

# Health Bits and Pieces (HFN 30:4)

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**Introduction.** We habitually think of our bodies as chemical factories, and don't realize to what extent they are also electronic mechanisms. Over one-third of the oxygen we breathe and around half of the food we eat are used to maintain electric charges across cell membranes. Authorities have been telling the public for decades that the intense and widespread man-made electromagnetic radiation presents no health threat because there are no ionizing effects (like X-rays or nuclear radiation) and no thermal effects – in other words, it doesn't heat body tissues (think microwave oven). The sources of electromagnetic radiation (EMF) particularly in the extremely low frequency (ELF) spectrum, are power lines, cell phones, Wi-Fi, and much more. This level of radiation is many times stronger than from natural sources.

There is still controversy about the relation between cell-phone use and brain cancer. Some studies have shown a link and others have rejected any connection. Most scientific authorities agree that most of the studies have flaws that prevent a final conclusion, but do not discount a possible link. Proponents of epidemiological studies claim that data collected over a 20-year period should lead to clear evidence of a brain-cancer link to cell-phone use. But there are many reasons to be concerned about the effects of daily exposure to EMFs on our health and well-being. We cannot discount the fact that there are some people who report a hypersensitivity to EMFs. Even if those individuals are not really as sensitive as they claim, EMF sensitivity should still be researched and the sensitivity of children to noxious influences must be taken into account scientifically and as a public-policy issue.

A spectrum analysis done in Canada 30 years ago showed that radiation from 60-hertz power lines, hydroelectric stations, 10-hertz Soviet radar emissions and signals from the Soviet Union, Japan, China, Europe, and Africa was collectively about ten times stronger than natural background radiation. Many experts on the biological effects of EMFs and wireless technologies believe that cell phones and related devices can cause DNA damage that can not only induce cancer but contribute to a wide variety of other conditions, even heart disease, infertility and depression. The second-biggest spender on Federal lobbying among industries in 2008 (after BigPharma) was the electric-utility industry, which spent \$156.7 million in 2008 (Project Censored May 8, 2010 [www.projectcensored.org](http://www.projectcensored.org)). Here is what they don't want you to know.

## DNA Effects

Dr. Martin Blank, PhD, of the Department of Physiology Columbia University, explains that DNA is especially sensitive to the effects of EMFs because the helical coils of DNA structure are like a type of antenna called a "fractal antenna," which is sensitive to a wide range of frequencies. He has also observed that cells react to EMFs by manufacturing "heat shock proteins" (HSP), which break up the DNA molecule. The presence of HSP indicates to cell biologists that the cells have encountered a noxious influence. *Blank M, Goodman R, "DNA is a fractal antenna in electromagnetic fields," International Journal of Radiation Biology*87(4): 409-415 (2011) ([doi:10.3109/09553002.2011.538130](https://doi.org/10.3109/09553002.2011.538130)); *Blank M, Goodman R, "A Mechanism for*

*Stimulation of Biosynthesis by Electromagnetic Fields: Charge Transfer in DNA and Base Pair Separation,” Journal of Cellular Physiology 214: 20–26, (2008).*

### **Blood-Brain Barrier Effects**

EMFs may have direct influences on all cells because of their effect on DNA, but they may affect brain cells even more strongly for two reasons. The obvious reason is that most people hold their cell phones to their ears, bringing the source of radiation into proximity of the brain cells. But another reason is that cell-phone radiation may affect an important protective mechanism of the brain – the blood-brain barrier. The blood-brain barrier (BBB) filters out toxins and large molecules from entering sensitive brain cells where it can cause permanent damage. Studies have shown that EMF exposure can increase the permeability of the BBB giving large molecules access to brain tissue. *Salford L, et al., “Permeability of the blood brain barrier induced by 915MHz electromagnetic radiation continuous wave and modulated at 8, 16, 50 and 200 Hz,” Microscopy Research Technique 27: 535–542 (1994); Schirmacher A, “Electromagnetic fields (1.8 GHz) increase the permeability of sucrose of the blood–brain barrier in vitro,” Bioelectromagnetics 21: 338–345 (2000).*

### **The Melatonin Hypothesis**

Some studies have shown a possible decreased release of melatonin in the brain among people who use a mobile phone for more than 25 minutes a day. Reduced melatonin could explain why some studies have shown a relationship with sleep disturbance and cell-phone use. But melatonin is also a free-radical scavenger and an anti-oxidant and this could also link cell phone use with cancer and other types of cellular damage. One study of electrical workers observed a link between reduced melatonin and an increase in a type of protein associated with Alzheimer’s disease. *Burch J, Reif J, Noonan C, et al., “Melatonin metabolite excretion among cellular telephone users,” International Journal of Radiation Biology 78: 1029–1036 (2002); Noonan C, Reif J, Burch J, et al, “Relationship between amyloid beta protein and melatonin metabolite in a study of electric utility workers,” Journal of Occupational and Environmental Medicine 44: 769–775 (2002).*

### **Breast Cancer**

But perhaps the most important function of melatonin is how it interacts with breast-cancer cells. Studies have found that a reduced level of melatonin in the body stimulates the growth of certain breast-cancer cells. When melatonin is added to these cells, their growth is inhibited. Women with breast cancer have as little as 1/10 the amount of melatonin in their bodies, compared to healthy women. *Liburdy R, Sloma T, et al., “ELF magnetic fields, breast cancer, and melatonin: 60 Hz fields block melatonin’s oncostatic action on ER+ breast cancer cell proliferation,” Journal of Pineal Research 14: 89–97 (1993).*

### **High-Voltage Power Lines and Leukemia**

**There is scientific evidence that exposure to magnetic fields from power lines with a field stronger than 4 milligauss is associated with an elevated risk of childhood leukemia.** Some scientific research indicates an elevated risk at levels of only 2 milligauss. A home that is not near a power line will usually have a level of less than 1 milligauss. Leukemia and brain cancer are also a threat for adults exposed to high levels as well. Lifetime exposure to electromagnetic

fields above 2 milligauss is associated with an increased risk of neurodegenerative diseases in adults, such as Alzheimer's disease and ALS (Lou Gehrig's disease). *HM, Im H, Lee M, et al, "Radio-frequency radiation exposure from AM radio transmitters and childhood leukemia and brain cancer," American Journal of Epidemiology 166: 270–279 (2007).*

## **Heart Disease**

Even at low doses there appears to be enough energy transmitted to create some degree of oxidative stress on tissues. The role of heat shock proteins could also play a role in heart disease. One of the highest rates of heart disease in the World was in a rural village in Finland not far from the Soviet border. The heart-disease cluster remained a mystery to epidemiologists until one scientist tentatively suggested that there could be some influence from one of the largest microwave relay installations in the World, part of the Soviet missile-defense apparatus, which was just across the lake that constituted the border between the two countries. The rate of mortality due to heart disease increased incrementally in those populations approaching the border. *Ozguner F, Altinbas A, Ozaydin M, et al., "Mobile phone-induced myocardial oxidative stress: protection by a novel antioxidant agent caffeic acid phenethyl ester," Toxicology and Industrial Health 21(9): 223–230 (2005); Pockley A, "Heat Shock Proteins, Inflammation, and Cardiovascular Disease," Circulation 105:1012-1017 (2002), doi:10.1161/hc0802.103729.*

## **Fertility**

There is evidence that cell phones decrease the sperm count, quality, motility, viability, and morphology of semen in humans. The decrease in these factors was dose-dependent, related to the daily length of exposure to cell phones. In rats and mice, studies have shown impaired reproductive ability in male and female studies. *Agarwal A, Deepinder F, Sharma RK, Ranga G, Li J, "Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study," Fertility and Sterility 89(1):124-8 (2008); De Iuliis G, Newey R, King B, Aitken R, "Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro," PloS One 4(7):e6446 (2009) PMID: 19649291; Kumar S, Kesari K, Behari J, "Influence of microwave exposure on fertility of male rats," Fertility and Sterility 95(4):1500-2 (2010) PMID:20723534; Rajaei F, Borhani N, Sabbagh-Ziarani F, Mashayekhi F, "Effects of extremely low-frequency electromagnetic field on fertility and heights of epithelial cells in pre-implantation stage endometrium and fallopian tube in mice," *Zhong Xi Yi Jie He Xue Bao* 8(1):56-60 (2010) [pubmed/20082760](#).*