

HEALTH EFFECTS OF EXPOSURE TO MAGNETIC AND RADIO-FREQUENCY FIELDS

*It is no measure of health to be well adjusted
to a profoundly sick society.*

KRISHNAMURTI

Figure this: every organ in the human body gets information about how to function from electrical or electrochemical signals. The brain, heart, blood, muscles, nerves, kidneys, and digestive organs each has its own dominant frequency;¹ and organs communicate to each other by electromagnetic signals. An adult heart, beating seventy times per minute, has a hertz rate of 1.17.² A baby's heart, beating 120 times per minute, has a hertz rate of two.³ The nervous system operates at multiple frequencies. Brainwaves operate mostly between 2 Hz and 20 Hz; the brain rests at about 10 Hz.⁴

1 J. Oschman, *Energy Medicine*, London: Churchill Livingstone, 2000.

2 *The New Book of Popular Science*, Grolier, 1996; also F. Magill, *Magill's Survey of Science*, Hackensack, NJ: Salem Press, 1991.

3 G. Lietz and Anne White, *Secrets of the Heart and Blood*, Durham, UK: Gerrard, 1965.

4 J. Oschman, *Energy Medicine*.

To function, our bodies also receive cues from hormones, chemistry, and the Earth's electromagnetic fields.⁵ We rarely perceive these cues consciously. Bees, birds, cows, fish, plants, and trees—indeed all living creatures—function by using internal electromagnetic signals and by receiving external ones.



Paul Martinez, 24, New York: *In school, I learned that the mind is most restful when it cycles about ten times per second. Most of the Earth's electromagnetic fields vibrate under 10 Hz. These fields are called the Schumann Resonances. So: a restful mind vibrates in sync with the Earth. But our buildings are wired for 60 Hz, and we're surrounded by devices that commonly vibrate millions and billions of times per second. How do I deal with this if my goal is a restful mind?*

We all know that some people smoke several packs of cigarettes every day and never get sick. Some people get lung cancer or other diseases from second-hand smoke. Likewise, every person arrives at the threshold of exposure to magnetic fields and radio-frequency fields uniquely. People who live, study, and/or work within buildings with wiring errors; near transformers, transmission lines, cellular antennas, transmitting utility meters; and who use mobile phones and Wi-Fi may be exposed to more radiation than people who have correctly wired homes far from transformers, use only corded phones, have no Wi-Fi, and live and work more than a mile from an antenna in buildings that have no transmitting utility meters.

In reality, most of us are probably exposed to magnetic fields, since more than fifty percent of homes in the U.S. have wiring errors.

5 R. Becker, MD, *The Body Electric: Electromagnetism and the Foundation of Life*, New York: William Morrow, 1985.

As for radiation from wireless technologies, from 2005 to 2007, the number of cell phone subscribers in the U.S. increased from 13% to 84% of our population. In 2010, more than 91% of our country's 308 million people had cell phones.⁶ Worldwide, the vast majority of our planet's seven billion people now have mobile service. By 2016, Cisco estimates that 1.2 million minutes of video will be streamed or downloaded every second.⁷ The cellular antennas that transmit signals for wireless devices are now ubiquitous, as are transmitting utility meters.

So what are the biological effects of exposure to electrosmog?

PART ONE:

HUMAN HEALTH, MAGNETIC FIELDS AND STRAY VOLTAGE

In the 1970s, Colorado epidemiologist Nancy Wertheimer began reporting cancer clusters and other health problems caused by exposure to magnetic fields. Around the same time, epidemiologist Samuel Milham, MD observed a connection between electrification and “diseases of civilization,” including cancer, cardiovascular disease, diabetes, suicide, and Alzheimer's.⁸ Dr. Milham also identified that electrical workers, electricians, radio and power station operators, and people who work in the aluminum industry—all of whom are exposed to strong magnetic fields—have an elevated risk of leukemia.⁹ Teachers who work in classrooms with high

6 See www.ctia.org/advocacy/research/index.cfm/AID/10323.

7 *Washington Post*, 11-29-2012, “Web video leaves deaf out of loop.”

8 S. Milham, MD, MPH, *Dirty Electricity*, iUniverse.com, 2010.

9 “Exposures to Extra Low Frequency EMFs in Occupations with Elevated Leukemia Rates,” *Applied Industrial Hygiene* vol. 3, no. 6 (1988): 189-193.

frequency voltage transients on the wires have an increased risk of a variety of cancers.¹⁰

A study at California's Kaiser Permanente Hospital showed that women who used video display terminals (VDTs) more than twenty hours per week had twice the number of miscarriages as women who did not use VDTs, and their offspring had increased birth defects.¹¹

Nancy Wertheimer and Ed Leeper also found that when pregnant women used electric blankets and waterbeds, they had a higher incidence of miscarriages. The highest risks occurred in winter, when electric blanket use is greater.¹²

A study of suicidal deaths between 1969 and 1976 in the West Midlands, England, published in the August, 1981 issue of *Health Physics* by F. Stephen Perry and colleagues, "Environmental Power-Frequency Magnetic Fields and Suicide," showed that "significantly more suicides occurred at locations of high magnetic field strength."

According to longtime watchdog *Microwave News*, "strong epidemiological evidence" shows that exposure to magnetic fields is a risk factor for Alzheimer's. Seamstresses who use industrial sewing machines are particularly vulnerable. A meta-analysis of fourteen occupational studies showed that exposure to EMFs on the job doubled the risk of developing Alzheimer's. People living within fifty meters of a high-voltage power line were more likely to die with Alzheimer's. The longer they lived

10 S. Milham and L. L. Morgan, "A new electromagnetic exposure metric: High frequency voltage transients associated with increased cancer incidence in teachers in a California school," *American Journal of Industrial Medicine*, vol. 51 (2008): 579-586.

11 M. K. Goldhaber, *American Journal of Industrial Medicine*, vol. 25 (1988): 150-155.

12 N. Wertheimer and E. Leeper, "Possible effects of electric blankets and heated waterbeds on fetal development," *Bioelectromagnetics* vol. 7 (1986): 13-22.

near a 220 to 380 kV power line, the greater the risk: after fifteen years, the odds of dying with Alzheimer's were double the expected rate.¹³

Safety Standards for Magnetic Fields

According to our federal Occupational Safety and Hazard Administration (OSHA) standards (determined by engineers), magnetic fields above one gauss—1000 mG—are dangerous.

Those who study health have made other conclusions. Because of the possible link between childhood leukemia and *in utero* exposure to ELF's, *The BioInitiative 2012 Report* (a compilation of 1,800 studies about the biological effects of electromagnetic fields and radio frequency radiation, edited by Cindy Sage, MA and David O. Carpenter, MD) recommends a 1.0 mG limit for existing habitable space for children and/or pregnant women, *To be clear, the BioInitiative Group recommends 1/1000th of what OSHA allows.*

The Seletun Statement, made by an international, scientific panel that met in Seletun, Norway in 2009, also recommends a limit of 1.0 mG exposure “for all new installations based on findings of risk for leukemia, brain tumours, Alzheimer's, ALS, sperm damage, and DNA strand breaks.”

The Institute for Building Biology (which provides environmental consulting primarily in Europe and the U.S.) considers readings below 0.2 mG of “no concern.” Readings between 0.2 and 1.0 mG are of “slight concern.” Readings between 1.0 and 5.0 mG are of “severe concern.” Readings above 5.0 mG are of “extreme concern.”¹⁴



13 L. Slesin, “Power-line EMFs: New focus on Alzheimer's disease,” *Microwave News*, 11-17-2008.

14 International Institute for Building-Biology and Ecology, *Electromagnetic Radiation Seminar Manual*, 212, 2011.

Lydia Shuster, 74, Washington: *I've enjoyed extremely good health all of my life. In 1985, I moved into a ground level apartment near Seattle. Starting in 2009, I gradually noticed a variety of ailments: about fifteen minutes after I went to bed, my upper legs would itch. Then, when I scratched, small bumps would appear. The rash would be gone by morning, but I woke up feeling like I hadn't rested, with debilitating, achy joints. I had difficulty concentrating. My hair started falling out. I moved in fuzzy, slow motion.*

When I left my condo for a couple of hours or more, my symptoms seemed to clear considerably. If I went out of town, within twelve hours, all of the symptoms would be gone. So I began to think that something in my condo was making me sick. I knew that several of the buildings in my association had severe mold issues.

In 2012, I hired a building biology consultant. She found mold in my shower stall. Then, with her gauss meter, she measured the magnetic fields in and around my condo. My bedroom measured 1.7 mG. At the transformer about thirty feet from me (across a parking lot), the reading showed 7 mG. The consultant found both of these readings alarming, since magnetic fields can harm health.

I moved out of my bedroom and began sleeping on my couch, where the gauss meter showed 1.2 mG. After a few weeks, I no longer had a rash. My joints improved by 80%. I still experience tiredness.

Following the building biologist's suggestion, I also quit using my cordless phone. Then, once, I used it for a long call. I had shooting pains and a headache for two days. So that gave me a good lesson. I put the cordless phone away.

It took me two months to convince my electric company to send an engineer to assess the situation. At my bedroom window, his gauss meter read 1.8 mG to 2.4 mG. My microwave

oven, which is built into a wall in my very small kitchen so that I can't unplug it, showed 54 mG while running, Turned off, it measured 43 mG. After the engineer got these readings, he would not stay in my kitchen. When he left, I shut off the wires that go to the microwave at my circuit breaker panel.

Yet later, a contractor found a leak and mold in my crawl space. Then, I discovered www.emf-portal.de, which posts studies about the relationship between mold and magnetic fields.

Meanwhile, the utility company emailed me that the magnetic fields in my condo are well within government standards, and that no further investigation is warranted.

I have friends reporting brain tumors and severe heart problems. We all need to pay attention and decrease our use of radiation-emitting devices.

Stray Voltage and Health

Stray voltage, electricity that travels on the ground, can also harm health. It occurs when the neutral wire that returns current to its source (the substation) is not sufficient. In March, 2013, a woman won a four million dollar lawsuit against Southern California Edison because she repeatedly got shocked from stray voltage that electrified her shower head.¹⁵ Dogs and cows (who do not cover their soles with rubber) have been electrocuted by stray voltage.¹⁶

15 B. Greenfield, "Woman Shocked in Shower Wins \$4 Million Lawsuit: Is Your Shower Safe?" *Shine*, 3-21-2013.

16 Dr. Magda Havas, speaking in Feb. 2013 in a public forum sponsored by the Perth County Federation of Agriculture in Listowel, Ontario; reported by Bob Reid in *Ontario Farmer*.

PART TWO:
HUMAN HEALTH AND WIRELESS DEVICES

David O. Carpenter, MD, and Cindy Sage, MA, *BioInitiative 2012 Report, Section 24:* *Bioeffects are clearly established and occur at very low levels of exposure to electromagnetic fields and radio frequency radiation. Bioeffects can occur in the first few minutes at levels associated with cell and cordless phone use. Bioeffects can also occur from just minutes of exposure to cellular base antennas, Wi-Fi and wireless utility “smart” meters that produce whole-body exposure. Chronic base station level exposures can result in illness. Many of these bioeffects can reasonably be expected to result in adverse health effects if the exposures are prolonged or chronic. This is because they interfere with normal body processes (disrupt homeostasis), prevent the body from healing damaged DNA, produce immune system imbalances, metabolic disruption and lower resistance to disease across multiple pathways.*

The Health Effects of Ionizing and Non-Ionizing Radiation

Before I report how wireless devices affect health, let me spell out different perspectives on the health effects of ionizing and non-ionizing radiation. (As explained in the previous chapter, radio frequency fields, including microwaves used by wireless devices, are non-ionizing.)

Scientists agree that the health effects of ionizing radiation are cumulative, and that these effects can harm and kill. For example, brief exposure to (ionizing) ultra violet light can cause an immediate sunburn. With enough exposure, a person might get cataracts or skin cancer.

Since non-ionizing radiation (emitted by radio, TV, and Internet broadcasts and mobile phones) usually does not heat tissue immediately, scientists disagree about whether or not it impacts health. However, in a microwave oven, non-ionizing

radiation causes water molecules to rotate rapidly in a frictional medium and produce heat. If the temperature rises high or long enough, and if its amplitude is strong enough, then non-ionizing radiation can cause tissue damage immediately.

The human body is two thirds water. Does cumulative exposure to non-ionizing radiation affect health? This is a controversy. Whether or not tissue is heated, many other biological effects occur; but not all scientists recognize non-ionizing radiation's non-thermal effects. All would recognize ionizing radiation's non-thermal effects.

Thermal and Non-Thermal Effects

Again, the FCC has so far determined the safety of wireless devices solely by their immediate *thermal* effects: when a six-foot-two mannequin weighing more than two hundred pounds (his head filled with fluid) used a cell phone for six minutes and his temperature did not change more than one degree Celsius, the FCC determined that cell phones are safe.¹⁷

Meanwhile, many scientists have found numerous *non-thermal*, biological effects from using mobile phones:

- After twenty minutes of use, double-strands of DNA break into fragments. If the body's repair systems can't keep up with these breaks, cancer and birth defects can result.¹⁸
- Cancer rates increase, especially when people begin using mobile phones as children and when anyone uses one for thirty minutes or more per day. The risk of tumors also

17 D. Davis, *Disconnect: The Truth about Cell Phone Radiation, What the Industry Is Doing to Hide It, and How to Protect Your Family*, New York: Dutton, 2010.

18 A. Campisi et al, "Reactive oxygen species levels and DNA fragmentation on astrocytes in primary culture after acute exposure to low intensity microwave electromagnetic field," *Neuroscience Letters*, vol. 473 (2010): 52–55, .

increases significantly with over ten years of cell phone use.¹⁹

- After two hours of use, the blood–brain barrier begins to leak, allowing neurotoxins in food, air, or water to affect the brain and nerves, eventually leading to brain cell death.²⁰
- For digital cell phone users who began using a cell phone as teenagers or younger, the increased risk of brain cancer is 420%.²¹
- Prenatal exposure to cell phones results in emotional and hyperactive problems in children around the time they reach school age.²²
- Exposure to electromagnetic fields activates voltage-gated calcium channels. This leads to increased calcium levels within cells, which leads to the production of a series of compounds including peroxynitrite. Peroxynitrite is at the root

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- 19 E. Cardis et al, “Brain tumor risk in relation to mobile telephone use: Results of the Interphone International Case Controlled Study,” *International Journal of Epidemiology*, vol. 39, no. 3 (2010): 675–694; L. Hardell et al, “Epidemiological evidence for an association between use of wireless phones and tumor diseases,” *Pathophysiology*, Aug. 2009, vol. 16., (2–3), 113–122; L. Hardell et al, “Tumor risk associated with use of cellular telephones or cordless desktop telephones,” *World Journal of Surgical Oncology*, vol. 4, no. 74 (2006); L. Hardell et al, “Long-term use of cellular phones and brain tumors; increased risk associated with use for >or = 10 years,” *Occupational and Environmental Medicine*, vol. 64 (2007): 626–632; Ö. Hallberg et al, “The potential impact of mobile phone use on trends in brain and CNS tumors,” *Journal of Neurology and Neurophysiology*, Dec. 2011.
- 20 L. G. Salford et al, “Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones,” *Environmental Health Perspectives*, vol. 111, no. 7, (2003).
- 21 L. Hardell and M. Carlberg, “Mobile phones, cordless phones and the risk for brain tumors,” *International Journal of Oncology*, vol. 35 (2009): 5–17.
- 22 H. Divan et al, “Prenatal and postnatal exposure to cell phone use and behavioral problems in children,” *Epidemiology*, vol. 19, no. 4 (2008).

of most inflammatory diseases, including neurodegenerative and cardiovascular diseases, migraines, and allergies.²³



Andrew Goldsworthy, PhD, professor emeritus of biology at London's Imperial College: *Is damage done by digital telecommunications due only to heating? Is it due to the electrical effect that their pulsating signals have on live tissue? The human body can act as an antenna, and signals from electronics and wireless devices can make electric currents flow through the body with the pulsations. This destabilizes the delicate membranes that surround each cell, which constitutes biological harmful interference: normal operation of cells and normal communication between cells are disrupted.*

Cell membranes are just two molecules thick. They are liquid crystals, made largely of negatively charged molecules that repel each other. They are stabilized by divalent positive ions (mostly calcium) that sit between them by mutual attraction and hold them together like mortar holds together the bricks in a wall.

In 1975, Suzanne Bawin and her coworkers showed us that modulated radio frequency electromagnetic radiation that is far too weak to heat tissue significantly can remove calcium ions (positively charged calcium ions) from cell membranes in the brain.²⁴ Actually, weak electromagnetic fields can have a greater effect than strong ones; prolonged exposure to weak radio frequency fields (where cells are maintained in the unstable condition for longer) is potentially

23 M. Pall, "Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects," *Journal of Cellular and Molecular Medicine*, 6-26-2013.

24 S. M. Bawin et al, "Effects of modulated VHF fields on the central nervous system," *Academy of Science*, 247: 74-81.

more damaging than relatively brief exposure to much stronger fields.²⁵

The loss of calcium is important, because calcium ions bind to and stabilize the cell's negatively charged membranes. Loss of just some of these calcium ions destabilizes the membrane and makes it more inclined to leak, which can have serious metabolic consequences.

For example, membrane leakage affects our neurons. Neurons transmit information between each other by chemical neurotransmitters that pass across the synapses where they make contact. Normally, neurotransmitters are triggered to release their neurotransmitters by a brief pulse of calcium entering the cell. If the membrane is leaky due to electromagnetic exposure, it will already have a high internal concentration of calcium. This puts the cells into hair-trigger mode: they are more likely to release neurotransmitters, and the brain as a whole may become hyperactive.²⁶ The brain may become overloaded, leading to a loss of concentration, Attention Deficit Hyperactive Disorder (ADHD), damage to DNA due to the release of reactive oxygen species from mitochondria, and digestive enzymes from lysosomes. Such DNA damage can cause a loss of fertility and an increased risk of getting cancer.

Membrane leakage can also open the blood–brain barrier, leading to Alzheimer's and early dementia. Damage to similar barriers that protect all of our body surfaces from foreign

25 A. Goldsworthy, electromagnetichealth.org/wp-content/uploads/2010/04/why_vodafone_should_not_increase2.pdf 2010.

26 R. C. Beason and P. Semm, "Responses of neurons to an amplitude modulated microwave stimulus," *Neuroscience Letters*, vol. 333 (2002): 175–178; J. F. Krey and R. E. Dolmetsch, "Molecular mechanisms of autism: A possible role for Ca²⁺ signaling," *Current Opinion in Neurobiology*, vol. 17 (2007): 12–119; N. D. Volkow et al., "Effects of Cell Phone Radio frequency Signal Exposure on Brain Glucose Metabolism," *Journal of the American Medical Association*, vol. 305 no. 8 (2011): 808–813. doi: 10.1001/jama.2011.186.

*chemicals can exacerbate a variety of illnesses, including asthma, allergies, and auto-immune disorders such as multiple sclerosis.*²⁷

SAR: A Measure of Radiation Absorbed by Body Tissue

The amount of radiation that tissue absorbs while exposed to a mobile device is called the device's Specific Absorption Rate (SAR). SAR measures the ratio of power to weight (watt/kilogram) at a given frequency above 100 kHz for a given period of time. A SAR is useful in a controlled laboratory that measures single-source, single-frequency exposures on mannequins. Beyond the lab, where isolation of a single frequency is likely impossible, a true SAR may not be obtainable.

A SAR is most relevant for quantifying radiation exposure from devices that are used near the body. Before 1996, our federal government provided no regulation of mobile devices held near your body. Starting in 1996, the FCC allowed a SAR of 1.6 W/kg or less for 1 gram of tissue. (1 g of body tissue is defined as tissue volume in the shape of a cube.)

In August, 2013, the FCC revised its SAR standards. Based on recommendations from the Institute of Electrical and Electronics Engineers (IEEE), the new standards reclassify the pinna (the outer part of the ear) as an extremity—the same as the feet, ankles, hands, and wrists. Extremities are permitted a SAR of 4.0 W/kg for any 10 g of tissue more than 30 minutes.

In 2004, electrical engineers Dr. Om Gandhi and Dr. Gang King voiced their concerns about this (then proposed) revision in the IEEE's peer-reviewed journal, *Transactions on Microwave Theory and Techniques*. They wrote that treating the pinna as

27 Find more at hese-project.org/hese-uk/en/papers/cell_phone_and_cell.pdf and at bioinitiative.org. Dr. Martin Pall's paper, "Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects," analyzes 24 studies in *Journal of Cellular and Molecular Medicine*, 6-26-2013.

an extremity would allow cell phone radiation at levels that are eight to sixteen times higher than levels allowed by the regulations established in 1996. The pinna is close to the brain. In fact, it acts as a conduit for cell phone radiation into the head. Thus, allowing 4.0 W/kg for any 10 grams of tissue will result in considerably higher cell phone radiated power levels. 4.0 W/kg is up to two times higher than levels permitted under international ICNIRP guidelines followed in over thirty countries.

Further, children have thinner skulls than adults. Scientists from the U.S., Japan, Spain, Brazil, France, and Switzerland²⁸ have shown in peer-reviewed journals that when children use cell phones, they absorb about two times as much radiation as adults do.

In 2013, typical mobile phones had a SAR of 1.6 W/kg. With the FCC's reclassifying the pinna of the ear as an extremity, presumably, mobile devices could have a SAR of 4.0 W/kg.

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- 28 O. P. Gandhi et al, "Electromagnetic absorption in the human head and neck for mobile telephones at 835 and 1,900 MHz," *IEEE, Transactions on Microwave Theory and Techniques*, vol. 44 (1996): 1,884–1,892; O. P. Gandhi and G. Kang, "Some present problems and a proposed experimental phantom for SAR compliance testing of cellular telephones at 835 and 1,900 MHz," *Physics in Medicine and Biology*, vol. 47 (2002): 1,501–1,518; J. Wang and O. Fujiwara, "Comparison and evaluation of electromagnetic absorption characteristics in realistic human head models of adults and children for 900 MHz mobile telephones," *IEEE Transactions on Microwave Theory and Techniques*, vol. 51 (2003): 966–971; M. Martinez-Burdalo et al, "Comparison of FDTD-calculated specific absorption rate in adults and children when using a mobile phone at 900 and 1,800 MHz," *Physics in Medicine and Biology*, vol. 49 (2004): 345–354; A. De Salles et al, "Electromagnetic absorption in the head of adults and children due to mobile phone operation close to the head," *Electromagnetic Biology and Medicine*, vol. 25 (2006): 349–360; J. Wiart et al, "Analysis of RF exposure in the head tissues of children and adults," *Physics in Medicine and Biology*, vol. 53 (2008): 3681–3695; N. Kuster et al, "Past, present and future research on the exposure of children," *Foundation for Research on Information Technology in Society, Foundation Internal Report*, 2009.

No agency regulates the effects of a cell phone's SAR on children.

Also note that some manufacturers of implanted medical devices (i.e., insulin pumps, cardiac pacemakers, and deep brain stimulators) warn users against an exposure greater than 0.1 W/kg for fifteen minutes.²⁹ Anyone with "smart" meters, Wi-Fi, broadband over power lines, cellular antennas, or mobile phone users in their area may find it impossible to limit exposure to this level.

How Do SAR Levels below 1.6W/Kg Affect Long-Term Health?

Rat studies have shown reduced memory (immediately) and early dementia (long-term) with exposure below 0.6 W/kg.³⁰ With exposures below 1.2 W/kg, single and double strand DNA breaks result immediately; long-term, brain tumors³¹ and dementia result.³² Early dementia, ALS, Parkinson's, and other neurological diseases occur long-term with exposure to SAR levels below 0.12 W/kg.³³ Another study found, at exposures below .12 W/kg, that normal DNA repair is impaired, the immune system

29 See www.MRIsafety.com.

30 H. Lai et al, "Microwave irradiation affects radial-arm maze performance in the rat," *Bioelectromagnetics*, vol. 15, no. 2 (1994): 95-104.

31 H. Lai and N. Singh, "Single- and double-strand DNA breaks in rat brain cells after acute exposure to radio-frequency electromagnetic radiation," *International Journal of Radiation Biology*, vol. 69, no. 4 (1996): 513-21; E. Diem et al, "Non-thermal DNA breakage by mobile phone radiation (1,800 MHz) in human fibroblasts and in transformed GFSH-R17 rat granulosa cells in vitro," *Mutation Research*, vol. 583, no. 2 (2005):178-83.

32 B. Wang and H. Lai, "Acute exposure to pulsed 2,450 MHz microwaves affects water-maze performance of rats," *Bioelectromagnetics*, vol. 21, no. 1 (2000): 52-56.

33 J. Eberhardt et al, "Blood-brain barrier permeability and nerve cell damage in rat brain 14 and 28 days after exposure to microwaves from GSM mobile phones," *Electromagnetic Biology and Medicine*, vol. 27, no. 3 (2008): 215-29.

malfunctions, and birth defects occur.³⁴ Exposed to cell-phone radiation at an early age at SAR levels between .016 W/kg and 2.0 W/kg, rats developed learning problems, ADD/ADHD, early dementia, Parkinson's, ALS, and other neurological diseases.³⁵



Gary Olhoeft, PhD: *I have Parkinson's disease. In 2009, I had a deep brain stimulator (DBS) implanted in my brain. It completely replaces the pharmaceuticals I took for fifteen years, which caused increasingly unpleasant side effects. My Medtronic manual says that a cell phone must be at least 20 inches away from me with a SAR of no more than 1.8. Held near my head, the phone's SAR can't be more than 0.25 for 15 minutes. Otherwise, according to Medtronic, it will cause dangerous heating of my implant. If the implant gets too hot, it will malfunction, my brain could be injured, or I could die.*

Second-hand SAR, like second-hand cigarette smoke, occurs from exposure to EMR sources without benefit—like when being near someone using a mobile phone or Wi-Fi. The effects of second-hand SAR on health (including babies exposed in utero to their mothers' mobile phones and laptops, children and people with medical implants) have not been studied.

While emissions from a cell phone may primarily affect the area nearest the phone (i.e., the brain, throat, heart, abdomen, or genitals), emissions from Wi-Fi and/or 4G reach the whole body.

To learn the SAR for a specific mobile device, find its FCC ID number on its case or after removing the battery pack. Then,

34 I. Pavacic et al, "In vitro testing of cellular response to ultra high frequency electromagnetic field radiation," *Toxicology in Vitro*, no. 5, (2008): 1,344–1,348.

35 O. Bas et al, "900 MHz electromagnetic field exposure affects qualitative and quantitative features of hippocampal pyramidal cells in the adult female rat," *Brain Research*, vol. 1,265 (04-10-2009): 178–185.

go to equipmentauthorization.gov; click on “FCC ID Search.” Enter the ID’s first three characters in “Grantee Code,” and the remaining characters under “Equipment Product Code.” Then, click on “Start Search” and “Display Grant.”

A Historical Context for the Biological Effects of RF Signals

In 1953, the Soviets installed a wireless system that radiated the American embassy in Moscow, a system that continued until the mid-seventies. (The Soviets’ intention for this installation remains controversial.) Because they were exposed to radio frequency radiation, many of the workers, including ambassadors, got leukemia and other diseases. The “low-level” of radiation that employees were exposed to was remarkably similar to exposures people now experience when they live near cellular antennas.

Soviet medical researchers first identified a syndrome they called microwave sickness, now called electro-hypersensitivity (EHS). The Soviets found that exposure to RF radiation can develop into tumors, blood changes, reproductive and cardiovascular abnormalities, depression, and other problems.³⁶

The U.S. Senate also studied the effects of low-level radiation emitted by the Soviets on personnel who worked at the U.S. Embassy.³⁷ The U.S. Senate’s Lilienfield Study found eczema, psoriasis, allergic and inflammatory reactions; neurological and reproductive problems; an increase of tumors (malignant in women, benign in men); blood abnormalities; and effects on mood and well-being including irritability, depression, loss of appetite, concentration, and eye problems. These symptoms are nearly

36 M. S. Tolgskaya and A. V. Gordon, “Pathological effects of radio waves,” Soviet Science Consultants Bureau, New York, 1973 133–137.

37 U.S. Senate, 1979. “Microwave radiation of the U.S. Embassy in Moscow,” Committee on Commerce, Science and Transportation, 90th Congress, 1st session, April 1979, 1–23.

identical to those reported by people with EHS and in studies of communities exposed to radiation from digital signals.³⁸

EHS symptoms can also include disturbed sleep, rashes, facial flushing, heart arrhythmia, muscle spasms, memory loss, sinusitis, deteriorating vision, seizures, paralysis, tinnitus, elevated blood sugar levels, stroke, nosebleeds, and digestive problems.

Dietrich Klinghardt, MD has explored the relationship between EHS and Lyme disease (klinghardtacademy.com).

Recently, the California Department of Health found that three percent of Californians (770,000 people) believe they have some form of EHS or radio-frequency sickness. Five percent of Swiss people experience RF Sickness.³⁹ Up to 9% of Germany's 2004 population, and 13.3% of Taiwan's 2010 population⁴⁰ experience electro-hypersensitivity.

If three percent of the U.S. population has RF Sickness, that's more than nine million people.

Why do some people experience RF Sickness and others—even in the same household or workplace—not experience it? Let's answer this question with two more: Why do some people

38 R. Santini et al, "Enquete sur la sante de riverains de stations relais de telephonie mobile: Incidences de la distance et du sexe. *Pathologie Biologie*, vol. 50 (2002): 369-373, doi.10.1016/50369-8114(02)00311-5; G. Abdel-Rassoul et al, "Neurobehavioral effects among inhabitants around mobile phone base stations," *Neurotoxicology*, vol. 22, no. 2 (2007): 434-440, doi.10.1016/j.neuro.2006.07.012; A. E. Navarro et al, "The microwave syndrome: a preliminary study in Spain, *Electromagnetic Biology and Medicine*, vol. 22, nos. 2-3 (2003): 161-169, doi:10.1081/JBC-120024625; B. Levitt and H. Lai, "Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays," *Environmental Reviews*, vol. 18 (2010): 369-395.

39 See www.dirtyelectricity.ca/images/Swiss%20EMF%20study.pdf

40 M. Tseng et al, "Prevalence and psychiatric comorbidity of self-reported electromagnetic field sensitivity in Taiwan: a population-based study," *Journal of the Formosan Medical Association*, vol. 110 (2011): 634-641.

smoke two packs of cigarettes every day and keep “healthy?” Why do some people get lung cancer from exposure to second-hand smoke?



Richard Conrad, PhD, biochemist, conradbiologic.com: *Exposure to a new electronic or wireless device, or spending an unusually long time near a device that was previously tolerated can initiate Electro-hypersensitivity. Physical symptoms are then re-triggered by exposure to much lower field levels, levels far below those the FCC considers “safe.” Some people are pre-disposed toward developing EHS because they were exposed earlier to toxins such as pesticides or heavy metals.*

I have talked to numerous scientists, engineers, programmers, financial advisors and realtors who love their work and their computers, but can no longer sit in front of a computer for more than a few minutes without getting debilitating symptoms. They can only drive older cars with early, less powerful computers under the hood. They can’t travel into many environments. They are truly disabled.

The World Health Organization on RF Radiation and Health

As I reported in chapter 2, in May 2011, the WHO International Agency for Research on Cancer (IARC) classified radio-frequency radiation as *possibly carcinogenic* to humans, based on an increased risk for glioma, a malignant type of brain cancer (common in the San Diego State cluster), when cell phones are used. IARC has also given this classification to DDT, lead, chloroform, and asbestos.

In a November 2011 lecture at Harvard Law School, Dr. Franz Adlkofer discussed the difficulties that he and other scientists face when presenting research on the carcinogenic effects of electromagnetic fields emitted by cell phones and

the institutional corruption that he says obstructs scientists' research. He described the European Union's 2004 REFLEX study,⁴¹ which demonstrated that cell phones that emit RFs below allowed exposure limits display gene-damaging potential. According to Dr. Adlkofer, if IARC had considered studies like REFLEX, it likely would have called cell phone radiation "probably" carcinogenic.

Before 2011, WHO reported that evidence of harm from cell phone use was not convincing. However, this report was authored by Michael Repacholi, an industry consultant who received hundreds of thousands of dollars from corporations with vested interests.⁴²

It's also worth noting that Dr. Gro Harlem Brundtland, MD, MPH, who served as Director General of the WHO from 1998 to 2003 (and, earlier, two terms as Norway's Prime Minister), does not allow cell phones in her office. Within four meters of a mobile phone, she gets headaches.⁴³

The Interphone Study

To date, Interphone is the largest and longest study to consider the relationship between cell phones and brain tumors. Funded in part by the industry, the average person in the study used a cell phone for four minutes per day. People who used a cell phone for thirty minutes per day over a ten-year period on one side of the head had a 40% increased risk of a brain tumor.

41 Risk Evaluation of Potential Environmental Hazards from Low Frequency Electromagnetic Field Exposure Using Sensitive In Vitro Methods.

42 L. Slesin, "It's official: Mike Repacholi is an industry consultant and he's already in hot water," *Microwave News*, 11-13-2006; L. Slesin, "WHO and electric utilities: A partnership on EMFs," *Microwave News*, 10-1-2005.

43 A. Dalsegg, "Mobile phone radiation gives Gro Harlem Brundtland headaches," *Dagbladet*, Oslo, 3-9-2002.

(Today, a half-hour of daily mobile phone use would be considered “light” use; at the time of the study, it was considered “heavy.”)

The study did not consider the user’s exposure to a phone that is on standby, carried in a pocket or near the head while sleeping. It did not consider the combined risk of exposure from cell phones, cordless phones, Wi-Fi, living near antennas, and/or “smart” meters. It did not consider the risks of cell phone use incurred by pregnant women, infants, children, teens, young adults, or people with medical implants.

“Second-Hand” Exposure To RF Radiation and Health

Robert Kane, Ph.D., electrical engineer, author of *Cellular Telephone Russian Roulette: A Historical and Scientific Perspective* (Vantage Press, 2001): *Prior to the 1980s, human exposure to radio frequency radiating sources was pretty much restricted to the occasional passing police car, commercial mobile radio, or the ultra low-level RF energies emitted by the sun and a sparse array of remotely located television and radio broadcast antennae. Today, it is virtually impossible to venture into a public place without being battered by unwanted radio frequency radiation from a variety of sources.*

Available research indicates that operation of a nearby portable cellular telephone will expose a non-user to radiation, some of which will be deposited into the non-user’s brain at levels higher than necessary to elicit undesirable biological effects, even though the phone may be more than ten feet away from the non-user.

In 1992, Robert Kane sued Motorola, claiming that he developed a brain tumor as a result of testing a prototype antenna for a cell phone while employed by the company. The case was settled as a confidential employer-employee resolution. Dr. Kane died in March, 2005. He was 56.



Alex Richards, tech executive and entrepreneur, 60, California: *I bought my first cell phone in 1990. It felt like a brick. It had a really long antenna that I pulled out for each call, and it cost more than \$500. Still, I was ecstatic to own it: my clients could reach me anywhere. Back then, cell phone conversations rarely lasted long, because calls cost a dollar a minute. By 2000, with a lighter phone and a more affordable plan. I spent 2,000 minutes on it each month.*

One day in 2003, waiting in an airport for my luggage, I suddenly felt an electric jolt followed by drilling in the back of my head. I turned around: seven people were using cell phones. I grabbed my bag, left the airport, and the pain went away.

Over the next few years, repeatedly, I would feel drilling—then notice someone nearby on a cell phone. I still had one, but I didn't think it caused me problems. It was analog, not digital; and I seldom used it.

Meanwhile, I focused on my health. For example, I used my landline and got a speakerphone. Once, a client couldn't hear me clearly, so I used my headset. After about a minute and a half, I felt burning in my head that lasted an hour and a half. Later that day, I used the receiver, not the headset, and I felt heat again. So then I learned that I could only use the speakerphone.

I also began to wonder if my cell phone caused me trouble. I didn't use it for a week. Then, the first time I tried it, I felt burning in my head.

In 2006, suddenly, after a vacation, I felt exhausted, and I had drilling in my head again. If I moved from my chair, the drilling stopped. I quit my cell phone entirely that day. I took out our Wi-Fi, cordless phones, wireless printers, fluorescent lights and the electronic garage door opener.

I still felt sick. I started waking in the middle of the night, extremely anxious. I felt like an antenna: I could pick up signals

from cordless phones, Wi-Fi, taxi cab and police radios, game stations and cell towers.

My wife doubted my “electro-sensitivity.” She figured I had a brain tumor or a psychological issue. So, I went to a neurologist and a neuropsychologist who tested my memory, cognitive abilities and mental health. They also kept a cell phone in the room with its ringer off and told me to raise my hand whenever a call came in. During eight hours of testing, I raised my hand eleven out of thirteen times within seconds of the call. By the test’s end, the doctors and my wife no longer doubted my sensitivity. (Apparently, when a call comes in, the cell phone emits microwaves to confirm receipt; some people can sense them.)

I could feel Wi-Fi signals coming into our house. Whenever the teenager next door texted on his deck, I felt a jolt. During World Series’ commercials, when I figure people texted, I felt ripped. We installed EMF window shields, which helped some, but I still had constant pain. I told our neighbors about my problem and asked if they would move their Wi-Fi routers or get cabled access. Some said yes; others said no. Twice, I put up walls on our property to block Wi-Fi signals, but each time, the wall simply reflected cell phone coverage into our house. Installing Stetzer filters gave me significant relief. Within a few short years, I spent \$30,000 trying reduce my exposure and stay in my house.

In August, 2010, PG&E sent notices around our neighborhood that they would install “smart” meters. I phoned repeatedly, but they refused to talk with me. I panicked. I did not know how to protect myself from a transmitting utility meter. For a significant loss, we sold our dream house.

Then came the question, Where do we go? Since 2006, I’ve looked for respite from RF radiation all over the country and in Mexico. I have not found a place. I have resources, but I can’t

know where “smart” meters or cell towers will get installed or whether neighbors would work with me. I know of no place that legally prevents military, TV and radio satellites or wall-to-wall 4G.

Wi-Fi and Health

Common symptoms from being around Wi-Fi include headaches, fatigue, nausea, rashes, and difficulty sleeping.

According to epidemiologist Samuel Milham, MD, MPH, “When industry apologists say that fields (like Wi-Fi) are too weak to cause biological effects, I point them to any number of electro-therapeutic devices, such as pulsed high-frequency field generators, that accelerate the healing of bone fractures. Anything that can stimulate cell division and growth is a potential carcinogen.”⁴⁴

In isolated human cells, Wi-Fi-like signals can activate the “cell suicide” response.⁴⁵

According to environmental consultant Stan Hartman, having a Wi-Fi antenna in a router on your desk gives you about the same amount of radiation that you would get thirty meters or less from a typical cellular antenna.⁴⁶

In 2006, the Simcoe County School District in Ontario, Canada installed Wi-Fi. Since that time, in at least fourteen of the district’s schools have students who became ill with speeding heart rate, fatigue, and headaches. Two teenaged students had cardiac arrests and went on heart medication. “Now,” Rodney Palmer, spokesman for the Simcoe Safe School Committee, reported to Canada’s Parliamentary Standing Committee on Health in December, 2010, “every school in Simcoe

44 S. Milham, MD, MPH, *Dirty Electricity*, iUniverse.com, 2010.

45 S. Leea et al, “2.45 GHz radio frequency fields alter gene expression in cultured human cells,” *FEBS Letters*, vol. 579 (2005): 4,829.

46 C. Reese and M. Havas, *Public Health SOS*, 2009.

County has its own defibrillator, as though teenage heart attacks are normal.”⁴⁷



Andrew Goldsworthy, PhD biologist, UK: *Like mobile phone signals, Wi-Fi signals can be expected to cause cell membranes to leak and calcium ions to flow through them in a relatively uncontrolled way. In the classroom, this may result in children’s brains losing the ability to concentrate. Wi-Fi should therefore be considered an impediment to learning, rather than an aid. Wi-Fi may be particularly hazardous to pregnant teachers, since exposing the brain of a fetus or a very young child to EMR prevents normal brain development. Autism may result.*⁴⁸

Effects on the nervous system are equally damaging since hyperactivity here can cause sensations such as pain, heat, cold and pins and needles. Hyperactivity in the cells of the inner ear can cause tinnitus (ringing in the ears). It can affect the sense of balance, causing dizziness and symptoms of motion sickness, including nausea. Students showing any of these symptoms should be treated with sympathy, and the Wi-Fi should be switched off.

Because of genetic and environmental variability, not everyone will suffer the same symptoms. Some may not suffer at all. For the sake of those who do suffer, Wi-Fi is not a good idea in schools—or anywhere else for that matter. Hard-wired cabled access is a healthier choice.

47 J. Nelson, “Jumping off the wireless bandwagon,” *The Monitor*, Canadian Center for Policy Alternatives, 3-1-2011; also see www.safeschool.ca.

48 J. F. Krey, “Molecular mechanisms of autism: A possible role for Ca²⁺ signaling,” *Current Opinion in Neurobiology*, vol. 17, no. 1 (2007): 112–119.

Radio-Frequency Signals and Autism

In a 2013 paper in *Pathophysiology*, Harvard pediatric neurologist Dr. Martha Herbert and *BioInitiative Report* coeditor Cindy Sage write that “dramatic increases in reported Autism Spectrum Conditions (ASC)...are coincident in time with the deployment of wireless technologies.” They outline evidence of plausible links between ASC and exposure to “low-intensity (non-thermal)” EMF/RFR levels. For example, “EMF/RFR exposure during pregnancy may send spurious signals to developing brain cells during pregnancy, altering brain development during critical periods, and may increase oxidative stress and immune reactivity that can increase risk for later developmental impairments, with further disruption later in development increasing risk, physiological dysregulation and severity of outcome.”

Herbert and Sage clarify that while their paper “does not prove that EMF/RFR exposures cause autism...it does raise concerns that they could contribute by increasing risk, and by making challenging biological problems and symptoms worse in these vulnerable individuals.” They urge schools, physicians and parents to take precautionary measures and provide children wired (not wireless) learning, living, and sleeping environments.



Dr. Goldsworthy: *Some genetic forms of Autistic Spectrum Disorders (ASD) can be accounted for by known mutations in genetic coding for ion channels that result in an increased background concentration of calcium in neurons. This would be expected to lead to neuronal hyperactivity and the formation of sometimes inappropriate synapses, which in turn can lead to ASD.*⁴⁹

49 T. Hawley and M. Gunner, “How early experiences affect brain development” (2000), <http://tinyurl.com/5u23ae>.

Before and just after birth, a child's brain is essentially a blank canvas. Then it goes through an intense period of becoming aware of new sensory input—e.g., recognizing its mother's face, her expressions, and eventually other people and their relationship to him or her.⁵⁰ During this process, the neurons in the brain make countless new connections, and the brain stores what the child learns. After a few months, connections that are rarely used are pruned. The patterns that remain could become hard-wired into the child's psyche.

If the child is exposed to radio frequencies during this period, the production of too many and often spurious signals will generate frequent random connections. These will not be pruned, even though they may not make sense. Because the pruning process in children exposed to RFs may be more random, these children—who may have more brain cells than the rest of us and may actually be savants—may lack the mindset for normal patterns of social interaction. This may then contribute to the various autistic spectrum disorders.

How Is Exposure to Radiation from Microwave Ovens Different from Radiation Emitted by Telecommunications?

Microwave ovens operate at 2.4 GHz. But they're used only for short periods and are shielded to prevent leakage—although they always leak slightly through their windows. (To test leakage on your microwave oven, unplug it, put a mobile phone inside and close the door. If the phone can receive a call, your oven probably leaks.)

Typically, Wi-Fi transmits, at 2.4 GHz. Because of widespread deployment of wireless devices, telecom antennas and “smart” meters, people are now constantly exposed to RFs

50 P. R. Huttenlocher and A. S. Dabholkar, “Regional differences in synaptogenesis in human cerebral cortex,” *Journal of Comparative Neurology*, vol. 387, no. 2 (1997): 167–178.

between 800 MHz and 2.4 GHz.⁵¹ These frequencies are new for humans and wildlife: they are not found in nature. It's also worth noting that cellular antennas require power supplies that may affect the power quality of nearby electrical systems.

How Does Living Near a Cellular Antenna (a Base Station) Affect Health?

Studies find that people living near a base station experience fatigue, headache, sleep disruption, irritability, depression, decreased libido, memory loss, dizziness, nausea, increased risk of cancer, tremors, loss of appetite, rashes, visual disruptions and overall discomfort.⁵²

People who live within 350 meters of a cellular antenna for more than a decade experience a four-fold increase in cancer rates. Among women, the increase is tenfold.⁵³

People who live within 200 to 500 feet of an antenna report genetic, growth and reproductive effects; increases in the permeability of the blood-brain barrier; behavioral, molecular, cellular, and metabolic effects; and an increased risk of cancer.⁵⁴

51 R. Santini et al, "Survey study of people living in the vicinity of cellular phone base stations," *Electromagnetic Biology and Medicine* vol. 22, no. 1 (2003): 41-49.

52 B. Levitt and H. Lai, "Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays," *Environmental Reviews*, vol. 18 (2010): 369-395. H. P. Hutter et al, "Mobile phone base stations: Effects on health and wellbeing," *Pathophysiology*, vol. 16 nos. 2-3 (2009): 123-135.

53 R. Wolf and D. Wolf, "Increased incidence of cancer near a cellphone transmitted station," *International Journal of Cancer Prevention*, vol. 1, no. 2 (2004). Review by M. Kundi, "Evidence for childhood cancers (leukemia), brain tumor epidemiology, III: Epidemiological studies of RF and brain tumors," C. Selvin et al, "The BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields" (<http://www.bioinitiative.org/>).

54 B. Levitt, *ibid*.

In Brazil, from 1996 to 2006, researchers tracked people who lived within 500 meters of a base station. They found 34.76 deaths by neoplasia (some kind of tumor) per 10,000 inhabitants. Outside of this area, a *decrease* in the number of deaths by neoplasia occurred.⁵⁵

In Israel, living near a cellular antenna for one year led to a dramatic increase of cancer. The increase correlates with previous data on significant increase in leukemia among people who live near broadcasting towers in Honolulu⁵⁶ and Hawaii.⁵⁷

Egyptian researchers found that long-term (six years) exposure to cellular antennas and mobile phones negatively impacts human hormone profiles: cortisol, serum progesterone (in females), and thyroid hormones are all affected.⁵⁸

After a cellular antenna was installed in Rimbach, a small town in Bavaria, Germany, sixty residents had their urine tested regularly over eighteen months, beginning in Spring, 2004. Participants' stress hormones (adrenaline and noradrenaline) increased significantly; their dopamine and phenylethylamine levels decreased substantially. While participants maintained their usual lifestyle, they experienced increases in sleep problems, headaches, dizziness, concentration problems, and allergies.

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- 55 A. C. Dode et al, "Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil," *Science of the Total Environment*, vol. 409, no. 19 (2011), 3,649-3,665
 - 56 J. R. Goldsmith, "Epidemiologic evidence of radio frequency radiation (microwave) effects on health in military, broadcasting, and occupational studies," *International Journal of Occupational and Environmental Health*, vol. 1, no. 1 (1995): 47-57.
 - 57 G. Maskarinec et al, "Investigation of increased incidence in childhood leukemia near radio towers in Hawaii; preliminary observations," *Journal of Environmental Pathology, Toxicology and Oncology*, vol. 13, no. 1 (1994): 33-7.
 - 58 E. F. Eskander et al, "How does long term exposure to base stations and mobile phones affect human hormone profiles?" *Clinical Biochemistry*, vol. 45, nos. 1-2 (2012): 157-161.

Because chronic disruption of hormones damages health in the long run, researchers expect “major health problems” from long-term exposure to radiation from cellular antennas.⁵⁹

For an excellent film about living near an antenna, see “Resonance: Beings of Frequency” by James Russell, available for free at vimeo.com. To learn how many antennas are in your neighborhood, go to www.antennasearch.com and type in the address of your home, school, or workplace. Or, locate any type of transmitter at the FCC Dashboard: <http://reboot.fcc.gov/reform/systems/spectrum-dashboard.fcc>.

“Smart” Meters and Health

In June 2012, in the Quebec-based magazine, *La maison du 21e siecle*, fifty-four scientists and health professionals from around the world released “Smart Meters: Correcting the Gross Misinformation.” This statement explains that “if a smart meter is located on a wall with a bedroom or kitchen, the RF exposure can be the same as if you are within 200 to 600 feet of a cell tower with multiple carriers. With both cell towers and “smart” meters, the entire body is immersed by microwaves that go out in all directions, which increases the risk of overexposure to many sensitive organs, such as the eyes and testicles. With a cell phone, people are exposed to microwaves primarily in the head and neck (unless using speaker mode), and only when they use their device.” These fifty-four scientists and medical experts urgently recommend a return to analog mechanical meters.

According to environmental consultants Sage Associates, “smart” meters violate the FCC public safety standards and endanger people with medical implants as well as developing

59 K. Buchner and H. Eger, , “Changes of clinically important neurotransmitters under the influence of modulated RF fields: A long-term study under real-life conditions,” *Umwelt-Medizin-Gesellschaft*, vol. 24, no. 1 (2011): 44–57.

fetuses and children whose central nervous systems continue to develop into their late teens.⁶⁰

For a video of a man whose pacemaker shut off after “smart” meters were installed around his neighborhood, go to youtube.com/watch?v=BRDhogkdxW4.

In Austin, Texas, Dr. Laura Pressley and her husband noticed that their legs twitched every 25 seconds at bedtime. A meter determined that the wireless utility meter near their bedroom also pulsed every 25 seconds.⁶¹

To refuse installation of a radiation-emitting surveillance device on your property or residence, see Jerry Day’s letter in the appendix.



Judy Neal, 52, Northeast: *I had good health, a cell phone and Wi-Fi until September 2009. I work at home, but starting that month, I could not focus enough to work. I could not remember words or where I’d put things. Every night, I woke up several times, agitated. I was always on high alert. Privately, I wondered if I had Alzheimer’s.*

In February 2010, during a winter storm, our electricity kept going off and on. I got a high-pitched, painful ring in my right ear. I started having heart palpitations and nightmares, and my other symptoms got stronger. I wondered if something was wrong with our electricity. My electrician wondered if my electric company had installed “one of those new meters” on our home. They had—in June 2009.

After several phone calls and a letter from my doctor, my electric company removed the transmitting “smart” meter.

60 Sage Associates, “Thirteen Flaws of Smart Meter Technology,” 2011; www.sagereports.com.

61 See an interview with Dr. Pressley, “Is Your Smart Meter Causing Brain Damage?” at youtube.com/watch?v=dhF6C_pB22g&feature=em-uploadermail.

Within days, the pulsing and loud buzzing quieted, and my thinking got clear again. But now, if I am near a cell phone or Wi-Fi or if I drive by a cell tower, I get sharp pain in my head and pressure in my ears.

I consider the “smart” meter my tipping point. Unfortunately, my neighborhood is still flooded with them. Each one transmits pulses of microwave radiation 24/7. When I requested studies about the meters’ effects on human health, my electric company told me I would need a subpoena.

In the fall of 2012, I compiled a list of friends and acquaintances in my town (population 8,000) who’ve gotten sick or died since transmitting meters were installed here:

- Three men (48, 55, and 60) and one woman (70) died of a massive heart attack in 2009; previously, none of them was known to have a heart condition.*
- Two women, who had each been in remission from breast cancer, had recurrences. One has died. The other is currently in treatment.*
- Two women in their fifties committed suicide.*
- One woman in her forties suffered a stroke.*
- Several people now have high blood pressure and tinnitus, problems they did not have before.*

When I reported this at a city council meeting, members of a Boy Scout troop, attending for another matter, spoke up and said that they have headaches and cannot sleep. Then, a friend told me that she knows seven people newly diagnosed with cancer. In 2013, two more men in their 40s had heart attacks; one died.

We need independently funded studies about the health effects of these meters, including when they’re installed on homes that have Wi-Fi, DECT cordless phones, fluorescent lights and/or digital appliances. States that have not yet

installed them need to wait until such tests have been conducted, because too many people are getting sick.



Nannette Proctor, 39, Northwest: *After our town got “smart” meters, my husband went on anti-anxiety medication for the first time. Two years later, our twelve-year-old told me that she did not do well on tests because she could not remember what she had studied the night before. That sobered me. I got the “smart” meter removed from our house.*⁶²

Other Health Effects of Electrification and Exposure to Wireless Devices

Diabetes

Until the 1950s, childhood type 1 diabetes was rare. Soon after the middle of the century, epidemiologists noted a rapid increase in the disease. Within a genetically stable population, a rapid change suggests that children were reared differently, or that something in their environment has changed.⁶³ Could electrification have contributed to the increase in childhood diabetes?

In a 2013 paper, epidemiologist Samuel Milham, MD, wrote, “The epidemics of obesity and diabetes, most apparent in recent years, had their origins with Thomas Edison’s development of distributed electricity in New York City in 1882. His original direct current (DC) generators suffered serious brush arcing, which is a major source of high-frequency voltage transients (dirty electricity). From the onset of the electrical grid, electrified populations have been exposed to dirty electricity. Diesel generator sets are a major source of dirty electricity today and

62 For a catalog of symptoms reported by ratepayers after “smart” meter installation, go to EmfSafetyNetwork.org.

63 E. A. Gale, “The rise of childhood type 1 diabetes in the 20th century,” *Diabetes*, vol. 51, no. 12 (2002): 3,353–3,361.

are used almost universally to electrify small islands and places unreachable by the conventional electric grid. This accounts for the fact that diabetes prevalence, fasting plasma glucose and obesity are highest on small islands and other places electrified by generator sets and lowest in places with low levels of electrification, like sub-Saharan Africa and east and Southeast Asia.”⁶⁴



Anton Mark, 37, Midwest: *Doctors don't really know why the immune system attacks the pancreas and causes Type I diabetes. I was diagnosed with it at eleven. I've wondered if exposure to high frequency fields could cause the disease, at least in part.*

When the house I grew up in was built, no one expected to use more electricity than it took to operate a few lightbulbs. Starting in the late seventies, my parents gradually rewired the house's inside. But the wires coming from the utility service—installed in the 1940s—were not replaced. Eventually, the insulation on these wires hung in shreds, and a pine tree grew into them. Each time a pine needle touched a wire, the house got an arcing event. Looking back, the tree likely started hitting the electrical wires in the year or two before I was diagnosed with diabetes, and my mother was diagnosed with rheumatoid arthritis.

My slender, active sister was recently diagnosed with Type I diabetes at 28. In the years before her diagnosis, she had a wireless router on the wall beside her bed and became very attached to her cell phone. At the time of her diagnosis, her home had two “smart” meters.

Is her diabetes a coincidence? Perhaps. But on an extended backwoods hike that she took after her diagnosis, she needed almost no insulin.

64 S. Milham, “Evidence that dirty electricity is causing the worldwide epidemic of obesity and diabetes,” *Electromagnetic Biology and Medicine*, vol. 33, no. 1 (2014); 75–78.

I switched from insulin shots to a pump to improve my blood-sugar control at twenty-three. As a farmer, I'm not often around wireless devices. No coworkers' cell phones; no close neighbors with Wi-Fi. A few years ago, I visited friends who turned off their wireless router during my stay. Then, a couple of hours before I left, they turned it back on. My blood sugar jumped to 260. Normally, I try to keep it between 80 and 120.

Visiting my sister's home, my blood sugar soared to 360 and stayed there in spite of repeated doses of insulin.

Another time, I harvested corn for a neighbor. For three hours, he and his cell phone rode with me in the cab of a combine. I started to feel unwell and agitated, so I tested my blood sugar. It was close to 300, and would not come down, even as I took appropriate doses of insulin. Once my neighbor and his cell phone left the combine and my insulin began to work, my blood sugar dropped like a rock to 30—dangerously low. I had to drink several cans of root beer to bring it back to safe levels.

In my experience, radio-frequency signals from wireless devices impair the action of insulin, stress the pancreas, and impair and hyperactivate the immune system. Certainly, I do not like subjecting myself to dangerous extremes, which wireless devices appear to cause. To safeguard my health, limiting my exposure to cell phones and Wi-Fi now means limiting my participation in society.

I'm a slender, physically active man. Does my experience explain why diabetes has become a national epidemic?

Along with Dr. Milham's observations, a 2009 email to the EMR Policy Institute responds to Anton's question. Richard Whitehead, a concerned citizen, compared the percentage of people in seven industrialized countries who had insulin-dependent

diabetes from 1993 to 1994⁶⁵ with the percentage of people who had cell phones in 1995.⁶⁶ Whitehead found:

Country	Diabetes rate	Cell phone use
Finland	36%	24.7%
Denmark	22%	21.9%
Norway	21%	24.6%
Great Britain	13%	10.2%
The United States	9%	14.4%
France	8%	2.9%
Germany	7%	5.7%

“Generally, but not exactly,” Mr. Whitehead observed, “the insulin-dependent diabetes rate coincides with the cell phone penetration rate. Of course, this doesn’t prove a relationship, but when considered along with the 1994 study by Navakattikian showing a serious drop in insulin caused by radio frequency non-ionizing radiation, it certainly looks suspicious. It is also interesting,” he continues, “that diabetes has increased steadily in recent years, right along with the increase in radiation-producing technology. Diabetes is often thought to be caused by obesity, but the obesity rate in the above countries does not coincide with the diabetes rate at all. According to the International Obesity Task Force,⁶⁷ England, Germany, and Finland’s obesity rates are 40 to 45%. The U.S. is about 50%. France, Sweden, and Norway are around 20 to 25%.

65 Data from “Prevalence and incidence of insulin-dependent diabetes” by R. E. LaPorte et al, <http://diabetes.niddk.nih.gov/dm/pubs/america/pdf/chapter3.pdf>.

66 Statistics are from IDATE World Atlas of Mobiles/Washingtonpost.com 1995 data.

67 See www.obesity.chair.ulaval.ca/ITOF.htm.

Whitehead also noted an article that appeared in the November 16, 2000, *Christian Science Monitor*, “Two Border Cities Seek End to Communications Chaos.” The article described an enormous proliferation of mobile phone usage and, thereby, cellular antennas, in Laredo, Texas. Meanwhile, the Laredo Health Department found an unusually high diabetes rate among their citizens. At the February 7, 2000, Laredo City Council meeting, Councilman Joe. A. Guerra stated that “Webb County has the highest death rate due to diabetes.” Webb County’s death rate from diabetes was 55.5 out of 100,000, while the average rate for counties on Texas’ western border (including Webb) was 43.6.⁶⁸



Emma Gunn, 31, Pennsylvania: *At twelve, I was diagnosed with type 1 diabetes, even though I ate very little sugar as a child. We had organic, homemade meals, fresh fruit and vegetables for snacks. I think I got the disease because my mother had dental mercury removed while she was pregnant with me, and then I had several vaccines in my early childhood.*

A few years ago, I got an insulin pump to help steady my blood sugar levels. Still, I find myself in precarious situations several times each month. If my blood sugar level gets too low, I can lose consciousness. I need juice or glucagon. I may need to call for help.

Before I had a cell phone, having type 1 diabetes meant that I needed another person and/or a landline near me at all times. I still have a landline, but the cell phone lets me be independent and mobile.

Recently, I’ve learned about the hazards of RFs and magnetic fields. I see that there are no easy answers—for me or for anyone. I have to admit that even with all I’ve learned—and

⁶⁸ See www.ci.laredo.tx.us/city-council/council-activities/council-minutes/2000Min/M2000-R-04.html.

the fact that I get a headache if I use my cell phone for more than a minute, I don't feel able to let go of it.

Allergies, Rashes, Asthma, and Cellular Inflammation

In May 2013, the Centers for Disease Control and Prevention reported that one in eight children now has eczema and other skin allergies, an increase of 69% from a survey conducted in the late 1990s. About one in twenty children now has food allergies, a 50% increase from the earlier survey. Dr. Lara Akinbami, the report's senior author, says that researchers don't know the cause of these dramatic increases.⁶⁹

Dr. Hajime Kimata, who has published research in the *International Archives of Allergy and Immunology*, says that mobile phones raise the levels of certain chemicals in the blood. These chemicals “provoke allergic reactions such as eczema, hay fever and asthma. Mobile phone radiation can ‘excite’ antigens—substances that cause allergies—in the bloodstream of people who already suffer from allergies.”⁷⁰

To hear cardiologist Stephen Sinatra, MD discuss why radiation from wireless devices is the number one cause of cell inflammation, how human-made EMFs cause cell death and can lead to brain cancer, heart disease, chronic fatigue, fibromyalgia, and more, go to www.heartmdinstitute.com/v1/wireless-safety/cordless-phone-use-can-affect-heart.

Neurological Diseases, Including Dementia

While mortality rates in twenty Western countries have decreased in the last few decades, death by neurological diseases

69 J. Silverberg et al, “Prevalence of allergic disease in foreign-born American children,” *JAMA Pediatrics*, vol. 167, no. 6 (2013) 554–560. M. Stobbe, “Study: Food, skin allergies increasing among children,” Associated Press, May 2, 2013.

70 See www.healthandgoodness.com/article/cell-phone-radiation-and-allergies.html.

such as Parkinson's, motor neuron disease, hereditary neuromuscular conditions, prion disorders, degenerative diseases and Alzheimer's has increased. Some countries report increasing rates of dementia, as well as early onset dementia and increasingly younger patients with motor neuron disease. In looking for potential environmental explanations, several British scientists suggested that "increased home technology involving increased background electromagnetic fields" from mobile phones, microwave ovens, computers, etc. might be involved.⁷¹

Meanwhile, in South Korea (perhaps the world's most digitally connected country, where more than 67% of the population has a smartphone and more than 64% of teenagers have one), doctors report a surge in "digital dementia" among young people: they have become so dependent on electronic devices that they can't remember details like their own phone numbers. Doctors are witnessing deterioration in young peoples' cognitive abilities that is similar to people who have suffered a head injury or a psychiatric illness. Dr. Byun Gi-won, a physician at Seoul's Balance Brain Center, told the *JoongAng Daily* that heavy users of smartphones and game devices are likely to develop the left and right sides of their brains disproportionately, leaving the right side "untapped or undeveloped."⁷²

Addiction to Mobile Devices

Addiction is compulsive behavior beyond an individual's control. When does use of a substance such as alcohol or a painkiller—or a behavior like using a cell phone—become an unhealthy addiction? Typically, psychologists consider the frequency of use, the amount of money spent on it, and the

71 C. Pritchard et al, "Changing patterns of neurological mortality in the 10 major developed countries 1979–2010," *Royal Society for Public Health*, vol. 127, no. 4 (2013): 357–368.

72 See www.telegraph.co.uk/news/worldnews/asia/southkorea/10138403/Surge-in-digital-dementia.html/.

degree to which the use interferes with family, social, and work relationships.

Addictive behavior is based in neurophysiology: the drug or behavior acts on the brain's neurotransmitters by creating pleasurable sensations and a "reward" system that keeps the user using more. The substance or behavior signals the brain that it (i.e., getting a text) is beneficial, which moves the user to increase message-checking.⁷³ This mechanism, sometimes called the dopamine effect, is not accessible to the conscious mind.

Microwaves (frequencies required for mobile devices to operate) increase activity of brain endorphins or endogenous opioids, which are the biological base of addiction to opium, alcohol, and morphine.⁷⁴

Exposure to radio-frequency fields activates benzodiazepine receptors (which relate to anxiety and stress responses) in a rat's brain.⁷⁵ The RFs probably reinforce the euphoric qualities of opiates. The brain's neurotransmitters are sensitive to weak, modulated microwaves—such as those found in cell phone radiation.⁷⁶ Whole body exposure (like that experienced around

73 J. Tirapu et al, 2004.

74 M. Paz de la Puent and A. Balmori, "Addiction to cell phones: Are there neurophysiologic mechanisms involved?" *Proyecto*, vol. 61 (Mar. 2007): 8–12; in English at emfacts.com.

75 C. Braestrup et al, "Benzodiazepine receptors in the brain as affected by different experimental stresses: The changes are small and not unidirectional," *Psychopharmacology* (Berlin), vol. 65 no. 3 (1979): 273–277; H. Lai et al, "Single vs. repeated microwave exposure: Effects on benzodiazepine receptors in the brain of the rat," *Bioelectromagnetics* vol. 13, no. 1, (1992): 57–66; B. M. Walker and A. Ettenberg, "Benzodiazepine modulation of opiate reward," *Experimental and Clinical Psychopharmacology*, vol. 9 no. 2 (2001): 191–197, .

76 W. R. Adey, "Electromagnetic fields, the modulation of brain tissue functions: A possible paradigm shift in biology," in G. Adelman and B. Smith (eds.), *International Encyclopedia of Neuroscience*, 2003.

“smart” meters, Wi-Fi, and/or a security system) can also activate endogenous opioids in the brain.⁷⁷

How do these scientific discoveries relate to real lives? In 2006, 90% of 106 students surveyed at the University of Staffordshire in Stoke-on-Trent in UK admitted that they took their phones everywhere. Nearly 40% said that they could not cope without their cell phone. Thirty-five percent said that they used mobile devices to escape their problems. Seven percent blamed their phone for the loss of a significant relationship or job.⁷⁸ Dr. David Sheffield, who administered the survey, likened such cell phone use to a gambling addiction. He also found that when the students used their cell phones less, their blood pressure lowered.⁷⁹

In 2008, at the University of Northampton in the UK, Nada Kakabadse, a professor at the Northampton Business School, found that one third of the workers she surveyed who used a mobile phone for work showed signs of addiction similar to alcoholics. At first, using a mobile phone made workers very productive, but then they became very anxious if their gadget was not nearby.⁸⁰

What are other characteristics of addiction to portable technology?

- a compulsion to reply to each new message, which leads to tiring and slowing down the brain.

77 H. Lai et al, “Intraseptal microinjection of beta-funaltrexamine blocked a microwave-induced decrease of hippocampal cholinergic activity in the rat,” *Pharmacology Biochemistry and Behavior* vol. 53, no. 3 (1994): 613–616; M.A. Rojavin and M. C. Ziskin, “Electromagnetic millimeter waves increase the duration of anesthesia caused by ketamine and chloral hydrate in mice,” *International Journal of Radiation Biology*, vol. 72, no. 4, (1997): 475–480.

78 See www.msnbc.msn.com/id/14832639/.

79 M. Paz de la Puente and A. Balmori, “Addition to cell phones,” *ibid*.

80 Forbes.com.staff04.03.08.

- spending more time with a mobile device than with family.
- the time between work and play becomes blurred so that the work-week never ends.
- the overwork leads to more stress and tiredness, less intimacy, more conflict with partners and premature career burnout.
- decision-making processes and judgments are impaired.⁸¹
- *nomophobia*, fear of being without a phone, increases.⁸²
- people are always partly somewhere else.

In Spain, in 2008, two children, ages twelve and thirteen, were admitted to a clinic for addiction because they had lied to relatives in order to get money for phones. They'd become irritable, antisocial, and their schoolwork had deteriorated. Dr. Jose Martinez-Raga, an addictions expert, warned that these cases could be "the tip of the iceberg."⁸³

Even toddlers now show signs of addiction to mobile devices. In 2013, a four-year-old who used an iPad up to four hours each day became "distressed and inconsolable" whenever her parents took the device away from her. The parents enrolled her in digital detox. According to Dr. Richard Graham, founder of London's Capio Nightingale Clinic, when their devices are taken away, young technology addicts experience the same withdrawal symptoms as alcoholics or heroin addicts.⁸⁴

In a 2013 survey of more than one thousand parents conducted by www.babies.co.uk, more than half allowed their babies to play with mobile phones and tablets. One in seven

81 See www.news.bbc.co.uk/1/hi/programmes/click_online/6411495.stm.

82 "Rise in Nomophobia: Fear of Being without a Phone," www.telegraph.co.uk/news, 2.16.12.

83 See www.news.bbc.co.uk/go/pr/fr/-2/hi/europe/7452463.stm.

84 See www.telegraph.co.uk/technology/10008707/Toddlers-becoming-so-addicted-to-iPads-they-require-therapy.html.

parents admitted that they let their babies use the devices for four or more hours per day.⁸⁵



Cindy Sage, M.A., Coeditor of the *BioInitiative Reports*, environmental consultant: *If the use of cell phones is physiologically addictive, then these devices need to be classified as drug delivery systems and regulated as such. Certainly children should not use them at all until this mechanism is more fully understood.*

Medical Implants

A brochure from pacemaker manufacturer Biotronik states that “pacemakers are protected against the impact of electric devices and their radiation to the greatest extent possible. However, if you should experience symptoms, such as increased heartbeat, irregular pulse or dizziness in the vicinity of electric devices, please move away from the device immediately and/or turn off the external device.” The brochure also says, “You can use (a cellular) phone without hesitation.” And, it states, “If you want to use a cellular phone, you should talk to your physician. To prevent possible interference, you should always hold the cell phone at the side opposite from the implanted pacemaker. *Even when not in use* (emphasis added) you should not keep it close to the pacemaker.”

Testing and regulation of the effects of interference on medical implants are long overdue. After he had a DBS implanted for Parkinson’s, a man drove his hybrid car. Each time the car’s charging system came on at a stoplight, his DBS shut off.



85 Ibid.

Gary Olhoeft, PhD, geophysicist and electrical engineer: *The Medtronic manual for my deep brain stimulator (implanted to ease effects of Parkinson's) lists more than sixteen pages of potential electromagnetic interferences. I have experienced interference with the operation and programming of my medical implant in elevators, on large commercial aircraft, at malls, libraries, government buildings and other places with security systems. Because interferences are almost everywhere, I built a monitor to carry around and warn me of potential hazards to avoid, including security and inventory control systems, Wi-Fi, "smart" meters, cell and radio/TV towers, wireless phones and wireless devices, buildings with faulty wiring, light dimmers, certain appliances, and many more.*

If I walk through a security system—like the ones commonly found in retail stores, airports, government buildings or in the library at the university where I teach—my DBS sometimes shuts off. I have four seconds to reset it or I shake so badly that I am unable to reset it without help.

The National Institute of Health estimates that twenty-five million Americans now have implanted medical devices. Besides brain stimulators, the functioning of cardiac pacemakers, insulin pumps, cochlear implants and bone stimulators can also be disturbed by RF signals. A disabled person's getting x-rayed while sitting in a metal wheelchair can be especially dangerous.

A friend with an insulin pump has to shut it off when he flies, because his pump interferes with the plane's avionics, and they interfere with his pump. This limits how far he can travel. A former student told me that if she's around several people using cell phones, her insulin pump malfunctions.

After another friend with a brain stimulator and a pacemaker had a cochlear implant installed, the signals from his implants interfered with each other. Each device functioned

inappropriately, and he experienced tremendous discomfort. The surgeons who installed the devices suggested that his home's electrical system was the source of his trouble. They did not believe that implants could interfere with each other. They can. Unfortunately, medical implants are not regulated for such interference; and my friend—who is an MD—had to prove to his physicians that they were causing him trouble.

Recently, at a meeting of people with brain stimulators for Parkinson's, I asked if any of their implants shut off when they walk through security doors at malls and other places. Fifty people were in the room. Everyone raised a hand.

But no agency studies the effects of radio-frequency signals on medical implants. Even doctors who implant devices are likely unaware of the problems—though implant manufacturers typically alert patients to pages of dangers in their manuals.

Medical Equipment

Medical equipment—including fetal monitors used in hospitals and cardiac pacemakers as well as sensitive, personal medical information—has become vulnerable to hackers. Increasingly, computer viruses and “malware” infect computers that view X-rays and CT scans; they can cause equipment to slow down or shut off. In 2010 and 2011, several hospitals temporarily closed their cardiac catheterization labs (which widen blocked arteries), because of infected devices.⁸⁶

According to John Halamka, chief information officer of Boston's Beth Israel Deaconess Medical Center, on a typical day, the hospital runs about 15,000 devices on its computer network. About 500 of these devices use older operating systems that are

86 See www.washingtonpost.com/national/health-science/facing-cybersecurity-threats-fda-tightens-medical-device-standards-2013/06/12/b79ccofe-d3jo-11e2-b051-3ea310e7bb5a_story.html.

especially susceptible to malware infections beyond the hospital's direct control.⁸⁷

In August 2012, the U.S. Government Accountability Office reported that defibrillators and insulin pumps are vulnerable to hacks.

To access hospital computers that hold patient records, physicians need to enter their password at various computers, sometimes hourly. When a nurse keeps a doctor "logged in" and when computers are left unattended, sensitive medical information becomes vulnerable.⁸⁸

Medical equipment may also affect health.



Katharine J. Lee, 66, New Mexico: *At 38, I was diagnosed with multiple sclerosis (MS). Call it an electrical problem: there's miscommunication between my brain and the rest of my body. At 57, I got a power wheelchair. It frees me to use my stamina for things other than rock-bottom essentials. It also means that I sit on two batteries every day and charge them several nights each week. I sense that the digital electronics, the batteries and their recharging are potentially harmful to me. But even with the risks involved, the power chair gives me so many benefits that I can't imagine living without it.*

Is there a way to shield myself from the batteries? Would filters make my electrical system safer while the batteries charge? Where can I go for information about this?



Emma Gunn, 31, Type 1 diabetic, Pennsylvania: *In the spring of 2013, I got a stomach virus. After nearly twenty-four hours of vomiting, I went to the hospital. In the ICU, I was wired to*

87 Ibid.

88 Ibid.

several monitors and a digitalized IV drip that gave me anti-nausea medication and another drug (that I am usually on) to raise my blood pressure. For four days, vomiting and dry heaves continued. When my blood pressure went up to 166/115, the drug that raises blood pressure was stopped. I was given another drug that lowers it. I could barely talk.

On Day 4, the virus began to subside. The time between vomiting got longer. I moved out of the ICU into a room that did not have a wired heart monitor—only a wireless one. This room also had a view of a cell tower about a quarter of a mile away. My health continued to improve, but I felt that the wireless monitor kept me from fully regaining my strength.

My mother told the doctor that Dr. Magda Havas, a medical researcher, found that blood-sugar control⁸⁹ and blood pressure⁹⁰ are affected by the radio-frequency signals that wireless devices use to operate. She asked if he could remove the wireless heart monitor.

Hospital policy states that when blood-pressure meds are delivered intravenously, the patient must wear a heart monitor. This good doctor realized that if I took the medication orally, then he could remove the wireless monitor.

My blood pressure normalized as soon as the monitor came off. I left the hospital the next day. My doctor wondered whether other patients are affected by wireless and digitalized equipment.

Indeed, I wonder how exposure to such equipment affected me. I wonder how medical workers are affected since they're

89 M. Havas, "Dirty electricity elevates blood sugar among electrically sensitive diabetics and may explain brittle diabetes," *Electromagnetic Biology and Medicine*, vol. 27, no. 2 (2008): 135–146.

90 M. Havas et al, "Provocation study using heart rate variability shows microwave radiation from 2.4 GHz cordless phones affects autonomic nervous system," *European Journal of Oncology*, vol. 5, (2010): 273–300.

exposed to wireless transmitting medical equipment throughout the work week—along with cell towers, Wi-Fi, fluorescent lights and wireless keyboards. I wonder what my options are if I get dangerously sick again.

While the FDA has the authority to regulate digitalized and wireless medical devices, Congress does not provide the funding to do so.

In the U.S., Canada, and Sweden, some hospitals have designated low-EMF zones.

Fertility

Fertility is the ability to reproduce. The quality of fertility matters to the health of every family—and to every community's survival. Every family and community that welcomes a baby wants him or her healthy—and for parents to keep healthy at least until their children reach adulthood. To begin, then, women need healthy menstrual cycles. Men need erectile function and healthy sperm. Women need healthy pregnancies.

In 1997, I began teaching natural family planning (NFP), a method of birth control also used as an aid for those who want to conceive. Based on charting a woman's waking temperature and cervical fluid, the method provides women an accurate way of knowing when they are fertile and infertile. By 2004, when my book, *The Garden of Fertility*, was published, one third of my NFP students were not ovulating. This correlated with national statistics about the percentage of women of childbearing age who had polycystic ovarian syndrome, a condition in which the woman ovulates infrequently or not at all. In *The Garden*, I also reported the detrimental effects of pharmaceutical family planning, of sleeping exposed to light (i.e., from a TV or a street lamp)—as well as the benefits of sleeping in darkness and a nutrient-dense diet.

In 2007, the biologist Sandra Steingraber wrote “The Falling Age of Puberty in U.S. Girls.” She reported that girls have begun to menstruate at younger and younger ages (and the early onset of menses increases a woman’s risk of breast cancer). Among other factors, Steingraber reported that early puberty is caused by girls’ watching television.

In the few years since these publications, use of electronics, wireless devices and wireless services has increased exponentially. So have my questions: What happens to a girl’s reproductive health if she gets exposed to first- or second-hand cell phone radiation before she menstruates? How are menstrual cycles and offsprings’ health affected if a teenaged girl sleeps exposed to Wi-Fi? If she sleeps with a mobile device under her pillow or keeps a phone in her bra? What are the effects of using a cell phone or sleeping near a Wi-Fi router while taking the Pill (or other pharmaceutical birth control)? What are the long-term health effects when people are exposed to cell phones, Wi-Fi, broadband over power lines, “smart” meters, and other radiation-emitting devices from conception onward? How is long-term reproductive health affected when children attend school with fluorescent lights, wireless tablets, and Wi-Fi routers?

I do not know of studies that answer these questions. In India, the Council of Medical Research has begun studying how use of a cell phone or proximity to a cell tower impacts a woman’s menstrual cycle and a man’s sperm count, as well as their sleep patterns and general behavior.

Meanwhile, here’s what studies that we do have report: Numerous studies show that sperm quality and motility are adversely affected when men wear a cell phone, PDA, or pager on their belt or in a pocket.⁹¹ Yet other studies conclude that

91 A. Agarwal et. al, “Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study,” *Fertility and Sterility*, vol. 92, no. 1, (2008): 124–128; and “Effects of radio frequency electromagnetic waves (RF-EMW) from cellular phones on

using a cell phone or storing one near the testes affects sperm counts, motility, viability, and structure.⁹²

The 2012 Proceeding of the World Meeting on Sexual Medicine reports that men with erectile dysfunction are 2.6 times more likely to keep their cell phones in their front pants pocket. (Researchers did not consider different types of phones, nor the amount of time that the man had kept his phone in his pocket.)

After five generations of exposure to RF radiation from cell towers (less than one microwatt per centimeter squared), mice become irreversibly infertile.⁹³

An increase in deep vein thrombosis as the leading cause of death in pregnancy now has researchers wondering about its connection with the growing use of mobile phones during pregnancy.⁹⁴

A new study associates mothers using mobile phones and computers during pregnancy with pre-term births.⁹⁵

human ejaculated semen: an in vitro pilot study,” *Fertility and Sterility*, vol. 92, no. 4 (2009): 318–325; A. Wdowiak et al, “Evaluation of the effect of using mobile phones on male fertility,” *Annals of Agricultural and Environmental Medicine*, vol. 14, no. 1 (2007): 69–172; G. N. De Iuliis et al, “Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro,” *PLoS One*, vol. 4, no. 7 (2009): e6446; I. Fejes et al, 2005, “Is there a relationship between cell phone use and sperm quality?” *Archives of Andrology*, vol. 51, no. 5 (2005): 385–393.

92 R. J. Aitken et al, “Seeds of concern,” *Nature*, vol. 432 (2004): 48–52; O. Erogul et al, “Effects of electromagnetic radiation from a cellular phone on human sperm motility: an in vitro study,” *Archives of Medical Research*, vol. 37, no. 7 (2006): 840–843.

93 I. N. Magras and T. D. Xenos, “RF radiation-induced changes in the prenatal development of mice,” *Bioelectromagnetics*, vol. 18, no. 6 (1997): 455–461.

94 D. I. Davis et al, “Swedish review strengthens grounds for concluding that radiation from cellular and cordless phones is a probable human carcinogen,” *Pathophysiology* vol. 20, no. 2 (2013): 123–129.

95 N. Col-Araz, “Evaluation of factors affecting birth weight and preterm birth in southern Turkey,” *Journal of Pakistan Medical*

Five Danish Ninth-Graders Experiment

In early 2013, five ninth-graders from the Hjallerup School in Denmark noticed that they often had difficulty concentrating in school if they slept the night before with a mobile phone near their head. The young women's question about how radiation emitted by cell phones affects people led to an experiment that tested the effect of two routers (which the students determined emitted about the same amount of radiation as a cell phone) on garden cress. The students put six trays of cress seeds in a room with two routers, and six trays in a room without routers. After twelve days, the seeds placed near the routers had not grown. The seeds in the other room were thriving.⁹⁶

OTHER VOICES ON HEALTH IN THIS VIRTUAL SEASON

Leah Morton, MD, doctor of family medicine, New Mexico: *My patients frequently report that their health worsened when they got a cell phone or Wi-Fi, or an antenna or a "smart" meter was installed near their home, school or workplace. They need to drastically reduce their exposure to radiation, but where can they go? Giving up one's own wireless devices is enormously challenging, but it is possible. I do not know, however, how anyone can avoid radiation emitted by antennas, neighbors', schools' and businesses' Wi-Fi routers, "smart" meters, fluorescent lights, or other peoples' mobile devices.*



Caroline Adair, 37, California: *I have nearly given up on doctors. First, almost every office has Wi-Fi, fluorescent lights, large TVs in the waiting room, and digitalized equipment and computers in each treatment room. Most doctors*

Association, vol. 63, no. 4 (2013): 459–462.

96 See www.liveleak.com/view?i=cd3_1369428648.

now carry a mobile phone in their breast pocket. Even in an emergency, I would not go to a hospital. Each one is flooded with fluorescent lights, “smart” meters and Wi-Fi; some have rooftop antennas, creating exactly the kind of environment that makes me sick.



Catherine Kleiber, electricalpollution.com, Wisconsin: *In 1996, shortly after graduating from college, my husband and I bought a farm. The following winter, spending more time indoors, I became sick with an illness that just wouldn’t lift. I woke feeling unwell. I was only in my early twenties, but I got heart palpitations from going up stairs. I had acid reflux and extremely dry skin. From September until May, my toes kept red, cold and sore. I had chills, low-grade fevers and drenching night sweats. Exertion often left me feeling like I had lactic acid burning in my muscles. Washing dishes, I got lightheaded. After cooking on my electric stove, I felt too sick to eat. I had nerve pain, everywhere.*

After five years, my husband and I learned that we had high frequencies on our wiring, which came from fluorescent lights, electronics, variable speed frequency drives (used by heating systems, milking machines and other common appliances) on our electrical grid.

As an experiment, we turned our circuits off at night. Almost immediately, I woke feeling well rested. The nerve pain and many other symptoms went away. But a week later, I woke full of despair again. I figured that my week of feeling better was a fluke. Then I flipped on a light. It went on, and I realized that my husband had forgotten to turn off the circuits the night before. So, my private “blind” study showed that electrical pollution affects my health.

We installed a dielectric union in the water pipes to prevent electric current from getting onto our water line. We got a gas stove and shut off all non-essential power. Later, when they became available, we installed Graham-Stetzer plug-in filters around the house. I got yet more relief and began to carry them with me for meetings and social gatherings.

After my health improved, my husband and I had two wonderful children. Then, in 2009, our electric company began installing AMR transmitting utility meters in our area. Immediately, the RF levels in our home increased, even though we had no transmitting meter and no near neighbors. In fall 2010, our younger son began waking in the middle of the night, saying that he didn't feel well. Eventually, I noticed that his heart was racing. Over a period of months, as his system wore down, his heartbeat changed from overly fast to slow and irregular, and finally to extremely slow and irregular.

I felt lucky to know that radio-frequency signals can cause cardiac arrhythmias, including in children. To reduce his exposure to RF signals, we disconnected circuits and removed wiring. With each modification, his health improved.

But our utility company installed more transmitting meters around us, and our neighbors used more electronics—which put more high frequency fields on our grid. The electrical pollution at our end-of-the-line home intensified. The radiation coming off of the transformer on our property made fissures on the bark of our sugar maple trees. While asleep, our younger son sweated profusely, and his sweat had a strange odor.

In summer 2011, a mobile cardiac Holter monitor showed that he had 1,500 bradycardia incidents per hour while he slept. A heart beating too slowly is a bradycardia event. A five-year-old boy should not experience them.

To decrease our exposure, we moved into a tent more than a half-mile from any electrical service. Immediately, we

noticed improvement in our children's health. While deeply asleep in the tent, our younger son never had more than 200 bradycardia incidents per hour. Once, sleeping back in the house because of broken tent poles, it got so slow that he lost bladder control.

Realizing that neither our public service commission nor our utility company would mitigate the high frequency fields coming into our house on the utility wiring and that we could lose our son, we went off-grid. We installed a gravity flow hot water heating system, a solar system (filtered) and a well pump and sump pumps that operate with direct current, also filtered. We got a propane refrigerator and battery-operated camping lights. We modified our computer so that it runs off of our battery bank, and we only use it when the bank is not charging. For Internet access, we use dial-up. Because the washing machine requires the generator (and its use puts high frequencies on our wiring), everyone gets out of the house at laundry time. We dry our clothes on the line outside or in the basement.

If someone had told us beforehand the lengths to which we would go to be healthy, we would NEVER have believed it.

We're still adjusting to the fact that wireless technologies have made us socially isolated. Our children can't go to school, soccer or gymnastics because these places all have transmitting utility meters and lots of mobile phones in use—and the RF radiation makes our boys sick.

Our seven-year-old often says, "I understand that those devices are convenient, but why would anyone risk their life to make a phone call or watch a video?"

I tell him denial is a powerful force. I tell him I don't really have an answer to his question.



Jennifer Litt, 53, Northeast: *In 2009, when “smart” meters were installed on our gas line, we began to do research and learned that our electric company installed a transmitting AMR meter on our house sometime in 1998, one foot from our infant son’s bed. Our son was born in July 1998. I had a difficult labor with Pitocin. He was suctioned and given oxygen. In his first year, he screamed for hours at a time. Was that colic? Was it the result of his difficult birth? Was it irritation from the meter?*

We had been a healthy family, but after 1998, we all had difficulty sleeping. I had nausea, burning and itching with an intermittent rash. My son had heart palpitations and chest pain. We never had Wi-Fi, but my daughter (born in 1990) got severe headaches and sometimes vomited at school when she was exposed to Wi-Fi and “smart” meters.

In 2010, after nine persistent months and a note from our doctor, we got the transmitting meters removed from our house. We can sleep now, and my son’s heart palpitations went away.

At school, if my son uses a Wi-Fi-enabled laptop, he gets a headache, his chest hurts, and he feels tingling sensations. So, his teachers let him work without a Wi-Fi-enabled laptop. Still, we need a doctor who can help us and an affordable house with enough space from neighbors so we don’t have to absorb radiation from their wireless devices.

In France, mobile phones are banned from primary schools, and advertising of mobile phones that targets children is prohibited.⁹⁷ In March 2013, the French National Assembly voted to exercise the Precautionary Principle, protect young children’s health and prefer cabled Internet over Wi-Fi in schools.⁹⁸

97 See www.lesondesmobiles.fr/.

98 See www.cnetfrance.fr/news/lesdesputes-ne-veulent-pas-de-wi-fi-dans-les-etablissements-scolaires-39788397.htm.

Just How Many Children Use Wireless Devices?

More than 75% of twelve to seventeen-year-olds own mobile phones.⁹⁹

In 2011, Common Sense Media reported, in “Zero to Eight: Children’s Media Use in America,” that 52% of all children have access to either a smartphone (42%), a video iPod (21%), or an iPad or another tablet device (8%). Ten percent of 0- to one-year-olds, 39% of two- to four-year-olds, and 52% of five- to eight-year-olds have used these newer mobile devices.¹⁰⁰

A 2011 survey by Elizabeth Englander of 20,000 students in Massachusetts found that 20% of third graders had a cell phone, 40% of fifth graders had one, and 83% of middle schoolers had one.¹⁰¹

In a typical day, the average eight- to-ten-year-old spends nearly eight hours with a variety of media; older children and teens spend more than eleven hours per day.¹⁰² If there’s a TV in the child’s bedroom, these figures increase; and 71% of children and teens report that they have a TV in their bedroom.¹⁰³

A bedroom TV increases a child’s risk for obesity, substance use, and exposure to sexual content.¹⁰⁴

99 See <http://www.pewinternet.org/2010/04/20/teens-and-mobile-phones/>.

100 See www.commonsensemedia.org/research/zero-eight-childrens-media-use-america.

101 E. K. Englander, “Research findings: MARC 2011 survey grades 3–12”: http://vcc.bridgew.edu/marc_reports/2.

102 V. Rideout, “Generation M²: Media in the lives of 8- to 18-year-olds,” Kaiser Family Foundation, 2010; www.kaiserfamilyfoundation.files.wordpress.com/2013/01/8010.pdf

103 Ibid.

104 A. E. Staiano et al, “Television, adiposity and cardiometabolic risk in children and adolescents,” *American Journal of Preventive Medicine*, vol. 44, no. 1 (2013): 40–47; C. Jackson et al, “A TV in the bedroom: Implications for viewing habits and risk behaviors during early adolescence,” *Journal of Broadcasting and Electronic Media*,

Indeed, the media landscape has changed drastically in one generation. Yet, few parents or teachers have rules about media use for the children in their care—rules that limit exposure to EMR or violent content, or rules that prevent or address addiction to media.

In October 2013, the American Academy of Pediatrics (AAP) issued a policy statement, “Managing Media: We Need a Plan.” It recommends that parents and pediatricians model “media diets” to help their children learn to be selective and healthy in their consumption of media. In other words, the AAP recommends that parents and pediatricians limit their own media use in order to help children limit their use. The AAP recommends that entertainment screen time be limited to less than one or two hours per day. For children under two, the AAP discourages screen media exposure.

Cellular Antennas on School Grounds and Rooftops

How many cellular antennas have been installed on school grounds and rooftops? What impact do they have on children’s long term health? How can we decrease or eliminate cell towers on school campuses?

For now, these questions have no answers.

In September 2006, the Healthy Schools Network (HSN), a national environmental not-for-profit corporation dedicated to assuring every child and school employee an environmentally safe and healthy school, submitted an *amicus curiae* brief

vol. 52, no. 3 (2008): 349–367; A. M. Adachi-Mejia et al, “Children with a TV in their bedroom at higher risk for being overweight,” *International Journal of Obesity*, vol. 31, no. 44 (2007): 644–651; J. L. Kim et al, “Sexual readiness, household policies and other predictors of adolescents’ exposure to sexual content in mainstream entertainment television,” *Journal of Media Psychology*, vol. 8, no. 4 (2006): 449–471; E. L. Gruber et al, “Private television viewing, parental supervision, and sexual and substance use risk behaviors in adolescents,” *Journal of Adolescent Health*, vol. 36, no. 2 (2005): 107.

to advise the U.S. Supreme Court of the need for enforcement of a court-mandated Environmental Impact Study (EIS) *before* the FCC deployed new Advanced Wireless Services. HSN was “quite concerned that a significant threat to the health of school children and personnel is posed by RF radiation from cell towers placed on or near schools or day centers.”

Healthy Schools Network urged the Court to act by the Precautionary Principle. It illuminated that by ignoring the National Environmental Policy Act requirement of an EIS, the FCC risked biological harm to the country’s 54 million vulnerable children.¹⁰⁵

The Court decided not to hear the Healthy Schools Network’s case.

In the Environmental Protection Agency’s February 8, 2012, draft of *State School Environmental Health Guidelines*, the following “common environmental health issues in K-12 schools” are discussed: routine cleaning and maintenance, mold and moisture, chemicals and environmental contaminants, good ventilation and pests and reducing pesticide use.” Health hazards related to magnetic fields from dirty power and RFs from mobile phones, laptops and pads, Wi-Fi, cellular antennas, and “smart” meters are not mentioned.

Parents, Take Note

The American Academy of Pediatrics and Kaiser Permanente warn that too much screen time is associated with children’s violent behavior, poor school performance, lower reading scores, sleep pattern disturbances, obesity, and bad habits later in life such as tobacco and alcohol abuse.¹⁰⁶ Kaiser recommends

105 “Brief of Healthy Schools Network, Inc. as *Amicus curiae* in support of Petitioner Maria Gonzales,” US Supreme Court, 06-175, 9-5-2006.

106 A-M. Tobin, “Limit screen time for healthier kids” (search at kaiserpermanente.org); V. C. Strasburger and B. J. Wilson, *Children, Adolescents, and the Media*, Thousand Oaks, CA: Sage, 2002, pp. 73ff.

limiting screen time to less than two hours a day for teens, less than one hour a day for children ages three through twelve, and no screen time for children under three. To reduce screen time, Kaiser suggests:

- turning the TV off during meals
- keeping TVs, computers and video game consoles out of kids' bedrooms
- keeping cell phones and iPods out of bedrooms at night
- not using screen time as a reward
- exercising as a family by walking, riding bikes, or playing sports together
- encouraging your children to write a story or create an art project.¹⁰⁷



Sandi Maurer, EMFsafetynetwork.org: *Throughout the U.S., schools have begun providing children with wireless computer tablets for learning and testing. New, stronger routers are being installed in classrooms. The Los Angeles Unified School District is issuing wireless iPads, even to elementary-aged students. This push for computers in the classroom is part of Common Core State Standards, the new federal curriculum. It eliminates community-based planning. It brings computer testing into schools and gives the government a new tool to track and profile children.*

Few parents (and educators) are well informed about the issues. For example, in the Fall of 2013, a Sebastopol, California, School Board received funding to upgrade their computer system. As Director of the EMF Safety Network and a parent, I presented the School Board with expert science and medical warnings that RF radiation emitted by routers and wireless computers can cause learning, concentration, memory and many other serious health problems.

107 A-M. Tobin, *ibid.*

I asked the Board to apply the Precautionary Principle and create a hard-wired computer lab that would provide safer, faster and more secure Internet access, since all children are at risk in a wireless environment. Children who already experience headaches, heart palpitations, seizures, EMF sensitivity and/or who have medical implants are at even greater risk. Such children may be isolated from peers when computers are used; or school may become inaccessible to them.

Dozens of other parents and teachers signed a letter stating, "Key to the (children's) professional success, social integration and economic sustainability, and therefore their health, will be their ability to navigate the world of technology." These well-intentioned parents urged the school board to invest "in computer infrastructure that is portable, wireless and cost effective."

The Board approved the wireless plan.

iPad Health Risks

In its users' manual, Apple warns iPad users about the device's health risks, including headaches, blackouts, seizures, convulsion, eye or muscle twitching, loss of awareness, involuntary movement, or disorientation.

The Apple Support Forum (discussions.apple.com/) posts consumer complaints such as:

"Is it just me or does someone else also feel dizzy or nausea after using iPad for a while?"

"I looove the iPad, but I don't think I can keep it as I get nausea and feel a bit dizzy just using it for a few minutes."

"Just today finished series of tests...echocardiogram, brain scan, ultrasound on carotid artery, the works...to diagnose dizziness, and even one fainting episode...since Xmas. Guess what I got for Christmas...iPad..."