Myth Fact on Statements Made to New Hampshire Legislature
Working Draft March 8, 2022

The State of New Hampshire is considering a proposed bill that would set a 1640-foot setback between cell towers and homes, schools and nurseries.

The CTIA Wireless Industry sent New Hampshire lawmakers testimony for the bill which we believe to be riddled with inaccurate and misleading information. In addition Josiah Bartlett also included numerous myths in a blog post about New Hampshire cell tower legislation.

This document compiles the inaccurate statements put forth by the CTIA wireless industry and documents the facts in a comprehensive detailed list with links to sources. The New Hampshire Commission 5G Report also covers a significant amount of these facts. Please see New Hampshire State Commission 5G Report. In the interest of time everything is sourced with hyperlinks. Please view this online to see references.

MYTHS

Click on the underlined myth to go to the section.

List of Myths

5. Myth: The Food And Drug Administration (FDA) has reviewed the science on 5G and cell towers and determined the radiation is safe and FCC limits protect public health.
6. Myth: The World Health Organization webpages confirm there are no health effects for cell towers or cell phones

RADIATION EXPOSURES

Myth: 5G will not increase RF radiation levels in your neighborhood because the power levels of 5G antennas are much much lower than large tall cell towers.

SCIENTIFIC EVIDENCE

Myth: There is no scientific evidence that 5G, cell towers or cell phones are harmful to health.
Myth: The majority of studies on RF show no harm. The WHO found only 5% of 25,000 studies showed harmful effects but that is the false positive rate.
Myth: Wireless radiation is not a carcinogen. The classification by the WHO International Agency for Research in Cancer of wireless radio frequency as a Class 2B “Possible Carcinogen” simply means wireless radiation like talcum powder or picked vegetables.
Myth: There is no cumulative health or biological effect from cell tower or radiofrequency radiation.
Myth: An Australian study found “no confirmed evidence that low-level RF fields above 6 GHz such as those used by the 5 G network are hazardous to human health,” so 5G is safe.

FCC LIMITS

Myth: FCC limits have a large safety margin- a 50 times safety factor.
Myth: Professor Swanson’s brain, the sun and his hot water bottle violate FCC limits.
Myth: FCC limits for cell tower radiation emissions are very strict and as Professor Swanson states, “protect us very well.”

Myth: The FCC “has commanded” local and state governments to streamline 5G small cells in front of homes and there is nothing we can do.

Myth: There is a scientific consensus for 5G, cell tower and wireless safety.

Myth: There is a scientific consensus that there are no known adverse health risks from 5G and wireless networks. The scientific consensus is that wireless networks are safe.

Example of the Myth Asserted by the CTIA Wireless Industry to New Hampshire lawmakers:

> *"The consensus of the US and international scientific community is that there are no known adverse health risks from the levels of RF energy emitted at the frequencies used by wireless devices (including cell phones) and facilities (including small cells)."* *LINK*

Fact: There is not a scientific consensus for safety. There are thousands of scientists, doctors and medical professionals cautioning that wireless technology can cause harm. Numerous expert reports recommend more accountability by governments to protect the public. Hundreds of researchers who have published research in the field of bioelectromagnetics are calling for urgent policy action due to the mounting scientific evidence confirming adverse effects.

- **255 scientists who have published in the field** signed the EMF Scientists Appeal which states "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."
- **419 scientists and doctors** have signed the European Union 5G Appeal which states, "5G will substantially increase exposure to radiofrequency electromagnetic fields (RF-EMF) on top of the 2G, 3G, 4G, Wi-Fi, etc. for telecommunications already in place. RF-EMF has been proven to be harmful for humans and the environment."
- **Over 3,500 medical doctors** signed onto a 2020 Consensus statement that wireless RF has been proven to damage biological systems at intensities below government limits (See signatures here, PDF of Consensus Statement).
- **Examples of Numerous Appeals by Medical Professionals:** International Society of Doctors for Environment, Cyprus Medical Association, the Vienna Austrian Medical Chamber and the Cyprus National Committee on Environment and Children's Health, Belgium Doctors Appeal, Canadian Doctors, Cyprus Medical Association, Physicians of Turin, Italy, the German Doctors Appeal, International Appeal to Stop 5G on Earth and Space, Letter to President Trump, Letter to President Biden and Chilean Doctors. There have been appeals and position statements for decades. Read a full list here.
- Numerous expert reports conclude that safety is not assured.
    - The New Hampshire State Commission 5G Report has 15 recommendations to protect the public
    - The Pittsburgh Law Review: The FCC Keeps Letting Me Be: Why Radiofrequency Radiation Standards Have Failed to Keep Up With Technology explains how the FCC and FDA have failed to develop adequate safety limits.
    - The Harvard Press Book "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates" details

how wireless companies are using the Big Tobacco playbook and how the FCC is a captured agency.

Fact: Groups often referenced as "authorities" that downplay health risks or say that health risks are "not established" are often small with documented conflicts of interest.

- **The International Commission on Non-Ionizing Radiation Protection (ICNIRP) for example, is an under 13 member private group** with documented conflicts of interest. Many ICNIRP members have a long history in wireless industry ties. The Journal of Cancer Science and Clinical Therapeutics published Aspects on the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2020 Guidelines on Radiofrequency Radiation" and a report commissioned by two European Parliament Members published in June 2020 entitled "The International Commission on Non-Ionizing Radiation Protection: Conflicts of Interest, Corporate Capture and the Push for 5G" which documents these conflicts.
- The IEEE's International Committee on Electromagnetic Safety ICES TC95, which develops safety limits and is referred to as supporting and being used in the FCC's human exposure "safety" limits has long been led by industry tied engineer. For example, the Chair has long been CK Chou- longtime Motorola Chief EME Scientist, the Director of Corporate EME Research Laboratory, responsible for RF product safety, now retired. (See ICES leadership here). Meetings are sometimes held at Motorola headquarters.
    - In 2016 ICES TC95 Chairman CK Chou gave a presentation at the Mobile Manufacturers Forum sponsored IEEE ICES Exposure Limits Above 6 GHz. "No adverse effects have been established from low-level exposures despite 50 years of research…The committee is unaware of any more recent studies that would change the conclusions reached in the 2005 version of the standard (June 2011)." (despite the NTP results.) "The development of this standard is based on protection against...established adverse health effects:"
    - You also can watch a 2017 presentation by CK Chou here to see what Chou presents.

- **WHO EMF Project Director confirms there is no consensus**: According to Dr. Emilie van Deventer, Head of the World Health Organization's EMF Project as quoted in The Daily Princetonian in 2015, "The data is gray. It's not black and white...There is no consensus, it's true." (Note, the WHO EMF project is different from the WHO International Agency for Research on Cancer and the EMF Project is also documented to have transparency issues and numerous conflicts of interest.)

Additional Documentation

- "Appeals that matter or not on a moratorium on the deployment of the fifth generation, 5G, for microwave radiation" published in Clinical and Molecular Oncology documents

the numerous appeals by independent scientists and states, *"It is striking that 5G is deployed without previous scientific evaluation of health risks. Not only cancer risks, but also other health effects such as fertility, cognitive and neurobehavioral effects, oxidative stress and electromagnetic hypersensitivity (EHS) have been associated with RF exposure."*

Fact: Numerous countries have taken steps to reduce cell phone, wireless and cell tower radiation exposure to the public. If there were a scientific consensus for safety why would these countries have such policies?

1. Countries that have set RF exposure limits and regulatory schemes for cell tower networks far more stringent than the FCC and ICNIRP include China, Russia, Canada, Israel, Turkey, Bulgaria, Brussels Belgium, Chile, Belarus, Serbia, Slovenia, Croatia, Montenegro, Italy, Switzerland, Greece, India, Liechtenstein, Tajikistan, Kazakhstan, Kyrgyzstan, Ukraine, Kuwait, Grand Duchy of Luxembourg, Bosnia Herzegovina, Georgia, Uzbekistan, Republic of Moldova, Iraq, (ITU-D Study Group 2, 2017; Madjar, 2016; Redmayne, 2016; Repacholi et al., 2012, GSMA Website).
2. Over a dozen public health bodies of various governments have issued recommendations on their websites or educational materials and brochures that the public and/or children should reduce exposure to their brain by keeping the phone away from their head. The recommendations *do not say* "if you are worried" but instead they clearly recommend reducing exposure. (A full list with direct links to sources can be found at Environmental Health Trust (EHT, 2021). Examples include:
    - Belgium: "Experts – including those on the Superior Health Council – advise everyone to limit their exposure to mobile phone radiation states the Health Food Environment Agency of Belgium (Belgian Federal Government, 2016)
    - Ireland: "Advice from the Chief Medical Officer on mobile phone use: We may not truly understand the health effects of mobile phones for many years. However, research does show that using mobile phones affects brain activity. There is general consensus that children are more vulnerable to radiation from mobile phones than adults. Therefore the sensible thing to do is to adopt a precautionary approach rather than wait to have the risks confirmed.In the light of these findings, the Chief Medical Officer of the Department of Health and Children strongly advises that children and young people who do use mobile phones, should be

encouraged to use mobile phones for “essential purposes only (Government of Ireland Department of Health, 2019).

- U.S. Public health authorities have issued recommendations.
    - The California Department of Health released an advisory on how to reduce cell phone radiation stating, "Parents should consider reducing the time their children use cell phones and encourage them to turn the devices off at night” (California Department of Public Health, 2021) and (California Department of Public Health, 2017).
    - The Connecticut Department of Public Health states it is “wise” to reduce RFR to one’s brain (Connecticut Department of Public Health, 2015). The North Carolina Public Health Department’s Occupational health Department lists the full cancer findings of the NTP study, the FDA stance and also the American Academy of Pediatrics recommendations to reduce cell phone radiation stating “there is some concern that exposure to non-ionizing radiation, also called radio frequency radiation, that is emitted by cell phones may result in an increased risk of cancer or other health effects” (North Carolina Department of Health and Human Services, 2020).
    - The Maryland State Children’s Environmental Health And Protection Advisory Council, whose 19 member Commission includes experts in public health issued a report recommending reducing RFR to children in schools (Environmental Health Trust Posted Friday, 2017).
- Several countries have laws in place to reduce exposure, in addition to their public health campaigns. For example, France, Belgium, and French Polynesia have bans on mobile phone ads targeted to children and bans on the sale of phones designed for children. Several countries limit Wi-Fi RFR in classrooms including France, Israel, French Polynesia and Cyprus (Environmental Health Trust, n.d.).
- A 2019 French government Order of the Minister for Solidarity and Health and the Minister for the Economy and Finance, stated consumers should be informed that they should use speakerphone to keep the phone away from their head, limit frequency and duration of cell phone calls for children and phones have instructions that state “keep away from the belly of pregnant women, Keep away from the lower abdomen of adolescents” (Order of 15 November 2019 Relating to the Display of the Specific Absorption Rate of Radio Equipment and to Consumer Information, 2019). Several other countries have laws and orders in place to inform consumers about the RFR from the device and educate the public to reduce exposure.

Myth: 5G will not increase RF radiation levels in your neighborhood because the power levels of 5G antennas are much much lower than large tall cell towers.

Myth in CTIA Statement to New Hampshire Legislatures
"Furthermore, a recent study demonstrated that 5G antenna densification does not increase the level of exposure" in contrast to a very popular belief. On the contrary, antenna densification does not change the exposure levels for the majority of the population, while, at base station proximity, a huge radiation decrease is experienced when more base stations are deployed in the same territory." (Footnote goes to Chiaraviglio 2021)

Professor Swanson asserted that 5G would result in lower exposure, "There is less immediate exposure when you make it low power…" and "they are very low power to all of our benefit Typically a block apart, again typically they are very low power, to our benefit, higher more reliable communication and less exposure." (Listen to Professor Swanson state 5G will lower exposure.)

Fact: It is a fact that ambient environmental RF levels will increase from the densification of small cell wireless facilities. 5G deployment goes hand in hand with the proliferation of small cell antennas and, in addition, more macro (tall) cell towers. 5G relies on 4G as its backbone so the current built companies are engaged in includes 5G *and* 4G. The antennas emit low, mid and high band frequencies.

Fact: Studies have shown an increase in RF in neighborhoods where dense small cell networks are deployed. The fact is that the closer you are to an antenna, the higher the RF. For people in close vicinity to a cell antenna, the RF levels will go up. The wireless industry statements that a small cell emits less than a large cell tower is technically correct but a misleading half truth. A person living in a neighborhood where small cell networks are deployed will likely have an increased ambient exposure, compared to their exposure before the small cell deployment. The person living with the cell antenna in front of their home will have a mich higher exposure.

Even though each individual "small" cell has less power than a macro tower, remember that there will be thousands of new 5G and 4G antennas, each increasing RF, in the vicinity of the new towers. Some communities will have several carriers and wireless facilities *on each block*.

A 2021 report by the French government on 5G analyzing more than 3,000 measurements found that RF levels had not significantly increased yet but this was due to the lack of 5G traffic. So they did additional measurements specific to 5G in the 3500 MHz band with artificially generated traffic and concluded, "initial results suggest an eventual increase of about 20% in overall exposure."

Additional research clearly documents the increase in environmental RF to people in close proximity to antennas.

- A 2018 study published in Annals of Telecommunications found small cell LTE networks in two European urban cities increased the radio emissions from base stations - ambient exposures- by a factor of 7–46.
- A 2020 paper "Radiation Analysis in a Gradual 5G Network Deployment Strategy," presented at the IEEE 3rd 5G World Forum documents how engineers found significant increases in RF levels if a mmWave-based 5G network was fully deployed in Austin Texas.
- A study published in Environmental Research created heat maps of RF from the proliferation of cell antennas mounted close to the ground on buildings and poles and the researchers found increasing RF levels.
- Countries that monitor RF (unlike the US) have found increases from 5G. For example, in Australia the telecom companies report RF levels with the proposals of new networks. Examples include 6.44% to 14.22%, 1.67% to 3.39% and 11% to .42% of the limit. A Russell Street Melbourne 5G network increased the level from .09% to .75% of the limit.

The CTIA letter references research that does demonstrate how people closer to 5G antennas *will have higher RFR, compared to those further away of the the 5G antenna. The reference does not consider 5G networks in the context of real world exposure.*

CTIA cites as a reference for the conclusion that 5G antenna densification "does not increase the level of exposure" the study Chiaraviglio 2021 which states, "Finally, specific groups of people may still receive a higher amount of exposure from a dense 5G deployment with respect to a sparse one. For example, cell phone providers may install small cells on utility poles close to buildings, and therefore, people working/living in close proximity to the small cells may receive exposure levels that exceed those from macrocells." Although the researchers state that "beyond the compliance distance (e.g., around a meter from a small cell) will be far below accepted safety limits," the reality is that safety limits have not been set to protect against cancer, DNA damage or oxidative stress. Government safety limits are not scientifically substantiated with an up to date science review. Importantly, what protections are in place for people close to the cell antennas.

Importantly, 5G networks will not exist on their own. As the paper describes, 5G networks will exist in addition to 4G networks, with an untold ever increasing amount of of new wireless devices and networks. The paper states, “In addition, any commercial 5G dense deployment has to coexist with base stations implementing other technologies (e.g., 4G)—which may be colocated or not over the same sites hosting 5G base stations—and base stations owned by other operators simultaneously covering the same area. In this case, the composite exposure resulting from all the base stations in the territory has to be always ensured below the maximum limits enforced by laws.” Macro towers with networks using lower frequencies will co-exist with new 5G networks for the time being. Thus there will be an exposure to a person that is a combination of all these networks- a composite exposure- not just exposure from the new 5G network. Because 5G mm-Wave band networks have not been widely deployed, more measurement studies and trials are needed to quantify the actual exposures from deployment. The critical question is - to what degree does the densification of 5G and *wireless networks in a neighborhood impact real world exposure? Only measuring 5G without looking at real world scenarios is not adequate.* These 5G networks will be situated among the real world with trees and other obstructions which can impact the signal for higher frequencies. In turn the power of the device will increase.

The reference provided by the CTIA does not ensure that a persons composite RF exposure will decrease with 5G. There are numerous real world variables that can only be evaluated in the actual world with proper **before and after** measurements. The reality is that current research shows that exposures are increasing. As described earlier in this document, when small cell networks are densified, the real world exposure measurements show an increase in ambient environmental exposures in the community.

This is why there is a need for companies to prioritize and promote safer wired technologies whenever possible in order to decrease the need to add more and more wireless networks.

Fact: Companies themselves state that new 4G and 5G network antennas will increase the wireless radiation levels in the area so much that they are working to loosen several governments’ radiation limits in order to roll it out. They claim they can't build out new networks unless the government changes the law to allow more RF.

If 5G and 4G did not increase RF levels in neighborhoods, then why would industry pressure governments to change their laws to allow more RF in order to deploy 4G and 5G?

Why does industry state that it is harder to rollout 4G and 5G in countries with strict RF limits?

- The ITU Report “The impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment” reviews how 5G deployment is “constrained” by these countries’ limits.

- The GSMA report discusses how strict exposure limits are problematic for 4G LTE.
- A powerpoint presentation by Ericsson "Impact of EMF limits on 5G network roll-out" that states the 5G rollout is "a major problem or impossible" due to some countries' precautionary RF limits.
- Industry lobbied Poland, Lithuania, Italy, Switzerland and Brussels Belgium to weaken their regulations in order to allow more radiation for 5G. In 2020, industry succeeded in Lithuania and Poland. Italy and Switzerland voted no. Brussels Belgium loosened their limits but they are still more stringent than ICNIRP. The maximum limit in Brussels Belgium will increase to 14.5 volts per meter, from the 6 V/m. Now industry has its eyes on Russia, which along with several countries such as China and India has RF limits much stricter lower than the USA.

Myth: The scientific consensus of U.S. federal health and safety agencies is that wireless networks and base stations compliant with the FCC's exposure levels are safe.

Example of the Myth Asserted by the CTIA Wireless Industry to New Hampshire Lawmakers in CTIA Testimony
"The scientific consensus as evaluated by expert international standard setting bodies, and federal health and safety agencies is that wireless devices and base stations at the FCC's exposure levels are safe."

Fact: Federal health and safety agencies have NOT evaluated the totality of up to date science to make any such determination. If anyone believes our federal agencies have performed an evaluation of FCC limits and the scientific evidence, please ask them to locate the research review or report that supports this conclusion. Such a report simply does not exist.

Fact: The Centers for Disease Control, National Cancer Institute, American Cancer Society, Food And Drug Administration and Environmental Protection Agency have not evaluated the latest science on 5G or cell tower exposures to issue a safety determination. Their website pages provide no substantiated proof of safety and some were drafted with industry consultants. No US regulatory agency with health or environmental expertise has completed a risk analysis or systematic review based on the latest evidence.

Click on the agency/org name for full documentation of the lack of scientific review.

- Centers for Disease Control
- National Cancer Institute
- American Cancer Society
- The Food And Drug Administration
- The Environmental Protection Agency

Myth: The National Cancer Institute (NCI) has determined that cell towers, 5G and cell phone radiation is safe.

Fact: The NCI has confirmed that they never systematically reviewed the science on wireless radiation to make a determination on cell tower safety or evaluate FCC limits.

Myth Included in Statement by CTIA Wireless Industry to New Hampshire Lawmakers: *'The National Cancer Institute agrees that "studies [on the possible association between cell phone using cancer] are mixed but overall they do not show an association between cell phone use and cancer.*" (CTIA Footnote goes to NCI cell phones and Cancer factsheet.)

Josiah Bartlett also misleadingly references the NCI in his blog post about New Hampshire cell tower legislation: *"The NCI says that cell phone radiofrequency "energy is too low to damage DNA" and "there are no other clearly established dangerous health effects on the human body from radiofrequency radiation."* Most people will read such statements and assume this means that cell phone and cell tower radiation is proven safe. This is false.

Fact: There are no scientific reports by the NCI that exist regarding 5G, cell tower or cell phone safety. Even if NCI scientists had an official determination (which they do not), the agency is only focused on cancer, and does not investigate other effects such as brain or reproductive damage. Thus, even if the NCI did have an opinion, it would not be proof of safety- as research has shown damage to the brain and fertility. .

Documentation on the National Cancer Institute's lack of safety evaluation.

1. The fact that the NCI has not reviewed the science nor concluded any official position on safety was confirmed by a letter from New Hampshire 5g Commissioner Denise Ricciardi to the NCI asking, "What is the NCI opinion on the safety of cell phones?" On July 30, 2020, the National Cancer Institute wrote Ricciari back that, "As a Federal research agency, the NCI is not involved in the regulation of radiofrequency telecommunications infrastructure and devices, nor do we make recommendations for policies related to this

technology…Our sister agencies, the FDA as well as the FCC, retain responsibility for reviewing guidance on safety concerns and informing the public if those circumstances change." Read the Exchange From New Hampshire 5G Commission Report.

2. The NCI did not provide any opinion on the safety of wireless radiation to the FCC during the 7 year inquiry opened re FCC's safety limits for wireless radiation. Instead the NCI sent a two paragraph letter to the FCC without mention of any opinion on the state of science. Read the NCI Letter to FCC

3. The NCI wrote to EHT's Executive Director Theodora Scarato, stating of the NCI that, "Neither the literature reviews, nor the fact sheets, make safety determinations." (Letter from NCI to Scarato)

Myth: The American Cancer Society (ACS) has determined that cell towers and cell phones are safe.

The CTIA Wireless Industry used the ACS in it's letter to New Hampshire Lawmakers: "Likewise the American Cancer Society explained that "the RF waves given off by cell phone towers don't have enough energy to damage DNA directly or to heat body tissues. Because of this it's not clear how cell towers might be able to cause cancer." (CTIA then Footnotes to ACS Cell Phone Towers Page

Josiah Bartlett also references the NCI in his blog post about New Hampshire cell tower legislation stating, "At this time, there's no strong evidence that exposure to RF waves from cell phone towers causes any noticeable health effects," the American Cancer Society has concluded."

Fact: The ACS has not reviewed the science on cell towers or cell phones and their webpages do not provide science backed safety assurances.

- In fact, the ACS website states very clearly that ACS does "not have any official position or statement on whether or not radiofrequency radiation from cell phones, cell phones towers, or other sources is a cause of cancer."
- Furthermore the ACS says they "look to other expert organizations to determine if something causes cancer " and the ACS then lists the International Agency for Research on Cancer (IARC) and the US National Toxicology Program (NTP) both of which document *science showing links to cancer.* See IARC and NTP.

- When the NTP found "clear evidence" of cancer from wireless RFr radiation, the ACS referred to the study in their press release as paradigm shifting "good science."

Furthermore the ACS press release on the NTP study: "The NTP report linking radiofrequency radiation (RFR) to two types of cancer marks a paradigm shift in our understanding of radiation and cancer risk. The findings are unexpected; we wouldn't reasonably expect non-ionizing radiation to cause these tumors."

Myth: The Food And Drug Administration (FDA) has reviewed the science on 5G and cell towers and determined the radiation is safe and FCC limits protect public health.

Myth: The FDA's website clearly shows that the FDA has reviewed the totality of scientific evidence and found cell phones, 5G and cell towers are safe. After all, the FDA concluded in February of 2020 that "there is no consistent or credible scientific evidence of health problems caused by the exposure to radio frequency energy emitted by cell phones.

Myth in CTIA Testimony to New Hampshire Lawmakers:
"And the FCC sister agency, the FDA stands in full support of the adequacy of the FCC standards. The director of the FDA center for Devices and Radiological Health wrote, "based on our ongoing evaluation of this issue and taking into account all available scientific evidence we have received, we have not found sufficient evidence that there are adverse health effects in humans caused by exposures at or under the current radiofrequency energy exposure limits."

Fact: The FDA has never evaluated the totality of the science to conclude any opinion on the safety of human exposure to 5G technology or cell tower radiation. All the FDA has done is to release a now outdated literature review (ending in 2018) focused solely only on cell phones and cancer. This literature review omits studies on damage to DNA, the brain and reproduction. The FDA literature review is not a systematic review nor is it a risk analysis nor is it an evaluation of FCC cell tower radiation limits, despite being presented in this way.

Fact: The FDA has no authority in regards to cell tower radiation and 5G infrastructure. This was confirmed in a January 11, 2022 letter by Ellen Flannery of the Director of the FDA Office of Policy Center for Devices and Radiological Health who wrote that the FDA doesn't regulate cell towers. When asked about the safety of a cell tower outside a California mother's window, she responded, "The FDA does not regulate cell towers or cell tower radiation. Therefore, the FDA has no studies or information on cell towers to provide in response to your questions." Link to FDA Letter.

While the public might assume the FDA is always monitoring the science and monitoring exposures, this is inaccurate. For example, the 2021 FDA's Annual report was released on January 31, 2022 and there is no mention of the issue of cell phones or cell towers or wireless electromagnetic radiation. The FDA has not shown any evidence of monitoring research with new agency reports, meetings or budget on the issue.

As the Pittsburgh Law Review article concludes, "The FCC and FDA have failed in their obligation to prescribe safe RFR guidelines produced from wireless communication devices to protect the public health and safety."

Additional Documentation

- The Government Accountability Report on 5G (GAO 2020) clarified that the FDA and other organizations "only reviewed a subset of the relevant research" and stated in regards to the FDA Literature Review that "The assessment focused on cancer-related animal and human studies of frequencies below 6 GHz."
- Not only did the FDA do a limited literature review looking *only at cancer,* but it omitted impacts to the brain, oxidative stress, and reproduction. It omitted evaluation of children's unique vulnerability. Most importantly it discounted the results of the National Toxicology Program which is why numerous scientists - including several now retired US government scientists - are calling for the FDA to retract the review as it offers unsubstantiated assurance of safety (EHT 2020).
- EHT's 150 page report "FDA's Misleading Information on Cell Phone Radiation on the FDA documents the lack of adequate research review and misleading information put forward by the FDA.
- In 2020, the FDA refused to testify to the New Hampshire State Commission on 5G and refused to answer specific questions regarding it's purported review of health effects of 5G and wireless networks. Although the FDA responded with a few general sentences about how "FDA's doctors, scientists and engineers continually monitor the scientific studies and public health data for evidence that radio frequency energy from cell phones could cause adverse health effects, "the FDA refused to answer specifics such as providing reports or answering questions about the safety margin, and the FDA's research activities. Read FDA Communications with the New Hampshire 5G Commission

The Centers for Disease Control and Prevention (CDC) has concluded 5G, cell towers and cell phones are safe.

Myth: The CDC website statements that "we do not have the science to link health problems to cell phone use" confirm that cell phones and towers are safe.

Fact: CDC experts have not reviewed the latest research on wireless radiation and the website pages do not reflect an opinion or determination on safety.

1. First,and most importantly, there are no scientific reports by the CDC on wireless safety, nor does the agency have staff with expertise monitoring the science and evaluating risk. As far as we know they have never undertaken any research review as the CDC has no authority on the issue.
2. In fact, due to the lack of CDC scientists with subject matter expertise in wireless, the agency hired an outside consultant to help draft several CDC webpages. This individual has longstanding financial ties to industry and consults for cell tower companies. The pages he helped draft at the CDC omit scientific research that has found health effects and the text downplays any health risk. Read the EHT expose on the CDC industry tied consultant here.
3. In 2014, the CDC actually posted cautionary statements that recommended people reduce cell phone radiation exposure. However, these statements were removed just a few weeks after they were posted. Read the New York Times article which tells part of the story as well as the Microwave News article on influence to CDC webpage from wireless industry consultants.
4. Of note- a now retired top CDC expert now states that the research shows cell phone radiation likely causes cancer. Chris Portier PhD, retired CDC Director of the National Center for Environmental Health and former Director of the Agency for Toxic Substances and Disease Registry submitted scientific research review in a major cell phone/brain cancer lawsuit where he concludes that "the evidence on an association between cellular phone use and the risk of glioma in adults is quite strong."

Myth: The Environmental Protection Agency has evaluated the science and deemed 5G and wireless networks as safe.

Fact: The Environmental Protection Agency (EPA) has not performed a research review for over thirty years and is not monitoring or researching the issue.

As the EPA stated to Theodora Scarato in a 2020 letter, "EPA's last review was in the 1984 document Biological Effects of Radiofrequency Radiation. The EPA does not currently have a funded mandate for radiofrequency matters."

Fact: The EPA was defunded from researching the issue just as it was poised to develop RF safety standards for human exposure in 1996. Thus, the US does not have federally developed safety standards based on U.S. agency expert research to determine a safe level. Instead the US has RF exposure guidelines promulgated by the FCC which set limits in 1996 based on limits created by industry dominated/tied groups.

Fact: The EPA used to measure RF and non-ionizing EMF levels. The last Report was a 1986 Report on Environmental Exposure Levels. The FCC also had programs taking RF measurements from cell antennas but the field offices were shuttered. In sharp contrast to the USA, many other countries have RF measuring projects with RF radiation levels posted on public websites including: France , Spain, Austria, Greece, Turkey, India, Israel, Gibraltar, Brussels Belgium, Switzerland, Bulgaria, Tunisia, Malta, Brazil, Bahrain, Monaco, French Polynesia, Bhuton, Senegal. France even has 5G monitoring stations.

Some communities are starting to address this lack of accountability. For example, see the Copake NY code: Pretesting and post testing by RF engineer and annual monitoring of RF emissions by the independent RF engineer using actual field measurements like in Copake New York. Davis, Burbank and Berkeley also have testing requirements in their ordinances. An RF engineer performs measurements and the OWNER of the wireless facility pays for this.

Fact: EPA scientists have long tried to address the inadequacies of FCC's limits. EPA expert staff signed onto letters in 1999 and 2003 to the RF limit setting group leadership requesting answers to identified shortcomings in their recommended human exposure limits.

Fact: In 2019, the EPA website pages on cell phones, cell tower and EMFs were rewritten (scrubbed) and now parrot FCC verbiage and link to the FCC as the authority, despite the fact that the EPA has done no recent research, nor developed any opinion on safety. When the FCC asked the EPA to comment on the need to update or change FCC's 1996 limits in their 2013 Inquiry, the EPA responded with a one paragraph letter offering no opinion.

Fact: EPA has confirmed that FCC RF exposure limits were not created to address health effects from long term exposure. A 2002 EPA letter stated, "I believe that it is correct to say that there is uncertainty about whether or not current guidelines adequately treat nonthermal, prolonged exposures (exposures that may continue on an intermittent basis for many years)…Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposure standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given

to sensitive populations, are often considered. Incorporating information on exposure scenarios involving repeated short duration/nonthermal exposures that may continue over very long periods of time (years), with an exposed population that includes children, the elderly, and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines."

Brief History

- Previous to 1996, the EPA conducted robust research on electromagnetic radiation (EPA Letter) and was in development of safety limits for wireless radiation. See EPA Briefing, and a 1995 EPA Letter to the FCC on their near completion of non ionizing EMF guidelines clearly detailing how they were in development of safety limits which considered thermal and thermal impacts. However, heavy industry lobbying abruptly halted the EPA from standards development. The same year it passed the Telecommunications Act of 1996, Congress eliminated EPA's funding for activities related to RF radiation in an appropriations bill. Congress specified that "EPA shall not engage in EMF activities." Thus the EPA shuttered its research on standards development.
- 1993 EPA Comments to the Federal Communication Commission's (FCC's) proposed RF/MW radiation limits 93-142 Guidelines For Evaluating the Non Thermal Effects of Radiofrequency Radiation includes information asserting that certain subgroups are more at risk (pregnant women, children and the elderly) and calls for an updated, comprehensive review that considers the biological effects of RF, specifically pointing to the need to update the (1986) NCRP Report 86 (Note: NCRP 86 is still the basis for US regulations according to the FCC and this report has not been updated to include biological effects). The EPA stated:

  > "The FCC should not adopt the 1992 ANSI IEEE standard; there are serious flaws in the standard that call into question whether the proposed use of the 1992 ANSI IEEE is sufficiently protective."
  >
  > "It is clear that the adverse effects threshold of 4W /kg is based on acute exposures (measured in minutes of a few hours) that elevate temperature in laboratory animals including non-human primates and not on long term, low level (non thermal) exposure."

Documentation

- 2020 EPA letter to EHT Executive Director Theodora Scarato.
- US Exposures Limits: A History of Their Creation documents how ANSI and IEEE limits were developed, despite awareness of biological effects.
- FCC's Legal Duties to Inform and Protect the Public by Sharon Buccino Natural Resources Defense Council Washington, DC

- 1984 letter by the U.S. Science Advisory Board that recommends that the EPA develop radiation protection guidance to protect the public.
- 1993 EPA Letter states that "it is clear" that the U.S. human exposure limits are based on short term exposures and not on research considering chronic long term exposures.
- 1996: EPA Letter that US Limits are only protective for thermal impacts
- 1996: EPA comments to FCC Docket 93-62 includes recommendations that the FCC request the NCRP revise its 1986 report to include an updated, comprehensive review of the biological effects of RF.
- 1999: Scientists from US federal agencies of the radiofrequency interagency workgroup (RFIWG) write IEEE Work Group Chair on critical issues about RF exposure limits
- 2002: EPA Letter stating FCC's 1996 RF limits do not protect against all effects
- 2003: Scientists from US federal agencies write IEEE again on additional issues re IEEE's RF exposure limits. Both 1999 and 2003 letters remain unanswered.

Myth: The World Health Organization webpages confirm there are no health effects for cell towers or cell phones.

Example of the Myth Asserted by the CTIA Wireless Industry to New Hampshire Lawmakers:

> "*The legislative findings and purpose section of HB 1644 erroneously suggests that the World Health Organization views RF emission from telecommunications equipment as a "carcinogen". To the contrary, the WHO position has been and continues to be that there is no convincing scientific evidence that the weak signals from base stations and wireless networks can cause adverse health effects."* (Note- the CTIAs footnote 7 goes to a 2006 WHO webpage)

The CTIA also states

> "The WHO also concluded that research has not been able to provide support for a causal relationship between exposure two electromagnetic fields and self-reported symptoms or electromagnetic hypersensitivity." (CTIA then footnotes to the WHO mobile phone web page with one unsubstantiated sentence).

Fact 1. The CTIA inaccurately conflates two separate entities of the WHO and the position the CTIA references was drafted over a decade ago by one person who used wireless company money to start the "WHO EMF Project."

The CTIA was inaccurate in stating the WHO "position was that of "no evidence." In fact, the WHO has two distinct and separate entities addressing the issue; 1. the WHO EMF Project who wrote the webpages referred to and 2. the WHO International Agency for Research on Cancer.

1.The WHO International Agency for Research on Cancer (WHO/IARC) in fact designated wireless radiation as a class 2 B "possible" carcinogen in 2011 largely based on human studies that found long term cell phone users had increased risk for tumors- glioblastomas and acoustic neuromas (Read the WHO/ IARC 2011 press release). The scientific documentation for the determination was compiled in a 2013 monograph (IARC 2013). Furthermore, because that determination was a decade ago, the WHO/IARC advisory group now has recommended wireless be re-evaluated as a "high priority" within 5 years due - largely in part- to the recent animal research (Falconi, 2018; NTP, 2018) would found evidence for cancer (IARC, 2019).

2.The World Health Organization (WHO) EMF Project webpages are not official determinations because this group has not reviewed the science *since 1993.*

There are two WHO EMF Project web pages that are often referenced by the wireless industry. 1. The mobile phone webpage that says "no adverse health effects have been established as being caused by mobile phone use" and 2. The base station (cell tower) webpage which states "from all evidence accumulated so far, no adverse short- or long-term health effects have been shown to occur from the RF signals produced by base stations."

Fact: The outdated WHO website statements are not based on a scientific review of the totality of the evidence.

- The WHO EMF Project website pages are outdated (cell towers in 2006, cell phones in 2014) and are not official conclusions from a review.
- The WHO EMF Project, the entity that drafted these webpages, has not reviewed the science *since 1993.* WHO webpages list the recent monographs (scientific research evaluations on health risks) and clearly state that the last one on radiofrequency wireless was completed in 1993. Read WHO Webpage stating 1993 as the last date of research review.
- The WHO EMF Project is trying to launch a systematic review of the research but it has not been completed. The process was stalled for years due to serious transparency issues.
- Further, these online WHO webpages are authored by a scientist who started the WHO EMF Project with wireless industry funding and with staff documented to have long standing conflicts of interest. Read a published article about the conflicts published in the International Journal of Oncology by Dr. Lennart Hardell.
- Listen to industry funded Scientist Michael Repacholi in a community meeting in India (brought in by the Cellular Operators of India) stating he wrote the online webpage

factsheets at the WHO in this video and how “they have been accurate for 10 years.” (Yet he shares no scientific reports.)

Conflicts of Interest at the WHO EMF Project

- The WHO EMF Project was started by a scientist, Michael Repacholi, who funneled money from wireless companies through a hospital to start the EMF Project at the WHO. Hardel and Carlberg 2017 states “Michael Repacholi immediately set up a close collaboration between WHO and ICNIRP (being head of both organizations) inviting the electric, telecom and military industries to meetings. He also arranged for a large part of the WHO EMF project to be financed by the telecommunication industry's lobbying organizations; GSM Association and Mobile Manufacturers Forum, now called Mobile & Wireless Forum (MWF).”
- The WHO EMF Project founder Repacholi is now on several wireless company advertisements speaking about cell phone and electromagnetic safety.
    - Watch him talk about children are safe with cell phones here
    - Watch him talk about how EMFs are safe here.

- **Transparency:** The engineer who now directs the EMF Project refuses to answer questions about how the online factsheets were written or where the scientific reports are that back up the cell tower and cell phone statements. Read letter sent to engineer Emile Van Deventer WHO EMF Project Director that remains unanswered. Dr. Lennart Hardell also describes transparency issues here. The current WHO Project Director is an engineer and not a medical doctor or public health expert.

Myth: FCC limits have a wide safety margin- a 50 times safety factor.

Fact: There is not a 50 times safety factor as confirmed by the latest science. It simply does not exist.

The CTIA misleadingly asserted this myth to New Hampshire lawmakers in the CTIA testimony stating that, *“Indeed, when setting limits for the RF emissions of wireless devices, the FCC intentionally provided a significant safety margin- 50 times below the threshold at which adverse effects have been observed in laboratory animals.”*

This statement is misleading because while it is true that FCC limits were set in 1996 based on animal studies, that was 25 years ago. New studies have found harmful effects in animals and humans at much lower RF levels yet they are all dismissed for various reasons by the industry tied groups considered "authorities" (Lerchl et al., 2015, Smith-Roe et al., 2020, Tan et al., 2017, Yakymenko et al., 2015, Schuermann & Mevissen, 2021, Bas et al., 2009; Deshmukh et al., 2015, Shahin et al., 2017, Megha et al., 2015, Aldad et al., 2012; Zhang et al., 2015, Sonmez, et al., 2010, Dasdag et al., 2015, Shahin et al., 2018, Obajuluwa et al., 2017, Tan et al., 2021, Hasan et al., 2021, U.S. National Toxicology Program, 2018, Uche & Naidenko ., 2021). Yet, the FCC/ICNIRP/IEEE limits continue to be based on a handful of small animal studies from the 70s (as detailed below).

The CTIA footnotes their statement that a safety margin exists by citing the FCC's 2013 Notice of Inquiry. However this was not a determination, *but an Inquiry.* The outcome of that Inquiry was an FCC action which was deemed arbitrary and capricious by a judgment of the U.S. Court of Appeals for the District Of Columbia in August 2021. Thus, the CTIA footnoted statement is irrelevant. The last defensible FCC determination was in 1996.

The CTIA also has a second footnote reference to the IEEE C95.1 2019 standard as if it provided up to date proof of a 50 times safety factor. Once again, the CTIA points to a document based on decades old science. Further, the IEEE C95 is not a peer reviewed systematic review and it's leadership/membership is largely industry financed. As just one example, the Chairman of the IEEE group that developed the 2019 IEEE Standard - ICES TC95 is Dr. C-K Chou, retired Chief Scientist at Motorola for RF safety, now industry consultant. The Co-Chair Kevin Graf is an Engineer at FCC formerly with Exponent- called a "science for hire" firm.

Importantly, the IEEE standard determines the "established critical temperature levels leading to adverse biological effects- the "effect threshold" which they determined to be 4 W/kg- citing only a few ancient small animal studies. The sixth row of Table B.10 on page 125 of the IEEE standard lists the studies specifically; De Lorge 1984- a study of five food-deprived rhesus monkeys; De Lorge 1983 (See full 1982 study report for naval research)- a study of five rhesus monkeys, one squirrel monkeys and one rat; and D'Andrea et al., 1977- a study of eleven rats. The fifty times safety factor is considered established based on these studies.

While numerous studies showing low level non thermal effects are referenced in the IEEE document, the bottom line is that the IEEE C-95 Committee concluded that none were reproducible or they had various flaws and thus they retain their effect threshold at 4W kg. Environmental Health Trust has detailed the inaccuracy of the often referenced "fifty-fold safety factor" in our Submission to the FCC.

Fact: Even when it comes to protecting against heating effects only, organizations that industry reference as the authority confirm that *there is not a 50 times safety factor, especially when it comes to local limits for cell phones*

ICNIRP 2020 Limits State Safety Factor is 2 and 10:

- The self appointed small invite only group named the International Commission on NonIonizing Radiation Protection (ICNIRP) which industry promotes as an authority states in their latest 2020 guidelines that for Type 2 tissues **such as the head** the local adverse health effect threshold is a SAR of 20 W/kg averaged over 10 g. Therefore, the reduction factors in the 2020 ICNIRP guidelines are 2 for the occupational local exposures and 10 for the general public local exposures- ***not 50***.

Fact: The August 2021 U.S. Court of Appeals of the District of Columbia Circuit ruling in favor of EHT et al highlighted the FCC's lack of justification for the "large safety margin" on page 19 of the federal court ruling. The judges stated the FCC had failed "to provide a reasoned explanation for its determination that exposure to RF radiation at levels below its current limits does not cause negative health effects." Further, cell phones emit RF levels that can exceed FCC limits by up to ten times. Studies show that if cell phones and wireless devices are in body contact positions (without a separation distance), the RF exposure can violate U.S. government human exposure limits up to 11 times the radiofrequency limit when the cell phone is pressed to the body. The FDA and FCC have been fully informed of this and knowingly allow the American public to be exposed to RFR levels that exceed the U.S. regulatory limit.

Fact: Even if the safety factor were 50 (which it is not), 50 is NOT a "wide margin" of safety. The Environmental Protection Agency typically uses safety factors in the 100's or 1000's range. A study in Environmental Health analyzing the findings of tumor and heart damage from the National Toxicology Program study concluded that FCC limits should be strengthened by 200 to 400 times to protect children according to current risk assessment guidelines (Uche 2021).

Not only does the CTIA repeat the myth of the 50 fold safety factor and footnote their statements with invalid references, but in addition, the CTIA then uses these invalid references to further assert that the safety margin protects people who are more sensitive to the exposure. The CTIA states of the FCC's 2019 Order (found to be arbitrary and capricious by the Court on August 2021) that "The agency explained the this 50 fold factor can well "accommodate a variety of variables such as different physical characteristics and individual sensitivities and even the potential for exposures to occur in excess of FCC limits without posing a health hazard to humans." As detailed earlier, the 2019 FCC Order Refusing to Change 1996 RF limits was found to be in violation of the law- specifically the Administrative Procedures Act.

Myth: An Australian study found “no confirmed evidence that low-level RF fields above 6 GHz such as those used by the 5 G network are hazardous to human health,” *so 5G is safe.*

Statement in Josiah Bartlett Blog post: “An Australian study published in March of 2021 reviewed 138 studies of radio frequency fields consistent with 5G networks. It found “no confirmed evidence that low-level RF fields above 6 GHz such as those used by the 5 G network are hazardous to human health.”

Fact: This study does not show proof of safety. In fact, it proves that no long term research even exists to assess health risks from years of 5G millimeter wave networks stating “there are no epidemiological studies investigating 5 G directly as yet.” Most importantly, this review was only on high band frequencies and not on the low and mid band frequencies- frequencies that 5G networks **will use** in addition to high band frequencies. In other words, 5G will use a wide range of frequencies, many of which have already been extensively studied.

The Nature review did not look at low and mid band frequencies of which there is copious research indicating biological effects. 5G uses 4G networks as its backbone so one cannot claim safety with one review that only focuses on 5G millimeter wave networks.

Notably, this study (not a systematic review) was authored by individuals associated with a group called ICNIRP- a small private group known to have conflicts of interest and to reject research showing harm.

Interestingly, in the Nature paper the authors declare no conflicts of interest. However, in several other papers, author Andrew Wood disclosed that he has three telecom company employees in his lab. A 2022 paper Wood co-authored states, “*Declaration of Competing Interest: The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: AWW directs a research group, which includes three technical associates who are telecommunications company employees.”*

*Another paper Wood co-authored states, "*AWW directs a research group, which includes three technical associates who are telecommunications company employees. The group is also providing advice for a local government authority and a utility on electric and magnetic field exposure issues on a fee-for-service basis."

Further, the laboratory contains equipment from Telstra Research Lab. The laboratory webpage states, "the Radiofrequency Dosimetry Laboratory was funded by Telstra Corporation and Swinburne and is part of the NHMRC-funded Australian Centre for Electromagnetic Bioeffects Research." Note NHMRC is in fact *also funded by Telstra* ***as documented in public information requests*** ***which show how*** *industry money is moved through the NHMC but comes from AMTA- the Australian Mobile Telecommunications Association.*

Thus author Andrew Wood has long had Telecom staff working with him in the Telecom equipment funded lab- with salaries paid for by Telstra, the telecommunications company of Australia.

- The *Journal of Cancer Science and Clinical Therapeutics* published an article on ICNIRP's conflicts here.
- Read an European Parliament Members Report on ICNIRP conflicts here.

Hardell and Carlberg published "Health risks from radiofrequency radiation, including 5G, should be assessed by experts with no conflicts of interest" (Hardell & Carlberg, 2020) detailing how the independent evaluations of RF radiation health risks are ignored by ICNIRP and other closely connected groups. They conclude that, " there seems to be a cartel of individuals monopolizing evaluation committees, thus reinforcing the no-risk paradigm. We believe that this activity should qualify as scientific misconduct."

Myth: There is no evidence that 5G, cell towers or cell phones are harmful to health.

Professor Eric Swanson testified at the February 7, 2022 New Hampshire House Committee hearing on the behalf of the CTIA wireless industry that there are "No verified effects on the human body except for heating… "

Fact: There are hundreds of credible research studies showing harmful effects from wireless radiation and non ionizing radiation.

The respected journal Lancet Planetary Health published Bandara and Carpenter 2018 that states:

> "A recent evaluation of 2,266 studies (including in-vitro and in-vivo studies in human, animal, and plant experimental systems and population studies) found that most studies (n=1546, 68·2%) have demonstrated significant biological or

health effects associated with exposure to anthropogenic electromagnetic fields. We have published our preliminary data on radiofrequency electromagnetic radiation, which shows that 89% (216 of 242) of experimental studies that investigated oxidative stress endpoints showed significant effects. This weight of scientific evidence refutes the prominent claim that the deployment of wireless technologies poses no health risks at the currently permitted non-thermal radiofrequency exposure levels."

Examples of research on radio frequency- including frequencies emitted from low/mid band 5G networks, small cells, cell towers, cell phones and wireless electronics.

- European Parliament requested a research report "Health Impact of 5G" released in July 2021 concluding that commonly used RFR frequencies (450 to 6000 MHz) are probably carcinogenic for humans *and* clearly affect male fertility with possible adverse effects on the development of embryos, fetuses and newborns.
- A review on real world exposure to 5G published in *Toxicology Letters* found that 5 G will have systemic effects as well as adverse effects to the skin and eyes (Kostoff et al., 2020).
- A landmark three part **2021 research review** on effects of non ionizing radiation to wildlife published in *Reviews on Environmental Health* by U.S experts, including former U.S. Fish and Wildlife senior biologist Albert Manville, states current science should trigger urgent regulatory action citing more than 1,200 scientific references which found adverse biological effects to wildlife from even very low intensities of non ionizing radiation with findings of impacts to orientation and migration, reproduction, mating, nest, den building and survivorship (Levitt et al., 2021a, Levitt et al., 2021b, Levitt et al., 2021c).
- 2021 systematic reviews that find RFR can harm sperm (Kim et al., 2021, Sungjoon et al. 2021, Yu et al., 2021).
- A 2021 systematic review on the effects of RFR to male reproductive hormones found that wireless can decrease testosterone (Maluin et al, 2021).
- A review on the genetic effects of non-ionizing electromagnetic fields found DNA strand breaks, micronucleus formation, and chromosomal structural changes (Lai 2021).
- A systematic review published in the Annals of the New York Academy of Sciences found that neuronal ion channels are particularly affected (Bertagna et al 2021).
- A review in the International Journal of Oncology describes how EMFs lead to dysfunction of ion channels which lead to reactive oxygen species/free radical overproduction providing " a complete picture" of how exposure may indeed lead to DNA damage and related pathologies, including cancer," (Panagopoulos et al. 2021).
- A systematic review and meta-analysis of case-control studies found evidence that linked cellular phone use to increased tumor risk (Choi et al., 2020).
- The Switzerland Institute of the Environment expert published review found increased oxidative stress in the majority of animal studies and cell studies with exposures within regulatory limits (Schuermann et al., 2021) corroborating an earlier review (Yakymenko et al 2016) on oxidative stress that concluded 93 of 100 studies found oxidative effects.

A sampling of research on cell tower radiation specifically:

- A 2017 study entitled the "Impact of radiofrequency radiation on DNA damage and antioxidants in peripheral blood lymphocytes of humans residing in the vicinity of mobile phone base stations" published in Electromagnetic Biology and Medicine found higher RFR exposures in people living near mobile phone base stations was linked to changes in the blood that are considered biomarkers predictive of cancer.
- A 2018 study Mobile Phone Base Station Tower Settings Adjacent to School Buildings: Impact on Students' Cognitive Health published in the American Journal of Men's Health found school-aged adolescents exposed to higher levels of RFR exposure had delayed fine and gross motor skills, spatial working memory, and attention in comparison to those exposed to lower RFR levels.
- A 2015 study Association of Exposure to Radio-Frequency Electromagnetic Field Radiation (RF-EMFR) Generated by Mobile Phone Base Stations with Glycated Hemoglobin (HbA1c) and Risk of Type 2 Diabetes Mellitus published in the International Journal of Environmental Research and Public Health on elementary students found higher Type 2 Diabetes Mellitus in students exposed to higher levels of RFR.
- A 2011 review found a year of operation of a powerful cell base station resulted in a dramatic increase in cancer incidence among the population living nearby.
- A large-scale animal study published in Environmental Research which exposed rats to cell tower levels of RF found increased cancers, the same tumor types as found by the National Toxicology program animal studies (Falcioni 2018).
- A 2020 study considering liability issues for wireless companies recommends that "although direct causation of negative human health effects from RFR from cellular phone base stations has not been finalized, there is already enough medical and scientific evidence to warrant long-term liability concerns for companies deploying cellular phone towers. In order to protect cell phone tower firms from the ramifications of the failed paths of other industries that have caused unintended human harm (e.g. tobacco)" the author recommends, "voluntarily restrictions can be made on the placement of cellular phone base stations within 500 m of schools and hospitals."
- An analysis of studies found ~80% showed biological effects near towers. "Many biological effects have been documented at very low intensities comparable to what the population experiences within 200 to 500 ft (*60–150 m) of a cell tower, including effects that occurred in studies of cell cultures and animals after exposures to low-intensity RFR. Effects re- ported include: genetic, growth, and reproductive; increases in permeability of the blood–brain barrier; behavioral; mo- lecular, cellular, and metabolic; and increases in cancer risk." (PDF).
- A 2021 study published in the International Journal of Environmental Research and Public Health Found higher cell tower RFR radiation exposures linked to increased mortality for all cancers including breast, cervix, lung, and esophagus cancers.

- A study from Germany found that stress hormones adrenaline and noradrenaline significantly increased over the first 6 months after cell tower antenna activation and after 18 month dopamine and PEA levels decreased.
- A study by a Municipal Health Department and several universities in Brazil found a clearly elevated relative risk of cancer mortality at residential distances of 500 meters or less from cell phone towers.
- A review published in the International Journal of Occupational and Environmental Health of epidemiological studies found in 80% of the studies, people living <500 m from base stations had an increased adverse neuro-behavioral symptoms and cancer.
- An analysis by human rights experts published in Environmental Science & Policy argues that cell tower placement near schools is a human rights issue for children because "protection of children is a high threshold norm in Human Right law" and "any widespread or systematic form of environmental pollution that poses a long-term threat to a child's rights to life, development or health may constitute an international human rights violation." The authors document numerous studies indicating a myriad of effects and conclude that, "because scientific knowledge is incomplete, a precautionary approach is better suited to State obligations under international human rights law." (PDF)
- A 2014 study entitled "RF radiation from mobile phone towers and their effects on human body" published in the Indian Journal of Radio & Space Physics surveyed residents 6 years after the cell tower was erected. They measured the RF and notably found very high levels when the antennas were closest to homes and also very high levels when the antennas were directly facing the antennas without any obstructions. Residents living within 50 meters had more health complaints (fatigue, nausea, sleep, headache etc.) than those living over 50 meters from the antennas.
- A 2021 research study with a total of 268 surveys completed by residents of a Madrid neighborhood surrounded by nine telephone antennas, and 105 measurements of electromagnetic radiation both outside and inside the houses found people who are exposed to higher radiation values present more severe headaches, dizziness and nightmares. Moreover, they sleep fewer hours."

Myth: 5G and wireless networks are safe because they are non-ionizing radiation.

Fact: Claims that 5G networks are safe because "the radiation is non ionizing" are simply false. More than enough research exists to confirm that non-ionizing radiation has biological effects.

Our scientific understanding of electromagnetic radiation is in a paradigm shift. The ionizing versus non-ionizing model is no longer relevant to understanding the health effects of RFR. Just because RFR is non-ionizing does not mean that it cannot initiate, promote, or play a role in the development of cancer. Research has found adverse health effects from RFR including increased cancer risk, cellular stress, increase in harmful free radicals, genetic damage, structural and functional changes in the reproductive system, learning and memory deficits, and damage to the nervous system (Belpomme et al., 2018; Miller et., 2019, Schuermann et al., 2021).

Fact: Scientists have published papers on the mechanisms by which non ionizing radiation can impact human health and the environment.

Several pathways have been suggested to explain how non-ionizing RFR could lead to DNA damage -without causing direct DNA damage in the same way as ionizing radiation, (Barnes and Greenebaum, 2018; Belpomme et. al., 2018; Blank and Goodman, 2009,: Markov et al., 2010).

RFR can interfere with oxidative repair mechanisms, induce oxidative stress, and impact cellular processes leading to cancer (Havas, 2017; Melnick, 2019; Yakymenko et al., 2016). A 2021 review reported the majority of the animal studies and more than half of the cell studies found increased oxidative stress caused by non-ionizing electromagnetic fields and concluded that “a trend is emerging” that non ionizing EMF exposure, even in the low dose range, may well lead to changes in cellular oxidative balance (Schuermann et al., 2021). Induction of oxidative stress is a key characteristic of many human carcinogens (Smith et al., 2016).

Several publications document biophysically plausible mechanisms for biological effects (Belyaev, 2015; Dasdag and Akdag, 2016; Georgiou CD, 2010; Pall 2013, 2015). For example, although they are low power, wireless RFR communication signals have complex waveforms, and include components of lower frequency non-ionizing electromagnetic fields, which can induce perturbations of Voltage Controlled Calcium Gates (VCCG) in cellular membranes. This leads to imbalances in cytoplasmic ionic concentrations, leading to excessive reactive oxygen species (ROS) and DNA damage (Panagopoulos, 2019; Panagopoulos et al., 2021).

Myth: Wireless radiation is not a carcinogen. The classification by the WHO International Agency for Research in Cancer of wireless radio frequency as a Class 2B "Possible Carcinogen" simply means wireless radiation like talcum powder or picked vegetables.

Fact: The WHO International Agency for Research on Cancer (IARC) concluded that RFR was a Group 2B "possible" carcinogen was largely based on human studies that found long term cell phone users had increased risk for tumors- glioblastomas and acoustic neuromas (WHO/ IARC 2011). The scientific documentation for the determination was compiled in a 2013 monograph (IARC 2013).

In 2011, there was limited animal evidence demonstrating carcinogenicity and this is one of the reasons the WHO/IARC designation was not stronger. However, since that date, two large scale animal studies have found increased tumors demonstrating carcinogenicity in laboratory animals exposed to both near field (cell phone) and far field (cell tower) exposures (Falconi, 2018; NTP, 2018). The tumor types found in the recent animal studies, glioma and schwannoma, are similar to those associated with the use of wireless phones, glioma and acoustic neuroma (vestibular schwannoma), in human epidemiological studies (Hardell, 2018). Thus, the WHO/IARC advisory group recommended RFR be re-evaluated as a "high priority" within 5 years due - largely in part- to the recent animal research findings positive for cancer (IARC, 2019). IARC has not reviewed the research since 2011.

Fact: The WHO/IARC Director recommended people reduce exposure after the 2011 classification.

"Given the potential consequences for public health of this classification and findings it is important that additional research be conducted into the long-term, heavy use of mobile phones. Pending the availability of such information, it is important to take pragmatic measures to reduce exposure such as hands-free devices or texting," stated WHO/IARC Director Christopher Wild Press Release from WHO/IARC classification

Fact: The research linking RFR to cancer has increased since 2011.

Several scientists, several of whom notably *served **on** the WHO/IARC EMF working group in 2011*, reviewed the findings of the NTP as well as other recent studies and now conclude the evidence is adequate for the International Agency for Research to conclude that cell phone radiation is a probable carcinogen and even a proven Group 1

human carcinogen (Miller et al., 2018; Peleg et al., 2018; Carlberg and Hardell 2017; Belpomme et al., 2018; Melnick, 2019; Portier, 2021; Lin, 2019; Directorate-General for Parliamentary Research Services (European Parliament) & Belpoggi, 2021).

There are publications which conclude that Bradford Hill criteria for carcinogenicity is met (Carlberg and Hardell 2017, Peleg et al 2018) meaning that yes, radiofrequency radiation can cause cancer.

Hardell and Carlberg 2018 comments that the NTP findings allow the following conclusion "there is clear evidence that RF radiation is a human carcinogen, causing glioma and vestibular schwannoma (acoustic neuroma). There is some evidence of an increased risk of developing thyroid cancer, and clear evidence that RF radiation is a multi-site carcinogen. Based on the Preamble to the IARC Monographs, RF radiation should be classified as carcinogenic to humans, Group 1."

Professor Lennart Hardell, who notably worked on DDT decades ago, presented his conclusion that RFR met Bradford criteria in a lecture entitled "Using the Bradford Hill viewpoints to evaluate the evidence on RF radiations from mobile phones to head tumors lecture"(Royal Society of Medicine, 2019) at Brunel University, London in October 2016.

Fact: In addition to brain cancer, research also associates RFR with thyroid cancer and breast cancer (Luo et al., 2020, Di Ciaula et al., 2021, Carlberg et al., 2020, Shih et al., 2020, West et al., 2013).

Fact: Research has found that wireless radiation could act as a tumor promoter. It also could combine with other toxic exposures synergistically, amplifying the effects.

Research has found that non ionizing EMF exposure can act synergistically with other environmental pollutants potentiating harmful effects (Kostoff and Lau, 2017). Animal studies have found tumor promoting effects when RFR is combined with a known carcinogen (Lerchl et al., 2015; Tillmann et al., 2010). Animal studies have also found combining lower frequencies of non ionizing electromagnetic fields (ELF-EMF) with known carcinogens can increase tumors (Soffritti et al., 2016, Soffritti et al., 2016).

Additionally, RFR can impact the integrity of the blood-brain barrier that protects the brain from toxic molecules circulating in the blood (Leszczynski et al., 2002; Salford et al., 2003; Sirav & Seyhan, 2011; Sırav & Seyhan, 2016; Tang et al., 2015). It is notable that prenatal and postnatal mobile phone exposure has been linked to greater neurobehavioral effects in children with elevated lead levels (Choi et al., 2017, Byun et al., 2017).

Fact: Cell phone and wireless radiofrequency cannot be compared with talcum powder or pickled vegetables.

First, all agents classified as a Class 2 B carcinogen like wireless radiation, talc and various chemicals are not the same. Other hazards that made it to the list of 2B carcinogens remain the subject of major regulatory attention, including pesticides like DDT and Kepone, industrial materials such as PBBs, carbon black and carbon tetrachloride, jet and diesel fuel, and mercury. The IARC classification is based on weight of evidence, not amount of risk. With any toxic exposure, it takes decades to accumulate enough weight of evidence, meaning enough scientific research and statistics (in human epidemiology this refers to sick people) to show the exposure is toxic.

Regardless, we are now exposed to cell phones and wireless radiation day and night, totally different from talcum powder.

As an example of how long it takes to show an exposure causes cancer, take the case of talcum powder. The talc in talcum powder for years was heavily contaminated with asbestos, which increases the risk of ovarian cancer. In fact, in 2016 Johnson & Johnson was fined to pay $72 million in damages to the family of a woman whose death from ovarian cancer was linked to her use of the company's body powders. According to the Washington Post, more than 1,200 women from across the country are suing Johnson & Johnson for failing to warn consumers of the dangers associated with talc—the mineral used in baby powder.

On June 23, 2020, the Missouri Court of Appeals upheld a jury verdict that Johnson & Johnson's talcum powder caused ovarian cancer in 22 women, and ordered the company to pay $2.1 billion.

On May 19, 2020, Johnson & Johnson announced it was stopping sales of its talc-based baby powder in the U.S. and Canada.

How do they know it is the talcum powder causing ovarian cancer? Answer: the talc was found within the tumors themselves—many of those tumors took 40 years to develop.

Myth: Professor Swanson's brain, the sun and his hot water bottle violate FCC limits.

At the February 7, 2022 New Hampshire House Committee hearing Professor Eric Swanson testified on the behalf of the CTIA Wireless Industry stating (at minute 1:33:00) that, “My brain is a radio transmitter…It violates FCC regulations by about a factor of 10. …The sun violates FCC regulations by about a factor of 16. My hot water bottle violates FCC regulations by about a factor of 50. As you might gather from what I am saying, these regulations are very strict and protect us very well.”

Fact : FCC limits apply to specific frequencies- 300 kHz to 100 GHz.The brain, sun and hot water bottle do not emit telecommunications frequencies in this frequency range. The statement is incorrect and scientifically unsound.

When a radiofrequency engineer measures the RF from a cell tower they do not measure the sun's rays. Even if they were measuring the sun's rays, these types of electromagnetic fields (EMFs) are not the same as artificial EMFs.

Panagopoulos et al 2015 published in the journal Nature explains how man-made EMFs (in comparison to natural EMFs like the sun) are polarized and thus more biologically active.

> “Polarized EMFs/EMR can have increased biological activity, due to: 1) Ability to produce constructive interference effects and amplify their intensities at many locations. 2) Ability to force all charged/polar molecules and especially free ions within and around all living cells to oscillate on parallel planes and in phase with the applied polarized field. Such ionic forced- oscillations exert additive electrostatic forces on the sensors of cell membrane electro-sensitive ion channels, resulting in their irregular gating and consequent disruption of the cell’s electrochemical balance. These features render man-made EMFs/EMR more bioactive than natural non-ionizing EMFs/EMR. This explains the increasing number of biological effects discovered during the past few decades to be induced by man-made EMFs, in contrast to natural EMFs in the terrestrial environment which have always been present throughout evolution, although human exposure to the latter ones is normally of significantly higher intensities/energy and longer durations. Thus, polarization seems to be a trigger that significantly increases the probability for the initiation of biological/health effects.”

The conclusions of Panagopoulos et al 2015 directly address Swanson’s inaccurate claims:

> “The present theoretical analysis shows that polarized man-made EMFs/EMR can trigger biological effects while much stronger and of higher energy (frequency) unpolarized EMFs/Non-Ionizing EMR (e.g. heat, or natural light) cannot. This is the reason why polarized microwave radiation of maximum power 1W emitted by a mobile phone can damage DNA and cause adverse health effects while non-polarized infrared, visible, and ultraviolet radiation from a 100 W light bulb, or ~400 W infrared and visible EMR from a human body cannot.”

Professor Swanson's analogy is solely focused on the heat from the sun and his hot water bottle. Heating is not the only harm. Adverse effects have been found at levels that do not increase heat (Belpomme et al., 2018, Miller et al., 2019, Yakymenko et al., 2015, Schuermann & Mevissen, 2021).

Myth: FCC limits for cell tower radiation emissions are very strict and as Professor Swanson states, "protect us very well."

At the February 7, 2022 New Hampshire House Committee hearing Professor Eric Swanson testified on the behalf of the CTIA Wireless Industry stating of FCC regulations that, "The regulations are extremely strict. I won't give you the numbers…As you might gather from what I am saying these regulations are very strict and protect us very well."

Fact: U.S. limits for radiofrequency radiation from cell tower networks are not strict. They are among the most permissible in the world, meaning the U.S allows RF emissions at levels that are so high – *they would be illegal in many countries.*

Note: When cell tower network RFR limits are discussed, ICNIRP limits are often referenced. For example, India dropped its limits to 1/10th of ICNIRP limits. FCC and ICNIRP cell tower emission limits are very similar so if a country has RF limits "more restrictive than ICNIRP," they are also more restrictive than FCC limits.

Countries which have limits far more stringent than the US include China, Russia, Italy, Switzerland, India and Israel, Turkey, Bulgaria, Brussels Belgium, Chile, Belarus, Serbia, Slovenia, Croatia, Montenegro, Greece, Liechtenstein, Tajikistan, Kazakhstan, Kyrgyzstan, Ukraine, Kuwait, Grand Duchy of Luxembourg, Bosnia Herzegovina, Georgia, Uzbekistan, and the Republic of Moldova.

- Note: Industry lobbied Poland, Lithuania, Italy, Switzerland and Brussels Belgium to weaken their regulations in order to allow more radiation for 5G. In 2020, industry succeeded in Lithuania and Poland. Italy and Switzerland voted no. Now industry has its eyes on Russia, which along with several countries such as China and India has RF limits much stricter lower than the USA.

Fact: When the Italian government considered weakening their RF limits in 2020, U.S. scientists who served in leadership positions in the CDC and at NIH wrote a letter to the lawmakers urging them to maintain their more stringent limits.

Linda Birnbaum PhD, retired Director of the National Institute of Environmental Health Sciences and Chris Portier PhD, former Director of the National Center for Environmental Health, US Centers for Disease Control and Prevention joined Lennart Hardell MD, Professor Department of Oncology, Faculty of Medicine and Health, Örebro University, Devra Davis PhD and several other experts as signatories to a letter to the government of Italy stating, "As senior scientists with relevant experience of EMF/RFR we are writing to you to caution against raising, by 100 times in terms of power density, the 20 year- old, and path- breaking, Exposure Limits for protecting the Italian public from EMF/RFR, and to replace them with the higher exposure limits recommended 20 years ago (and reiterated in 2020) by the private sector body, ICNIRP."

Documentation

- Scientists letter to the Italian government, April 6, 2021
- "Human radio frequency exposure limits: An update of reference levels in Europe, USA, Canada, China, Japan and Korea"
- TU-D Study Group 2, "Strategies and policies concerning human exposure to electromagnetic field, 6th Study Period, 2014-2017"
- GSMA Website on 5G Deployment Policy and EMF RF Limits , GSMA website with Map of SAR and RF limits
- Mary Redmayne (2016) International policy and advisory response regarding children's exposure to radio frequency electromagnetic fields (RF-EMF), Electromagnetic Biology and Medicine, 35:2,

Fact: China and Russia have strict limits because of research indicating non-thermal effects.

In a 2003 International Seminar of the World Health Organization, Dr. Huai Chiang of Zhejiang University School of Medicine, China explained the basis for China's continued strict RF limit rested on science that found a variety of behavioral, neurological, reproductive abnormalities, as well as DNA damage.

"In summary, there are many reports of non-thermal potential health effects from microwave radiation using both in vivo and in vitro, and some of them are cited above. The SAR threshold for the adverse effects in the frequency range from 100 kHz to 10 GHz may be at 0.5 to 1.0 W/kg, rather than 4.0 W/kg. Thus, a whole body average SAR of 0.1 W/kg is chosen as the restriction for occupational exposure, and 0.02 W/kg for general public exposures in the draft of amending China exposure standard"

"The main differences (with ICNIRP) and its own rationale are as follows: (1) ICNIRP guidelines are based on short-term, immediate health effects such as stimulation of peripheral

nerves and muscles, and elevated tissue temperature resulting from absorption of energy during exposure to EMF (thermal effects). However, there is a body of literature, which reports that health effects can be shown at such a level of radiation that does not produce heating or stimulation."

- Read Proceedings from Dr. Chiang's presentation *on page 69* of the International EMF Seminar in China: Electromagnetic Fields and Biological Effects Guilin, 2003
- Read Dr. Chiang's Short Summary here.

A 2012 paper documents the scientific evidence such as impacts to the nervous system used to develop the original USSR RF exposure limits and subsequent Russian public health standards- which are more strict than FCC or ICNIRP limits.

According to the The Russian National Committee on Non-Ionizing Radiation Protection, "the following health hazards are likely to be faced in the near future by children who use mobile phones: disruption of memory, decline in attention, diminished learning and cognitive abilities, increased irritability, sleep problems, increase in sensitivity to stress, and increased epileptic readiness. For these reasons, special recommendations on child safety from mobile phones have been incorporated into the current Russian mobile phone standard."

- Read Scientific Basis for the Soviet and Russian Radiofrequency Standards for the General Public

Fact: Wireless companies warn their shareholders of a financial risk should they lose lawsuits or should regulations change regarding radiofrequency radiation. Wireless companies warn their shareholders but they do not warn the users of these products, nor do they warn the people exposed to emissions from their products and infrastructure. These corporate investor warnings by companies such as AT&T, Verizon, Vodaphone and Crown Castle are contained in their Annual Reports filed on Form 10-K (or Form 20-F or 40-F for foreign companies) with the Securities and Exchange Commission (SEC) and they clearly inform shareholders that companies may incur significant financial losses related to electromagnetic fields. Safety is not assured.

- Verizon Wireless warns their shareholders in their 10-K form to the US Securities and Exchange Commission that: "Our wireless business also faces personal injury and wrongful death lawsuits relating to alleged health effects of wireless phones or radio frequency transmitters. We may incur significant expenses in defending these lawsuits. In addition, we may be required to pay significant awards or settlements."
- As another example, Crown Castle states in their 2020 Annual Report, "If radio frequency emissions from wireless handsets or equipment on our communications infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues. The potential connection

between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us…If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters."

- Wireless companies themselves define non-ionizing radiation as a "pollutant". Both AT&T Mobile Insurance (pg. 4) and Verizon Total Mobile Protection(page 10) state that coverage is excluded for pollutants, which are defined as "Any solid, liquid, gaseous, or thermal irritant or contaminant including smoke, vapor, soot, fumes, acid, alkalis, chemicals, artificially produced electric fields, magnetic field, electromagnetic field, sound waves, microwaves, and all artificially produced ionizing or non-ionizing radiation and waste."
- Insurers rank 5G and electromagnetic radiation as a "high" risk, comparing the issue to lead and asbestos. A 2019 Report by Swiss Re Institute, a world leading provider of insurance, classifies 5G mobile networks as a "high", "off-the-leash" risk stating, "Existing concerns regarding potential negative health effects from electromagnetic fields (EMF) are only likely to increase. An uptick in liability claims could be a potential long-term consequence" and "[a]s the biological effects of EMF in general and 5G in particular are still being debated, potential claims for health impairments may come with a long latency."
- US Mobile operators have been unable to get insurance to cover liabilities related to damages from long term exposure to radiofrequency emissions for over a decade.
- Due to the high risk that electromagnetic (EMF) field exposure poses, many insurance companies do not cover electromagnetic fields as standard practice and have very clear "electromagnetic field exclusions." EMFs are classified as a "pollutant" alongside smoke, chemicals and asbestos. A&M Insurance for Medical Professionals – No Coverage for Electromagnetic Fields states "GENERAL INSURANCE EXCLUSIONS: Electromagnetic fields directly or indirectly arising out of, resulting from or contributed to by electromagnetic fields, electromagnetic radiation, electromagnetism, radio waves or noise."

- If you want insurance that will cover EMFs you often have to purchase additional "Pollution Liability" or "Policy Enhancement" coverage.
    - The Electromagnetic Fields Exclusion (Exclusion 32) is a General Insurance Exclusion and is applied across the market as standard. The purpose of the exclusion is to exclude cover for illnesses caused by continuous long-term non-ionising radiation exposure i.e. through mobile phone usage." - CFC Underwriting LTD in London, the UK agent for Lloyd's

- Complete Markets "Electromagnetic Fields (Utilities) Liability Insurance" states: "Classified alongside chemicals, smoke, and asbestos as "pollutants" electromagnetic fields (EMF) poses a high risk to various persons such as users of electrical power, electrical power generating companies, power transmission companies, and large generators. Sources of possible EMF health risks include radio frequencies, extremely low frequencies, and static magnetic fields. In homes, EMF exposures come from electrical appliances. The public has targeted cell phone manufacturers and electric power lines as likely EMF targets. Electromagnetic Fields (Utilities) Liability Insurance is a way for prudent companies to minimize exposure to vexatious litigation and adverse publicity.

- Some insurance companies not only exclude coverage for harm, but also exclude coverage for defense related to recommendations that should or should not have been given. For example, the City of Ann Arbor Michigan Insurance Policy: Electromagnetic Radiation Exclusion not only excludes mitigation and harm from electromagnetic radiation but also excludes paying for the defense of "any supervision, instruction, recommendation, warning or advice given or which should have been given in connection with bodily injury, property damage, abatement and/or mitigation etc. (page 14)

If FCC limits "protect us very well" then why does the New Hampshire Commission Report on 5G conclude to reduce wireless radiation exposure?

- The New Hampshire State Commission 5G Report has 15 recommendations including reducing public exposure to cell phones, wireless devices and ensuring cell network infrastructure antenna setbacks from schools and homes as well as the establishment of establish wireless radiation-free zones.

If FCC limits "protect us very well, then why do scientists conclude with the recommendations to reduce wireless radiation exposure?

- The American Academy of Pediatrics recommends families redice cell phone radiation and states of cell towers that, "An Egyptian study confirmed concerns that living nearby mobile phone base stations increased the risk for developing: headaches, memory problems, dizziness, depression, sleep problems. Short-term exposure to these fields in experimental studies have not always shown negative effects, but this does not rule out cumulative damage from these fields, so larger studies over longer periods are needed to help understand who is at risk. In large studies, an association has been observed between symptoms and exposure to these fields in the everyday environment."

- Roda & Perry, 2014 states, "dearth of legislation to regulate the installation of base stations (cell towers) in close proximity to children's facilities and schools clearly constitutes a human rights concern…"
- Singh and Kappor 2014 conclude, "For the time being, the public should follow the precautionary principle and limit their exposure as much as possible."
- Bandara and Carpenter 2018 recommend a "coordinated international effort" to reduce public exposure.
- Sangun et al., 2015 reviewed effects to the endocrine system (an issue OHA omitted) and concluded that "Although the results are conflicting and cannot be totally matched with humans; there is growing evidence to distress us about the threats of EMF on children."
- Redmayne 2016 concludes "minimum exposure of children to RF-EMF is recommended."
- Miller et al., 2019 concludes, "current knowledge provides justification for governments, public health authorities, and physicians/allied health professionals to warn the population that having a cell phone next to the body is harmful, and to support measures to reduce all exposures to RFR."
- Moon 2020 a review on impacts to children states, "Precautionary approaches are recommended for children…"
- Frank 202 on 5G deployment and children's health concludes, "after reviewing the evidence cited above, the writer, an experienced physician-epidemiologist, is convinced that RF-EMFs may well have serious human health effects...Based on the precautionary principle, the author echoes the calls of others for a moratorium on the further roll-out of 5G systems globally, pending more conclusive research on their safety."

Myth: There is no cumulative effect from cell tower or radiofrequency radiation.

Myth presented at the February 7, 2022 New Hampshire House Hearing after a Representative asks, "What is the cumulative effect of me constantly walking by or living near a cell tower and having it outside by door." Professor Swanson then states, "There actually is no cumulative effect…[he gives an analogy of trying to throw a rock across the river]…There is not enough energy on these 5G waves to disrupt anything and it doesn't matter how long you stand there. It's still not going to disrupt anything for basically the same reason as I said… the rock throwing."

Fact: Research has shown a cumulative effect from exposure. Chronic, low-intensity cumulative exposures have been ignored by standard setting groups. They claim as Professor Swansn does, without independent systematic scientific documentation, that cumulative effects do not exist. Numerous studies show that a longer duration of exposure (i.e more hours or years) increases effects. A one time exposure is different than years and years of exposure.

A comprehensive meta-analysis of case-control studies found significant evidence linking cellular phone use to increased tumor risk, especially among cell phone users with cumulative cell phone use of 1000 or more hours in their lifetime (which corresponds to about 17 min per day over 10 years), and especially among studies that employed high quality methods. (Choi et al., 2020).

The Switzerland Institute of the Environment review which found increased oxidative stress in the majority of animal studies and cell studies (with exposures within regulatory limits) documents how several studies showed "effects can be cumulative with duration of exposure" (Schuermann et al., 2021).

- "After 24 h of exposure with a 1.8 GHz RF-EMF (GSM signal, continuous, or intermittent), an increase in oxidative DNA damage, ROS production, and autophagy activity was observed in GC-2 cells at the highest SAR dose of 4 W/kg [164,169,170,171]. Hence, there is evidence that the increase in ROS production does not occur immediately but with increasing exposure time (>12 h) or cumulative dose [170]."

Studies on people living near cell towers and base station antennas (antennas mounted on buildings) are important in considering cumulative impacts as people are exposed continuously.

A 2018 study "Radiofrequency radiation from nearby base stations gives high levels in an apartment in Stockholm, Sweden: A case report" which documents high RF levels in apartments close to mobile phone base stations on the roof summarized several cell tower studies showing the longer the exposure, the higher the impacts.

- Buchner and Eger studied residents in the village of Rimbach in Germany after a GSM mobile base station was built and found for the participants with RF radiation exposure over 100 µW/m2 at home, 3 neurotransmitters showed a clear dose-response relationship. Phenylethylamine (PEA) levels decreased at first for the highest exposed group, but after 18 months the 3 groups were all statistically significantly decreased. After 18 months, even the lowest exposed group had decreased dopamine and PEA levels. PEA is often low in patients with depression and attention deficit hyperactivity disorder (ADHD). Chronic dysregulation of the catecholamine system and PEA may contribute to chronic illnesses and health problems in the long term.

The study "How does long term exposure to base stations and mobile phones affect human hormone profiles?" followed participants for 6 years. Blood samples were collected regularly every 3 years for time intervals of 1 year, 3 years and 6 years. They found a reduction in volunteers' plasma ACTH, serum cortisol levels as well as a decrease in the release thyroid hormones. "In addition, each of their serum prolactin in young females (14–22 years), and testosterone levels significantly dropped due to long-term exposure to radio frequency radiation. Conversely, serum prolactin levels for adult females (25–60 years) significantly rose with increasing exposure time." The researchers concluded that, "The intensity and frequency of RFR and exposure duration are important determinants of the cumulative effect that could occur and lead to an eventual breakdown of homeostasis and adverse health consequences. Therefore, greater commitment from policy makers, health care officials and providers is needed to raise public awareness about the hazardous outcomes of long term exposure to RFR."

Additional documentation

- A large-scale animal study from the Ramazzini Institute used RF exposure levels similar to those from a mobile phone base station. They exposed rats to levels (lower than FCC limits) every day until their death. The study found increases in tumors (Falcioni et al., 2018).
- A study carried out by the Municipal Government of Belo Horizonte along with 3 Universities located in Brazil looked at death records, telecommunications records and city population data. The results found higher mortality rates were exhibited for the residents inside a radius of 500 meters from cellular telephone base stations. In fact, there were 14 times more deaths within a 500 meter radius than outside 500 meters.
- A 2018 review Effect of radiofrequency radiation on reproductive health concludes that "available data indicate that exposure to EMF can cause adverse health effects. It is also reported that biological effects may occur at very low levels of exposure. The RFR effect can be more intensified based on the range and duration of the exposure."
- A study on 4G found kidney inflammation in mice was higher in the mice exposed for 60 minutes compared to 40 minutes (Hasan et al., 2021.) "It is concluded that fourth-generation cell phone radiation exposure may affect blood hemostasis and inflammation of mice's kidney and testis tissue. Based on these studies, it is important to increase public consciousness of potential adverse effects of mobile phone radiofrequency electromagnetic radiation exposure."

Myth: The majority of studies on RF show no harm. The WHO found only 5% of 25,000 studies showed harmful effects but that is the false positive rate.

Myth in Professor Swanson's testimony to New Hampshire Lawmakers in February 7, 2022 Hearing:

- A Representative asked, "We just heard some testimony about bio effects…Voltage gated channels being disrupted… I wonder if you have any impressions…"
- Professor Swanson responded, "I hear about this all the time, it's all wrong, all of it. And I want to explain why this even exists. The medical industry standard for conducting a study is to work at 5 percent false positive level, it's called alpha."
- Swanson continued, "All medical studies desire to have a 5% false positive level. Meaning that if you run a hundred studies, five of them are going to find something. That's the definition of a false positive level. Twenty five thousand studies have been done estimated by the World Health Organization. 5 percent of that is about a thousand. About a thousand studies are going to find something."
- Swanson summarized that, "Now what do they find? It's random, remember. It's a false positive rate. So they find random stuff and it's all over the map. And the reason it's all over the map and the reason you get such a long laundry list of disastrous things is because it's random. When people focus on these thousand studies -the five percent- they are ignoring the 95% of studies that don't find any effect whatsoever. Its natural instinct of course to just - oh that agrees with my viewpoint, i'm going to pay attention to that. And ignore the 95% that disagrees with you. That's what underpins all of this stuff."

Fact #1: Numerous reviews and analysis have found the majority of studies for various endpoints do show effects. Professor Swansons reference to 25,000 is based on an unknown statement (?) and is not based on any up to date analysis. We hope that Professor Swanson will be asked for scientific substantiation for his statement.

Numerous analyses of studies have found the majority of studies evaluated show effects.

1.The respected journal Lancet Planetary Health published Bandara and Carpenter 2018 that states: "A recent evaluation of 2,266 studies (including in-vitro and in-vivo studies in human, animal, and plant experimental systems and population studies) found that most studies (n=1546, 68·2%) have demonstrated significant biological or health effects associated with exposure to anthropogenic electromagnetic fields. We have published our preliminary data on radiofrequency electromagnetic radiation, which shows that 89% (216 of 242) of experimental studies that investigated oxidative stress endpoints showed significant effects. This weight of scientific evidence refutes the

prominent claim that the deployment of wireless technologies poses no health risks at the currently permitted non-thermal radiofrequency exposure levels."

2. A November 18, 2021 letter from Cindy Sage, M.A., David O. Carpenter, MD., Lennart Hardell, M.D., Ph.D., Prof. Henry Lai, Ph.D. documents the majority of recent studies show effects concluding that the "research published over the last two years has added significant additional weight to the body of evidence which indicates that FCC public safety exposure limits are grossly inadequate to protect public health given the proliferation of RFR-emitting devices now in common usage."

- "When the cumulative body of evidence is assessed over the last decades of research, the overall picture for studies on radiofrequency radiation effects shows clear and consistent patterns of effects on living tissues. Chronic RFR exposures at environmental levels common today can reasonably be presumed to produce health harm at and below current FCC safety limits for humans and should be substantially lowered."
    - Neurological effects: Effect= 74% (271 studies); No Effect= 26% (97 studies) (literature up to November 12, 2021)
    - Oxidative effects: Effect= 92% (258 studies); No Effect= 8% (23) studies) (literature up to November 12, 2021)"
    - Genetic effects: Effect= 67% (259 studies); No Effect= 33% (129 studies) (literature up to November 12, 2021)

3. Earlier in 2020, Henry Lai PhD updated his reports on published studies finding effects from RFR and non ionizing radiation. He posted this analysis as well as all the abstracts for the studies.

- Neurological RFR studies report effects in 73 % of studies on RF radiation -- or 244 of 336 studies. (Bioinitiative 2020).
- Genetic effect studies report effects in 65 % of studies on RF radiation -- or 224 of 346 studies (Bioinitiative 2020).
- Free Radical (Oxidative Damage) effect studies report effects in 91 % of studies on RF radiation -- or 240 of 261 studies (Bioinitiative 2020).
- RFR Comet Assay effect studies report effects in 65 % of studies on RF radiation -- or 78 of 125 studies (Bioinitiative 2020).

4. Numerous published reviews confirm and corroborate such evaluations.

- For example, the Switzerland Institute of the Environment expert published review found increased oxidative stress in the majority of animal studies and cell studies with exposures within regulatory limits (Schuermann et al., 2021).
- An earlier review (Yakymenko et al 2016) on oxidative stress concluded 93 of 100 studies found oxidative effects.
- Recent systematic reviews find harm to sperm (Sungjoon et al, 2021, Yu et al., 2021, Kim et al., 2021) corroborating earlier reviews that concluded harm to sperm (Adams et al 2014, Houston et al 2016, Liu et al 2014).

Additional Comments on the CTIA Testimony

The CTIA has created a false impression of safety with true statements and industry tied conclusions. Here are some examples.

1.The CTIA presents conclusions of so-called authorities neglecting to mention the reports are well outdated, authored by scientists known to have conflicts of interest and some of the organizations are even defunct.

The CTIA states, "Likewise both the United Kingdom Health Protection Agency Independent Advisory Group on Non ionizing Radiation and the Swedish Council for Working Life and Social Research agree that RF exposure below guideline levels consistent with FCC limits do not cause health effects."

- The CTIA Footnote goes to two reports *from 2012.*
- The United Kingdom Health Protection Agency Independent Advisory Group on Non ionizing Radiation *no lon*ger exists. The CTIA has it as a link to the wayback machine. The incorrect and misleading statements as serious conflicts of interest of the group is documented in a published paper entitled, "Inaccurate official assessment of radiofrequency safety by the Advisory Group on Non-ionising Radiation" (Starkey 2016). (Watch a video of Dr. Starkey presenting her research/Download Dr. Starkey's PPT).
- The Swedish Swedish Council for Working Life 2012 Report that the CTIA references (found here) was was authored by 4 scientists: Professor Ahlbom was officially removed from WHO/IARC's Expert Working Group on RF the day before the meeting began, due to conflicts-of-interests as he found to be a member of the Board of Directors of Gunnar Ahlbom AB, a lobby group headed by his brother Gunnar Ahlbom that represented the interest of the leading Swedish mobile phone operator TeliaSonera, among others; Maria Feychting also has a long history of industry ties.

Additional Resources

Policy

- New Hampshire State Commission 5G Report
- Pittsburgh Law Review: The FCC Keeps Letting Me Be: Why Radiofrequency Radiation Standards Have Failed to Keep Up With Technology, 2021
- The Harvard Press Book "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates"
- FCC's Legal Duties to Inform and Protect the Public by Sharon Buccino Natural Resources Defense Council Washington- an overview of some of the key legal principles that affect the authorization of wireless services and the construction of the networks needed to provide these services.

Santa Clara Medical Association Magazine Articles

- "Wireless Silent Spring"
- "A 5G Wireless Future: Will it give us a Smart Future"
- "Wi-Fi in Schools Are We Playing It Safe With Our Kids?" **PDF**
- "Shallow Minds: How the Internet and Wi-F in Schools Can Affect Learning"

Investigative Reports

- Santa Fe New Mexican, Report says wireless radiation may harm wildlife, Scott Wyland
- The Journal of Scientific Practice and Integrity, Experts Blast David Robert Grimes for His Failure to Understand Science and Love of Self-Citation, January 18, 2022
    - Also published in Disinformation Chronicle "Experts Blast David Robert Grimes for His Failure to Understand Science and Love of Self-Citation"
- Wireless Hazards by Barbara Koepell in the Washington Spectator
- "Is Wireless Technology an Environmental Health Risk?" Society of Environmental Journalists Journal
- The Harvard Press Book "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates"
- Investigate Europe's Three Part Investigation on 5G
    - "The ICNIRP Cartel: Who's Who in the EMF Research World
    - 5G The Mass Experiment (Part 1)
    - How Much is Safe? Finances Effect Research (Part 2)
    - Real 5G issues overshadowed by Covid-19 conspiracy theories (Part 3)

- A report released by European Members of Parliament "The International Commission on Non-Ionizing Radiation Protection: Conflicts of Interest, Corporate Capture and the Push for G." (PDF)

- "How Big Wireless Made Us Think That Cell Phones Are Safe: A Special Investigation: The Disinformation Campaign—And Massive Radiation Increase—Behind The 5G Rollout" by Mark Hertsgaard And Mark Dowie in The Nation April 23, 2018
- NPR, On Point "The Connection Between Cellphones And Cancer" April 5, 2018
- KALW News "The Nation investigates how big wireless made us think that cell phones are safe"
- Is 5G Going to Kill Us, The New Republic by Christopher Ketcham
- Seattle Magazine, "UW Scientist Henry Lai Makes Waves in the Cell Phone Industry." Seattle Magazine on Motorola working to create doubt and attack Dr. Lai's research finding DNA damage.
- We Have No Reason to Believe 5G is Safe. Scientific American, by Joel Moskowitz PhD
- There's a clear cell phone-cancer link, but FDA is downplaying it. The Hill, Ronald Melnick, Ph.D.
- Alternet: What the Cellphone Industry Doesn't Want You to Know About Radiation Concerns: A leading expert goes to battle against a multi-trillion-dollar industry.
- Today Show: Pediatricians' New Warning: Limit Children's Exposure to Cellphones