

EMF Health Effects: All About 5G

London Sept 28 2019

Martin L. Pall
Professor Emeritus of Biochemistry
and Basic Medical Sciences
Washington State University
martin_pall@wsu.edu

1

How are the non-thermal effects produced?

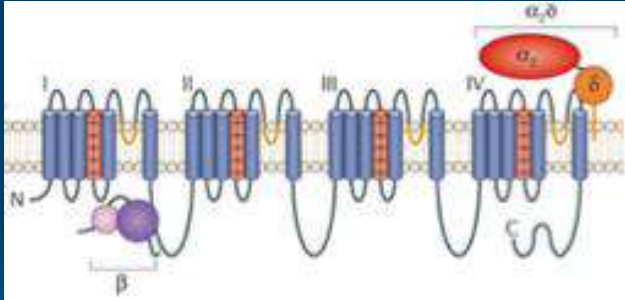
28 studies have shown that non-thermal effects of microwave/other frequency EMFs can be blocked or greatly lowered by calcium channel blockers. (5 different types of calcium channel blockers were used in these studies, each having distinct chemical structures and binding to different sites to block channels.)

This proves that EMFs act by activating the voltage-gated calcium channels (VGCCs), allowing calcium ions (Ca2+) to flow through the plasma membrane into the cell.

This effect occurs with millimeter waves, microwave/RF frequency waves, intermediate frequencies and extremely low frequency EMFs (such as from our electrical power lines) and also static electrical and magnetic fields.

Voltage-gated sodium, potassium and chloride channels are also activated by EMFs, as are the TRP channels. Each of these contain a similar voltage-sensor – the direct target of the EMFs.

2



Taken from Prof. Annette Dolphin, Nature Reviews Neuroscience

Coulomb's law $F = q q' / \epsilon_r r^2$
Gaussian units:
 $\epsilon_r =$ dielectric constant

3

In comparing the forces on the voltage sensor with the forces on singly charged groups in the aqueous parts of the cell:
The force on the voltage sensor is approximately:

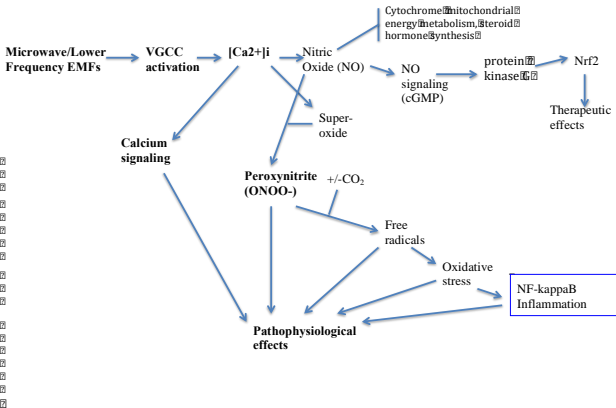
$20 \times 120 \times 3000 = 7.2$ million times stronger

This is an estimate, not a precise calculation.

In other words, the safety guidelines allow us to be exposed to EMFs that are approximately 7.2 million times too high!

Much of the documentation with citations on this presentation can be obtained from: <https://ehtrust.org/wp-content/uploads/SafetyGuidelineFraud2.pdf>

4



Pathways of action following EMF exposures

5

Table 1: 1998 ICNIRP “Safety Guidelines”

	Frequency Range	Whole-body SAR (averaged over 6 minutes)	Localized SAR (head & trunk, averaged over 6 minutes)	Localized SAR (limbs, averaged over 6 minutes)
Occupational exposure	100 KHz-10 GHz	0.4 (W/kg)	10 (W/kg)	20 (W/kg)
General Public Exposure	100 KHz-10 GHz	0.08 (W/kg)	2 (W/kg)	4 (W/kg)

EU & 2103 UK and Australian safety guidelines are identical.
US FCC and Health Canada’s Safety Code 6 are almost identical.
(Canada’s standard slightly looser.)

6

Current US/international safety guidelines only based on thermal (heating) effects, even though many non-thermal effects occur at levels many orders of magnitude lower.

Examples of non-thermal biological effects?

1. Lowered fertility (25 different reviews).
Changes in structure of testis, ovaries; lowered sperm count, motility, quality; lowered number of follicles (eggs), increased spontaneous abortion, lowered levels of 3 sex hormones, lowered libido
2. Neurological/Neuropsychiatric effects (29 reviews)
Insomnia, fatigue, depression, headache, lack of concentration/cognitive dysfunction, anxiety/stress agitation, memory dysfunction, etc. Major brain structure changes seen in animals.
3. Cellular DNA damage, 3 types (24 reviews)
Single & double DNA breaks, oxidized bases (8-HOdG); cause both cancer and germline mutations
4. Apoptosis, programmed cell death (15 reviews)
Lead to both reproductive and neurodegenerative effects

7

Examples of non-thermal biological effects?

5. Oxidative stress, free radical damage (25 reviews)
6. Endocrine (hormonal effects) (15 different reviews).
Both non-steroid and steroid hormones systems affected; in some cases EMFs can produce both increased and decreased hormone activity under different conditions.
7. Excessive intracellular calcium [Ca2+]i (16 reviews)
Underlying cause of almost everything else.
8. Cancer (38 reviews)
Increases initiation of carcinogenesis, tumor promotion and progression, including increased tissue invasion and metastasis
9. Cardiac effects via electrical control of heart (9 reviews).
Tachycardia; chronic exposures can lead to bradycardia; both cause arrhythmia; also get heart palpitations.

8

Body of Evidence:

- In sum: 197 review articles show serious health-related effects caused by EMF intensities well below current safety guidelines.
- Anyone arguing for the safety guidelines must show that each of these 197 bodies of evidence are deeply flawed.

9

Pulsed EMFs are, in most cases much more biologically active than are non-pulsed, continuous wave EMFs of the same average intensity (13 reviews).

Because all wireless communication devices communicate via pulsations, they are potentially and I believe actually much more dangerous. The smarter the device, the more it pulses and therefore, the more dangerous it will be.

Average intensities, the basis of the safety guidelines, cannot be used to predict biological effects!!

5G is designed to be extraordinarily highly pulsed and will therefore be vastly more dangerous as a consequence

10

Example:

Nanosecond pulses are between 1 nanosecond and 1 microsecond.

But here is the problem: Our existing “safety guidelines” measure *average* the intensities over 6 minutes. In other words, a typical 40 nanosecond pulse, is averaged over 10^{10} – 10 billion times longer. In other words, this decreases the average intensity by a factor of 10 billion!

Current safety guidelines try to sell us on the idea that nothing can happen in 40 nanoseconds, when in fact we know there are effects.

One such effect is the over-activation of voltage-gated calcium channels.

The false logic used by EMF regulators:

A high-powered rifle bullet travels over 700 meters per second, but it only needs 50 microseconds to injure my body. So you go to the regulatory agency with your fears and they respond: Don't worry – if you just average the bullet's force over of a 10 billion times longer period (about 75 days), the force is so low it won't do anything.

11

Pairs of nanosecond pulses that occur within a few microseconds of each other also produce effects not predicted by “safety guidelines” – another failure of the “safety guidelines.”

Any full-fledged 5G system, communicating with the “internet of things” will inevitably have trillions of nanosecond pulses and hundreds of billions of paired nanosecond pulses of identical polarity, producing vast effects, none of which are predicted by “safety guidelines.”

12

There is another fatal flaw in "safety guidelines" coming from pairs of nanosecond pulses.

Pairs of nanosecond pulses when they occur within a few microseconds of each other have special properties: if the 2 pulses have identical polarity, they produce supra-additive effects. If the 2 pulses have opposite polarity, the second pulse cancels most of the first pulse. Both of these findings contradict "safety guidelines" where only additive effects can occur because only additive effects can be averaged.

The flaw here in the safety guidelines is that they average exposures as if EMFs were scalars but we know that they are not scalars, they are vectors with polarity. ANOTHER FATAL FLAW IN THE PHYSICS OF SAFETY GUIDELINES!!

Any full fledged 5G system, communicating with the "internet of things" will inevitably have trillions of nanosecond pulses and hundreds of billions of paired nanosecond pulses of identical polarity, producing vast effects, none of which are predicted by "safety guidelines."

13

Three more fatal flaws:

9 reviews each show that there are exposure windows, ranges of intensity which produce maximum effects but when you go to lower or higher intensity, effects drop way down! Dose-response curve are neither linear nor monotone, they do not always increase with increasing exposure. Using average exposures only makes sense if you have linear dose-response curves. So here we have still another fatal flaw in the "safety guidelines." Some of these exposure windows produce high level effects at levels approximately 100,000 times below the safety guideline allowable levels.

When individual research groups study EMF effects in different cell types, using identical methodology, they find that cell types differ widely in responses to EMF exposure. This shows clearly that you cannot ignore the biology, but that is exactly what the "safety guidelines" do.

There are also specific frequency windows where specific frequencies produce effects at levels orders of magnitude below those required by nearby frequencies. These have been ascribed to resonance interactions with specific targets.

14

I have shown you 8 different types of evidence which test predictions of the safety guidelines, including Canada's "safety code 6."

In each case the safety guidelines fail and fail massively to predict biological effects and therefore fail to predict safety.

We have, therefore, a multitrillion dollar set of companies, the telecommunications industry, all of whose claims of safety are based on failed safety guidelines and are, therefore, fraudulent.

15

Four reasons why EMFs are more active in children than adults:

1. Children have higher surface to volume ratios, such that their tissues are much more exposed to EMFs.
This may be particularly important in the head where thinner skulls mean brain exposures are much higher.
2. Children have very high densities of stem cells which are particularly sensitive to EMFs. (discussed previously by Dr. Igor Belyaev)
3. The developing brain appears to be especially sensitive to EMFs.
4. Young tissues have much greater extracellular water content than do older tissues. This leads to much deeper penetration of effects. (discussed previously by Dr. Devra Davis)

For these reasons, Wi-Fi and cell phone tower radiation in schools are both of special concern.

16

Four other probable biological effects from RF over-exposures:

- Very early onset Alzheimer's and other dementias.
People in their 30s developing Alzheimer's and "digital dementias" in some younger.
- Both ADHD and Autism may be caused by late pre-natal and early post-natal EMF exposures.
Five mechanisms control synapse formation in the developing brain, each controlled by intracellular calcium [Ca2+]i. Excessive [Ca2+]i following EMF exposure can disrupt synapse formation, causing ADHD and autism via that mechanism.
- Electromagnetic Hypersensitivity (EHS)

17

Problems with 5G

The extraordinary numbers of 5G antennae in close proximity to homes, schools, hospitals and businesses.

Implications?

1. Impossible to avoid extraordinarily high level of pulsed exposures.
2. 5G millimeter wave effects penetrate at least 20 times more deeply than the industry claims possible.
3. Each of the previously discussed findings strongly suggest 5G wireless radiation will produce vastly greater health impacts than existing devices which already produce very large effects.
4. 5G radiation will produce severe effects on the outer parts of the body but will also produce much deeper effects in the body.

18

Lowered fertility (25 different reviews).

Changes in structure of testis, ovaries; lowered sperm count, quality; lowered number of follicles (eggs), increased spontaneous abortion, lowered levels of each of the 3 sex hormones, lowered libido.

1. These effects appear to be increasing in our technologically advanced societies. Sperm counts in all such societies have dropped to below 50% of normal (Levine et al, 2017 Temporal trends in sperm count: a systematic review and meta-regression analysis).
2. Reproduction in those societies have dropped well below replacement levels, averaging about 73% of replacement levels in 2016. Magras and Xenos showed that EMF levels well below "safety guideline" allowable levels caused reproduction in mice to crash -- apparently irreversibly crash to zero within about 90 days to 150 days.
3. We are now seeing first signs of such crashes in three densely populated, high technology east Asian countries. Singapore had a 31% drop in reproduction between 2016 and 2017. Macao had a 26% drop in reproduction between 2016 and 2017. South Korea had an 11% drop in reproduction between 2016 and 2017; and had another 9% drop in the first half of 2018.
4. 2019 study in Switzerland showing that 62% of young males are infertile. Two 2018 studies in Finland and in Denmark showing that 78 or 79 % of males are either in the low fertility range or in the infertility range.

19

It is highly probable that 5G radiation will push many countries over the reproductive cliff much more rapidly, possibly as much as 10 times more rapidly.

20

Neurological/Neuropsychiatric effects (29 reviews)

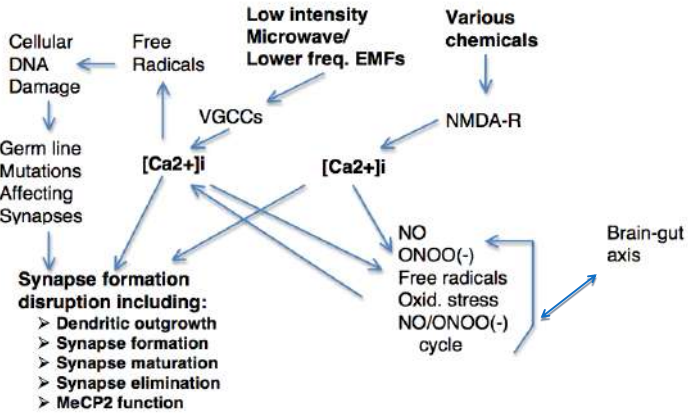
Insomnia, fatigue, depression, headache, lack of concentration/cognitive dysfunction, anxiety/stress agitation, memory dysfunction, etc. Major changes in brain structure seen in animals – these brain changes are similar to the formation of neurofibrillary tangles that are produced in Alzheimer's disease.

These effects are already far along in our societies.
Based on our existing exposures and on how fast these cumulative effects develop with time (i.e. human occupational exposures; animal exposures leading to severe disruption of brain structure), I estimate our society's collective brain function will probably crash in 4 to 6 years. With the further expansion of 4G and the introduction of 5G wireless, along with putting radar units in automobiles, our society's collective brain function could crash in months, rather than years.

When this occurs, the integrity of our whole social fabric will begin to disintegrate, and we will descend into chaos.

Example 3: Very Early Onset Alzheimer's & other dementias:

- Neurofibrillary tangle type changes seen in EMF animal brains. Cause: hyperphosphorylated tau protein produce by calcium signaling via CamKII, CREB and lowered PDE1.
- Excessive intracellular calcium has other essential roles in causing Alzheimer's and other neurodegenerative diseases.
- Epidemiological studies report that people exposed to EMFs occupationally have higher Alzheimer's disease incidence.
- EMFs produce large increases in the amyloid beta (Aβ) protein in isolated neurons – probably via oxidative stress - has key role in Alzheimer's.
- Two studies in rats, showed that a series of EMF pulses given to young rats, followed by cessation of pulses, produced 100% Alzheimer's-like effects in middle aged rats – memory and behavioral changes and also high levels of Aβ protein and oxidative stress in the brains. Jiang et al, Arch Med Res 2013;44:178-184. Jiang et al, Brain Res. 2016; 1642:10-19.
- **If extremely highly pulsed 5G radiation produces similar effects in humans, 5G will inevitably produce universal or almost universal very early onset Alzheimer's dementias.**



EMFs and Autism: How 5G may cause near universal autism.

Cellular DNA damage, 3 types (24 reviews)

Single & double DNA breaks, oxidized bases (8-HOdG); cause both cancer and germ-line mutations

- These types of DNA damage all produced by the free radical attack on the DNA.
- Each of the types of mutations commonly involved in *de novo mutations* in autism, chromosomal rearrangements, copy number mutations and point mutations.
- It appears from the autism *de novo mutation* studies, we already have much higher levels of mutation because of EMF exposures and because 5G radiation will be so much more damaging than our already existing EMFs, a much higher mutation frequency produced by 5G is likely to again be sufficient to cause extinction.

#6 Cardiac effects via electrical control of heart (9 reviews).

Tachycardia; chronic exposures can lead to bradycardia; both cause arrhythmia; also get heart palpitations.

Produced via VGCC activation in pacemaker cells. Can cause sudden cardiac death. Epidemic.

5G testing in Holland produced bird death via sudden cardiac death.

Millimeter wave EMFs cause sudden cardiac death in rodents.

30 race horse deaths at Santa Anita Racetrack in 7 months. May be due to 36 4G and 5G and other antennae. Deaths due to apparent sudden cardiac death and also massive bone breakage.

Massive bone breakage may also be due to repeated high level VGCC activation.

25

5G’s Ecological Impacts

Because millimeter waves will have much higher impacts on tissues near the surface of the body, organisms with much higher surface to volume ratios will be much more impacted than we will. Implications?

Massive harm impacts to insects, birds, small mammals, and most plants. Even large trees have their leaves and reproductive organs highly exposed. Many insect species may have rapid extinctions.

In 2000 and 2001, two US patents issued for the use of millimeter wave EMFs as insecticides (patent #s 6,073,365 and 6,192,598). These were for using non-pulsed EMFs not the extraordinarily pulsed and therefore dangerous 5G EMFs.

Confirmed reports from the Netherlands that 5G tests were linked to large numbers of bird fatalities from apparent sudden cardiac death. One report of mass deaths of birds flying through EMF from a microwave relay. These reports are highly credible since pacemaker cells in the heart have very high densities of VGCCs.

26

Further 5G Ecological Impacts

5G will likely cause massive fires because of the impact of 5G EMFs on plants.

EMFs impact plants producing large increases in intracellular calcium levels which act in turn to produce large increases in highly volatile and highly flammable terpenes. This, in turn, can make the plants burn as if they were sprayed with a light spray of gasoline.

We may have just seen the first 5G fires.

Five cities along the east coast of South Korea, where some of the earliest 5G rollouts in the world occurred, had their 5G systems turned on on April 4, 2019. The five unprecedented fires occurred in those same cities the next day, April 5, 2019!
<https://www.thehindu.com/sci-tech/technology/s-korea-launches-5g-networks-early-to-secure-world-first/article26730605.ece>
<https://www.telegraph.co.uk/news/2019/04/05/thousands-flee-homes-wildfires-rip-south-korea/>
<https://www.thesun.co.uk/news/8799140/south-korea-biggest-wildfire-near-olympic-city/>

27

Do we have safer alternatives?

Yes. Wired fiber-optic systems.

They are faster, more reliable, more secure than any wireless system, and have minimal negative health impacts.

And in the future... we may see a whole new generation of cell phone technology, one that uses safer line-of-sight infrared LiFi communications systems very much akin to your TV remote at home, yet which don’t require any large cell phone broadcast antennae or WiFi units in any home, office, school, hospital or public library.

28



This article is more than 1 month old

How baseless fears over 5G rollout created a health scare

Misconceptions about the technology and lack of consultation with local communities may have boosted conspiracy theories

Alex Hern

Alex Hern is technology editor of Guardian running industry propaganda.

29

In summary:

5G presents threats of a sort that have only been equaled once in human history – the threat of instant nuclear annihilation.

5G must be stopped because failure to do so may well spell the demise of our species on this planet.

30