels, calcium cyclotron resonance and the geomagnetic magnetoreception mechanism. Five properties of non-thermal EMF effects are discussed. These are that pulsed EMFs are, in most cases, more active than are non-pulsed EMFs; artificial EMFs are polarized and such polarized EMFs are much more active than non-polarized EMFs; dose-response curves are non-linear and non-monotone; EMF effects are often cumulative; and EMFs may impact young people more than adults. These general findings and data presented earlier on Wi-Fi effects were used to assess the Foster and Moulder (F&M) review of Wi-Fi. The F&M study claimed that there were seven important studies of Wi-Fi that each showed no effect. However, none of these were Wi-Fi studies, with each differing from genuine Wi-Fi in three distinct ways. The tiny numbers studied in each of these seven F&M-linked studies show that each of them lack power to make any substantive conclusions. In conclusion, there are seven repeatedly found Wi-Fi effects which have also been shown to be caused by other similar EMF exposures. Each of the seven should be considered, therefore, as established effects of Wi-Fi.

He states:

It should be obvious, that non-thermal EMFs:

1. Attack our nervous systems including our brains leading to widespread neuropsychiatric effects and possibly many other effects. This nervous system attack is of great concern.
2. Attack our endocrine (that is hormonal) systems. In this context, the main things that make us functionally different from single celled creatures are our nervous system and our endocrine systems – even a simple planaria worm needs both of these. Thus the consequences of the disruption of these two regulatory systems is immense, such that it is a travesty to ignore these findings.

3. Produce oxidative stress and free radical damage, which have central roles in all common chronic diseases.
4. Attack the DNA of our cells, producing single strand and double strand breaks in cellular DNA and oxidized bases in our cellular DNA. These in turn produce both cancer and mutations in germ line cells with germ line mutations producing mutations impacting future generations.
5. Produce elevated levels of apoptosis (programmed cell death), events especially important in causing both neurodegenerative diseases and infertility.
6. Lower male and female fertility, lowered sex hormones, lowered libido, increased levels of spontaneous abortion and, as already stated, attacks on the DNA in sperm cells.
7. Produce excessive intracellular calcium  $[Ca^{2+}]_i$  and increased calcium signaling.
8. Act in the cells of our bodies via 15 different mechanisms to cause cancer.

Martin Pall's booklet can be downloaded for free online. <https://peaceinspace.blogspot.com/files/5g-emf-hazards--dr-martin-l.-pall--eu-emf2018-6-11us3.pdf>

Presentation to the NIH: <https://www.youtube.com/watch?v=lulKq3FMGGs>

### **Other expert sources to look into further**

Ronald Melnick PhD, retired Senior Toxicologist at the US National Institute of Environmental Health, has spoken publicly about the threat to health from wireless radiation.

Dr Sharon Goldberg is a radiation researcher and expert witness at legal cases against 5G masts in the US who states that there is no longer any debate around the harm to health posed by our existing wireless radiation.

For references for the 1000s of papers:

Some are referenced in this document. Presumably a meta-analysis of all the studies has not yet been funded (tbc). Dr Erica Mallory-Blythe is a strictly evidence-based doctor in the UK and more information may be obtained from her; another possible resource would be Sharon Goldberg or a radiation expert and 5G litigator in the US Sally is in touch with who wishes to remain anonymous. This litigator states that there are 25K studies showing harm to health (compared with 11K for tobacco).

### **Extra risks for babies and children**

In 2017 neuroscientist Dr Sarah Starkey submitted a list of evidence of damage to human health from WiFi, 3G and 4G to the Westminster Parliamentary Science and Technology Committee for their Inquiry into Early Years Interventions, which has so far been ignored. A full list of her study references is available here: [https://cdn.website-editor.net/2479f24c54de4c7598d60987e3d81157/files/uploaded/Early\\_Years\\_Inquiry\\_EY10062.pdf?fbclid=IwAR1ZldB\\_ozZECf7-Fte0OSMdQQaSYsFmRfkSNBZMUWpmwGMC-HLdplJndjw](https://cdn.website-editor.net/2479f24c54de4c7598d60987e3d81157/files/uploaded/Early_Years_Inquiry_EY10062.pdf?fbclid=IwAR1ZldB_ozZECf7-Fte0OSMdQQaSYsFmRfkSNBZMUWpmwGMC-HLdplJndjw) (18). Starkey states that current UK government guidelines do not reflect the evidence base. Children, babies and pregnant women are of particular concern, since children absorb microwave radiation from, for example, WiFi in the home, much more readily than adults. (19) In 2013 an independent group called SSITA (Safe Schools Information Technology Alliance) complained to Public Health England about their failure to provide precautionary advice on pulsed microwave-emitting technologies other than mobile phones, particularly the use of wireless networks in schools, based on studies such as those cited by Dr Starkey.(20)

Starkey's summary:

A limited number of studies in humans, plus substantial evidence from animal studies, point to wireless radiofrequency signals being able to cause physical damage during development (prenatally, postnatally, in childhood and adolescence), as well as in adulthood, which may result in serious negative health, wellbeing or developmental outcomes. That effects are seen in animal studies indicates that the radiofrequency signals themselves can have adverse effects, and it is not just children or young people accessing social media/internet through mobile devices, or time spent looking at screens. Exposures to wireless radiofrequency signals need to be considered when looking at developmental, health, behavioural, wellbeing and mental health issues in children and young people. If children are to be protected from harm, or possible harm, restrictions and regulations need to be introduced.

Martin Pall's paper in *Environmental Research* (as above): Most arguments that have been made that microwave frequency EMFs may be much more damaging to young children have centered on the much smaller skulls and skull thickness in young children, increasing the exposure of their brains to EMFs [60, 61]. However there are other arguments to be made. EMFs have been shown to be particularly active in producing effects on embryonic stem cells [62-71]. Because such stem cells occur at much higher cell densities in children, with stem cell densities the highest in the fetus and decreasing with increasing age [62, 63], impacts on young children are likely to be much higher than in adults. The decreased DNA repair and increased DNA damage following EMF exposure, in conjunction with the increased cell division in young children, strongly suggest that young children may be increasingly susceptible to cancer following such exposures [62-64, 71]. Two reviews discussed in the next chapter provide further evidence on higher cancer susceptibility of children. EMF action on stem cells may also cause young children to be particularly susceptible to disruption of brain development [66,71], something that may be relevant to autism causation.

### Electrosmog versus mobile phones

Mobile phones emit more intense electromagnetic radiation than Wi-Fi systems. However, as SSITA (Safe Schools Information Technology Information) doctors have written in a complaint to Public Health England: 'Failure to promote precaution in the case of other wireless technologies such as Wi-Fi and smart meters cannot be justified on the grounds that exposures are less than from mobile phones. This does not take into account the fact that exposure from Wi-Fi in schools and smart meters is constant whereas mobile phone exposure only occurs during phone calls. Furthermore, mobile phone exposure is voluntary whereas in the case of Wi-Fi in schools and smart meters in homes it is involuntary, i.e. people are being forced to be exposed to the pulsed microwaves and cannot choose to exercise precaution. This is arguably a violation of the Right to Health Protection as outlined in Section 4 of the article 'Precautionary Environmental Protection and Human Rights' (2007).' (21)

### **Base stations and cell towers:**

The standard advice from Cancer Research UK is that proximity to cell masts does not increase cancer risk. The BMJ claims there is no association, based on a study of children whose mothers lived by base stations during pregnancy, and this is widely-cited by the press and government bodies.

Yet this article in the British Medical Journal (<https://www.bmj.com/rapid-response/2011/11/01/journalists-not-using-all-data>) states:

*Dr Grahame Blackwell, Independent UK physicist and consultant has summarised six studies of masts and effects:*

*“These above six studies are the only studies known of that specifically consider the effects of masts on people. All six of these studies show clear and significant ill-health effects. There are no known studies relating to health effects of masts that do not show such ill-health effects.*

*Professor Santini et al. Pathol Biol (Paris)*

*“... it is advisable that mobile phone base stations not be sited closer than 300 meters to populations”*

*Netherlands Organization for Applied Scientific Research (TNO) Study for the Netherlands Ministries of Economic Affairs, Housing, Spatial Planning and the Environment, and Health, Welfare and Sport found significant effects on wellbeing, according to a number of internationally -recognised criteria (including headaches, muscle fatigue/pain, dizziness etc) from 3G mast emissions well below accepted ‘safety’ levels (less than 1/25,000th of ICNIRP guidelines)*

A British Medical Journal article states that conflicts of interest cloud results when looking at RF radiation generally; this may also apply to studies of proximity to masts. <https://www.bmj.com/rapid-response/2011/11/01/journalists-not-using-all-data>

There have been studies from developing countries showing cancer clusters around masts which may reflect poor regulation of emissions. Eg:

[https://www.researchgate.net/publication/318916428\\_Impact\\_of\\_radiofrequency\\_radiation\\_on\\_DNA\\_damage\\_and\\_antioxidants\\_in\\_peripheral\\_blood\\_lymphocytes\\_of\\_humans\\_residing\\_in\\_the\\_vicinity\\_of\\_mobile\\_phone\\_base\\_stations](https://www.researchgate.net/publication/318916428_Impact_of_radiofrequency_radiation_on_DNA_damage_and_antioxidants_in_peripheral_blood_lymphocytes_of_humans_residing_in_the_vicinity_of_mobile_phone_base_stations)

This study shows adverse effects, particularly within 80 metres:

The RF power density of the exposed individuals was significantly higher ( $p < 0.0001$ ) when compared to the control group. The HPBLs were cultured and the DNA damage was assessed by cytokinesis blocked micronucleus (MN) assay in the binucleate lymphocytes. The analyses of data from the exposed group ( $n = 40$ ), residing within a perimeter of 80 m of mobile base stations, showed significantly ( $p < 0.0001$ ) higher frequency of micronuclei when compared to the control group, residing 300 m away from the mobile base station/s. The analysis of various antioxidants in the plasma of exposed individuals revealed a significant attrition in glutathione (GSH) concentration ( $p < 0.01$ ), activities of catalase (CAT) ( $p < 0.001$ ) and superoxide dismutase (SOD) ( $p < 0.001$ ) and rise in lipid peroxidation (LOO) when compared to controls. Multiple linear regression analyses revealed a significant association among reduced GSH concentration ( $p < 0.05$ ), CAT ( $p < 0.001$ ) and SOD ( $p < 0.001$ ) activities and elevated MN frequency ( $p < 0.001$ ) and LOO ( $p < 0.001$ ) with increasing RF power density.

In 2008 a cancer cluster was reported in the area around a tower in Dudley found to have the highest levels of radiation in the UK (yet still within safety guidelines).

In 2014 government inspectors are reported to have turned down the erection of a mast due to potential health issues. <https://www.emfacts.com/2014/08/uk-mobile-phone-company-banned-from-erecting-a-mast-because-of-health-fears/>.

In some developing countries there have been reports of cancer clusters: Brazil study ‘Mortality by neoplasia and cellular telephone base stations’ (Dode, 2011).

A 10-year study by Brazil Health Department and several universities - elevated cancer mortality at 500m or less. After this study almost half of the city antennas were removed and cell phone companies were sued.

It would seem important to investigate further any bias in BMJ studies and **to confirm also that with 5G masts added to existing stations that radiation levels will be higher.**

## **Health issues specific to 5G microwave radiation:**

5G antennas will greatly increase levels of existing wireless radiation.

The UK radiation level limits are already set much higher than in other countries (see chart below, under 'ICNIRP') and in addition the ICNIRP have voted to relax guidelines.

5G will use current frequencies in addition to high millimetre wave and sub-millimetre wave frequencies of 100GHz and beyond.

Therefore bioeffects from both increased cumulative effects of existing radiation, which may be synergistic and not just additive (see chart supplied as additional reading; this has been provided by a postmasters' in radiation as a guide but is not in peer-reviewed literature) as well as those specific to high-frequency radiation may be anticipated.

### Professor Joel Moskowitz of the University of California

Joel M. Moskowitz is a Professor Emeritus of radiation at the School of Public Health at the University of California Berkeley and an expert in mobile phone radiation and electromagnetic fields. He states:

- Millimetre waves such as those in use by 5G are absorbed by the first 1-2 mm of skin and the eye cornea. Since the skin contains nerve endings and capillaries, bio-effects may be transmitted further.
- Thermal (or heating) effects as used by the military's ADS system occur when the power density of the waves is above 5–10 mW/cm<sup>2</sup>. The maximum permissible exposure that the FCC permits for the general public is 1.0 mW/cm<sup>2</sup> averaged over 30 minutes for frequencies that range from 1.5 GHz to 100 GHz. This guideline was adopted in 1996 to protect humans from acute exposure to thermal levels of radiofrequency radiation. However, the guidelines were not designed to protect us from nonthermal risks that may occur with prolonged or long-term exposure to radiofrequency radiation.
- With the deployment of fifth generation wireless infrastructure (aka 5G), much of the nation will be exposed to MMWs for the first time on a continuous basis. Due to FCC guidelines, these exposures will likely be of low intensity. Hence, the health consequences of 5G exposure will be limited to non-thermal effects produced by prolonged exposure to MMWs [ie high-frequency millimetre waves] in conjunction with exposure to low- and mid-band radiofrequency radiation [from existing radiation]. Few studies have examined prolonged exposure to low-intensity MMWs, and no research has focused on exposure to MMWs combined with other radiofrequency radiation. It has not therefore been proven safe.
- Biologic effects of low-intensity MMWs have been studied for decades, particularly in Eastern Europe, study results are often inconsistent because the effects are related to many factors including the frequency, modulation, power density, and duration of the exposures, as well as the type of tissue or cells being investigated. Therefore results vary across studies with not all showing harmful effects.

- MMWs have been shown to induce or inhibit cell death and enhance or suppress cell proliferation. Some studies found that the radiation inhibits cell cycle progression, and some studies reported no biologic effects (Le Drean et al., 2013)
- A review of the research in 2010 noted that “A large number of cellular studies have indicated that MMW may alter structural and functional properties of membranes.” Exposure to MMWs may affect the plasma membrane either by modifying ion channel activity or by modifying the phospholipid bilayer. Water molecules also seem to play a role in these effects. Skin nerve endings are a likely target of MMWs and the possible starting point of numerous biological effects. MMWs may activate the immune system through stimulation of the peripheral neural system (Ramundo-Orlando, 2010).
- In 1998, five scientists employed by U.S. Army and Air Force research institutes published a seminal review of the research on MMWs. They reported:
  - “Increased sensitivity and even hypersensitivity of individual specimens to MMW may be real. Depending on the exposure characteristics, especially wavelength, a low-intensity MMW radiation was perceived by 30 to 80% of healthy examinees (Lebedeva, 1993, 1995). Some clinical studies reported MMW hypersensitivity, which was or was not limited to a certain wavelength (Golovacheva, 1995).”
  - It is important to note that, even with the variety of bioeffects reported, no studies have provided evidence that a low-intensity MMW radiation represents a health hazard for human beings but they have also not looked at health risks. In view of numerous bioeffects and growing usage of MMW technologies this research objective seems very reasonable. Such MMW effects as alterations of cell growth rate and UV light sensitivity, biochemical and antibiotic resistivity changes in pathogenic bacteria, as well as many others are of potential significance for safety standards, but even local and short-term exposures were reported to produce marked effects. It should also be realized that biological effects of a prolonged or chronic MMW exposure of the whole body or a large body area have never been investigated. Safety limits for these types of exposures are based solely on predictions of energy deposition and MMW heating, but in view of recent studies this approach is not necessarily adequate.” (Pakhomov et al., 1998)
  - Microbes are also affected by MMW radiation. In 2016 a review of the research on the effects of MMWs on bacteria was published (Soghomonyan et al., 2016). The authors summarized their findings as follows: “...bacteria and other cells might communicate with each other by electromagnetic field of sub-extremely high frequency range. These MMW affected *Escherichia coli* and many other bacteria, mainly depressing their growth and changing properties and activity. These effects were non-thermal and depended on different factors. The significant cellular targets for MMW effects could be water, cell plasma membrane, and genome....The consequences of MMW interaction with bacteria are the changes in their sensitivity to different biologically active chemicals, including antibiotics....These effects are of significance for understanding changed metabolic pathways and distinguish role of bacteria in environment; they might be leading to antibiotic resistance in bacteria.”
  - “Changing the sensitivity of bacteria to antibiotics by MMW irradiation can be important for the understanding of antibiotic resistance in the environment. In this respect, it is interesting that bacteria [that] survived near telecommunication-based stations like *Bacillus* and *Clostridium* spp. have been found to be multidrug resistant (Adebayo et al. 2014).” (Soghomonyan et al., 2016)
- In 1977, N.P. Zalyubovskaya published a study, "Biological effects of millimeter waves," in a Russian-language journal, "Vracheboyne Delo." The CIA declassified this paper in 2012. The study examined the effects of exposing mice to millimeter radiation (37-60 GHz; 1 milliwatt per square centimeter) for 15 minutes daily for 60 days. The animal results were compared to a sample of people working with millimeter generators. Here is a brief summary of the paper: studies conducted on humans and animals showed structural alterations in the skin and internal organs, changes in blood and bone marrow composition, changes in enzymatic activity and nucleic metabolism. ‘the degree of unfavourable effect of radiation depended on the duration of the radiation and individual characteristics of the organism.’

- In sum, the peer-reviewed research demonstrates that short-term exposure to low-intensity millimeter wave (MMW) radiation not only affects human cells, it may result in the growth of multi-drug resistant bacteria harmful to humans. Since little research has been conducted on the health consequences from long-term exposure to MMWs, widespread deployment of 5G or 5<sup>th</sup> generation wireless infrastructure constitutes a massive experiment that may have adverse impacts on the public's health.

### Tissue damage

A new study (Neufeld & Kuster, 2018) has shown that due to the heating effect of 5G electromagnetic waves, the exposure times 'tolerated by the International Council on Non-Ionizing Radiation Protection guidelines may lead to permanent tissue damage after even short exposures, highlighting the importance of revisiting existing exposure guidelines.'

### Sweat ducts

Environ Res. 2018 May;163:208-216. 2018 Feb 22.

The human skin as a sub-THz receiver - Does 5G pose a danger to it or not?

Betzalel N1, Ben Ishai P2, Feldman Y3.

In the interaction of microwave radiation and human beings, the skin is traditionally considered as just an absorbing sponge stratum filled with water. In previous works, we showed that this view is flawed when we demonstrated that the coiled portion of the sweat duct in upper skin layer is regarded as a helical antenna in the sub-THz band....The presence of the sweat duct led to a high specific absorption rate (SAR) of the skin in extremely high frequency band. In this paper, we summarize the physical evidence for this phenomenon and consider its implication for the future exploitation of the electromagnetic spectrum by wireless communication. Starting from July 2016 the US Federal Communications Commission (FCC) has adopted new rules for wireless broadband operations above 24 GHz (5 G). This trend of exploitation is predicted to expand to higher frequencies in the sub-THz region. One must consider the implications of human immersion in the electromagnetic noise, caused by devices working at the very same frequencies as those, to which the sweat duct (as a helical antenna) is most attuned. We are raising a warning flag against the unrestricted use of sub-THz technologies for communication, before the possible consequences for public health are explored

Dr Sharon Goldberg: MD in internal medicine, professor, clinical researcher testified at 5G legislation in Michigan. This testimony can be viewed online. Some notes:

WR has biological effects in all life forms. Clear evidence of cancer in humans now, DNA damage, cardiomyopathy, neuropsychiatric effects - the science is settled. Unsustainable healthcare expenditures. We have been sitting on the evidence for decades. Epidemics are linked. Diabetes is linked according to peer-reviewed literature; the nearer to a cell tower the higher your glucose and therefore 5G antennas are dangerous. The way to create diabetes in rats in the lab is to expose them to 2.2GHz. Diabetes causes chronic kidney disease. Mental health epidemic, suicide, violent crime, opioids - the peer-reviewed literature in PubMed shows clear links which have been glossed over by the wireless industry; industry-funded studies are not clear but independent studies are very clear. We need to start measuring how much radiation people are exposed to before we roll out 5G. US Toxicology Programme study is just one cell phone but we have cell towers, smart meters, wifi, 4G and so on - many layers. Don't roll out a new untested technology. The American Cancer Society saying there is no evidence: this is due to conflicts of interests. In academia 5G is 'an untested application of a technology we know is harmful from the science. It's called human subjects research. You can't just roll out a research on human beings unless you inform them and have their approval. We have decades of evidence to show that it is not safe.'

SCHEER (the EU Scientific Committee on Health, Environmental and Emerging Risks) SCHEER state in their 2018 report that 'the lack of clear evidence to inform the development of exposure guidelines to 5G technology leaves open the possibility of unintended biological consequences' and include electromagnetic radiation, especially from 5G, along with e-cigarettes, nanoparticles and other toxins in their list of concerns.  
[https://ec.europa.eu/health/sites/health/files/scientific\\_committees/scheer/docs/scheer\\_s\\_002.pdf](https://ec.europa.eu/health/sites/health/files/scientific_committees/scheer/docs/scheer_s_002.pdf)

### **Further resources which contain references to peer-reviewed literature:**

<http://phiremedical.org/full-overview/> headed by strictly science-based Dr Erica Mallory-Blythe who is a 5G campaigner and speaker - her leaflet accompanies this document

EMF Appeal <https://www.emfscientist.org>

Bioinitiative: a group of MDs and professors with a large body of evidence showing harm to living organisms.

EH Trust <https://ehtrust.org/scientific-research-on-5g-and-health/>

### **Anecdotal reports of EMF symptoms from existing 5G areas**

UN staff worker Claire Edwards in Vienna where 5G has been rolled out on reports of EMF poisoning: Friends and acquaintances and their children in Vienna are already reporting the classic symptoms of EMR poisoning:<sup>[9]</sup> nosebleeds, headaches, eye pains, chest pains, nausea, fatigue, vomiting, tinnitus, dizziness, flu-like symptoms, and cardiac pain. They also report a tight band around the head; pressure on the top of the head; short, stabbing pains around the body; and buzzing internal organs. Other biological effects such as tumours and dementia usually take longer to manifest, but in the case of 5G, which has never been tested for health or safety, who knows

### **Coalitions of scientists appealing to freeze 5G**

The 5G Appeal Scientists and doctors from 36 countries have signed the Appeal calling for a moratorium on the roll-out of 5G and the mandatory exposure to wireless radiation this would impose on humans and the environment.

The 5G Space Appeal Hundreds of scientists from the Appeal state: 'RF radiation has been proven harmful for humans and the environment. The deployment of 5G constitutes an experiment on humanity and the environment that is defined as a crime under international law.' With "the implementation of 5G threaten serious, irreversible consequences for humans," warn more than 400 physicians and scientists.

The EMF Scientist Appeal 230 scientists from all over the world have stated in the Appeal that 'numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines.'  
Scientific basis for our common concerns: Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life.



These findings justify our appeal to the United Nations (UN) and, all member States in the world, to encourage the World Health Organization (WHO) to exert strong leadership in fostering the development of more protective EMF guidelines, encouraging precautionary measures, and educating the public about health risks, particularly risk to children and fetal development. By not taking action, the WHO is failing to fulfill its role as the preeminent international public health agency.

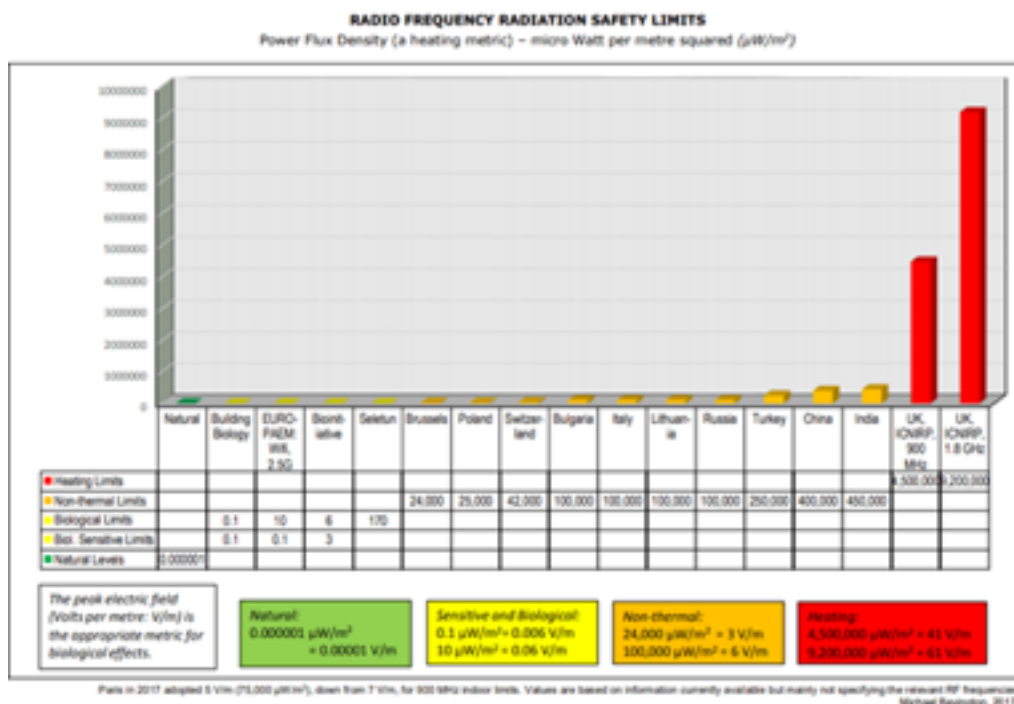
Since there is controversy about a rationale for setting standards to avoid adverse health effects, we recommend that the United Nations Environmental Programme (UNEP) convene and fund an independent multidisciplinary committee to explore the pros and cons of alternatives to current practices that could substantially lower human exposures to RF and ELF fields. The deliberations of this group should be conducted in a transparent and impartial way. Although it is essential that industry be involved and cooperate in this process, industry should not be allowed to bias its processes or conclusions. This group should provide their analysis to the UN and the WHO to guide precautionary action.

Further info: <https://www.emfscientist.org>

Claire Edwards can be contacted at [stop5gappeal@protonmail.com](mailto:stop5gappeal@protonmail.com). Her colleague Arthur Firstenberg can be contacted at [spaceappeal@fastmail.fm](mailto:spaceappeal@fastmail.fm) or [www.5gspaceappeal.org/contact/](http://www.5gspaceappeal.org/contact/).

## ICNIRP guidelines on mobile radiation exposure

Current UK guidelines are already comparatively extremely high and are due to be relaxed further:



For more on UK limits see: <http://phiremedical.org/safety-limits-and-political-conflicts-of-interest/>

The ICNIRP is a small, private, industry-loyal group

The ICNIRP (International Committee on Non-Ionising Radiation Protection) sets the guidelines for radiation exposure. Bodies such as the WHO and PHE (Public Health England) as well as the NHS ultimately take their cue from the ICNIRP.

The ICNIRP is a private non-accountable NGO consisting of six self-selected members and is an industry-loyal group. The group does not disclose its funding sources.

Journal of Oncology <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504984/>

In 2014 the WHO launched a draft of a Monograph on RF fields and health for public comments. It turned out that five of the six members of the Core Group in charge of the draft are affiliated with International Commission on Non-Ionizing Radiation Protection (ICNIRP), an industry loyal NGO, and thus have a serious conflict of interest. Just as by ICNIRP, evaluation of non-thermal biological effects from RF radiation are dismissed as scientific evidence of adverse health effects in the Monograph. This has provoked many comments sent to the WHO. However, at a meeting on March 3, 2017 at the WHO Geneva office it was stated that the WHO has no intention to change the Core Group.

The only proven adverse health effect of radiofrequency electromagnetic fields cited by ICNIRP is the heating of the tissue, as occurs at high dosage, as happens with a microwave oven. According to ICNIRP, after 2 watts per kg of body weight the tissue temperature rises measurably. The association set the value in 1998 and today's limits from base stations and mobile phones are based on that. Critics say that the restriction on the heating effect is arbitrary. High-frequency beams also produce non-thermal effects in living cells, even when they are low-dose. Biological processes are always based on electrochemical processes, such as the transmission of nerve impulses. The members of ICNIRP do not deny that. "We just are not convinced that these effects have been proven to be harmful to health," explains its chairman, the Dutch biologist Eric van Rongen.

EMF scientist appeal criticism: It is our opinion that, because the ICNIRP guidelines do not cover long-term exposure and low-intensity effects [of 4G and 3G], they are insufficient to protect public health.

Bioinitiative: (<https://bioinitiative.org>) A report by 29 professors and medical researchers from eleven countries represent all of the required disciplines such as cancer research, molecular biology and epidemiology, and they published a counter-report to the ICNIRP position. "The biological effects of cell phone radiation prevent the body from healing damaged DNA and reducing its resistance to disease," the authors write, citing more than 1,000 scientific publications. This could profoundly affect the metabolic and reproductive functions. According to Swedish oncologist Lennart Hardell, one of the lead authors, studies with several thousand cell phone users surveyed have "proven that high-frequency electromagnetic radiation increases the risk of brain tumors".

### Public Health England

In 2013 SSITA (Safe Schools Information Technology Alliance) complained to PHE about their failure to provide appropriate precautionary advice on pulsed microwave-emitting technologies other than mobile phones, particularly the use of wireless networks in schools and homes, and Smart Meters in homes and small businesses. The HPA (previous body similar to PHE) did not mention studies showing the risks. 'This is arguably a violation of the Right to Health Protection as outlined in Section 4 of the article 'Precautionary Environmental Protection and Human Rights' (2007).'

AGNIR (Advisory Group on Non-Ionising Radiation) the now-defunct government group on non-ionising radiation who advise PHE, conclude that 'there is no convincing evidence that radio wave exposures below the ICNIRP guideline levels cause health effects in adults or children.'

However, the SSITA strongly disagrees with this statement, saying that 'a large body of published scientific data has found that pulsed radiofrequency microwaves below the guideline levels can cause biological and adverse health effects, although many of these papers were omitted from the AGNIR 2012 report...As stated in the Benevento Resolution (2006) from the International Commission for Electromagnetic Safety, 'arguments that weak (low intensity) EMF cannot affect biological systems do not represent the current spectrum of scientific opinion.'

### A note on Wikipedia

The entry for 'mobile radiation and health' states that there has been found to be no risk from mobile phones and does not mention the three large recent studies cited at the top of this document - the two showing glioma in rats and the study showing that glioma rates have doubled.

The entry for 'mobile phone overuse' says: 'Cancer, specifically brain cancer, and its correlation with phone use, is under ongoing investigation. Many variables affect the likelihood of hosting cancerous cells, including how long and how frequently people use their phones. There has been no definitive evidence linking cancer and phone use if used moderately, but the International Agency for Research on Cancer of the World Health Organization said in 2011 that radio frequency is a possible human carcinogen, based on heavy usage increasing the risk of developing glioma tumors.<sup>[36]</sup> Although a relationship has not been fully established, research is continuing based on leads from changing patterns of mobile phone use over time and habits of phone users.<sup>[37]</sup> Low level radio frequency radiation has also been confirmed as a promoter of tumors in mice.<sup>[38]</sup> Minor acute immediate effects of radio frequency exposure have long been known such as the Microwave auditory effect which was discovered in 1962.<sup>[39]</sup>

### **Legal action and councils**

The public has not been consulted on whether or not it wants 5G. The rollout of 5G entails mandatorily subjecting every member of the public to 5G exposure which will be at higher levels in cities.

Currently litigators are working in the US and Australia on behalf of those affected by 5G; in Australia this is done on the grounds of assault and technological trespass.

In the UK some groups are beginning to look into crowdfunding legal action whilst others are attempting to hold local councils to account. Councillors claim no obligation but as they contract the suppliers and the central government has given the responsibility to local councils to contract out, for example, lampposts, this is not in fact the case. The wording of the Constitution which can be downloaded online must be looked at.

Communities are being advised on taking Class Actions and public interest challenges whereby government and local councils are the defendants, for example against a local council, since on the one hand, it is a commercial partner of companies that develop and operate infrastructure (and pay for the use of council property and street lights to site base stations and antenna), versus its obligations to residents as regards human health and environmental protection.

Notices of Liability will be lodged by individual residents and targeting telecoms companies and infrastructure providers.

FOIs: these have been submitted but in the case of BCC a reply was sent saying that the questions about masts and proof that 5G has been safety-tested could not be answered.

## Signs that the Telecoms companies are aware that medical advice could change:

Shareholders are warned about changing values caused by safety concerns: As Vodafone notes in the 2017 annual report: "Electromagnetic signals emitted by mobile devices and base stations can pose health risks with potential consequences, including: changes in national legislation, a reduction in mobile phone use or litigation." Deutsche Telekom also warns its Shareholders said there was "a risk of regulatory intervention, such as lowering electromagnetic field limits or implementing precautionary measures in mobile communications".

The "legal information" supplied by phone manufacturers advise keeping the phone an inch from the body. 'Failure to do so may cause your smartphone to exceed the specified limits.'

Insurance companies will not insure for wireless radiation damage due to 'high impact risk'

## Safe technology alternatives to explore

Fibre optics; cables  
Ethernet  
WiFi in schools  
4G (at a minimum) instead of 5G, using fibre optics

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### Further reading and resources

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<https://www.thenation.com/article/how-big-wireless-made-us-think-that-cell-phones-are-safe-a-special-investigation/>

Claire Edwards' report from Vienna: <https://www.globalresearch.ca/5g-wireless-technology-is-war-against-humanity/5679372>

<https://bioinitiative.org>

Scientists and 5G appeal <https://www.5gappeal.eu/the-5g-appeal/>

<http://www.5gspaceappeal.org/the-appeal>

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Senator Richard Blumenthal, senator for Connecticut, raises concerns: <https://www.youtube.com/watch?v=hsil3VQE5K4>

Senator Patrick Colbeck: YouTube video about health concerns: <https://www.youtube.com/watch?v=Ov1iskVvFSs&feature=youtu.be&fbclid=IwAR0vXTO5LQpBdFQ1P9IX9PYmjpvE-f8cetBtFRXjYEAYE1WU1XvxLHzKqBI>

### Further studies on millimetre waves

Belyaev IY, Shcheglov VS, Alipov ED, Ushakov VD. Nonthermal effects of extremely high-frequency microwaves on chromatin conformation in cells in vitro—Dependence on physical, physiological, and genetic factors. *IEEE Transactions on Microwave Theory and Techniques*. 2000; 48(11):2172-2179.

This finding suggested an interaction of microwaves with cell-to-cell communication. Such dependence on several genetic, physiological, and physical variables might be a reason why, in some studies, the authors failed to reproduce the original data of others.

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Ramundo-Orlando A. Effects of millimeter waves radiation on cell membrane - A brief review. *Journal of Infrared, Millimeter, and Terahertz Waves*. 2010; 31(12):1400–1411.

Abstract

The millimeter waves (MMW) region of the electromagnetic spectrum, extending from 30 to 300 GHz in terms of frequency (corresponding to wavelengths from 10 mm to 1 mm), is officially used in non-invasive

complementary medicine in many Eastern European countries against a variety of diseases such as gastro duodenal ulcers, cardiovascular disorders, traumatism and tumor. On the other hand, besides technological applications in traffic and military systems, in the near future MMW will also find applications in high resolution and high-speed wireless communication technology. This has led to restoring interest in research on MMW induced biological effects. In this review emphasis has been given to the MMW-induced effects on cell membranes that are considered the major target for the interaction between MMW and biological systems.

<https://link.springer.com/article/10.1007%2Fs10762-010-9731-z>

Ryan KL, D'Andrea JA, Jauchem JR, Mason PA. Radio frequency radiation of millimeter wave length: potential occupational safety issues relating to surface heating. *Health Phys.* 2000; 78(2):170-81.

#### Abstract

Currently, technology is being developed that makes use of the millimeter wave (MMW) range (30-300 GHz) of the radio frequency region of the electromagnetic spectrum. As more and more systems come on line and are used in everyday applications, the possibility of inadvertent exposure of personnel to MMWs increases. To date, there has been no published discussion regarding the health effects of MMWs; this review attempts to fill that void. Because of the shallow depth of penetration, the energy and, therefore, heat associated with MMWs will be deposited within the first 1-2 mm of human skin. MMWs have been used in states of the former Soviet Union to provide therapeutic benefit in a number of diverse disease states, including skin disorders, gastric ulcers, heart disease and cancer. Conversely, the possibility exists that hazards might be associated with accidental overexposure to MMWs. This review attempts to critically analyze the likelihood of such acute effects as burn and eye damage, as well as potential long-term effects, including cancer.

<https://www.ncbi.nlm.nih.gov/pubmed/10647983>

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Soghomonian D, Trchounian K, Trchounian A. Millimeter waves or extremely high frequency electromagnetic fields in the environment: what are their effects on bacteria? *Appl Microbiol Biotechnol.* 2016; 100(11):4761-71. doi: 10.1007/s00253-016-7538-0.

#### Abstract

Millimeter waves (MMW) or electromagnetic fields of extremely high frequencies at low intensity is a new environmental factor, the level of which is increased as technology advance. It is of interest that bacteria and other cells might communicate with each other by electromagnetic field of sub-extremely high frequency range. These MMW affected *Escherichia coli* and many other bacteria, mainly depressing their growth and changing properties and activity. These effects were non-thermal and depended on different factors. The significant cellular targets for MMW effects could be water, cell plasma membrane, and genome. The model for the MMW interaction with bacteria is suggested; a role of the membrane-associated proton FOF1-ATPase, key enzyme of bioenergetic relevance, is proposed. The consequences of MMW interaction with bacteria are the changes in their sensitivity to different biologically active chemicals, including antibiotics. Novel data on MMW effects on bacteria and their sensitivity to different antibiotics are presented and discussed; the combined action of MMW and antibiotics resulted with more strong effects. These effects are of significance for understanding changed metabolic pathways and distinguish role of bacteria in environment; they might be leading to antibiotic resistance in bacteria. The effects might have applications in the development of technique, therapeutic practices, and food protection technology.

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Torgomyan H, Trchounian A. Bactericidal effects of low-intensity extremely high frequency electromagnetic field: an overview with phenomenon, mechanisms, targets and consequences. *Crit Rev Microbiol.* 2013; 39(1):102-11.

#### Abstract

Low-intensity electromagnetic field (EMF) of extremely high frequencies is a widespread environmental factor. This field is used in telecommunication systems, therapeutic practices and food protection. Particularly, in medicine and food industries EMF is used for its bactericidal effects. The significant targets of

cellular mechanisms for EMF effects at resonant frequencies in bacteria could be water (H<sub>2</sub>O), cell membrane and genome. The changes in H<sub>2</sub>O cluster structure and properties might be leading to increase of chemical activity or hydration of proteins and other cellular structures. These effects are likely to be specific and long-term. Moreover, cell membrane with its surface characteristics, substance transport and energy-converting processes is also altered. Then, the genome is affected because the conformational changes in DNA and the transition of bacterial pro-phages from lysogenic to lytic state have been detected. The consequences for EMF interaction with bacteria are the changes in their sensitivity to different chemicals, including antibiotics. These effects are important to understand distinguishing role of bacteria in environment, leading to changed metabolic pathways in bacteria and their antibiotic resistance. This EMF may also affect the cell-to-cell interactions in bacterial populations, since bacteria might interact with each other through EMF of sub-extremely high frequency range.

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Wu T, Rappaport TS, Collins CM. The human body and millimeter-wave wireless communication systems: Interactions and implications. *IEEE International Conference on Communications (ICC)*, Jun 2015. <https://ieeexplore.ieee.org/document/7248688>