

Cell Phone Radiation: Health Impacts, What can we do to Increase Safety

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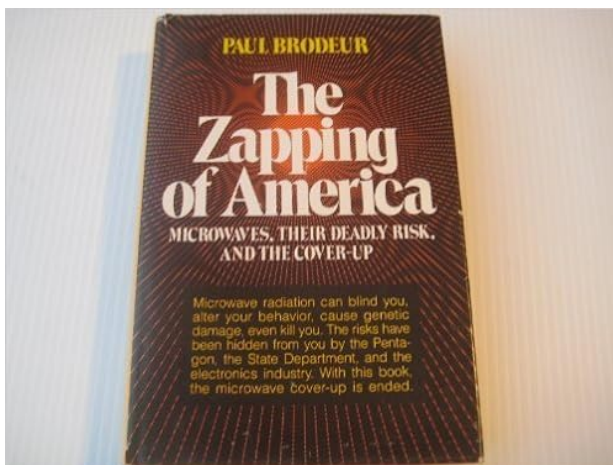
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Cell phones are so bright and cheery and a thing of our time, that we forget their darker beginnings connected to WWII and radars. Their growing presence, everywhere we go, their utility and our mundane use of them, help us overlook their increasing complexity and their impact on our lives. In general, we have little understanding of how they work really, or knowledge about their effects on us. Our love for technology and our fear of it keep us close and away. It also provide us with a naïve hope that all our troubles, which at times seem overwhelming, can be solved by our goddess technology. But technology does not offer magical solutions, and often creates problems of its own. We forget this and use it recklessly, often failing to think in terms of safety first, not learning caution from the past.

Cell phones, and the towers they need to function, generate radiation. Cell phones numbers have increased fast, by 2010 there were already 5 billion cell phones in the world and 2 years later the number had grown by .5 billion; just extrapolating from this we can guess that there are easily more than 6 billion cell phones in a world of 7.6 billion people, not too far from a phone for each one of us. Because cell phones could not exist without their towers and grids to help them connect, we also live within that grid of microwave radiation. Still, we do not seem concerned about it, or about its effects on our health and the health of our children. Science is showing that we should, and a campaign about keeping cell phones at a distance started.

Microwaves in our ovens



Paul Brodeur, a graduate from Andover and Harvard, Army counter intelligence in Germany in the 50s and a staff writer for The New Yorker, raised concerns about microwave radiation in his book “The Zapping of America.” Brodeaur made the connection between radars and microwave ovens. He believed microwave ovens were dangerous because the electromagnetic energy they use can radiate and penetrate deeply into the human body

causing damage. There were other culprits, radars, FM radio, TV transmitters all using microwaves (MW). Brodeaur was particularly concerned about the effects of repeated MW radiation exposure on children; he argued that radiation leaked into homes making safety an issue. Brodeaur believed standards were lax, subjecting people to excessive exposure. Nobody questions this, he said, because our modern weapon system (radars, satellites, space communication) depends on MW. (1)

Microwave ovens were developed by Raytheon in the US; they also made the magnetrons used by radars in WWII. Their first microwave oven prototype was completed in 1947; it took until 1955 for the first domestic model to emerge. It was called "RadaRange" a name connecting too closely ovens and radars so it disappeared by the mid 70s replaced by the most acceptable one of "microwave oven," which became popular and a must in every home. In the US the number of units sold each year climbed reaching a million in 1975. About 24% of US homes had them by 1986 and 90% had them by 1997 when they could be bought for U\$S 200. Today, more than 30 million microwave ovens are sold annually throughout the world. (2) Few people even consider not having one and they are big business.

Microwave ovens encase MW radiation within a metal box and were subjected to testing before approved. There have been issues when food is heated in a MW oven using plastic containers including Biphenol A or phthalates these migrate into the food. Thus, MW oven safe containers emerged and people learned to use them. **Professor Magda Havas**, a radiation expert from Trent University (Ontario in Canada) shares on the dangers of popping our meals in the oven - and watching them cook. People need to know, she said, that MW ovens leak radiation. They have a metal mesh to protect the waves from leaking but she tested over a dozen of the most popular brands and every single one of them leaked. Energy leaks have at least one proven effect on our health: they cause cataracts on people exposed. Most scientists agree and called them "radiation cataracts." We have to protect our eyes avoiding looking into our MW oven when is on. Some argue MWs lower the nutritional value of our food, Dr. Havas believes so and mentions that "*enzymes are denatured by the process of radiation, meaning you get a fraction of the nutrients you would get otherwise,*" but heat denatures enzymes, heat is not unique to MW ovens. Dr. Havas shares something she tested herself: MWs affect our hearts. Monitoring the heart rate of people standing near MW ovens she documented variations in heart rates when the oven is on. (3) The next step should be exploring whether MWs change enough the food we cook to cause measurable negative effects on people who ingest it, a still controversial issue.

Microwaves in our Cell phones

Like MW ovens, cell phones use Radio Frequency (RF) waves, or MWs. **Devra Davis** describes cell phones as "microwave radios." Without reason or logic, I think, cell phones were assumed to be safer than MW ovens. We are dealing with electromagnetic radiation, the faster the frequency and the shorter the wavelength the greatest the damage they can cause. At the end of the spectrum, X and Gamma rays; we call them ionizing radiation because they break the ionic bonds that hold compounds together. Exposure to them is lethal to life. The rest of the spectrum receives the name of non-ionizing radiation because they do not break those links as fast. MWs are not X-rays but we should not presume them safe without considering the long term effects of exposure to them. In the past, routine examinations of pregnant women included low dosage X-rays and everybody believe them safe and was outraged when Alice Stewart, from the UK, challenged this in 1956 suggesting a link between X-ray examinations of pregnant women and childhood onset of cancer in the

child. It took more than 25 years for Stewart's views to be proved right and accepted. (5)

In making cell phones, Motorola probably assumed them safe based on this view of MWs that as long as they did not burn us they are safe; thus, Motorola ensured phone components did not get hot or heat up things around them. Today we suspect this is not enough. MW ovens and cell phones are very popular –the goal for MW ovens is one or more in each home; the goal for cell phones is probably a cell phone for every woman, man and child. The difference between the two: we do not put our heads into our MW ovens, hug them while we cook, or take them to bed with us but we do those things with our cell phones. Safety has to be a priority. In their almost 5 decades of history cell phones have changed markedly in size, capacity and power, the radiation they emit is also higher. (4, 5)



In 1973 Motorola engineer **Martin Cooper** called from a New York city street in front of reporters from a device weighting 1.5 kilos, it was the first call from a portable mobile phone. Motorola spent almost a million dollars producing it. The first commercial one was marketed 10 years later (1984) and it was the Motorola Dyna TACs (weighting 800 grams and carrying a rechargeable battery that would last 8 hours). In 1993 Bellsouth and IBM produced the first “smart phone” including a pager, e-mail, styles for writing on its screen and a complete pad featuring numbers and letters (weighting 500 grams, suggested retail price U\$S 900). They never made more than 2000 of them. In 2002 the Nokia 7650 appeared almost at the same time with the SPC-5300 produced by Sanyo. They were small, light, and the first phones with built in cameras publicly available. A year later, in 2003, Blackberry created the first integrated phone: the Blackberry 6210 (weighting 136 grams including battery) with e mail, texting, web browser and a messenger service allowing communication between blackberries. The iPhone was created by Apple in 2007; it integrated a mobile phone, an iPad and a wireless communication device, included a visual voicemail box, a touch pad and keyboard, a photo library and a display for watching movies and television. (4)

It seems we never questioned whether they were safe but assumed they were. By now we need them, and want them, all our friends have them. Our children want them too, cell phones are flashy and cool, and everywhere. They are our constant companion. We carry them proudly wherever we go, checking, talking and listening to them in the streets, taking pictures and uploading them to the web, confirming to the world that we exist, and have a life. Sometimes, we take them to bed, so they sooth us with music or white noise. They wake us up in the mornings. We have a “special relationship” with our cell phones and they are useful. They come to work with us and have become indispensable: our 24 hour link to “everything and everybody.” Having one is not always a matter of choice; like my boss told me once, you have to accept and learn about new technology, it is part of your job. Furthermore, our phones represent us: the quality we buy, the gadgets and covers we choose, the pictures and videos we carry, the constantly growing number of sophisticated applications, even for babies, that we can get. Devra Davis, a well known scientist, never questioned their safety either and she loved her cell phone too.

Dr. Devra Davis, the founding director of the Center for Environmental Oncology at University of Pittsburg Cancer Center, published her book about cell phone radiation in 2010; it was a National Book Award finalist. The title, “Disconnect,” highlights her concern with the lack of connection between what we already know about cell phone radiation and

human health, and the total lack of public awareness about this, even among researchers and scientists. Davis was surprised by what she found out. Like most of us she thought that if there was anything wrong with cell phones she would know, she is a well informed scientist and an expert on environmental health dangers, but, she was wrong. After researching she felt she had to write and inform people, working to ensure concerns were addressed. The weight of her credentials could help. Few scientists dare to ask questions anymore, those who did paid a price. This is like previous health issues, tobacco, asbestos, benzene and so on Davis says; cell phones are big business; the industry procrastinates action and sponsors research that creates doubt in people's minds. But Davis is a grandmother and particularly concerned about the aggressive promotion of cell phones to children and the dominant disregard in exposing them to cell phones. As Brodeaur, she thinks children are particularly vulnerable to MW radiation:

"My grandkids come equipped with an array of modern protective armor...their own car seats and bike helmets...pads for wrists, knees and elbows...but what about that phone they are set to have?" (5)

After reading her book I searched the quick start guide coming with my cell phone; for the first time I saw the warning to users. Yes, at the end of page 13 of this 13 page guide, under Industry Canada Radiation Exposure Statement it reads: *"this equipment should be installed and operated with minimum distance of 1 cm between the radiator and your body."* Now, nobody mentions "heads" but I guess we can assume them as included in this warning about "bodies." I see no warning about pregnancy or pregnant women however, but Smart phones Davis says come with one: *"Do not keep near the pregnant abdomen,"* and Blackberry adds to it saying: *"don't keep near the abdomen of teenagers."*

Science and the need for further research

There is increased risk of brain tumors on heavy and long term cell phone users but research is still not conclusive. Every study, Davis explains, that ever looked at people who have used a cell phone heavily for ten years or more *"finds a doubled risk of brain tumors, including the industry-sponsored ones, and there aren't that many of those."* However, the majority of studies on cell phones and brain cancer have been negative. The issue is that they define a user as a person who averaged one call a week for six months and the average person in the study used a phone for less than six years. "Brain cancer takes a minimum of ten years to develop," she says, so if you're studying a group of people who've made very few phone calls and have used a phone for a short period of time, you are not going to find anything. (6)

In 2011 the International Agency for Research on Cancer (IARC), part of World Health Organization, appointed a Working Group to examine evidence on the use of cell phones; they classified cell phone use as possibly carcinogenic to humans based on limited data but arguing that findings could not be dismissed, a causal interpretation could not be excluded. The American Cancer Society and the National Institute of Environmental Health Science said that the evidence was not strong but further research was recommended. But, the US Food and Drug Administration, the US Centers for Disease Control and Prevention and the Federal Communications Commission point was that research had failed to establish a causal link between wireless device use and cancer or other illnesses. (8)

A long term study, the COSMOS study, is underway in Europe since 2007. It is a cohort study

of mobile phone use and health involving 290 000 adults to be followed from 20 to 30 years focusing on outcomes and risks of cancers, as well as of benign tumors, neurological and cerebral-vascular diseases and specific changes, such as headaches and sleep disorders. Also, with increased use of cell phones by children and adolescents, there is growing concern about their health which prompted a multinational epidemiological case control study of brain tumours diagnosed in young people in relation to electro-magnetic fields exposure from cell phones and other sources of RF radiation in 14 countries (Australia, Austria, Canada, France, Germany, Greece, India, Israel, Italy, Japan, Korea, New Zealand, Spain, The Netherlands) between 2010 and 2015. The results of the study are under peer review. (7, 9)

Dr. Hugh Taylor, medical professor and chief of Yale's Department of Obstetrics, Gynecology and Reproductive Sciences, co-authored a study in 2012 to explore the impact of cell phone exposure on pregnancies. They had pregnant mice in cages and simply put a cell phone on top of the cage. In half the cages the phone was active and in the other half it was turned off. The researchers allowed the mice to give birth and waited until the newborns were young adults to test behaviors. The mice exposed to cell phones in mother's womb were more active, their memory was slightly decreased. They were bouncing off the walls Dr. Taylor said, and acting as if they did not have a care in the world. According to him, the study shows there is a "*biological basis*" to suggest cell phone exposure can impact pregnancies. He is encouraging patients to be cautious with them and recommends pregnant women to hold phones away from their body. Cell phone manufacturers, including Blackberry and Apple, also say consumers should keep devices away from the body due to potential safety risks but these warnings often go unnoticed because they are featured in manuals and people rarely read them. (10)

The effects we know and what can we do to increase safety

Davis explains that we know MW radiation effects do not follow the doses-effects response model; increasing the dose does not mean an increase response or effect follows. She thinks effects have more to do with the characteristics of the signal, which is erratic, and with chronic exposure. In her view, cell phone radiation disrupts "resonance" and "interferes" with body functions, such as DNA repair. Research needs to consider this if we are to have answers, she says. We know that MW radiation disrupts/relaxes the brain-blood barrier, which plays a crucial role in protecting our brains from substances that are in the blood and can be damaging or toxic. The brain-blood barrier develops as we grow. If we introduce a blue dye in the blood of an animal, its entire body will go blue but its brain will remain pink. Cell phone radiation relaxes this barrier reason why is used now to enhance the uptake of drugs into the brain, for instance to treat a brain tumor with medications. We also know that cell phone radiation interferes with DNA repair. And, we know that it penetrates further into tissue that is not protected by bone or density -breasts, chest, gonads, which are more vulnerable to its effects. (11)

Davis believes that current regulations are lax. The standard to estimate radiation exposure -the "standard anthropomorphic male" or SAM is not representative of the population exposed to cell phone radiation. SAM was taken from the top 10% of military recruits in 1989 -a six-foot-three 220 pounds male with an 11-pound head. Most people in the world do not have SAM's head and we know that radiation goes more deeply into smaller heads than larger ones, and we know that today, three out of every four 12-year-olds, and half of all ten-year-olds, have a cell phone. It is too risky to wait for more science when we already know enough to be concerned. We should change regulations to make it safer for cell phone

users and we should inform people about the risks and what they can do to be safe. (5)

There is also a strong concern about pregnant women and their babies because of what is known already about animal studies. It may be legal for companies to show advertisements of phones being used in ways that are not recommended, Davis says, but it is not ethical. Selling phones to people, then telling them in fine print to not use them next to the body while in all advertisements they are shown using cell phones exactly next to the body, it is a serious disconnect, and people need to be aware of this. Some countries around the world, including France, have banned companies from advertising cell phones to children due to the possible risks. (10)

Cordless phones are an issue too; they are dangerous but most of us are unaware. The base station of cordless phones radiates all the time; when we hold the handset to our head we get a huge dose. About a third of our exposure to MW radiation comes from cordless phones. Davis recommends we do not use cordless phones, and if we do avoid having the base station close to our bed or in our bedroom. (6)

Davis understands that cell phones are not going away. Her point is about increasing safety for people using cell phones and for companies to consider the safety of users when they make them. Experimental studies show that good nutrition like *“literally exposing animals or cells to the natural hormone melatonin or vitamins A, E, or C before you expose them to RF radiation—may help repair damage.”* Good cell phone practices help. They include using a speaker-phone or a headset with the phone held a hand’s distance away, never keeping a phone turned on next to our body, or a wireless headset on in our ear or pocket, without turning off the phone. Also, we should use our phones only when signal quality is good, weaker signals boost MW radiation. And, we should text rather than talk on the phone, and teach our children to do the same. Tweens and teens, and the rest of us, should never sleep with cell phones on under our pillow or next to our beds. Pregnant women should keep their cell phones away from their abdomen; and, new mothers should protect babies from their phones. Men should keep their cell phones off when in their pockets; radiation affects their sperm quantity and quality. We should use a landline at home and avoid cordless phones too. We also need to do some political work and require warning labels about safety in using cell phones be applied to cell phones directly, not in manuals where nobody reads them. Also, cell phones should always include earpieces and speakerphones. And, major revisions of safety standards should be conducted, and specific recommendations should be made about lowering direct radiation to the head. Furthermore, a national survey of cell phone radiation exposure is needed, as well as monitoring of heavy cell phone users by creating access to cell phone billing records to qualified researchers, increasing the power of studies made. (5)

In 2015, **Dr. Martin Blank** (Department of Physiology and Cellular Biophysics, Columbia University) presented a letter signed by a scientists concerned with electromagnetic radiation and their effects on our health, particularly their impact on our DNA. Blank said:

“We are really all part of a large biological experiment, without our informed consent. To protect our children, ourselves, and our ecosystem, we must reduce exposure by establishing more protective guidelines. And so, today, scientists from around the world are submitting an Appeal to the United Nations, its member states and the World Health Organization, to provide leadership in dealing with this emerging public health crisis”. (12)

Cell phones may be here to stay; but, we can demand that they are safe. We, our children and grandchildren, deserve to be protected from the effects of cell phone radiation. We should challenge the callous disregard cell phone makers have shown for our health and well being. We know enough to make some needed changes, reducing exposure, and implementing appropriate safety guidelines. We know that corporations have vested interest and procrastinate addressing this issue, creating doubt about findings so things continue as they are. This has happened before with tobacco, asbestos, insecticides and so on. We are challenging a more than a trillion dollar global industry. Change never happened without struggle. To act we need to be informed, please be informed.

Notes

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