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DATA SOURCES IN THE MOBILE PHONE CONTROVERSY

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Millions of people are concerned about radiation. Few issues involving a majority of the world population have generated as much controversy as the issue of whether cell phone radiation can affect health. Green Swan does not offer health products — the only purpose of our Too Close app is providing a tool to promote compliance with the distance-from-the-body standards in the back of your smart phone owner's manual.

However, for those who want to make their own decision about radiation issue, this article will provide sources.

There seem to be three basic positions on this issue:

1. That there is no way that non-ionizing radiation can affect human tissue; the only possible harm is through the secondary effect of heat, **or**:

2. The jury is still out, meaning there are not sufficient data available to justify any finding, **or**:

3. Modulated non-ionizing radiation from cellular telephones presents a clear and present health danger to billions of people who regularly use those devices.

Most people don't even know that distance limits are stated in the mouse print of those little books, here are some samples, based upon an industry standard expectation of a maximum of 1.6 W/kg SAR value over six minutes of continuous use.

SAR Safety Warnings

Cell Phone Model	SAR (Head)	SAR (Body)	Min Spatial Distance for Use
HTC Evo 3D	0.88 W/kg @1g	1.11 W/kg @1g	0.40 inches (1 cm)
HTC Sensation 4G	1.40 W/Kg @1g	0.70 W/Kg @ 1g	0.59 inches (1.5 cm)
T-Mobile My Touch 4G Slide	0.94 W/kg @1g	1.03 W/kg @1g	None obtainable
HTC Thunderbolt	1.20 W/kg @1g	1.46 W/kg @1g	0.50 inches (1.3 cm)
Motorola Droid Bionic	0.88 W/kg @1g	0.94 W/kg @1g	1.00 inches (2.5 cm)
T-Mobile G2x	0.83 W/kg @1g	0.72 W/kg @1g	0.79 inches (2 cm)
Motorola Atrix 4G	1.47 W/kg @1g	1.35 W/kg @1g	1.00 inches (2.5 cm)
Apple Iphone 4G	0.97 W/kg @1g	0.69 W/kg @1g	0.62 inches (1.55cm)
Motorola Phantom 4G	0.93 W/kg @1g	0.91 W/kg @1g	1.00 inches (2.5 cm)
Samsung Charge	1.01 W/Kg @1g	1.00 W/Kg @1g	0.59 inches (1.5 cm)

Based on a maximum 1.6 W/kg SAR value over a 6 minute period of continuous use. Data taken directly from manufacturers' user guides.

A fourth position will be made here, which is that end users should be urged to comply with the FCC proximity warnings, which are listed in the back of the Owner's Manual for each and every cellular telephone sold in the United States. Green Swan does not endorse SAR as the sole and best test, but it is the one that the government uses, and our notification app issues an alert before the above and similar values are reached.

If you didn't notice the distance limits in your own manual, don't feel lonely, an informal yet careful survey by Green Swan Inc. at the most recent Cellular Telephone Industry Association (CTIA) convention that less than 2% of cell telephone users actually read deep enough into their operating manuals to find the proximity warnings. Did you know, for example, that the FCC standard for safe direct contact between a cell phone in use and the human head is based upon the assumption that such use should not exceed six minutes per day? Tell that to your teenager. *Please.*

The "Can't Harm Humans" Position

Just as this letter was being prepared, yet another study has widely hit the news, being the latest study led by the Institute of Cancer Epidemiology in Denmark, which looked at more than 350,000 mobile phone subscribers over an 18-year period. A group consisting of 350,000 account holders was examined, and according to the BBC story on the study, the results were "reassuring," because this study, "which built on previous research that has already been published by carrying out a longer follow-up, found no significant difference in rates of brain cancers among those who had mobiles and those that did not. The extent to

which one may choose to be reassured by this new study may be affected by recognition of the underlying assumptions upon which it was made.

Here's the common sense approach, often touted by studies with industry-friendly results:

1. We are all animals, made of molecules, and:

2. Molecules are made of atoms, and:

3. Atoms can only be changed through ionic binding with other atoms, and:

4. Since non-ionizing radiation is incapable of forcing such ionic change (moving electrons out of their shells), it is impossible for people to be directly harmed by non-ionizing radiation, and the sole danger is from microwave heating from the phones.

It takes a long time to cook a head at the relevant wattage levels. Many studies have supported the industry positions, including a widely publicized finding from a researcher in Florida that cell phone radiation might help fend off Alzheimer's in rats. Others argue that the "jury is still out," on the issue of harm to the brain.

The new Danish study was based upon cellular telephone *account holders,* only. There was no measurement at all of the respective daily use patterns of any of the account holders involved in the study, nor any assurance that the account holder was even the sole user of the involved phone. The study necessarily included people who use a cell phone an hour a month, as well as people who use a cell phone thirty hours a month. According to news sources, limitations in the study included the exclusion of "corporate subscriptions", thereby excluding people who used their phones for business purposes, amongst the heaviest users." Other observations about this new Danish study are in the third section of this letter, titled "Guilty As Charged?" For those who may be interested in the creation of doubt as an industry-shielding technique, see the book *Doubt Is Their Product: How Industry's Assault On Science Threatens Your Health,* by David Michaels.

"The Jury Is Out"

A doctor's article in the New York Times recently took the position that the question of health risks is unresolved. Some view such findings as industry-friendly. The article was by Siddhartha Mukherjee, an assistant professor of medicine in the division of medical oncology at Columbia University. Dr. Mukherjee noted, amongst many factors, that:

> Since non-ionizing radiation cannot directly affect the structure of DNA, experiments linking phone radiation to DNA damage are generally unconvincing. The most striking study linking cellular phone radiation to DNA damage, published in 2005 by researchers from the Medical University of Vienna, has recently been embroiled in even deeper scientific controversy: researchers studying the data intensively have argued that the original study is fraudulent.

After using his opinion that non-ionizing radiation can't directly affect the structure of DNA as a foundation stone, Dr. Mukherjee went on to state that there are not sufficient data:.

> But thus far, this extraordinarily wide-cast net has yet to find solid proof of risk for cellphone radiation: not a single trial or test that has attributed carcinogenic potential has been free of problems. Population wide studies have failed to demonstrate an increased incidence; retrospective trials have been contradictory and riddled with biases; animal studies negative; human physiological experiments inconclusive; cellular studies inconsistent and weak. What is clearly needed, experts agree, is a single, definitive, unbiased study — 'one trial,' to borrow Paget's terminology. Logistically speaking, the simplest such human trial is a case-control study that compares cancer patients with healthy patients, using phone-log data that companies have thus far been reluctant to provide. The simplest animal study involves subjecting rats and mice to long-term exposure to cellphone radiation. The National Toxicology Program has begun such a study. Cellphone radiation will be turned on and off for 10-minute stretches for 20 hours each day. This experiment — the closest we will get to making mice use actual cellphones — is likely to be published in 2014.

As these quotations have perhaps shown, there is sometimes a fine line between the "can't possibly hurt" and "not enough data" positions. See also the 2005 Lund University study from Sweden (**http://www.ncbi.nlm.nih.gov/pubmed/18821198**, and see also the concise Popular Science (at page 35 of the February 2004 edition) in which study very low cellular telephone wattage levels were shown to cause violation of the blood-brain barrier in rats, and other anomalies on frozen section.

In conflict with the Lund finding, Dr.Mukherjee says that "non-ionizing radiation cannot directly affect the structure of DNA" - which remains disputed (see the work of Dr. Henry Lai, from the University of Washington later on here). Also, the Vienna study he references to have been "argued" as "fraudulent" refers to the work at two different facilities, with repeated result verification, from scientists led by Dr. Adlkofer, which found cell damage from cell phone radiation which the researchers had not expected. Also, as discussed by the epidemiologist Davis in the book Disconnect (see below), the scientist who led the attack against Dr. Adlkofer had an employment history by an industry - government consortium involved with wireless communications. Also, Davis reports that at the time of Adlkofer's findings, eleven other studies had shown cell damage from non-ionizing radiation. For Dr. Davis, though, the jury is not out, but has returned to the courthouse, and voted "guilty."

Guilty As Charged?

It is beyond this scope of any one publication to treat every issue and sub-issue in this complex controversy. Dr. Davis, though, a world class epidemiologist, shows a long history of relationship between microwave signal and direct effect upon the human brain.

Such an effect is not a surprise to Dr. Mukherjee, since his Times article discusses a recently published study in the Journal of the American Medical Association, generally called the Volkow study:

> When Volkow compared subjects with phones turned on with subjects who had their phones turned off, she found a striking pattern: there was a telltale sign of increased brain-glucose activity in the area of the brain immediately adjacent to the antenna of the phone. But as Volkow points out, there is still a long conceptual leap from "increased brain-glucose activity" to 'brain cancer.' Our brains are constantly altering the metabolism of sugar — the flux of glucose changes when we remember Grandma's house in Texas or listen to Bach or smell roses. When human beings dream during sleep, the increase in glucose metabolism in some parts of the brain is just as striking as the increase found in Volkow's study with phones. "It's not a dramatic increase," she says.

However, whether or not the Volkow study shows any evidence linking cell phones and health consequence, it does appear to the undersigned that this JAMA published study from NIH undercuts the prior position that there can be no physical effect, except as secondary from heat, since such a direct physical effect was very carefully measured. Even a fairly cursory review of the literature will show that Volkow was not actually first in apparently documenting physical effects. Here are some further interesting facts and findings:

1. While the Specific Absorption Rate, one standard by which cellular microwave absorption by the body is commonly measured, is typically based upon a penetration through an inert emulation of a human head, competent experimental work indicates that **the level of absorption in living tissue is twenty-four times greater than the level of microwave absorption through an inert liquid, such as water.** Thus, in a 1983 article entitled *An Optical Method for Investigating the Microwave Characteristics of DNA and other Biomolecules in Solution,* by Mays L. Swicord and Christopher C. Davis, as published in the professional journal ***Bioelectromagnetics,*** experimental results were reported which determined that: "A significant increase in the absorption of DNA solutions as compared with pure water has been observed that is consistent with microwave absorption by the longitudinal mode of the double helix." Thus, in their conclusion Swicord and Davis state that: "However, the results presented in this work are in good agreement with the Prohofsky model of acoustic mode absorption by varying lengths of DNA. Prohofsky and Van Zandt predicted that 450 to 2000 base pair segments of synthetic DNA should absorb 101 to 102 times as strongly in the microwave region as an equivalent mass of water with a decrease in peak absorption due to water damping. The 1.7% dilution of DNA investigated by PFLOH spectroscopy in this work indicated a 40% increase in absorption above pure water at 8 GHz and at 10 to 12% increase at 12 GHz. The measured DC conductance of this DNA sample was quite low yet its absorption coefficient was still 25% higher at 8 GHz than a saline solution of 20 times greater DC conductance. **We conclude therefore that the observed absorption of the DNA solution does not come from ionic behavior. The observed absorption is suggestive of direct microwave absorption by the longitudinal acoustic mode of the double helix discussed by Prohofsky and co-workers. Based on the concentration of the DNA solution which gave 40% more absorption than pure water at 8 GHz, the microwave absorption of DNA at this frequency is 24 times greater than an equivalent mass of water."**

2. This very little discussed experimental finding, that there are many orders of magnitude of increase in microwave absorption when DNA is present, may likely explain the considerable body of experimental evidence strongly indicating a relationship between long term cellular telephone use, and diseases involving DNA strand abnormality, such as brain cancer. As, due to the Inverse Square Law, the strength of a radio broadcast will be inverse to the square of the distance form the source, exposure levels will diminish rapidly with distance, and a Device which occasions increased distance will thereby reduce signal strength absorbed by the human head.

3. Scientific studies [i.e. H. Lai et al, from the University of Washington, 1984, 1988, and as presented in 1998, Vienna, Austria, and 2009 in Stavanger, Norway; O. Johansson, Associate Professor, Dept. of Neuroscience of the Karolinska Institute, Stockholm, and Professor, Royal Institute of Technology, Stockholm, as presented in 2009 at Stavanger, Norway; Carl F. Blackman a founder of the Bioelectromagnetics Society, as presented in 2009, at Stavanger, Norway; Martin Blank, Ph.D., Associate Professor, Columbia University, as presented in 2009 Stavanger, Norway, Franz Adlkofer, M. D., doctorate from the Max Planck Institute for Biochemistry as presented at Stavanger Norway, 2009, also the following presenters at the International EMF Conference 2009 at Stavanger, Norway: Lukas h. Margaritis, Ph.D, Greece; Elihu D. Richter, MD, M.P.H., Israel; Alvaro Agusto A. de Salles, Ph.D., Brazil; Fredrik Soderqvist, Ph.D., Sweden, Yuri G. Grigoriev M. D. Sci., Russia; Anton V. Merkulov Ph.D., Russia], have shown potential health risks, in some instances showing DNA breakage, as associated with human exposure to non-ionizing radio wave sources, including but not limited to those emitted from mobile telephone devices and handsets, including but not limited to cellular telephones.

As indicated by the above references, there exists substantial empirical data which support that physiological effects upon living tissue result from the level and sort of microwave radiation coming from cellular devices.

Earlier in this letter, I mentioned the study from Denmark released this week, which was characterized in the press as "reassuring." This most recent Danish did not demonstrate unambiguous effects on human health, and many cell device buyers will be thereby reassured.

However, even at the news outlet level, interesting factors about this new Danish study include that all corporate accounts were excluded from the study, thereby excluding the highest time users, and there were no time-of-use figures available at all. That much was available from the news. Equally interesting factors can be found by looking at the study itself. These include:

1. The survey included data from a study covering the years 1982 to 1985, and:

2. The information was also taken from account records for the years from 1990 to 2007, and:

3. The report was limited to participants of greater than 30 years of age, and born in Denmark after 1925.

When evaluating these factors, one might wish to contemplate that:

4. In the period from 1982 through 1985, cellular telephone usage was vastly more expensive than today, with costs exceeding fifty cents per minute, and sometimes much higher, resulting in lower times of use, and:

5. The period from 1990 to 2007 also includes, in the early period, rates which were prohibitive to long use for many or most subscribers, and:

6. The usage during the period from 1990 to 2007 did not include the new and highest speeds, such as 3G and 4G, and therefore such usage, whatever the consequence, does not correspond to current usage patterns, and:

7. The newly announced Danish study, in part for reasons already stated, excluded user groups tending towards highest usage, including both teens and corporate use, in particular that *all persons who obtained a cellular telephone when under 18 years of age were systematically excluded from the study.* Cell phone consumers may wish to take the less-published and non-covered aspects of this new Danish study into account prior to entirely relaxing into a belief as to the harmless nature of such devices.

A Fourth Approach

Green Swan's flagship product, called Too Close, is available at The Android Market and on Amazon. Green Swan believes that the best immediate solution is to help the public comply with the serious proximity warnings typically found in the very last back pages of your User's Guide. For examples of those warnings that you didn't read, the warning sold with Motorola phones states that:

> If you wear the mobile device on your body, always place the mobile device in a Motorola-supplied or approved clip, holder, holster, case or body harness. If you do not use a body worn accessory supplied or approved by Motorola, keep the mobile device and its antenna at least 2.5 centimeters from your body when transmitting." Using accessories not supplied or approved by Motorola may cause your mobile device to exceed RF energy exposure guidelines.

Similarly, the Blackberry comes with warnings which include:

> The highest SAR value for this BlackBerry device when clipped to a belt, in a Research In Motion (RIM) approved holster equipped with an integrated belt clip, is outlined below. Carrying solutions, including RIM approved carrying solutions that do not come equipped with an integrated belt clip SHOULD NOT be worn or carried on the body. For more information regarding the wearing or carrying of this BlackBerry device without using a RIM approved carrying solution equipped with an integrated belt clip, see the Holster information in the Additional safety guidelines section of this document.

In its insert, as to pacemakers, T-Mobile tells us that users:

- Should ALWAYS keep the phone more than six inches from their pacemaker when the phone is turned ON.
- Should not carry the phone in a breast pocket.
- Should use the ear opposite the pacemaker to minimize the potential for interference. If you have any reason to suspect that interference is taking place, turn your phone OFF immediately."

Kyocera is one of the major makers of cellular telephones, and they say that the user "must provide" physical separation between the user and the telephone:

> This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. To maintain compliance with FCC RF exposure guidelines, if you wear a handset on your body, use the Kyocera Wireless Corp. (KWC) supplied and approved accessory designed for this product. Using accessories that are not supplied or approved by KWC may violate FCC RF exposure guidelines.
>
> Other accessories used with this device for body-worn operations must not contain any metallic components and must provide at least 15 mm separation distance including the antenna and the user's body."

In fact, warnings about proximity can be found in every user's guide, even if your teenage daughter didn't happen to read those warnings, as she puts her Smart Phone under her pillow at night.

Dr. Devra Davis has founded a charitable foundation called The Environmental Health Trust, and a listing of many different proximity standards can be found at her non-profit website (**www.environmentalhealthtrust.org**). Disclosure: I have worked hard as a volunteer for The Environmental Health Trust, and support their efforts, but there is no relationship between Dr. Davis or EHT and Green Swan, Inc.; citation of her work for academic purposes should not be misinterpreted as her endorsement of our products.

The Green Swan Position

Green Swan as a company does not take a stand on the question of health risks. We are not a medical company nor epidemiologists like Dr. Davis, or Dr. Carlo, who was the industry's first expert epidemiologist on this subject, and who later wrote a book about the experience titled *Cell Phones: Invisible Hazards in the Wireless Age: An Insider's Alarming Discoveries about Cancer and Genetic Damage.*

Rather, we are about one issue, *proximity,* for those who, for whatever reason of thought or conscience, wish to reduce the exposure of their children or themselves to cellular telephone radiation.

Green Swan's issue is that people, especially young people, who have thinner skulls, should make every effort to comply with the proximity guidelines which came with their phones. Green Swan's inexpensive Too Close application issues a voice warning ("Too Close") as the cell phone is placed in proximity to the head, and ***before*** any of the industry SAR proximity warnings have been breached.

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