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MICROWAVE NEWS • ISSN 0275-6595 •
155 East 77th Street, New York, NY 10075 •
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E-mail: <info@microwavenews.com> •
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Anomalies in Interphone Paper Point to Meningioma Link

September 2 ... While we were away on a summer break, another **Interphone** paper was released online: An analysis of the incidence of meningiomas (brain tumors) among cell phone users in five Northern European countries. It comes from the same teams that have previously reported increased risks of both **glioma** (another type of brain tumor) and **acoustic neuroma** (a tumor of the acoustic nerve) among long-term users. This time around the researchers from Denmark, Finland, Norway, Sweden and the U.K. say that they did not uncover anything of note. Here's the summary statement from their **paper** in the *International Journal of Epidemiology*:

"We did not find evidence of increased risk of meningioma in relation to mobile phone use, as regular use, years since first use, lifetime years of use or cumulative number of calls, were not associated with an increased risk."

Yet, if you take a close look at the tables in the paper, some anomalies pop out. First and foremost, the calculated tumor risks or odds ratios (ORs) are all low. (An OR of less than one is protective, and an OR greater than one is detrimental.) There are two possible explanations: either cell phones confer close to instant protection against meningiomas, or —much more likely— some systematic bias skewed the study.

We counted 65 ORs in the tables; 62 of these are below one. If cell phones have no effect, good or bad, all the odds ratios should be randomly distributed above and below one. But in the new meningioma paper, only three are above one. The Interphone teams acknowledge this surplus of low ORs. The "likely explanation," they say, is selection bias, which can lead to "the underestimation of the risk."

What they don't mention in the paper is that all three ORs that rise above one are risks for long-term users —that is, those who have used cell phones for ten or more years have the highest risks. Nor do the research teams compare these new results for meningiomas with their previously published findings showing elevated risks for glioma and acoustic neuroma among the same class of long-term users.

Sam Milham, an epidemiologist who has continued to work on EMFs since he officially retired some years ago, has published three different letters to the editors (**two** to the *American Journal of Epidemi-*

(continued on p.2)

ology and **one** to the *British Journal of Cancer*) questioning the low ORs in papers published by the Interphone teams from these five European countries. We called him and asked what he thought of this new paper.

“It’s déjà vu all over again,” replied Milham. “I guess I’m going to have to write another letter.” “But there’s more,” he said, “there’s a striking trend in the ORs.” Milham explained that in 16 of 17 categories of exposure and latency among cell phone users, the OR in the most exposed groups is greater than the OR in the lowest exposed groups. Yet, that’s not the case for contralateral risks—for tumors on the side of the head not exposed to the phone. In only one of these three categories is the OR greater in the highest exposure group.

“The bottom line,” Milham concluded, “is that I think the paper shows that cell phones are in fact associated with meningiomas.”

Everyone agrees that there are at least two kinds of bias potentially at work in the Interphone studies: selection bias which tends to lower observed risks, as in this latest

paper, and recall bias which would raise the risks. We are told that the final paper has been delayed for close to three years because the participants cannot agree how to interpret the elevated risks from long-term use. It appears that that some members of the Interphone project have no problem publishing papers with consistently low ORs, but have qualms about releasing results with high ones. Call it publication bias.

So, where are we? Even before the final Interphone paper is published, we can be sure that, when it does finally appear, the controversy over long-term tumor risks will continue. Some say that prospective epidemiological studies (for instance, **COSMOS**) are the way to resolve the uncertainties. They may well help, but we would have to wait for a generation for the results. Epidemiologists no doubt favor 25-30 year projects—think of it as lifetime employment—and the mobile phone industry would also welcome a time-out, but from a public health point of view, this is unacceptable.

“Science” Magazine Misrepresents the State of Scientific Knowledge

September 3... Making sweeping statements about scientific knowledge is always challenging, especially when writing about an unfamiliar field of research. Take, for example, this opening sentence from an article, “Fraud Charges Cast Doubt on Claims of DNA Damage from Cell Phone Fields” by Gretchen Vogel in this week’s *Science* magazine:

“The only two peer-reviewed scientific papers showing that electromagnetic fields (EMFs) from cell phones can cause DNA breakage are at the center of a misconduct controversy at the Medical University of Vienna.”

Sweeping ... and wrong.

Not counting the **two papers** from Hugo Rüdiger’s lab in Vienna, here are 11 papers that point to changes in DNA breaks following exposures to cell phone radiation:

- R.J. Aitken et al., “Impact of Radiofrequency Electromagnetic Radiation on DNA Integrity in the Male Germline,” *International Journal of Andrology*, 28, pp.171-179, 2005 (Australia);
- W. Baohong et al., “Studying the Synergistic Damage Effects Induced by 1.8 GHz Radiofrequency Field Radiation (RFR) with Four Chemical Mutagens on Human Lymphocyte DNA Using Comet Assay in Vitro,” *Mutation Research*, 578, pp.149-157, 2005 (China);
- W. Baohong et al., “Evaluating the Combinative Effects on Human Lymphocyte DNA Damage Induced by Ultraviolet Ray

C Plus 1.8 GHz Microwaves Using Comet Assay *in Vitro*,” *Toxicology*, 232, pp.311-316, 2007 (China);

- G. Gandhi and Anita, “Genetic Damage in Mobile Phone Users: Some Preliminary Findings,” *Indian Journal of Human Genetics*, 11, pp.99-104, 2005 (India);
- J. Kim et al., “*In Vitro* Assessment of Clastogenicity of Mobile-Phone Radiation (835 MHz) Using the Alkaline Comet Assay and Chromosomal Aberration Test,” *Environmental Toxicology*, 23, pp.319-327, 2008 (Korea).
- S. Lixia et al., “Effects of 1.8 GHz Radiofrequency Field on DNA Damage and Expression of Heat Shock Protein 70 in Human Lens Epithelial Cells,” *Mutation Research*, 602, pp.135-142, 2006 (China);
- J. Phillips et al., “DNA Damage in Molt-4 T-Lymphoblastoid Cells Exposed to Cellular Telephone Radiofrequency Fields *in Vitro*,” *Bioelectrochemistry and Bioenergetics*, 45, pp.103-110, 1998 (U.S.);
- T. Nikolova et al., “Electromagnetic Fields Affect Transcript Levels of Apoptosis-Related Genes in Embryonic Stem Cell-Derived Neural Progenitor Cells,” *The FASEB Journal*, 156, pp.495-502, 2001 (Germany);
- K. Yao et al., “Effect of Superposed Electromagnetic Noise on DNA Damage of Lens Epithelial Cells Induced by Microwave Radiation,” *Investigative Ophthalmology & Visual Science*, 49, pp.2009-2015, 2008 (China).
- K. Yao et al., “Electromagnetic Noise Inhibits Radiofrequency Radiation-Induced DNA Damage and Reactive Oxygen Species Increase in Human Lens Epithelial Cells,” *Molecular Vision*, 14, pp.964-969, 2008 (China).
- D. Zhang et al., “Effects of GSM 1800 MHz Radiofrequency Electromagnetic Fields on DNA Damage in Chinese Hamster

Lung Cells,” *Chinese Journal of Preventive Medicine*, 40, pp.149-152, 2006 (China, in Chinese).

Some of these experiments investigated the effects of cell phone radiation alone while others looked at synergistic action with other agents. Some found large effects, while others saw small ones. Most found increased DNA breaks, while Jerry Phillips measured both increases and decreases. Nevertheless, they all reported DNA changes with cell phone radiation.

In addition, others have shown chromosomal changes following exposure to cell phone radiation. For instance:

- L. Manti et al., “Effects of Modulated Microwave Radiation at Cellular Telephone Frequency (1.95 GHz) on X-Ray-Induced Chromosome Aberrations in Human Lymphocytes *in Vitro*,” *Radiation Research*, 169, pp.575-583, 2008 (Italy);
- M. Mashevich et al., “Exposure of Human Peripheral Blood Lymphocytes to Electromagnetic Fields Associated with Cellular Phones Leads to Chromosomal Instability,” *Bioelectromagnetics*, 24, pp.82-90, 2003 (Israel);
- P. Sykes et al., “Effect of Exposure to 900MHz Radiofrequency Radiation on Intrachromosomal Recombination in pKZ1 Mice,” *Radiation Research*, 156, pp.495-502, 2001 (Australia).

And finally, a number of researchers have documented DNA changes at other, similar microwave frequencies but which are not used in mobile phone networks. For instance:

- H. Lai and N.P. Singh, “Acute Low-Intensity Microwave Exposure Increases DNA Single-Strand Breaks in Rat Brain Cells,” *Bioelectromagnetics*, 16, pp.207-210, 1995 (U.S.);
- H. Lai and N.P. Singh, “Single- and Double-Strand DNA Breaks in Rat Brain Cells After Acute Exposure to Radiofrequency Electromagnetic Radiation,” *International Journal of Radiation Biology*, 69, pp.513-521, 1996 (U.S.);
- R. Paulraj and J. Behari, “Single-Strand DNA Breaks in Rat Brain Cells Exposed to Microwave Radiation,” *Mutation Research*, 596, pp.76-80, 2006 (India);
- S. Sarkar et al., “Effect of Low-Power Microwave on the Mouse Genome: A Direct DNA Analysis,” *Mutation Research*, 320, pp.141-147, 1994 (India);
- M. Zhang et al., “Study of Low-Intensity 2450MHz Microwave Exposure Enhancing the Genotoxic Effects of Mitomycin C Using Micronucleus Test and Comet Assay *in Vitro*,” *Biomedical and Environmental Sciences*, 15, pp.283-290, 2002 (China);
- M. Zhang et al., “Effects of 2450MHz Microwave on DNA Damage Induced by Three Chemical Mutagens *in Vitro*,” *Chinese Journal of Industrial Hygiene and Occupational Diseases*, 21, pp.266-269, 2003 (China, in Chinese).

Sources tell us that there are more papers now in the publication pipeline.

None of this should be interpreted as indicating that the cell phone–DNA issue is closed. Others have failed to see such genetic effects and the jury is still out. But, clearly, to state that only two papers have shown DNA breaks is

grossly misleading—no, simply wrong.

We have been closely following the University of Vienna story for some months and we will be reporting on it in detail sometime soon. The *Science* story reveals but a glimpse of some of the maneuvering going on behind the scenes; in this case, manipulating the media to influence public opinion. At the moment, we are still trying to sort out who is doing what.

Industry Group To Sponsor Public Info Booklet on EMFs

September 5... In an unprecedented move, the Electric Power Research Institute (EPRI), the research arm of the utility industry, will sponsor a public information booklet on EMFs for a unit of the National Institutes of Health (NIH). The National Institute of Environmental Health Sciences (NIEHS) is working out an arrangement whereby EPRI would pay for the writing and printing of a new edition of the NIEHS booklet, *EMFs: Questions & Answers*.

“This would be absolutely hands off,” Christine Flowers, the director of communications at NIEHS in Research Triangle Park, NC, told *Microwave News*. “They cannot influence the document.”

News of the deal landed with a thud. “This is an outrageous proposal that should not be allowed to happen,” said **David Carpenter** the director for the Institute for Health and the Environment at the State University of New York in Albany. “The public health issues are too serious to allow them to be perverted by EPRI and the industry. NIEHS has no business taking funds from a group with such a clear conflict of interest.” Carpenter led the New York Power Line Project in the 1980s.

“It does sounds strange,” said **Michael Gallo** of the Environmental and Occupational Health Sciences Institute in Piscataway, NJ, who has had a long association with NIEHS. “If totally funded by EPRI, it would then raise the question of objectivity,” he added.

Another observer commented that this would be like having Exxon pay for an EPA pamphlet on global warming. No one interviewed, including those at NIEHS, could offer an example of an industry group paying for a government public health document in which it has a direct stake.

“You need a sharp line between government and industry,” commented **Seth Shulman**, the author of *Undermining Science: Suppression and Distortion in the Bush*

Administration. “This makes me very uncomfortable, it seems highly inappropriate.”

Merrill Gozner, the director of the **Integrity in Science** project at the Center for Science in the Public Interest in Washington, offered a similar view: “This is a new one on me and it sounds a little dangerous.”

Chris Portier, the associate director of NIEHS, is brokering the deal between the institute and EPRI. “If they are truly going to do this with no strings attached, it would be remiss of me not to accept it,” he said in an interview. Portier explained that EPRI would contribute to the NIEHS’ “Gift Fund” and then “we could spend it any way we want.” He estimated that the job would cost \$100,00-\$130,000 for 30,000 copies and take 12 to 15 months to complete. “We will not do it in-house, a contractor would do it,” Portier said.

In a **flyer** that seeks contributions from member electric utilities, EPRI explains the need for a new Q&A booklet, which was last revised in 2002:

“It is critically important that the public relies on EMF health-related information that is timely and relevant. Since 2002, the research conducted on EMF health effects... has expanded... An update to the 2002 edition of the report will ensure that the public has access to the best information when deliberating over new transmission line projects.”

EPRI is asking participating utilities to contribute \$30,000 apiece.

One of the ironies of this project is that, in recent years, EPRI has taken a stand against public information, denying the public access to its research findings. Reports that EPRI used to make available to the press and interested parties are now kept under wraps. The only way to obtain an EPRI report today is to buy it at a cost of \$5,000 or more. Rob Kavet, the director of EPRI’s EMF program, and his predecessor, Leeka Kheifets, have made it difficult to get even the most basic information about EPRI’s activities. Kavet routinely declines to respond to e-mails for clarification on EMF issues, as does the EPRI office of media relations. Since returning from serving as Mike Repacholi’s assistant at the WHO **EMF project** in Geneva, Kheifets has gone back to work as an EPRI consultant.

The **first edition** of the Q&A booklet was released in 1995 and revised in 2002. NIEHS’ Mary Wolfe, who coordinated the last revision, will also work on the new round, Portier said.

September 13... A number of mainstream newspapers, including the *Wall Street Journal* and the *Seattle Post Intelligencer*, have picked up the NIEHS–EPRI story on

their Web sites (see **September 5**, on p.3). The *PI*’s **Andrew Schneider** reports that some at NIEHS are “outraged” by the tie-in with EPRI. “I know we are having budget problems like the rest of the government research labs, but to sell out integrity for a few hundred thousand dollars of industry money means we should hang a large red light over the door and just admit what we are,” one staffer told him. ... We grossly underestimated the cost of some EPRI reports in our last post. Today EPRI sent us an announcement for *Overview of Personal Radiofrequency Communication Technologies*, a primer on RFID, WiFi, WLAN, WiMax and cell and cordless phones as well as much else. The price: \$25,000.

Where’s Interphone?

September 18... “Where is **Interphone**?” asked Ian Gibson, a member of the U.K. Parliament, at last week’s **Radiation Research Trust (RRT) conference** in London. “Whose desk is it on?” No one offered an answer, not even **Anders Ahlbom**, a member of the Swedish Interphone group, who earlier that morning had given a talk on EMF epidemiology.

During the lunch break, we ran into **Mike Repacholi**, who with RRT’s Eileen O’Connor, had helped organize the meeting at the Royal Society. We asked what he had heard: Was the Interphone team making progress towards resolving the deadlock now well into its third year? Early last month, Elisabeth Cardis, the study director, told the French press that the final paper on possible cell phone links to brain tumors would likely be submitted for publication by now (see our **August 1** story). Repacholi’s message was don’t hold your breath. “It seems that they’ve still got a lot to resolve,” he said. “The study team is not close to consensus.” In fact, he went on, “The positions seemed to have hardened.”

When we got back to New York, we checked in with Cardis. “It’s true the paper has not yet been submitted,” she said, explaining that that it’s hard to make progress over the summer with so many people on vacation. When might we expect a consensus draft? “Very soon,” Cardis told us.

Ian Gibson, a Labor MP who was a cancer researcher before he got into politics (he did a postdoc at Indiana University), is one of the few elected officials watching out for Interphone. Another is **Dennis Kucinich**, the Ohio congressman and former presidential candidate. Kucinich may well bring it up next Thursday, September 25th, when his

Domestic Policy Oversight Subcommittee hosts the first Congressional hearing on cell phones in 15 years. Among those slated to appear are **David Carpenter**, a coeditor of the **BioInitiative** Report, **Ronald Herberman** of the University of Pittsburgh Cancer Institute (see **July 23, 25 & 28**) and the FCC's **Julius Knapp**, as well as Ellen Marks of California, whose husband is a brain tumor survivor. A Congressional aide said that the **CTIA**, the wireless lobby group, was invited but declined to testify.

Inskip To Testify at Congressional Hearing

September 22... **Peter Inskip**, an epidemiologist at the National Cancer Institute, has been added to the witness list for Thursday's Congressional hearing on "Tumors and Cell Phone Use: What the Science Says" (see above). He was invited by the Republican members of Rep. Kucinich's subcommittee. In a **paper** published in 2001, Inskip reported finding no increased risk of brain tumors or acoustic neuromas among cell phone users. Because the NCI study began in 1993 when phones were relatively new, it could not shed much light on possible long-term risks. Inskip is a member of the advisory panel for the Interphone study.

For our report on the testimony at the hearing ("Are Brain Cancer Rates Rising Among Young Adults?") see *MWN*, **September 30**.

Cancer Bulletin Overlooks Long-Term Cell Phone Risks

September 23... The latest issue of the NCI **Cancer Bulletin**, released today, presents the National Cancer Institute's **outlook** on the cancer risks associated with cell phones. It is based largely on the views of NCI's Peter Inskip.

Here is NCI's bottom line: "The suggestion that using a cell phone may increase a person's risk of developing brain cancer [is] not supported by a growing body of research on the subject." And Inskip adds this: Of all the potential health risks associated with cell phones that have

been examined so far, the most convincing evidence concerns the risk of motor vehicle accidents among people distracted by using their cell phone while driving.

Inskip was scheduled to testify at Thursday's Congressional **hearing** (see **September 18**, on p.4), but, at the last minute, he was replaced by **Robert Hoover**, the director of the Epidemiology and Biostatistics Program in NCI's Division of Cancer Epidemiology and Genetics.

As we have reported now many times, the primary concerns about tumor risks are over what happens in the long-term, that is, usually after at least ten years. This is based on both the work of **Lennart Hardell** and the Interphone teams from five Northern European countries. Like Hardell, the pooled data from these five countries show an increased risk of risk of **glioma** and **acoustic neuroma** (two types of tumors) on the same side of the head the phone was used, but only after ten years. Instead, Inskip and the NCI focus on what has been reported for exposures of ten years or less. As Inskip states and the NCI highlights in large type: "We now have studies covering up to ten years of cell phone usage, and we're still not seeing any convincing evidence of an increased brain cancer risk." With respect to Interphone, the NCI skips over the key findings on long-term risks in the two five-country meta-analyses, noting only: "[S]ome of the 13 participating countries have pooled their data and reported little or no effect on the risk of brain tumors."

To support the contention that there is nothing to worry about, the NCI cites two epidemiological studies: **one** on Motorola workers by a group at **Exponent**, a consulting firm, and **one** on Navy radar technicians during the Korean War. Both are vitiated by lousy exposure assessment. As was pointed out in a **commentary** accompanying the Exponent study: "A more notable limitation ... is the absence of information on mobile telephone use or RF exposures." This means that no one knows whether the Motorola employees were actually exposed to any electromagnetic radiation (see *MWN*, **M/A00**, p.7).

In the process, the NCI makes a telling error: Instead of citing the Navy radar study, it links to a 1995 **review** by **John Goldsmith**, the noted environmental epidemiologist. In this paper, Goldsmith concluded that there was—even then—enough evidence pointing to microwave-induced health effects, including cancer, to warrant a precautionary policy of limiting exposures. Goldsmith closed with these prescient words:

"There are strong political and economic reasons for wanting there to be no health effect of RF/MW exposure, just as there are strong public health reasons for more accurately portraying the risks. Those of us who intend to

speak for public health must be ready for opposition that is nominally but not truly scientific."

Maybe the NCI cited the right paper after all.

"Economist" Magazine Blasts Interphone

September 26... This week's *Economist* features the harshest criticism of the **Interphone** project to date. Under the headline "Mobile Madness," the **article** charges that the "massive" study "has ended in chaos"—even before the final paper has been submitted for publication. The magazine goes on to say that, because nine of the 13 participating countries have reported their findings individually, the public has been assaulted with a "farrago of misinformation." Nic Fleming, who wrote the unsigned piece, cites an anonymous source as saying that the relations among the Interphone researchers are "strained" (see **June 19**). Indeed, except for a couple of quotes from Elisabeth Cardis, the head of Interphone, most of the story is presented without attribution. Formerly a reporter for the **Telegraph**, Fleming pins his hopes of finding out whether there is cell phone-tumor risk on future prospective studies, however long they might take.

"Moderate" Link Between Cell Phones and Cancer, Says Kundi

September 28... Are you confused about cell-phone tumor risks? Need a roadmap to the epidemiological stud-

ies? Want a handle on their strengths and weaknesses? Then read Michael Kundi's new review, "**The Controversy About a Possible Relationship Between Mobile Phone Use and Cancer**," in *Environmental Health Perspectives*. (*EHP* is an open access journal and all its papers are available for free.) Kundi, an epidemiologist and the head of the Institute of Environmental Health at the University Medical of Vienna, is not totally convinced that there is such a link, but he is persuaded that it's looking that way. So far, Kundi finds, the epidemiological evidence points to an association of "moderate strength," similar to the one for passive smoking and lung cancer, and that there are as yet "no valid counterarguments and no strong evidence" to shake his confidence in a causal relationship.

Another Reason To Publish Interphone

October 20... A spate of spurious stories that were in the news last week needs to be aired and corrected. They also provide yet another reason to get the Interphone study out as soon as possible.

Le Soir, one of Belgium's leading French-language newspapers, kicked it off on the 15th. "**GSM Is Carcinogenic**" ran the headline at the top of its front page. The paper based its scoop on what it called the first results of the Interphone study, adapted from the latest project **update**, which had been posted on IARC's Web **site** the previous week. In fact, they were really old news. The last update, issued in February, had already included those results that point to a tumor risk—they were far from conclusive, however. As Elisabeth Cardis, the coordinator of Interphone, later confirmed to *Microwave News*, "There is

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nothing new in terms of risk in that [October] update.” In two follow-on stories in its inside pages, *Le Soir* took a more measured tone, noting that these new “disturbing” results need to be confirmed. Cardis, now at **CREAL** in Barcelona, told the paper: “We must remain cautious in the interpretation of the Interphone results.” Her words stand in contrast to the less than cautious warning on page one.

By the following day, the “news” had crossed the North Sea and been amplified by a couple of U.K. papers. “Mobile phones do increase the risk of brain cancer,” stated both the *Telegraph* and the *Sun*. The papers ran identical quotes from Cardis: “To underestimate the risk would be a complete disaster.” This did not fit with what Cardis has said in the past and was even inconsistent with her interview with *Le Soir*. Not surprisingly, Cardis told us that the quote was wrong. She disavowed it.

We saw Cardis at a workshop hosted by the Swiss national **EMF research program** in Zurich earlier this month, where she gave a talk, in which she cited her latest project: the soon-to-be-funded MOBI-Kids, an 11-country study on the possible carcinogenic effects of mobile phones on children and adolescents. As we always do, we asked when the Interphone results would be submitted for publication. We got the now-standard answer. “Soon,” she said. Cardis seemed genuinely candid and we believed her.

We hope Cardis is right this time and that we aren’t being too credulous. Otherwise the rumor mills will continue to spew out more nonsense about what we do and do not know about the consequences of long-term cell phone use. It’s easy to blame the press, but equally responsible are those members of the project who have been arguing about how to present the results for three long years without reaching consensus.