


Wireless Radiation



What we don't know can hurt us!

Figure 1. Child with tablet on lap. Retrieved from Dreamstime, 2022

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Goals

1. Define wireless radiation.
2. Describe 'until proven safe' and the 'precautionary principle'.
3. Identify 3 areas of research which quantify harmful effects of wireless radiation (experimental, epidemiological, cancer incidence).
4. Profile global concerns and initiatives.
5. Employ a variety of methods to reduce wireless radiation exposure.

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TECHNOLOGY MANAGEMENT

Wireless Radiation

Part 1


What is it, mechanism of harm

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Mobilize (2013)

Film Trailer



Video 1. Shown with permission from *Mobilize* director Kevin Kunze. Retrieved from www.norad4u.com, 2021

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Wireless...Why Worry?

- Exposure is universal, global.
- No control group.
- Warnings about cancer from smoking took 30 years.
- Technology companies now producing 'backlash' research to counter valid data.
- Industry saying "we never said WiFi was safe".
- Insurance companies making conditions related to wifi exempt.




Figure 2. Radiation hazard. Retrieved from Pixabay, Clker-Free-Vector-Images, 2021

Dr. Martin Pall 2017, CTIA Wireless Industry 2018

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What is Wireless Radiation?

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All Living Things Emit Electromagnetic Radiation

- Solar energy.
- Earth.
- Manmade sources.
- Humans:
 - Electroencephalogram (EEG) of brain 1-30 Hz.
 - Electrocardiogram (ECG) of heart 2 Hz.
 - Body 8 Hz.





Figure 3. Human being wired for EEG. Retrieved from Creative Commons, 2021


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Wired vs. Wireless Electricity



Wired electricity – insulated cables



Ethernet electricity - insulated cables



Wireless electricity – NOT INSULATED

Wireless electricity (WiFi) is electromagnetic radiation (EMF) that operates at radio wave frequency (RF).

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Figure 4a. Plug. Retrieved from Unsplash. Kelly Sikkema, 2021 b. Router. Retrieved from Pixabay, Eliud-cesar, 2021 c. Cable & Computer. Retrieved from Pixabay, OpenClipart-Vectors, 2021 d. Wireless. Retrieved from Pixabay, Annpictures, 2021

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Electromagnetic Fields (EMF)

Electric Fields

- Produced by voltage measured in volts per meter (V/m).
- Present even when device is turned off.
- Easily shielded or weakened by walls and other objects.

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Magnetic Fields

- Results from current flow through wires measured in milliGauss (mG).
- Requires device be turned on.
- Passes through buildings, materials and living things.

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EMF = HF + ELF + RF

Electromagnetic Fields (EMF) are measured in Hertz (Hz) include the following radiation spectrum:

Non-ionizing frequency

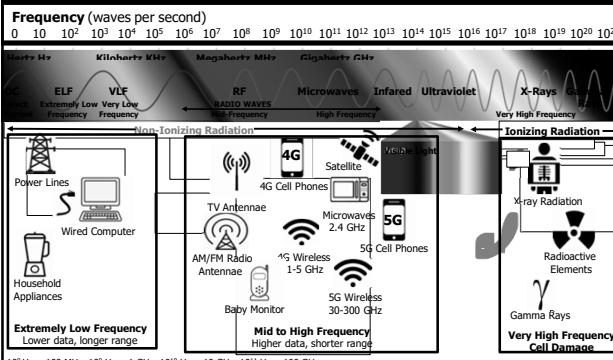
- Ionizing frequency
- High-Range Frequency (HF) > 3000 Hz:
 - X-rays, gamma rays, radioactive, produces heat, damages DNA.
- Extremely Low Frequency (ELF) 3–3000Hz:
 - High voltage transmission lines and towers.
 - In home wired devices including appliances.
 - Includes electric (V/m) and magnetic (mG) fields.
- Mid-High Range Radio Frequency (RF) 30 KHz–300 GHz:
 - Mobile phones, smart devices, base stations, WiFi, 5G technologies.

Auhor consultation with Dr. Tarmo Koppel, PhD Environmental Engineer, Taltech University, Estonia, 2022

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Electromagnetic Spectrum



10⁰ Hz = 100 MHz; 10⁶ Hz = 1 GHz; 10⁹ Hz = 10 GHz; 10¹¹ Hz = 100 GHz

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Figure 5. Produced by author, 2021

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Ionizing vs. Non-ionizing

- Ionizing happens when the frequency of the radiation is so high, an electron is removed from a molecule.
- Low frequency electromagnetic radiation is 'non-ionizing' and did not produce heat, so was thought to be not harmful to cells or DNA.
- So why the sign??

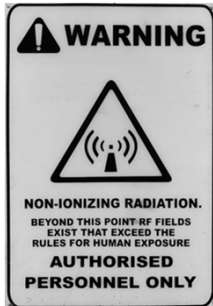


Figure 6. Warning sign for non-ionizing radiation. Retrieved from Dreamstime, 2021

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What Devices Emit Wireless Radiation?

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What Emits Wifi Radiation?

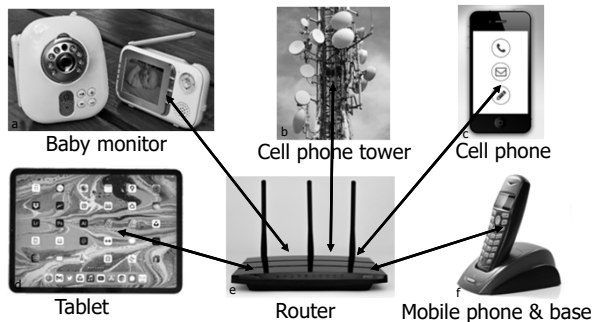


Figure 7a. Baby monitor. Retrieved from Dreamstime, Lianna2013, 2021 b. Cell phone tower. Retrieved from Pixabay, Tibor Janosi Mozes, 2021 c. Cell phone. Retrieved from Pixabay, Pixabay, 2021 d. Tablet. Retrieved from Unsplash, Jeremy Bezanger, 2021 e. Router. Retrieved from Pixabay, USA-Ressblogger, 2021 f. Wireless telephone. Retrieved from Dreamstime, Ruslan Glimanshin, 2021

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How Much Radiation?



Figure 6a. Smart meter. Retrieved from Unsplash, Dan LaFebvre, 2021 b. Baby monitor. Retrieved from Dreamstime, Lianna2013, 2021 c. Wii controller. Retrieved from Dreamstime, Susanne Neal, 2021 d. Nintendo. Retrieved from Unsplash, Ravi Palwe, 2021 e. WiFi access point. Retrieved from Pixabay, WikimediaImages, 2021 f. Cordless phone. Retrieved from Pixabay, Atimedia, 2021 g. Cell phone. Retrieved from Pixabay, StockSnap, 2021

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How to Measure Wireless Radiation

For Measuring EMF
Gigahertz Solutions ME 3830B



For Measuring RF
EMF Fields Acoustimeter



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Figures 9 a & b. Gigahertz Solutions and EMF Fields Acoustimeter. Retrieved from Safe Living Technologies website, 2021

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What is 5G Wireless Radiation

- 5th generation WiFi: 3G+ 4G + 5G.
- Network of radiation.
- Internet of Things (IoT):
 - Cars, phones, homes, robots, virtual reality...
- Faster, but shorter range.
- 600 MHz – 100 GHz.



Figure 10. 5G towers. Retrieved from Dreamstime, 2021

Citizens for Safe Technology - 5G Report 2021

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Is Wireless Radiation Safe?

If you don't look for something, you won't find it.

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Erroneous Assumption

- Microwave radiation heats food and was deemed safe for humans, hence insulation.
- Wireless radiation does not emit heat, so deemed "safe".
- Biological effects of wireless radiation were not measured, only heat.
- If you don't look for something, you won't find it.



Figure 11. Microwave oven. Retrieved from Dreamstime, 2021

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In 2011, International Agency for Research on Cancer with World Health Organization Categorized Wireless Radiation as a Class 2B Possible Carcinogen

- | | |
|---|---|
| ➤ Wireless radiation | ➤ Fungicides |
| ➤ Insecticides | ➤ Hexachlorobenzene and Hexachlorocyclohexane |
| ➤ DDT, Chlordane, Heptachlor, Mirex, Endrin and Toxaphene | ➤ Bitumen |
| ➤ Lead | ➤ Diesel |
| ➤ Chloroform | ➤ Engine exhaust, gasoline |
| ➤ 1,4 Dioxane & Furan | ➤ Phenobarbital |
| ➤ Dry Cleaning Fluids | ➤ Methylmercury compounds |
| ➤ Vinyl Acetate | ➤ Napthalene |
| ➤ Welding Fumes | ➤ Occupational Firefighter Exposure Risk |

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Retrieved from IARC Website 2021

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Health Canada's Safety Code 6

- In 1996 with the development of microwave ovens, Health Canada regulations set standards for equipment certification and exposure compliance specifications for governing WiFi.
- In 2014 Royal Society of Canada's Expert Panel Review of Safety Code 6 Report to Health Canada stated:
"Health Canada should pursue research to expand our current understanding of possible adverse effects of exposure to radiofrequency energy at levels below Safety Code 6. Several gaps in the evidence are identified in Section 7 of this report."
- Safety Code 6 revision in 2015 for 3 kHz - 300 GHz RF which addresses device thermal and non-thermal (biological) effects did NOT change standards.

Citizens for Safe Technology - 5G Report 2021;
Health Canada website - Safety Code 6, 2015

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US Telecom Act - Section 704

- 1996 Telecom Act standards address device thermal effects, **not biological** – heating effect from microwave cooking was the primary concern.
- (Section iv) *No state or local government may regulate the placement, construction and modification of personal wireless service facilities on the basis of the environmental effect (including adverse health effects) of radio frequency emissions.*
- *Note: The rules regarding environmental effects are defined by the Federal Communications Commission (FCC) who are effectively indemnified against lawsuits for environmental effects of radio frequency emissions.

Policy Guidance Regarding Wireless Radiation, by US Senator Pat Colbeck and MD Angie Colbeck, 2018

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History Lessons *Can we learn from the past?*

Governments not only approved the following, but promoted their use:

- DDT
- Tobacco
- Thalidomide
- Asbestos
- Wireless??

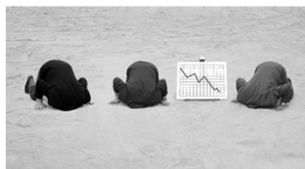


Figure 12. Heads in the sand. Retrieved from Dreamstime, 2021

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Radiation Regulatory Agencies

- Canada - Health Canada (HC); Industry Canada (IC)
 - Safety Code 6, 1996.
- US - Federal Communications Commission (FCC)
 - Responsible for definition of human exposure standards.
 - Commissioners appointed by acting President.
 - Telecom Act, 1996 section 704.
- Other Radiation Regulatory Agencies
 - International Commission on Non-Ionizing Radiation Protection (ICNIRP).
 - World Health Organization (WHO).
 - International Agency for Research on Cancer (IARC).
 - Environmental Protection Agency (EPA).

Policy Guidance Regarding Wireless Radiation, by US Senator Pat Colbeck and MD Angie Colbeck, 2018

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Dr. Devra Davis, CEO *Environmental Health Trust (EHT)*



Fernandez 2017

Video 2. Scientists Speaking on Health Effects of Cell Phone Wireless Radiation. Shown with permission from EHT. Retrieved from Environmental Health Trust website, 2022
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As Early as 1970's...

Studies showed the following adverse health impacts from wireless radiation:

- Cancer
- Oxidative damage, DNA damage, failure to repair DNA
- Cardiac arrhythmias, damage to heart muscle, vascular and blood pressure effects.
- Disrupted calcium metabolism.
- Sleep disturbances, memory loss.
- Disrupted immune function.
- Impaired fertility. *Policy Guidance Regarding Wireless Radiation*, by US Senator Pat Colbeck and MD Angie Colbeck, 2018

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Yet...National Cancer Institute *Says Electromagnetic Radiation is Safe*

- No mechanism by which ELF-EMFs or RF radiation could cause cancer has been identified.
- Unlike high-energy (ionizing) radiation, EMFs in the non-ionizing part of the electromagnetic spectrum cannot damage DNA or cells directly.
- In animals: studies have not provided any indications that exposure to ELF-EMFs is associated with cancer.
- In humans: no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found (power lines, electrical appliances, wifi, phone base stations, cell phones etc.).
- Parental exposure and risk to offspring requires further study.

Figure . NIH's National Cancer Institute – Electromagnetic Fields and Cancer. Retrieved from www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet, 2022
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Precautionary Principle *Safe Schools Policy – Best Practice Standards for Screens and Radiation*

1. Prohibit all cell phones from school environments.
2. Replace wireless with wired technology; relocate cell phone towers.
3. Ensure literacy achieved grades K-3; prohibit all educational technology until grade 4.
4. Limit education technology duration to less than 1 hour/day; education technology content should pass 'high quality research' criteria and standards.
5. Requirements for outdoor physical activity should increase relative to education technology use.





Figure 13. Reykjavik, Iceland conference. Cris Rowan 2nd from left, Dr. Lennart Hardell 4th from right, Dr. Tarmo Koppel 1st on right, 2017.
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Wireless Radiation brochure

Resource Handout



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Measuring Wireless Radiation

You can't do what you don't know

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Studies Can't Measure an Undefined Parameter

- As move from 2G, 3G, 4G to 5G, antennas increase, wireless signals change.
- Wireless radiation is pulsed; devices pulse differently; biological impact changes.
- Type of device changes biological impact; devices change constantly.
- People are vastly different.

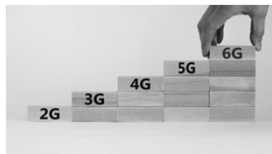


Figure 14. 2G, 3G, 4G, 5G, 6G photo. Retrieved from Dreamstime, 2022

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EMF Evaluation Guidelines

		Anomaly	No	Slight	Severe	Extreme
High Frequency	HF	$\mu\text{W}/\text{m}^2$ (Peak)	< 0.1	0.1 - 10	10-1000	> 1000
	M	nT	< 20	20 - 100	100-500	> 500
Low Frequency	E	with grounding cable V/m	< 1	1 - 5	5 - 50	> 50
		potential-free V/m	< 0.3	0.3 - 1.5	1.5 - 10	> 10

Figure 15. Building Biology Evaluation Guidelines chart. Courtesy of Building Biology. Retrieved from www.buildingbiology.com 2022.

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Outdoor Pulsed RF Radiation Exposure Limits

Country Comparison (power density)

- Austria - .1 $\mu\text{W}/\text{m}^2$
- Bulgaria – 100 $\mu\text{W}/\text{m}^2$
- Belgium, Ukraine – 240 W/m^2
- Switzerland – 425 $\mu\text{W}/\text{m}^2$
- China, Russia, Italy, Poland, France – 1000 $\mu\text{W}/\text{m}^2$
- India, Israel – 10,000 $\mu\text{W}/\text{m}^2$
- Canada, US, Australia – 100,000 $\mu\text{W}/\text{m}^2$

BioInitiative Report, 2021

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Specific Absorption Rate

- Measure of the rate at which energy is absorbed per unit mass by the human body when exposed to a radio frequency (RF) electromagnetic field. \
- US and Canada < 1.6 Watts/kg for head (4.0 W/kg for body) for 6 min. duration.
- European Union < 2 W/kg.
- Used Standard Anthropomorphic Mannequin (SAM) for average male (not applicable for infants or children).

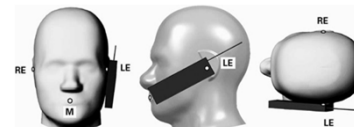


Figure 16. Using Standard Anthropomorphic Mannequin (SAM) to measure SAR from cell phone. Courtesy of Teruo Onishi, 2006 Research Gate.

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C4ST vs. Rogers

THE CLEGG SAFETY CHALLENGE

“ Show me your evidence that radiation from 5G and cell tower antennas is safe.”



FRANK CLEGG
Former President of

vs.



DEAN PREVOST
A President of

Video 3. Frank Clegg and Dean Prevost. Shown with permission from Citizens for Safe Technology, 2021

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What is the Impact of Wireless Radiation on Humans?

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No Safe Level

- Research has yet to determine safe levels of wireless radiation.
- Consider accumulation and differential susceptibility.
- Numerous studies now show biological harm.
- At some unknown point, damage may become irreversible.
- 5G ramping up....




Fig. 17. Pregnant woman, laptop, router. Purchased from Dreamstime, 2021

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EMF Effects on Humans

- Stimulation: electromagnetic stimulation to nerves.
- Thermal: heat produced by device.
- Non-thermal: can't feel it, see it, difficult to measure it due to variables in frequency, modulation, pulsing etc.


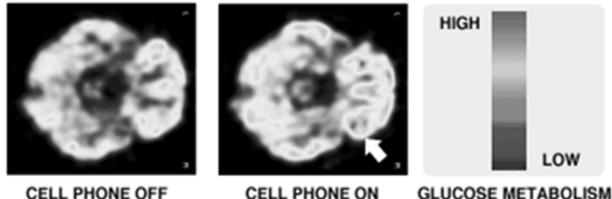


Figure 18. Cell phone in wifi mode with red showing highest radiation blue lowest using DSLR camera, long exposure with Arduino based Kirilian device (WiFi sensor connected to processor connected to LED strip). Reproduced with permission from Luis Hernan, 2021

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Brain Sensitivity to WiFi



CELL PHONE OFF CELL PHONE ON GLUCOSE METABOLISM

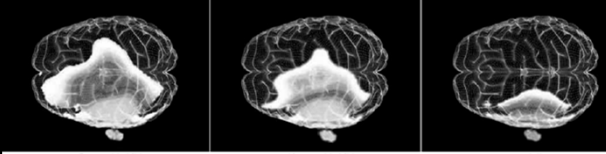
Even though the radio frequencies that are emitted from current cell phone technologies are very weak, they are able to activate the human brain. Volkow 2014

Figure 19. Scans of brains while using cell phone. Courtesy of Volkow (2014), 2021.

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Children Are More Vulnerable



Electromagnetic fields from cell phones are estimated to penetrate the brain, especially in children. Modest estimate of the absorption of electromagnetic radiation from a cell phone based on age (Frequency GSM 900 MHz).

- Smaller head (shorter distance to brain).
- Thinner skull (more penetration therefore more damage).
- More aqueous brain and body (higher conductivity of tissue).
- Higher cell turn over (higher risk for DNA damage/replication).
- Life time of exposure (from pregnancy to death).
- No long term studies.


Figure 20. Scans of brains while using cell phone. Reproduced with permission from Ghandi, Lazzi, Furse (1996), 2021.

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Children Absorb 10 X More Radiation

Children Are not "Little Adults"



- Thinner skulls, smaller heads (shorter distance to brain centers)
- Different dielectric properties (higher liquid content)
- Brains are less myelinated and still developing

Not to scale. Fernandez, de Salles, Davis (2015)

Figure 21. Scans of 3, 6, 34 year old brains while using cell phone. Courtesy of Fernandez, de Salles, Davis (2015), 2021

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UK Educational Health Care Plan Mandated for EHS Child

- In 2022 UK government body legally mandated to make low EMF educational provisions to accommodate a child with Electromagnetic Hypersensitivity Syndrome (EHS).
- "On balance we concluded, in the face of considerable evidence produced by the parents, that the impairment existed and that child met the definition of disability within section 6 of the Equality Act 2010: that is that it had substantial long-term effect on day-to-day functioning."




Figure 22. Retrieved from Physicians Health Initiative for Radiation and the Environment www.phiremedical.org 2022

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Meet Theodora Scarato

- Executive Director of Environmental Health Trust.
- Directs EHT educational programs, publishes research and coordinates scientific conferences.
- Co-authored articles on electromagnetic field policy.
- Lead policy analyst and researcher for the EHT database on international actions.



Figure 23. Theodora Scarato pic provided by Theodora Scarato, 2021

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Interview with Theodora



© Sunshine Coast Occupational Therapy Inc. 2021 Video 4. Theodora Scarato interview with Cris Rowan, 2022

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Environmental Health Trust Resources – ehtrust.org

- Key Issues: safety, cancer, telecom industry influence.
- Science: research, conferences.
- Policy: legal testimony, insurance.
- Resources: film, classroom, graphics, toolkits, factsheets.

Schools - check out *Student Guide: Cell phones, wireless and your health.*

- Publications: books, newsletters, media, op-eds.
- Get Educated: Wi-Fi reduction products and tips.
- Actions: safe tech initiatives, resolutions, right to know.



Figure . Environmental Health Trust website image retrieved from ehtrust.org 2021.



Figure 24. EHT – Wireless in Schools website image retrieved from ehtrust.org 2021

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TECHNOLOGY MANAGEMENT Wireless Radiation

Quiz 1 *What is it, mechanism of harm*

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Zone'in Technique *Salutations to the Sun*



© Sunshine Coast Occupational Therapy Inc. 2021 Figure 25. Full extension. Retrieved from Dreamstime 2022

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TECHNOLOGY MANAGEMENT Wireless Radiation

Part 2 *3 areas of impact research*

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Wireless Radiation Research

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3 Areas of Study

1. **Epidemiology research** tells us about the past; looks at patterns and causes/effects of health and disease conditions in defined populations.
2. **Experimental studies** are methodological procedures carried out with goal of verifying, falsifying or establishing the validity of a hypothesis.
3. **Cancer incidence statistics** analyze cancer data and trends over time.



Figure 26. Research stack and mouse. Purchased from Dreamstime, 2021

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Epidemiology Research

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Electromagnetic Frequency Portal - emfportal.org

- Institute for Occupational, Social and Environmental Medicine based at Uniklinik RWTH University Hospital in Aachen, Germany.
- Extensive literature database on effects of electromagnetic fields with inventory of:
 - 34,182 publications;
 - 6931 summaries of individual scientific studies.

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276 Epidemiological Studies Effects of Low Frequency Radiation On Children

Effects	# Studies
Leukemia	118
Pregnancy Outcomes	68
Other Health Effects	66
Brain/CNS Tumor	62
Other Types of Cancer	30
Cancer Unspecified	18
Lymphoma	18

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Figure 27. 276 Epidemiological Studies chart. Retrieved from EMF Portal website, 2017

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CEP Vol. 63, No. 11, 422-428, 2020
<https://doi.org/10.3345/cep.2019.0114>

Review article

Health effects of electromagnetic fields on children

Jin-Hwa Moon, MD, PhD
Department of Pediatrics, Hanyang University School of Medicine, Seoul, Korea

- The nervous systems of children are more vulnerable to the effects of electromagnetic waves than adults, therefore require different protection standards.
- The exposure to electromagnetic fields (EMFs) among children should be minimized.
- According to International Agency for Research on Cancer (IARC) EMFs are possibly carcinogenic, it should not be overlooked or interpreted with bias.

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EMF Impact Research

- Mitochondrial damage.
- Oxidative stress.
- Cell membrane damage:
 - Calcium channels altered.
- Higher glucose metabolism in brain.
- Decreased sperm motility and DNA damage.



Figure 28. Oxidative Stress graphic. Courtesy of Scientific Animations. Retrieved from www.thebigwobble.org, 2022

Excerpts from Dr. Devra Davis video Wireless Radiation and Health: A Scientific and Policy Update, Oct. 2, 2019

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Possible Biological Mechanism of Harm

- EMF is electric and can change 'voltage gated' channels in cell walls.
- Calcium is a charged particle which can abnormally enter/exit cells exposed to EMF radiation.
- Heart has large number of calcium channels.
- Studies show EMF impacts heart muscle/function.



Figure 29. Private photo of author with Dr. Hardell while co-presenting at conference on wireless radiation; visiting tectonic rift at Thingvellir National Park, Iceland, 2014.

Dr. Lennart Hardell, 2014

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Carcinogenic Mechanism

- Mobile phone RF/EMF radiation plays a role both in the initiation and promotion stages of carcinogenesis.
- Mechanism is pulsed radiation opens voltage gated calcium channels.
- Calcium influx into cell causes ptosis (cell death).
- Current guidelines need to be urgently revised.
- RF/EMF should be reclassified as a WHO Group 1 Probable Carcinogen. International J of Oncology, Hardell L. 2013

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Epidemiological Study Highlights

- Studies results are inconsistent due to replicability issues from changing parameters of ELF and RF radiation from 1st to 5th generation:
 - Increasing signal frequency, unknown latency.
 - Changes to modulation, pulsing.
 - Cumulative effects undetected; difficult to assess.
- Long term studies show:
 - Acoustic neuromas and brain gliomas in cell phone users after 20 years.
 - Sperm DNA fragmentation and decreased sperm motility in laptop users at 20 years.
 - Variable results on childhood leukemia.

Pall 2013, Emre 2010, Khurana 2009, Avendano 2011, Hardell 2013, Burkhamer 2017

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Young Testicles Not Tested

Mobile Phone Radiation Induces Reactive Oxygen Species Production and DNA Damage in Human Spermatozoa *In Vitro*

Geoffry N. De Iulius^{1,2}, Rhiannon J. Newey², Bruce V. King³, R. John Aitken^{1,2*}
1 ARC Centre of Excellence in Biotechnology and Development, Callaghan, New South Wales, Australia, 2 School of Environmental and Life Sciences, The University of Newcastle, Callaghan, New South Wales, Australia, 3 School of Mathematical and Physical Sciences, The University of Newcastle, Callaghan, New South Wales, Australia

- 2009 study by Iulius showed decreased sperm motility and vitality while also stimulating DNA base adduct formation and DNA fragmentation.
- EMF Portal collated multiple duplicated peer reviewed scientific studies documenting sperm and fertility damage from RF exposure.

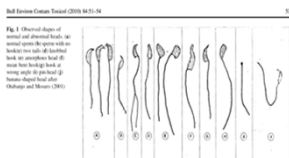


Figure 30. Preliminary study on the induction of sperm head abnormalities in mice, *Mus musculus*, exposed to radiofrequency radiations from global system for mobile communication base stations graphic. Courtesy of Oztolotju 2010. Retrieved from EMF Portal website, 2021

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Do No Harm Principle Best Practices for Schools

- Children have a right to be healthy (so do adults)!
- Can mandate that school districts and worksites ensure safety:
 - Go wired.
 - Ban cell phones.
- Can have your child opt out of devices at school.



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Experimental Studies

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National Toxicology Program (NTP) *Experimental Studies*

- In 1999 FDA sponsored a \$25 billion study conducted by the *National Institute of Health – National Toxicology Program*.
- Rats exposed to 9 hrs./day low frequency (non-thermal) radiation for 2 year period.
- Preliminary results released in 2016; final results in 2018 following panel review by 11 experts.
- Study and expert review confirmed that WiFi radiation causes cancer and DNA damage at non-thermal levels below the FCC "safety" limits.

© Sunshine Coast Occupational Therapy Inc. 2021 Retrieved from NIH National Toxicology Program website 2021

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NTP Results

Tumor Site	Male Rat	Female Rat
Heart Schwannoma	Clear Evidence	Equivocal Evidence
Brain Glioma	Some Evidence	Equivocal Evidence
Adrenal Gland	Some Evidence	Equivocal Evidence
Prostate, Pituitary, Pancreas, Liver	Equivocal Evidence	

➤ Clear (causal) evidence: dose-related increase of malignant tumors.
 ➤ Some evidence: agent-related increase of malignant, or benign tumors.
 ➤ Equivocal evidence: marginal increase of tumors that may be agent related.

Figure 32. Chart created by author from data retrieved from NIH National Toxicology Program website, 2021

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Yet Health Canada, FCC, FDA *Report Wireless Radiation is Safe*

National Toxicology Program Results Refuted

Weight of Evidence Used as Excuse

- Gov't's report that NTP used higher wireless exposure in experiments with rats than human daily exposure.
- Yet, French studies show humans are exposed to 3-12 times higher radiation than recommended limits where phone touches body.
- Gov't's cite "Weight of Evidence" e.g. more studies showing 'no harm' vs. studies showing 'harm'.
- There should be NO STUDIES showing harm to classify wireless radiation as SAFE.

© Sunshine Coast Occupational Therapy Inc. 2021 Author email with Ron Melnick, NIH/NTP Sr. Researcher, 2018

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Federal Communication Commission *Response to National Toxicology Program Study*

"Some studies have also examined the possibility of a link between RF exposure and cancer. Results to date have been inconclusive. While some experimental data have suggested a possible link between exposure and tumor formation in animals exposed under certain specific conditions, the results have not been independently replicated. Many other students have failed to find evidence for a link to cancer or any related condition".

Federal Communications Commission Official Position on Adverse Health Impacts Sept. 14, 2018; Retrieved from FDA website – FDA Radiation-Emitting Products Page, 2021

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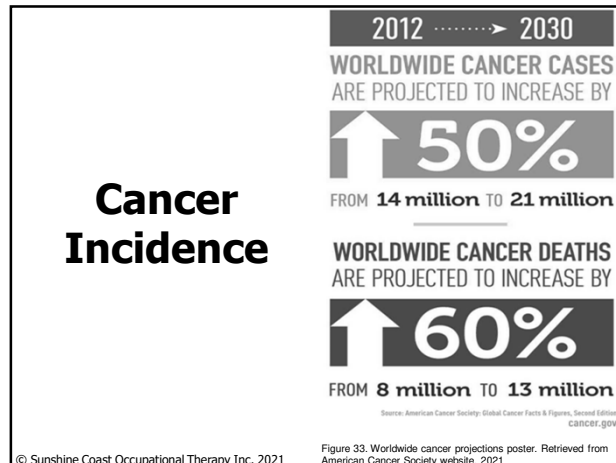
Ramazzini Institute (RI)

- The RI findings on far field exposure to RFR are consistent with and reinforce the results of the NTP study on near field exposure, as both reported an increase in the incidence of tumors of the brain and heart in RFR-exposed Sprague-Dawley rats. These tumors are of the same histotype of those observed in some epidemiological studies on cell phone users. [Falconi 2018](#)
- A recent evaluation of 2266 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%) demonstrated significant biological or health effects associated with exposure to anthropogenic electromagnetic fields (EMF). [Bandara 2018](#)

66

Cancer Incidence Statistics

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Breast Cancer

Video 5. Dr. Devra Davis PhD, MPH presentation on cell phones in bra and breast cancers in women. Courtesy of EHT. Retrieved from www.ehtrust.org, 2022

Figure 34. No Phone Zone pic. Courtesy of EHT. Retrieved from www.ehtrust.org, 2022

Figure 35. The Association Between Smartphone Use and Breast Cancer Risk. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/33149685/>, 2021

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Skin Cancer from Indoor Transformer Stations

> Occup Environ Med. 2022 Jan;79(1):49-54. doi: 10.1136/oemed-2021-107776. Epub 2021 Sep 30.

Residential extremely low frequency magnetic fields and skin cancer

Muhammad Waseem Khan^{1,2}, Jukka Juutilainen³, Jonne Naarala³, Päivi Rovainen^{3,4}

Affiliations + expand
PMID: 34593542 DOI: 10.1136/oemed-2021-107776

Results: The HR for MF exposure ≥6 month was 1.05 (95% CI 0.72 to 1.53) for melanoma and 0.94 (95% CI 0.55 to 1.61) for squamous cell carcinoma. Analysis of the age at the start of residence showed an elevated HR (2.55, 95% CI 1.15 to 5.69) for melanoma among those who lived in the apartments when they were less than 15 years old. This finding was based on seven exposed cases.

Conclusions: The results of this study suggested an association between childhood ELF-MF exposure and adult melanoma. This is in agreement with previous findings suggesting that the carcinogenic effects of ELF-MFs may be associated particularly with childhood exposure.

Figure 36. Residential extremely low frequency magnetic fields and skin cancer. Retrieved from Occupational and Environmental Health Journal, 2022

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Wireless Prenatal Exposure

BabySafeProject.org

- Unborn fetuses the most vulnerable.
- Rats exposed prenatally to wireless had increased hyperactivity and behavior problems and decreased learning and memory.

Figure 37. Baby Safe Project website home page. Retrieved from www.BabySafeProject.org, 2021

Dr. Hugh Taylor, Chair of Obstetrics, Gynecology & Reproductive Sciences, Yale School of Medicine, Bas 2009

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Pediatric Cancer Incidence

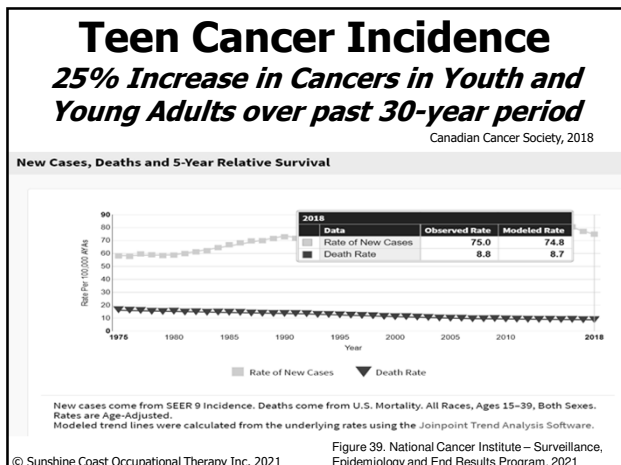
- Incidence of pediatric cancer increased 2001-2014 across sex, age, race/ethnicity, region, economic status, and rural/urban status.
- For lymphoma, thyroid, brain, kidney and liver representing 98.8% of population.
- Brain cancer highest in 0-4 yr. population.

Figure 38. Pregnant woman with phone. Retrieved from Pexels, Amina Filkins, 2021

Center for Disease Control 2018, BabySafeProject.org

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Electromagnetic Sensitivity

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Electromagnetic Sensitivity

Individualized Susceptibility

Physiologic Effects

- Impaired detoxification.
- Changes in calcium signaling (voltage gated channels).
- Activation of free radicals.
- Disruption of the blood-brain barrier.
- Altered dermatologic, microvasculature, hematologic and immune systems.

Symptoms

- Altered neurological and cognitive functions.
 - headaches, seizures.
- Neuro-hormonal.
- Neuro-psychiatric.
- Over-sensitized neural responses.

Stein 2020, Belhomme 2020

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EMS Considerations

Differential Susceptibility

- Everyone is different.
- Think bell curve...why is there one?

Cumulative Effect

- Already have > 10,000 studies showing harm.
- What happens when our children mature into adults?
- Cancer secondary to cigarettes, DDT, asbestos etc. was not immediate.
- Need to proceed with caution to protect the vulnerable.

Figure 40. Pencil bell curve photo. Retrieved from Dreamstime 2022

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Autism and EMF

Dr. Martha Herbert, PhD, M.D.,
specialist in neurodevelopmental and autism spectrum disorders states:

- "The claim ...that the only concern is thermal impacts is now definitively outdated scientifically."
- "...thousands of papers document adverse health and neurological impacts...children are more vulnerable."
- "WiFi radiation and cell towers can exert a disorganizing effect on the ability to learn and remember, and can also be destabilizing to immune and metabolic function."

Figure 41. Dr. Martha Herbert photo. Retrieved from www.drmarthaherbert.com website, 2019

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TECHNOLOGY MANAGEMENT

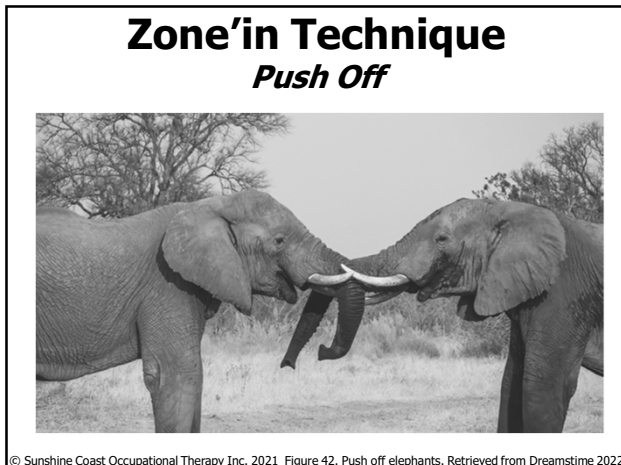
Wireless Radiation

Quiz 2

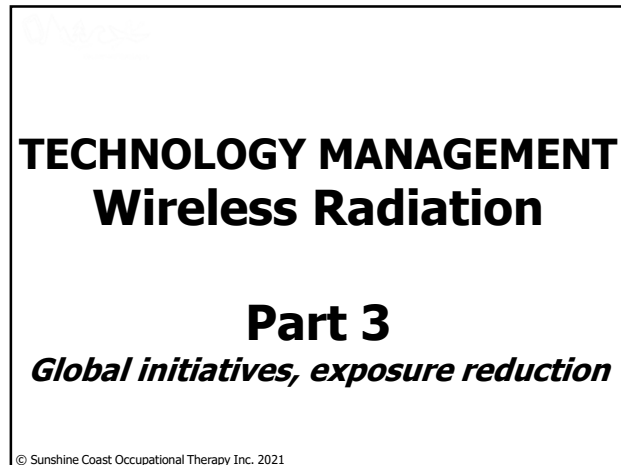
3 areas of impact research

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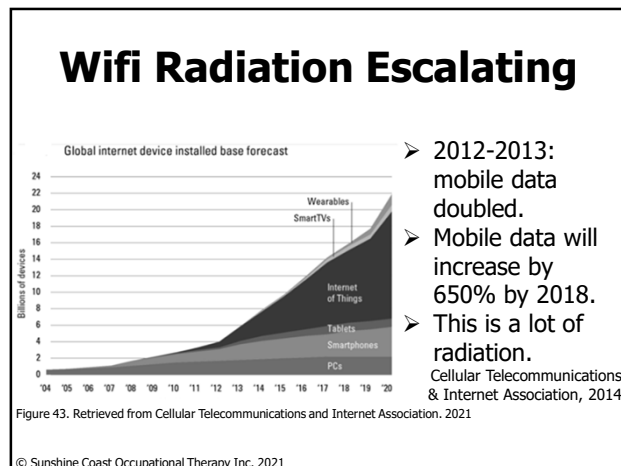
79



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Towers, Base Stations, Satellites

3/4G Towers, 5G Small Cell Base Stations

- 3 & 4G Towers in place.
- Small Cell Base Stations every 2-10 houses.
- Fire risk: unable to extinguish, toxic fumes.



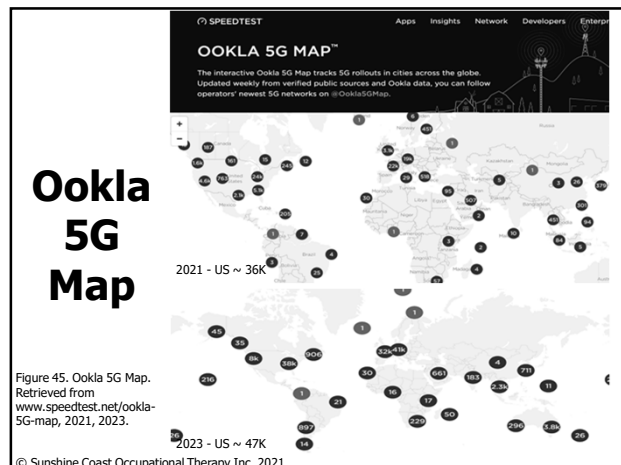
5G Satellites

- Low earth-orbit (LEO) satellites.
- Canadian Radio-TV and Telecommunications (CRTC) approved launch of 12,000 LEO's by Elon Musk's SpaceX to orbit at 550 km above earth.
- Traditional telecommunications satellites orbit at 20,000 km above earth.
- 441,439 LEO's globally approved for 2022 launch.

Figure 44. 5G Tower. Purchased from Dreamstime. 2021

© Sunshine Coast Occupational Therapy Inc. 2021 Cellphonetaskforce.org, 2022

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The Internet is the largest thing that humanity has built.

- How much energy does it use?
- What ores do we extract to build it?
- What hazards do workers endure? Katie Singer, 2021



Figure 46. Reports about nature and technology blog pic provided by Katie Singer, 2021

© Sunshine Coast Occupational Therapy Inc. 2021

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Meet Katie Singer

- Writes about technology's impacts on nature.
- Has spoken about the Internet's footprint at the United Nations and on a panel with Dr. James Hansen.
- Well known speaker at schools and universities.
- *An Electronic Silent Spring* is Katie's most recent book.
- www.OurWeb.tech/letters.



Figure 47. Katie Singer pic provided by Katie Singer, 2021

© Sunshine Coast Occupational Therapy Inc. 2021

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Interview with Katie



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Video 5. Katie Singer interview with Cris Rowan, 2022

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Katie's Resources

- OurWeb.tech
- OurWeb.tech/campaign
 - For citizen researchers to study one substance in their smartphone.
- OurWeb.tech/letters
 - Reports about tech's impacts on nature.
- ElectronicSilentSpring.com
- Katie@KatieSinger.com



Figure 48. An Electronic Silent Spring book pic provided by Katie Singer, 2021

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Government, Research and Expert Recommendations

Wireless Radiation Warnings

- 2011 Health Canada issued warning children < 12 years should not carry cell phones.
- iPhone and Blackberry product warnings states to hold phone "away" from head.
- 200 Scientists warns risk of cancer, calling on UN, WHO, and national governments.
- Insurance Companies now excluding health-related claims resulting from WiFi.
- Research evidence indicates harm: <http://www.c4st.org/MDSymposium>


Health Canada 2011, Columbia University 2015, Blank 2015, Product Monograph, World Health Organization 2011

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Canada Bill C 648 Terrance Young, Ontario MP



Global NEWS

© Sunshine Coast Occupational Therapy Inc. 2021 Video 6. Terrance Young speech on Bill C 648 (2015).
Courtesy of Global News, 2021

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Precautionary Principle

- There is NO RESEARCH on effects of 5G (combined with 4G, 3G, 2G and 1G radiation) on humans.
- *When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm.* (UNESCO 2015).
- Call for moratorium on the further roll-out of 5G systems globally, pending more conclusive research on their safety.

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American Academy of Pediatrics

- American Academy of Pediatrics, *December 2012*:
 - Children disproportionately impacted by cell phone radiation.
 - Radiofrequency energy deposition in brain of child is 2 times higher than adult and 10 times higher in bone marrow.
 - Standards based on the impact of adult male are not safeguarding younger and vulnerable populations.


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AAP Letter to FCC

Urges adoption of radiation standards that...

- Protect children’s health and well-being.
 - Children are not little adults!
- Reflect current usage patterns.
 - The FCC has not assessed the standard for cell phone radiation since 1996.
- Provide meaningful consumer disclosure.
 - The current metric of RF exposure available to consumers, the Specific Absorption Rate, is not an accurate predictor of actual exposure.



August 29, 2013
The Honorable Maggie L. Hironaka
Acting Commissioner
Federal Communications Commission
445 Constitution Avenue, NW
Washington, DC 20548

The Honorable Dr. Margaret A. Hamburg
U.S. Food and Drug Administration
1085 North Mountain Avenue
Silver Spring, MD 20910

Dear Acting Chairwoman Hironaka and Commissioner Hamburg:


The American Academy of Pediatrics (AAP), a non-profit professional organization of child health and pediatricians, pediatric medical and nursing professionals, and public health scientists, is pleased to send you this letter of advice, advice, and strong child protection recommendations regarding the adoption of a standard for cell phone radiation. The Department of Exposure to Environmental Factors, U.S. Environmental Protection Agency, published in the Federal Register on June 6, 2013.

Figure 49. 2013 Letter from American Academy of Pediatrics to Federal Communications. Retrieved from www.aap.org, 2022

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American Academy of Pediatrics *Cell Phone Guidelines for Children*



Protect the ones you love.

American Academy of Pediatrics Recommends:

CELL PHONE SAFETY TIPS FOR FAMILIES

- Make only short or essential calls on cell phones.
- Use cell phones in speaker mode or with the use of hands-free kits.
- Avoid carrying your phone against the body like in a pocket, sock, or belt. Cell phone manufacturers' recall guarantees that the amount of radiation your device absorbs will be of a safe level.
- If you plan to work or work on your device, download it first, then switch to airplane mode while you work in order to avoid unnecessary radiation exposure.
- Keep an eye on your signal strength (i.e. how many bars you have). The weaker your signal, the higher your phone has to work and the more radiation it gives off.
- Avoid making calls in cars, elevators, trains, and buses. The cell phone needs to work (and emits more radiation) to get a signal through metal.
- Remember that cell phones are not toys or hearing aids.

From AAP's HealthyChildren.org

RESEARCH SHOWS: Cell phone (Wi-Fi) radiation can disrupt the developing brain, sperm, and sleep. Research indicates increased cancer risk, headaches, hyperactivity, and memory problems from cell phone radiation.

All wireless devices emit the same type of radiation as cell phones.

AT HOME: Easily reduce wireless radiation at home. Get a corded landline phone and forward cell phones to it.

100% SAFETY = CORDED ETHERNET CONNECTIONS Use non-wireless corded connections for printers, music, computers, laptops, tablets, video game systems, e-readers, routers, keyboards, headphones, speakers, and other accessories with wireless functions off.

MOVE AT ENTHrust.org
ENVIRONMENTAL HEALTH TRUST

Figure 50. "Protect the ones you love" poster. Courtesy of Environmental Health Trust, 2022

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Environmental Working Group

- The *Environmental Working Group* analyzed the findings of tumor and heart damage from the National Toxicology Program study and concluded that FCC limits should be strengthened by 200 to 400 times to protect children according to current risk assessment guidelines. Uche 2021
- Based on the evidence reviewed, IARC's current categorization of RFR as a possible human carcinogen (Group 2B) should be upgraded to Carcinogenic to Humans (Group 1). Miller 2018

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United States President Obama

- 2011- Obama's own Cancer Advisory panel urges Precautionary Principle:

"Children's and adolescent's risk from using wireless devices is the most pressing issue."

- 2014 - Dr. Devra Davis, PhD, founder of the Environmental Health Trust wrote Obama urging endorsement of fiber-optic cable in favor of WiFi in schools and communities out of concern for children's brains and bodies.

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President's Cancer Panel 2011, Davis 2014

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Worldwide WiFi Warnings

- Israeli Ministry of Education
- French National Assembly
- Council of Europe
- Bavarian Parliament
- German government
- Russian National Committee
- Austrian Medical Association
- Swiss Government
- Taiwan Government
- Schools in England, France & Canada

World News, 2015, State of Israel 2013, Parliament of France 2013, Council of Europe 2011, Russia 2011, Swiss Government, 2014, Taiwan Government 2015, OTTAWA 2012

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American Academy of Environmental Medicine *RF/EMF Medical Alert 2012*

Radio frequency radiation (RF) may be underlying cause of patient's disease and recommends avoiding RF/EMF exposure with these conditions:

- Neurodegenerative – Parkinsons, Alzheimers, ALS
- Neurological - headaches, depression, fatigue, anxiety, sleep & memory disruptions, tremors, dizziness, ADD, vision changes
- Musculoskeletal – pain, tightness, spasm, fibrillation
- Pulmonary – chest tightness, dyspnea, decreased function
- Gastrointestinal – nausea, irritation
- Autonomic Nervous System Dysfunction
- Fetal Abnormalities and Pregnancy
- Genetic Defects and Cancer
- Liver and Genitourinary diseases

© Sunshine Coast Occupational Therapy Inc. 2021 American Academy of Environmental Medicine website 2021

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BC Teachers Federation *Health and Safety – Advice to Members section Wireless – Is it Safe?*

"One can no longer evade these pulsed microwaves. They heighten the risk of already present chemical/physical influences, stress the body's immune system, and can bring the body's still-functioning regulatory mechanisms to a halt. Pregnant women, children, adolescents, elderly and sick people are especially at risk."

Freiburger Appeal signed by over 3000 German Doctors.

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British Columbia Teacher's Federation website 2021

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Global Initiatives to Reduce Wifi

- France, Cyprus banned WiFi from child care centres (including libraries), Wifi default "off" in schools, cell towers must meet mandatory requirements for radiation, mandated phones sold with head set.
- Belgium banned sales/marketing of cell phones to children, WiFi risk warnings mandatory on phones.
- Supreme Court of India mandated removal of cell towers from vicinity of schools, hospitals, and playgrounds.
- Taiwan banned device use < 2 years of age.
- Israel banned WiFi for preschool – grade 2; grades 3-4 WiFi restricted to < 3 hours/week; Health Ministry called for halt to new WiFi installations.
- Russia NCNIRP recommended WiFi be prohibited in schools.

© Sunshine Coast Occupational Therapy Inc. 2021 *Policy Guidance Regarding Wireless Radiation, by US Senator Pat Colbeck and MD Angie Colbeck, 2018*

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Legal Action

***Life and death do not wait for
legal action.***

Daphne du Maurier

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Environmental Health Trust Sues Federal Communication Commission

- Aug. '21, US Court of Appeals for the District of Columbia Circuit ruled in the historic case EHT vs. the FCC that the Dec. '19 decision by the FCC to retain its 1996 safety limits for human exposure to WiFi radiation was "arbitrary and capricious."
- FCC failed to respond to "record evidence that exposure to RF radiation at levels below the Commission's current limits may cause negative health effects".
- FCC failed to address impacts of long-term wireless exposure, impacts to children, the testimony of people injured by wireless radiation, impacts to wildlife and the environment, impacts to the developing brain and reproduction.

© Sunshine Coast Occupational Therapy Inc. 2021 Environmental Health Trust website, 2021


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Flawed Assumptions International Commission on the Biological Effects of Electromagnetic Fields



Flawed Assumptions

Regarding FCC and ICNIRP Exposure Limits for RFR (Radiofrequency Radiation)



ICBE-EMF: International Commission on the Biological Effects of Electromagnetic Fields, October 2022

Video 7. Shown courtesy of International Commission on the Biological Effects of Electromagnetic Fields, Oct. 18, 2022.

© Sunshine Coast Occupational Therapy Inc. 2022 Biological Effects of Electromagnetic Fields, Oct. 18, 2022.

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EMF Insurance Policy Exclusion is GOLD STANDARD

- Insurers rank 5G and EMF radiation as "high risk" and "likely to increase".
- Many public school policies state EMF exclusions and define EMF as a "pollution".

EHT Resource: "Electromagnetic Field Insurance Policy Exclusion are the Standard".

"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

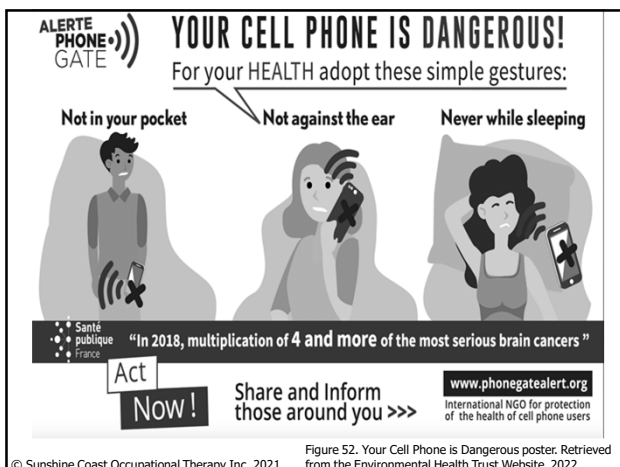
Figure 51. Excerpt from Lloyds in London exclusion for illnesses caused by radiation. Retrieved from the Environmental Health Trust Website, 2022.

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What Can You Do?

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ALERTE PHONE-GATE

YOUR CELL PHONE IS DANGEROUS!

For your HEALTH adopt these simple gestures:

- Not in your pocket
- Not against the ear
- Never while sleeping

"In 2018, multiplication of 4 and more of the most serious brain cancers"

Act Now! Share and Inform those around you >>>

www.phonegatealert.org
International NGO for protection of the health of cell phone users

Figure 52. Your Cell Phone is Dangerous poster. Retrieved from the Environmental Health Trust Website, 2022.

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Remember the 3 D's

- Increase **Distance** – every 1" away decreases wireless radiation by 10%.
- Decrease **Duration** – stay within expert guidelines.
- **Disable** Device – put in airplane mode, work offline, turn Wifi off (timers).
- **Go Wired** – use ethernet cables, corded mice/keyboard.
- **Shield** Device – put table between laptop/tablet and person.




Figure 53. Phone radiation. Retrieved from Dreamstime, Zinco79, 2021

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Go Wired!

- Wired systems are faster than wireless.
- Wired systems are safer (no identity theft, no radiation).
- Wired systems are private.
- Wired systems are more reliable and effective.





Figure 54. Network cable. Retrieved from Pixabay, Adrian Malec, 2021

Environmental Health Trust 2018
© Sunshine Coast Occupational Therapy Inc. 2021

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How To Wire Devices

- USB – Ethernet adaptor.
- Wired mouse, keyboard and speakers.
- Line powered phone.
- Battery alarm clock.
- Cat 7 ethernet cord.
- EMF anti-radiation air tube headphones (not blue tooth).



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How To Disable Devices


<h3>Mobile Devices</h3> <ul style="list-style-type: none"> ➤ Tablet: <ul style="list-style-type: none"> ➤ Download whatever, then turn wifi and Bluetooth off. ➤ It's not enough to turn on Airplane mode. ➤ Cell phone: <ul style="list-style-type: none"> ➤ Turn off blue tooth and wifi. ➤ If need for calls, leave in another room. ➤ Forward cell calls to wired phone. 	<h3>Wired Devices</h3> <ul style="list-style-type: none"> ➤ Laptop: <ul style="list-style-type: none"> ➤ Get wireless adaptor for internet. ➤ Place on desktop, never lap. ➤ Router: <ul style="list-style-type: none"> ➤ Clicker on/off switch. ➤ Automatic timer; off at nite.
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Radiation Shields Don't Work

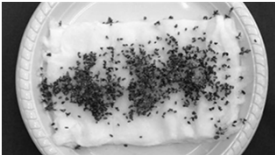
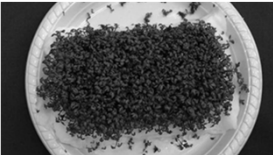
- Shields ON or IN devices don't work as would stop wireless signal.
- Lead shields (lead glass, curtains, walls) might work, but again stops or weakens wireless signals.
- Best Idea! Turn wireless off by plugging modem into timer.



© Sunshine Coast Occupational Therapy Inc. 2021 Figure 56. Radiation shields. Retrieved from Public Domain, '21

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Grade 9 Experiment

<h3>Cress seeds with wifi</h3> 	<h3>Cress seeds without wifi</h3> 
--	---

England, Sweden, Holland...

© Sunshine Coast Occupational Therapy Inc. 2021 Figure 57. Cress seeds & wifi. Retrieved from EHT. 2021

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Environmental Health Trust



Video 8. Wifi Stops Plants Growing. Shown with permission from Environmental Health Trust. 2021

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Salient Concerns

- Wireless not proven safe.
- Current research on 3G and 4G shows harm.
- Wireless radiation is cumulative.
- No immediate or long term research on 5G.
- More antennae's required = more radiation.
- No consultation from citizens, only need to "be informed".

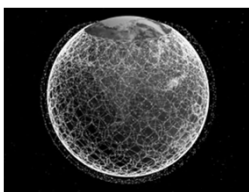


Figure 58. Computer scientist rendering of SpaceX's constellation of satellites. Courtesy of Business Insider, 2021

Citizens for Safe Technology – 5G Report 2021

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Resources

- Environmental Health Trust – ehtrust.org; research, education, schools, policy, products; sued the FCC.
- Citizens for Safe Technology – c4st.org; read *An Overview of 5G*.
- Electromagnetic Frequency Portal – emfportal.org; collated research on impact of wireless radiation.
- Electromagnetic Radiation Safety – saferemr.com.
- Physicians for Safe Technology – Mdsafetech.org.
- BioInitiative Report – bioinitiative.org; scientists, researchers, public health professionals.
- Katie Singer – katiesinger.com; read *The Silent Electronic Spring*.
- Collaborative for High Performance Schools – chps.net; read the *Best Practice Manual* for schools.

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Collaborative for High Performance Schools



Resource for Schools: download the CHPS *Best Practices Manual* in *Resource section* @ chps.net.

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Figure 59. CHP website home page www.chp.net, 2021

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Environmental Health Trust

ehtrust.org

- Think tank that promotes a healthier environment through research, education, and policy..
- Large database of research on effects of wireless radiation.
- Relentless advocate for demanding telecom industry prove wireless safety for children.
- School curriculum and safety guidelines.

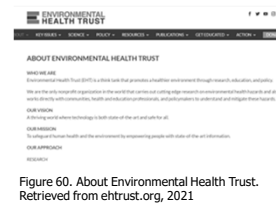


Figure 60. About Environmental Health Trust. Retrieved from ehtrust.org, 2021

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Physicians Health Initiative for Radiation and the Environment

phiremedical.org

- Independent association of medical doctors and associated specialists.
- Improving education regarding health effects of non-ionizing radiation.
- Collate research, share and critique it, conduct their own research.



Figure 61. PHIRE website home page. Retrieved from www.phiremedical.org, 2022

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Courses

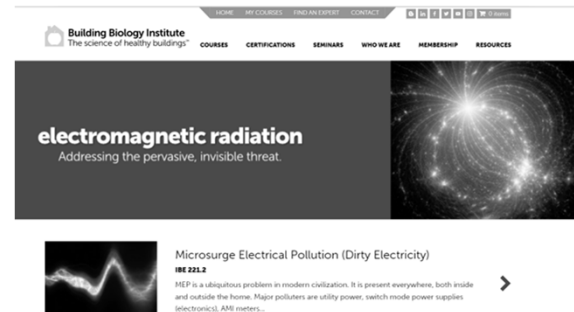


Figure 62. Building Biology Institute website. Retrieved from www.buildingbiologyinstitute.org, 2022

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Conference



The EMF Medical Conference 2021
Join with the leaders in EMF science, medicine and protection!

This conference was convened online in January 2021 and was attended by over 800 people from 30+ nations. The information and resources provided at this conference is still very relevant today. Presentations made by internationally recognized scientists who have published in the field of bioelectromagnetics; by knowledgeable health practitioners who treat people for EMF associated illness and injuries; and, by healthy building engineers who test EMF exposures and mitigate hazards provide a high quality education and training experience.

We recommend you review the program schedule and the list of faculty members.


Due to popular demand, we will continue offering two CME/CE accredited courses designed for health practitioners based on the conference until May 2023.

Figure 63. EMF Medical Conference course outline, videos. Retrieved from www.emfconference2021.com 2022

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Zone'in Technique Wall Slide



© Sunshine Coast Occupational Therapy Inc. 2021 Figure 64. Wall slide. Author's private photo, 2022

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TECHNOLOGY MANAGEMENT Wireless Radiation

Quiz 3

Global initiatives, exposure reduction

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