

The Latest Reassurance Ruse about Cell Phones and Cancer

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After a number of prominent, peer-reviewed studies indicating that cell phone radiation can cause genetic damage, brain and blood cell dysfunction and a host of health problems including cancer, now comes a Danish study that appears to say there is no danger at all. And, that is exactly what cell phone users want to hear – if it is true.

The problem is that the new Danish cohort study does not support the reassurances that have been ascribed to it. It is a ruse based upon a program initiated by the telecommunications industry more than a decade ago to control the global scientific research agenda concerning cell phones and health effects. The industry strategy has been to fund low-risk studies that will assure a positive result – and then use it to convince the news media and the public that it is proof that cell phones are safe. Even though the actual science proved nothing of the sort.

It is against this backdrop that the Danish study provides an illustrative case history.

THE STUDY

In my training as a professional epidemiologist, I learned early in my career how to properly design a study to produce a valuable finding. In the process it became evident that it was also possible to skew a study in order to produce a pre-ordained outcome. And this is what appears to have happened in this Danish epidemiological study. This study, funded by the telecommunications industry, was clearly created in order to produce a positive, low-risk finding.

A low risk study is one that has minimal opportunity to conclude with results contrary to the interests of the industry. Epidemiological studies are targets because they are observational in nature instead of experimental (the subjects are not manipulated according to a study protocol) and there are methodological shortcomings in all study designs. It is therefore possible to design studies with pre-determined outcomes that still fall within the range of acceptable science. Thus, even highly flawed epidemiological studies can be published in peer-reviewed journals because they are judged against a pragmatic set of standards that assume the highest integrity among the investigators.

¹ Jill Unger, Milt Bowling and Martin Schram contributed to this work

Experienced investigators clearly understand the influences of various decisions in the study process, and that is why epidemiological studies contain very extensive discussions about methodological assumptions and shortcomings. Because this in-depth knowledge of methods is a necessary skill for all epidemiologists, epidemiological studies can be relatively easy to manipulate – in design, implementation and reporting.

The Danish Cohort Study Was Epidemiologically Designed To Produce A Pre-Ordained Positive Outcome

The study, although published in the *Journal of the National Cancer Institute*, followed a pre-determined methodology that gave it little chance to find any increase in the risk of cancer among cell phone users in Denmark. The basis for this assertion is described below. The study was also industry-friendly from a public relations perspective: several hundred thousand people could be included in the study, and thus it could be packaged as a very large study that would seem meaningful to the media. Prior to the onset of the study, it would have been clear that, if managed properly, the study could provide very useful data for the industry's position that cell phones are safe.

The Working Hypothesis And Statistics Were Weighted Toward Finding No Risk.

- The working hypothesis involved looking at a large group of cell phone users and comparing their estimated cancer expectancy with the general population in Denmark. The cell phone user population was heterogeneous in terms of gender, age, socio-economic status, personal health habits and occupation. There was nothing in the definition of who was included and who was not that was actually relevant to cell phone radiation exposure – a cell phone user was defined as someone who made only one call per week over a period of six months or more. Finding a cell phone related cancer risk among this group would be akin to identifying excess lung cancer risk among people who smoked one cigarette a week – similar to finding a needle in a haystack.
- The investigators failed to include statistical power calculations in the report. These data would have detailed specifically how large a risk the study could address as well as how large a statistical risk could be excluded with this study design. A doubling or tripling in risk could still be in the data but not revealed because the statistics were not robust enough to find it. Leaving the power calculations out of the report opened the door for un-challenged, open-ended assurances about the safety of cell phones – which were not based at all on data within the study.
- The Danish investigators failed to explain that, even if taken at face value, the study can only rule out statistical risks that are dramatically large. In fact the study did not contain even one statistically significant finding that would attest to the veracity of the headlines that it spawned. The only statistical finding in the

study had to do with latency of more than ten years from the time people began using the cell phone to the development of their tumor. Latency is a very poor measure of cumulative exposure to cell phone radiation as evidenced by a dozen other published studies.

The Study Included No Reasonable Exposure Variables And Thus Created Bias Toward A Finding Of No Risk.

- The study covered phones used from 1982 through 1995 – antique technology that bears little resemblance to the phones in use today. Early phones operated with very different power profiles compared to modern phones and thus exposure plumes with the ability to affect biological cells were very different. In addition, background levels of information-carrying radio waves are orders of magnitude higher in today’s environment than in the past; synergies between ambient exposures and phone related near-fields are more severe today than during the time-frame of the study. The investigators failed to point out these caveats and the probability that the study has little relevance to the dangers of phones that are being used currently by more than 2 billion people around the globe.
- Without quantitative exposure variables, it is not possible to obtain a reasonable assessment of cause and effect. In this study, all 420,000 people were assumed to use the cell phone exactly the same way. No account is made for time on the cell phone at all. No measures of minutes or hours per day of use were included. The underlying premise, therefore, is that everyone in the study used the phone for the same amount of minutes. Common sense and experience tells us that would not be the case. This assumption of similar use produces a dramatic misclassification of exposure. Statistically, this bias leads to a significant underestimation of true risk because the exposure variable is imprecise. In this case, the exposure variable has no precision at all because it is non-existent. Thus, statistical findings of no risk would be the primary expectation from this study design.
- Further, in the early days of cell phones, time on the phone was very expensive. People did not use a cell phone as a major source of communication. Thus, people in the Danish study were unlikely to have used cell phones for very long each day. It is therefore reasonable to assume that exposures across the entire cohort were on average very low. Low exposures coupled with no precision in the distinguishing high from low exposures compounds bias in this study design toward the null. Thus, at the outset, it would be clear to both the investigators and the sponsors of the study that the chances of finding any increase in risk were very minimal.

The Study Was Not Based On Any Previous Biological Findings, So Its Chances Of Finding A Biological Risk Were Exceedingly Low.

- A basic tenet of epidemiology is that hypotheses in studies should be linked to biological mechanisms that will help explain the observations in the research. Studies intended to assess risk therefore include rationale that would address, for example, brain tissue exposed within the near-field plume emanating from a cell phone and subsequent biological responses. That is why studies that have provided the most information about risks in humans from cell phones have focused on such epidemiological variables as concordance between the side of the head where a phone is used and the side of the head where a tumor occurs. No such rationale was included in the Danish study design so the study had no biological basis. Thus, any finding of risk increase would be due to chance and therefore extremely unlikely.
- Further, the investigators took no account in their writing of findings already confirmed in the peer-reviewed literature. Studies show that radio frequency radiation causes biological cell membrane dysfunction that leads to genetic damage, cellular dysfunction including blood-brain barrier leakage and disruption of intercellular communication – all harbingers of serious disease, including cancer. The working hypothesis of the Danish study remained purely statistical and by design stayed away from anything to do with mechanisms of disease. It is noteworthy that disease mechanism data which portend disease are the weak point in the industry's argument that cell phones are safe.

The Investigators Limited Their Access To Data That Would Have Made The Study More Robust, Thus Limiting The Chances Of Finding Any Risk Increase.

- The most important data in this study would have come from people who used the phones most. The enrollment criteria for the study, one phone call per week for six months is likely to have created a very large group of study subjects who had very little exposure to cell phone radiation. In the *a priori* study design, all commercial phone subscribers were excluded from the study. Considering the high expense of phone minutes during the 1980s and 1990s where the study was focused, it is likely that commercial subscribers would have been the heaviest users. Therefore, a selected group who would have provided important information on any disease risks actually related to cell phone radiation was eliminated by choice of the investigators.
- Another important subset would have been those people who used their phones on the same side of the head where their tumors were located. This would be the only subset of phone users with tumors who would definitively have been exposed to measurable levels of cell phone radiation in the only part of the head where the radiation could have an effect. Those people were not culled out and studied and thus an opportunity to learn something important about brain cancer

risk was missed. Because the investigators had access to subscriber information and user lists obtained from the phone companies, it is reasonable to assume that type of in-depth study could have been completed if the investigators so desired.

Internal Inconsistencies Raise Red Flags About the Methods.

- The most fundamental portion of a scientific report is the review of prior literature and a clear statement of the hypothesis the study is intended to address based on that literature. The balance and fairness with which the report is written is reflected in the review of the literature. It is noteworthy that on the first page of the Danish report virtually all research that indicated any risk from cell phones was summarily dismissed. One specific quote by the Danish investigators on page one is illustrative: “Most studies have not found a statistically significant overall association with the risk of brain tumors for use of 10 or more years, except two, for which methodologic issues have been raised.” That quote does not square with the data presented here in the appended Table 1. In the peer-reviewed published literature, there are more than 300 statistically significant findings indicating an increase in risk. It is noteworthy that most of the same studies cited under Table 1 are also cited in the Danish paper.
- In this study the risks of all types of cancer in the Danish men and women were statistically low, except for cervical cancer in women. Those findings would suggest that the population of Denmark has a comparatively low cancer risk overall. However, international cancer statistics show that Denmark is among the top 15 countries in the world for cancer deaths among both men and women. Some tallies show Denmark to be number one in cancer mortality among women. The bottom line is that this study shows Danes have low cancer risk but the world data say they have high cancer risk. The low Danish cancer risk hypothesis does not hold up and it suggests something is wrong within the study’s data.
- The apparently low site-specific cancer risk findings could be the result of a systematic overestimate of the expected numbers of cancer cases that were calculated in the study. That would mean that the analytical algorithm, or the method used by the investigators for calculation, was somehow altered or flawed. If expected numbers are artificially high, then risk estimate numbers would be artificially low. Such a phenomenon would result in an artificial finding of no risk in the study. Only the investigators themselves have control over that aspect.

DISSEMINATION OF THE STUDY RESULTS

It is not likely an accident that immediately after the Danish study was released media outlets from around the world were somehow made aware of the new study and the findings. It is noteworthy that the bland title of the study, “Cellular Telephone Use and

Cancer Risk: Update of a Nationwide Danish Cohort,” bears little resemblance to the headlines it produced.

- “Cell Phones Don’t Cause Brain Cancer” – The Toronto Daily News
- “Cell Phones Don’t Raise Cancer Risk” – Reuters
- “Big Study Finds No Link Between Cell Phones, Cancer” – SJ Mercury News
- “Study: Cell Phones Cause Cancer” – Albuquerque Tribune
- “Study: Cell Phones Safe” – Newsday
- “Cell Phones Do Not Cause Cancer” – Techtree.com, India

It is also not likely to be an accident that science groups immediately and aggressively weighed in to validate the conclusion.

- “Cellular Telephones Not Associated With Cancer Risk” – JNCI Spectrum
- “Cell Phone-y Scare” – American Council on Science and Health

It would strain the credulity of even the most casual observer to believe that these media and science groups were anxiously awaiting the release of the Danish cohort update. That the information release was highly coordinated would be a reasonable assumption based on the facts. However, given the weaknesses in the study and the obvious limitations that follow from those weaknesses in terms of ruling out a cell phone related cancer risk, it is remarkable that so many groups would blindly run with the headlines.

However, when a study like this Danish report is released, the media need a reason not to cover it, especially against the frontal public relations assault that comes from the industry with the release of new data that they believe supports their position. No one is providing those reasons to the media, so the stories run around the globe.

But, there is more going on here.

In 1993, I was asked by the cell phone industry to run a \$28.5 million dollar research effort, funded by the industry and overseen by the federal government. The program, called the WTR, was aimed at addressing the cell phone and brain cancer question. When the initial studies seemed to indicate no problem, the industry was pleased and supportive; but when the subsequent and more thorough studies indicated that cell phone radiation caused biological changes, the industry became displeased and sought to close down the program. Completed in 2000, the WTR program remains the largest ever addressing cell phones and cancer.

Our WTR program also had a tie with the present Danish study. Back in the 1990s, two of the authors of the 2006 Danish study, John Boice and Joe McLaughlin, applied to the WTR program for funding to do the same epidemiology study that was released this week. When they made the proposal on behalf of their company, the International Epidemiology Institute, both were employees of the National Cancer Institute. That affiliation was an important part of how they presented their credentials. After consideration of their proposal, we denied them funding because we were not convinced

they would provide meaningful findings. We also were not comfortable with the study design that was presented to us: the investigators put too much emphasis on the probability that the study would not find risk increases. Because the program was funded by the industry, they might have thought the low-risk pitch was what we wanted to hear. When we refused to give them funding to do the work, Boice and McLaughlin went directly to the industry with the same pitch – and they were hired.

The Danish study released this week is one of many studies from this group of investigators – all concluding with similar findings of no tumor risk from cell phones. In 2001, they released what they then lauded as one of the largest studies to date, and Boice went on a television tour to blunt the effects of a book I co-wrote with renowned Washington syndicated columnist, Martin Schram. The book, *Cell Phones: Invisible Hazards in the Wireless Age* told of the clash of science and politics within the research program and concluded that by 2001, science had raised serious red flags about the health of millions of cell phone users.

The American Cancer Society is also in on the support bandwagon for the Danish study. Now circulating to attest to the findings of the study are comments from Michael Thun, a vice-president at the society. He has taken the position that the Danish study confirms no risk from cell phones. It is noteworthy that in 2002, scientists from the American Cancer Society testified on behalf of the cell phone industry in brain cancer litigation. The case was brought in Federal Court in Baltimore, Maryland by surgeon Christopher Newman, who had claimed that his terminal brain tumor was the result of his cell phone use. The American Cancer Society testified that the tumor had not been caused by his cell phone.

Within a year of that testimony, a report was released by the American Cancer Society that included cell phones as one of that year's greatest cancer myths. The subsequent connection between the American Cancer Society and the cell phone industry was arrogantly blatant. In 2005, Dr. Sanjay Gupta of CNN ran a story that included Mt. Sinai Medical Center surgeon Keith Black. Dr. Black believed that the tumor that took the life of his patient, famous attorney Johnnie Cochran, was due to cell phone use. The industry did not even reply to the questions raised in the story about the link between the tumor and Johnnie Cochran's cell phone use. Instead, the industry submitted a written statement that simply referred to and quoted the American Cancer Society's report indicating that cell phones were a cancer myth. Thus, the industry was able to use the American Cancer Society paper as a public relations shield to manage the story.

FINAL COMMENT

The world wants to know that the cell phones that they have used and will continue to use are safe. But the Danish study was epidemiologically constructed to produce a finding of reassurance that may well not have been supported even by a more professionally conceived study designed to really assess risk. The study has been trumpeted far beyond any reasonable reading of the data as proof that cell phones are safe. This is a disservice to consumers who want to believe that scientists and doctors can be trusted to be honest

with data and to keep them safe. The Danish registry remains a valuable resource. But, we are still awaiting a proper epidemiological study that will be able to use that resource to help tell the world what it needs to know.

The cell phone industry indeed has a sophisticated program in place to guard their financial interests. That is reasonable so long as harm to an unwitting public is not part of the result. One symptom of the effectiveness of the program is that industry-funded studies in many cases now produce industry-desired outcomes. But tampering with the integrity of scientists, scientific systems and public information steps over the lines of propriety that are appropriate for protecting business interests – especially when the casualty of the interference is public health and safety.

Appendix

Table 1

**Statistically Significant Findings from
Key Epidemiological Studies^{1,2} of the
Link between Cell Phones and Tumors by
Source of Finding – Independent or Industry**

	<u>Number</u>	<u>Mean Risk Ratio³</u>
Independently Funded		
Positive Findings (show a link)		
Malignant Tumors	182	2.7
Benign Tumors	25	2.7
Negative Findings (show no link)		
Malignant Tumors	0	0
Benign Tumors	0	0
Industry Funded		
Positive Findings (show a link)		
Malignant Tumors	59	1.2
Benign Tumors	39	1.5
Negative Findings (show no link)		
Malignant Tumors	1	0.7
Benign Tumors	16	0.6

Footnotes:

1. Includes the recent Danish cohort study
2. Appearing in peer-reviewed journals since 2001
3. For example, a risk ratio of two indicates a doubling of the risk of tumors in cell phone users

Index Medicus Citations for studies included in Table 1:

1. **Auvenin**, Anssi; Hietanen, Maila; Luukonen, Ritva; Koskela, Riitta-Sisko. May 2002. Brain Tumors and Salivary Gland Cancers Among Cellular Telephone Users. *Epidemiology* 13(3):356-359
2. **Hardell**, Lennart; Mild, Kjell Hansson; Sandstrom, Monica; Carlberg, Michael; Hallquist, Arne; Pahlson, Anneli. 2003. Vestibular Schwannoma, Tinnitus and Cellular Telephones. *Neuroepidemiology* 22:124-129 DOI: 10.1159/000068745
3. **Hardell**, L., Carlberg, M., Mild, K. Hansson. 2005. Case-Control Study on Cellular and Cordless Telephones and the Risk for Acoustic Neuroma or Meningioma in Patients Diagnosed 2002-2003. *Neuroepidemiology* 25:120-128. DOI: 10.1159/000086354
4. **Hardell**, L., Carlberg, M., Mild, K. Hansson. 2006 Pooled analysis of two case-control studies on the use of cellular and cordless telephones and the risk of benign brain tumours diagnosed during 1997-2003. *International Journal of Oncology* 28:509-518
5. **Hardell**, L., Carlberg, M., Mild, K. Hansson. 2006 Pooled analysis of two case-control studies on use of cellular and cordless telephones and the risk for malignant brain tumours diagnosed in 1997-2003. *International Archives of Occupational and Environmental Health* DOI: 10.1007/s00420-006-0088-5
6. **Hardell**, Lennart; Carlberg, Michael; Mild, Kjell Hansson. 2006. Case-control study of the association between the use of cellular and cordless telephones and malignant brain tumors diagnosed during 2002-2003. *Environmental Research*. 100:232
7. **Hepworth**, J. Sarah; Schoemaker, J. Minouk; Muir, R. Kenneth; Swerdlow, J. Anthony; van Tongeren, Martie J.A.; McKinney, Patricia A. November 14, 2005. Mobile phone use and risk of glioma in adults: case-control study. *BMJ Online First* www.bmj.com 5 pages.
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9. **Kundi**, Michael; Mild, K. Hansson; Hardell, Lennart; Mattsson, Mats-Olaf. 2004. Mobile Telephones and Cancer – A Review of Epidemiological Evidence. *Journal of Toxicology and Environmental Health, Part B*. 7:351-384 DOI: 10.1080/10937400490486258 ISSN: 1093-7404 print/ 1521-6950 online
10. **Lonn**, S; Ahlbom, A; Hall, P; Feychting, M; Swedish Interphone Study Group. March 15, 2005. Long-term Mobile Phone Use and Brain Tumor Risk. *Am. J Epidemiol.* 16(6):526 DOI:10.1093/aje/kwi091
11. **Muscat**, Joshua E., MPH; Malkin, Mark G., MD, FRCPC; Thompson, Seth, PhD; Shore, Roy E., PhD; Stellman, Steven D., PhD; McRee, Don, PhD., Neugut, Alfred I., MD, PhD; Wynder, Ernst I., MD. December 20, 2000. Handheld Cellular Telephone Use and Risk of Brain Cancer. *Journal of the American Medical Association* 284(23):3001-3007
12. **Muscat**, J.E., Ph.D.; Malkin, M.G., M.D., FRCPC; Shore, R.E., Ph.D.; Thompson, S., Ph.D.; Neugut, A.I., M.D., Ph.D.; Stellman, S.D., Ph.D.; Bruce, J., M.D. 2002. Handheld cellular telephones and risk of acoustic neuroma. *Neurology* 58:1304-1306
13. **Shuz**, Joachim; Jacobsen, Rune; Olsen, Jorgen H.; Boice, John D. Jr.; McLaughlin, Joseph, K. and Johansen, Christoffer 2006 Cellular Telephone Use and Cancer Risk: Update of a Nationwide Danish Cohort *Journal of the National Cancer Institute* 98(23):1707-1713