Electromagnetic Radiation Safety

Scientific and policy developments regarding the health effects of electromagnetic radiation exposure from cell phones, cell towers, Wi-Fi, Smart Meters, and other wireless technology .... Joel M. Moskowitz, Ph.D., University of California, Berkeley

Monday, May 23, 2016

Should Cellphones Have Warning Labels? (Wall Street Journal)

The ***Wall Street Journal*** asked me to write an essay about why cellphones should have warning labels. Dr. Larry Junck, a neurology professor, was asked to write the opposing arguments.

The two essays were published with the title, "**Should Cellphones Have Warning Labels?"** in the print edition of the *Journal* on May 23, 2016. The online version was posted on the *Journal*'s web site a day earlier.

Prior to publication, the *Journal* shared with me four of Dr. Junck's assertions. However, my responses were cut due to space limitations.

My essay below contains additional links and references that do not appear in the WSJ version. I have annotated the article with my comments indented in italics.

Should Cellphones Have Warning Labels?

Wall Street Journal, May 22, 2016

Supporters of warnings say consumers should be alerted to phones' possible risks. Opponents say the risk, if any, is not great enough to warrant it.

We press them against our ears every day, often for hours. We carry them around with us in our pockets, front, rear and breast.

In short, we do lots of things with our cellphones that we're not supposed to do, according to the warnings and instructions for proper use that typically come with these products in one form or another.

For now, how seriously one takes warnings about possible risks associated with radio-frequency waves emitted by cellphones largely depends on whether one believes the many studies that suggest there are links to risks of cancer or other ill effects, or the many studies that suggest there is no proof of such risks.

Whatever studies one believes, some concerned observers believe that cellphone companies should make a more assertive effort to warn consumers of the possibilities of such risks. And one way to do that, these advocates say, is with a clearly printed label on the outside of the device.

> *My Comment: I actually wrote the following, which was edited by the WSJ. "Whether by means of software inside the devices, package labeling, or other forms of communication, cellphone users need better information about the risks and harm reduction options associated with their choices."*

Or would that, as some others argue, just unnecessarily scare customers away from a product whose possible threat to public health is not certain?

Joel M. Moskowitz, Ph.D., a researcher and the director of the Center for Family and Community Health in the School of Public Health at the University of California, Berkeley, believes that such labels are needed. Arguing that warning labels aren't called for is Larry Junck, professor of neurology at the University of Michigan Health System.

YES: Consumers Should Be Alerted to the Possible Risks

By Joel M. Moskowitz

Consumer products from toothpaste to stepladders come with obvious safety-warning labels. Why shouldn't cellphones?

Cellphone use in the U.S. has mushroomed over the past two decades. But the industry falls seriously short in its efforts to provide cellphone users with information about the health risks associated with their choices and ways they can minimize possible harm.

Exposure to radio-frequency, or RF, radiation is a major risk of cellphone use. Manufacturers have a legal duty to provide warnings that are clear and conspicuous when products raise health and safety concerns. But, typically, RF safety instructions are buried in user manuals with tiny print, hidden within smartphones, or made available on the Internet.

There have been numerous calls for clearer warnings. The Environmental Working Group and 11 other consumer groups in 2013 submitted a letter to the Federal Communications Commission calling for better disclosure about the risks of RF emissions. The American Academy of Pediatrics, representing 60,000 physicians, submitted a similar letter. Consumer Reports in 2015 recommended that cellphone manufacturers "prominently display advice on steps that cellphone users can take to reduce exposure to cellphone radiation."

While the research is not conclusive, higher-quality studies show that mobile-phone use is associated with brain-tumor risk and reproductive harm. In 2011, for example, the World Health Organization's International Agency for Research on Cancer, or IARC, declared RF radiation "possibly carcinogenic" based on evidence of increased brain-tumor risk.

By 2016, we have evidence from more than a dozen epidemiological studies that heavy cellphone users, usually over long periods, 10 years or more, face increased risk of malignant and nonmalignant brain tumors. **(References 1-3)**

The U.S. incidence of nonmalignant brain tumors has increased in recent years, especially among adolescents and young adults. It's unlikely the increase was entirely due to improved detection because, according to one review, we would expect to see a plateau, then a reduction in incidence, which has not occurred. The most serious type of brain cancer has increased in parts of the brain near where people hold their phones. Observations that overall increases in brain cancer were not seen after the introduction of cellphones merely serve to illustrate that there can be a considerable lag between exposure to a carcinogen and the cancer's diagnosis. **(Refs. 4-5)**

Skeptics about the risks of cellphones often cite studies that are flawed. They ignore evidence in a 2014 review of 10 studies associating exposure to cellphones with reductions in sperm motility and viability. And while some have argued that the IARC did not have adequate evidence to classify RF radiation as "possibly carcinogenic," the IARC is considered the gold standard for making such determinations. Last year, 220 scientists who have published peer-reviewed research on the effects of electromagnetic fields signed an appeal to governments to strengthen consumer disclosure and RF radiation standards citing "numerous recent scientific publications" showing effects of such fields on living organisms.

As for people who claim there is no mechanism to explain how cellphones cause cancer, in 93 out of 100 laboratory studies, low-intensity RF radiation was found to cause a cellular-stress response which can lead to carcinogenicity. **(Ref. 6)**

Insurers are paying attention. Lloyd's, the London insurance market, in a 2010 report on emerging risks, took no position on whether cellphones cause harm, but warned that scientific and legal developments could change the insurance climate, as occurred with asbestos. Similarly, Swiss Re AG in 2013 identified "unforeseen consequences of electromagnetic fields" as a leading risk for the industry. Concerns about the cost of potential claims against the cellphone industry have led some insurers to exclude coverage for claims related to electromagnetic fields in their commercial general liability policies.

Even before we had scientific consensus about the public health threat from tobacco, Congress mandated warning labels on cigarettes in 1965.

The public has a right to know that cellphone radiation exposure can be reduced by keeping devices away from the head and body, and by using a speakerphone, wired headset, or text messaging.

Dr. Moskowitz is a researcher and the director of the Center for Family and Community Health in the School of Public Health at University of California, Berkeley. Dr. Moskowitz, a Ph.D., has a website on electromagnetic-radiation safety. He can be reached at reports@wsj.com.

NO: The Risk, if Any, Is Not Great Enough to Warrant It

By Larry Junck

Each year, about 78,000 Americans are diagnosed with a malignant or benign brain tumor. These lead to about 17,000 deaths —seventh among deaths due to cancer. As a physician kept busy caring for people with brain tumors, I would like nothing more than to see some of these tumors prevented.

Unfortunately, a label warning purchasers of cellphones about an unproven brain-tumor risk would not be a step toward that goal.

Consider that brain tumors have not increased in incidence in correlation with cellphone use. If cellphones were an important cause of brain tumors, we would have seen an increase perhaps starting in the 1990s, when cellphones came into widespread use, or starting several years later, if it took several years of cellphone use to cause a brain tumor. While the number of people diagnosed with brain tumors has risen, the increase has been mainly among the elderly, who use cellphones less than others. The increase started before the 1990s, and the numbers have leveled off. The increase is believed to be largely due to our improved detection of brain tumors using CT scans and MRI.

> *My Comments: Malignant tumors often require decades to develop before they are detected so one would not necessarily expect to see a strong correlation between cellphone adoption rates and brain tumor incidence.*
>
> *Brain tumor increases in the 1990s that preceded widespread cellphone use may be accounted for by cordless phone use. Cordless phones were adopted before cellphones; they emit RF radiation, and Hardell's research has found cordless phone use to be associated with increased brain tumor risk.*

Also, there is no known scientific mechanism by which mobile phones might cause brain tumors. For carcinogenic chemicals and other environmental causes of cancer, we can generally show that these cause mutations in DNA or changes in other molecules, sufficient to explain the resulting cancers. However, radiofrequency emissions such as those emitted by cellphones generally pass through tissues without causing these effects.

> *My Comments: There is peer-reviewed evidence for several mechanisms that explain how low-intensity cellphone radiation can cause oxidative stress, free radicals, and DNA damage leading to cancer and neurodegenerative diseases. See the papers referenced in **#6 below**. There are also papers that describe a mechanism for sperm damage.*
>
> *The research shows that the cellphone's RF emissions are absorbed by the head and body. The young child's brain absorbs twice as much radiation as the adult brain.*

Numerous epidemiologic studies considered together do not conclusively show an increase in risk of brain tumors associated with cellphone use. The majority of studies show no association at all. A number of studies do suggest an increase in risk, but some of these studies depend on patients' recall of their cellphone usage and thus are susceptible to bias.

> *My Comments: It often takes decades of **independently-funded** research before scientific consensus is reached about a health risk.*
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> *Much of the cell phone radiation research has been funded by the telecommunications industry. In our 2009 review of the epidemiological research, we found that studies with industry funding tended to use lower quality research methods. These studies either failed to find increased brain tumor risk or dismissed the significant evidence of risk that was observed. Dr. Henry Lai has reported that the industry-funded studies were also much less likely to report biological effects.*
>
> *The higher-quality research on long-term, heavy cell phone use among adults consistently finds increased brain tumor*

risk. The risk is roughly doubled after 10 years of cellphone use. Although little research has been conducted on children, a few studies suggest that the risk is greater for children and adolescents who use cellphones.

Although a few industry-funded scientists recommend we take precaution about cellphone use, many argue we should wait 25 or more years until they complete their current research studies. In contrast, the 220 scientists who signed the International EMF Scientist Appeal believe that we have sufficient evidence to take precaution now. They argue for stronger regulations and better disclosure.

Regarding bias in studies that depend on patient recall, it is true that people err when they report their cellphone use in these studies. They tend to underestimate the duration of calls and overestimate the number of calls they make. These two biases cancel each other out. The net effect when the data are analyzed for the total amount of cellphone use is to ***underestimate*** *the association between cellphone use and brain tumor risk.*

One of the largest studies, the Interphone study done in 13 countries and published in 2010, showed no increase in risk in its primary analysis. A widely criticized secondary analysis showed that among the 10% of subjects who recalled the highest usage, incidence of glioma (the most common of serious brain tumors) was increased by 40%—of marginal significance due to the small number of tumors in the secondary analysis. Based largely on this study, WHO's International Agency for Research on Cancer classified radio-frequency electromagnetic fields as "possibly carcinogenic" in humans, a category that includes coffee and pickled vegetables. Many experts have expressed opinions disagreeing with this classification because of the lack of good evidence supporting it.

My Comments: The 13-nation Interphone Study reported in a 40% increased risk of glioma for heavy cellphone users who used cellphones 1,640 or more hours in their lifetime, which averages to about 30 minutes a day over 10 years (Table 2). This was a primary, not a secondary analysis of the data.

The Interphone Study has been criticized by many scientists for its methodological shortcomings, but most of the biases are in the direction of underestimating brain tumor risk. For example, the Interphone study presented a secondary analysis in Appendix 2 of the paper which corrected one methodology problem. This analysis found an 82% increased risk of glioma for the heavy cellphone users instead of the 40% increased risk reported in the main body of the paper.

In another paper, the Interphone Study reported a 289% increased risk of acoustic neuroma for heavy cellphone users.

The 30-member IARC expert group depended heavily on the Interphone study and research by Lennart Hardell and his colleagues when they decided to classify RF radiation as "possibly carcinogenic" in 2011.

IARC classified Asian pickled vegetables and coffee as "possible carcinogens" because consumption of the first increases risk of esophageal cancer, and the second, bladder cancer. The cellphone industry has cited these findings to diminish IARC's classification of radiofrequency radiation as a Group 2B possible carcinogen to humans, which is also the same category as DDT and lead.

Other conceivable risks of RF have also been studied. An example is effects on sperm. A meta-analysis of many studies looking for an association of cellphone use with changes in sperm reported that one of three variables studied, sperm motility, shows a small but statistically significant relationship. But the authors do not indicate how sperm development might be affected by RF from cellphones, considering that RF emissions are concentrated near their source and that cellphones are generally held far from the scrotum while in use.

My Comments: The most recent meta-analysis found that cellphone radiation harms both sperm motility and viability -- two of the three effects examined.

Several mechanisms have been proposed for sperm damage (see my post, "Effects of Mobile Phones on Sperm Quality").

Cellphones emit radiation at least once a minute whenever they are powered on. Since males often store cellphones in their pants pocket, they are exposing their genitals to this radiation. A Cleveland Clinic study of 361 men undergoing infertility examination found that the "decrease in sperm parameters was dependent on the duration of daily exposure to cell phones."

Most scientific organizations that have studied this issue, such as the World Health Organization and the National Cancer Institute, find no convincing evidence of risk of brain tumors or other harms. The Food and Drug Administration states, "The weight of scientific evidence has not linked cellphones with any health problems."

My Comments: The U.S. Environmental Protection Agency found evidence of genotoxicity from exposure to cellphone radiation in the 1990's. Based upon the research, the EPA advocated for stronger regulations than the FCC adopted in 1996. Congress ended the EPA's funding for research on RF radiation so the EPA has not conducted any research since the 1990's.

The FDA called for a government-funded study in 2001 to resolve their concern that cellphone radiation is harmful. The federal government has funded one major study, but fifteen years later the investigators have yet to report any results. Further, the study examines the effects of second-generation cellphone technology which will soon be obsolete as most cellphone use fourth-generation LTE.

The federal health agencies currently have little expertise regarding RF health effects because most federal scientists with expertise have retired or passed away.

The FCC's cellphone radiation regulations have not changed since 1996. Although the FCC has been gathering input from scientists and the public since 2003, it has never issued a review of the evidence it has received. A recent Harvard publication reported that the FCC has been "captured" by the industries it regulates including the telecommunications industry.

Before WSJ editing, my original essay contained information about the cellphone industry – their tendency to oppose and lobby against all "Right to Know" legislation that crops up from the grass roots. I know of six states where allegations have been made that proposed regulations to inform about potential cellphone risks have failed under industry pressure.

Meanwhile, supporters of stronger warnings point to reports in the insurance industry citing the possibility of increased liability to claims of health damage from cellphones, but such conclusions appear to be based on fear of liability arising from public concerns that are not based on evidence of harm. I submit that public policy should be based on actual risk, not on popular perceptions that aren't supported by evidence.

My Comments: Of course public policy should be based upon actual risk, not perceived risk. And insurers are probably worried about both compensating victims of actual harm associated with cellphones, as well as paying for the expense of defending lawsuits regardless of the merits.

The insurance industry has a legitimate concern that the cellphone industry will someday be held liable for cellphone radiation health effects because the scientific evidence has grown substantially over time. Moreover, the cellphone industry funded much of the early research that found evidence of harm which suggests that the industry knew the risks but failed to act responsibly. Although most cellphone companies issue safety information about how to reduce RF radiation exposure, the information is not user-friendly.

Do risks of cellphones require more study? Yes, especially looking for any long-term risk to children who use them extensively over many years. Meanwhile, there is not much basis for modifying our use of mobile phones because of the risk of brain tumors or other risks from RF emissions.

If a risk exists at all, it is not high enough to justify a warning label for consumers. Warning labels are best reserved for risks that are both more clear-cut and larger. Perhaps use of cellphones while driving is an example.

My Comments: Hardell and his colleagues have found a three-fold risk of brain cancer for 25 or more years of wireless (cellphone and cordless) phone use and a four-fold risk of acoustic neuroma for 20 or more years of use. Given how widespread cellphone use is these risk estimates should be of great concern to neuro-oncologists. Some research suggests that children who use cellphones may have greater long-term risk of brain tumors.

I discussed two risks for which we have the most evidence: brain tumors and sperm damage. In addition, there is scientific evidence for other health problems associated with cellphone radiation. These risks include other head and neck tumors, breast cancer, electromagnetic hypersensitivity, and reproductive health risks including miscarriage and fetal effects (e.g., ADHD).

Bottom line: There is less "harm" in warning consumers about potential risks based on what we know or suspect than in failing to do so and later on facing another tobacco or asbestos debacle. Precautionary warnings are the least we can do at this point in time.

Dr. Junck is professor of neurology at the University of Michigan Health System. He can be reached at reports@wsj.com.

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