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INSIDE...

Australian Cell Phone Cancer Study Prompts Widespread Skepticism

A new animal study from Australia is being touted by its authors and the mobile phone industry as refuting an earlier experiment that linked cell phones to cancer. But a wide array of researchers from around the world say that the paper—and perhaps the whole study—is deeply flawed.

The paper by Drs. Tammy Utteridge, Tim Kuchel, and coworkers, which appears in the September issue of *Radiation Research*, has a number of anomalies and omissions, according to its critics. Since the paper's release in mid-August, letters have been sent to the journal pointing out these inconsisten-

Does the new Australian experiment suggest that RF radiation can protect against cancer? See p.12.

cies and calling for clarification—some have already been accepted for publication. The study team is working up a unified response but, as of the end of September, had yet to release any official statement.

In 1997, Dr. Michael Repacholi, then at Australia's Royal Adelaide Hospital, announced that he had observed a significant increase in lymphoma in transgenic mice chronically exposed to GSM radiation. His *Pim*-1 mice had 2.4 times more cancer compared to unexposed controls (see *MWN*, M/J97). The Repacholi study has been widely considered to be the most significant evidence pointing to a cancer risk from cell phone radiation.

(continued on p.10)

Evidence Linking Mobile Phones to Brain Cancer Is Flawed, Judge Rules

In a major victory for the wireless industry, a federal judge has rejected the entire slate of expert witnesses who were ready to testify that mobile phone radiation can lead to brain cancer. On September 30, Judge Catherine Blake of the U.S. District Court in Baltimore ruled that the evidence for such a link has not "gained general acceptance in the scientific community."

Four days later, Blake announced that she would dismiss the $800 million lawsuit on October 30, unless either side files an objection by October 25.

Dr. Christopher Newman, a 43-year-old Baltimore neurologist, sued Motorola and other leading cell phone companies in August 2000, alleging that his brain tumor was caused by the use of a handheld analog phone.

"We will appeal," John Angelos, one of Newman's attorneys at the Peter Angelos law firm in Baltimore, told *Microwave News*—even though he initially conceded to the *Wall Street Journal* (October 1) that Blake's September decision was "pretty much a complete victory" for the defense.

(continued on p.5)

European Labs Show EMFs Induce DNA Breaks; Intermittent, Not Continuous, Fields Are Effective

Labs in Austria and Germany have shown that power-frequency magnetic fields can induce DNA damage. Researchers at the University of Vienna and the University of Hannover bring to six the number of groups that have demonstrated this type of genotoxic effect, which was first reported seven years ago.

Drs. Oswald Jahn and Hugo Rüdiger of the University of Vienna observed increases in DNA breaks only after intermittent exposure and only in some types of cells. "This study strongly indicates a genotoxic potential of intermittent EMFs," they write in the August issue of *Mutation Research, Genetic Toxicology (519*, pp.1-13, 2002).

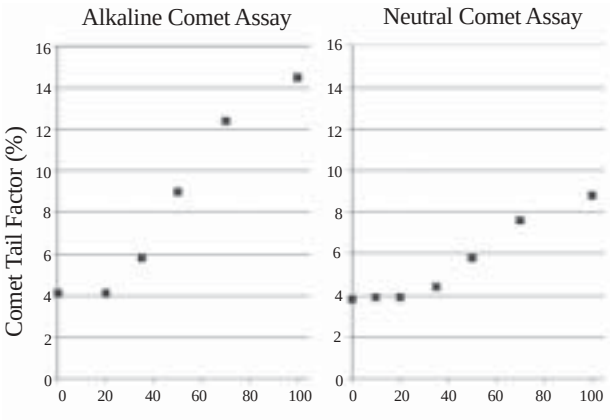
In Hannover, Dr. Hans-Albert Kolb was so skeptical that he bet that he could not repeat the Vienna experiment in his own lab. "I lost a bottle of champagne," Kolb told *Microwave News.*

Dr. Niels Kuster of IT'IS in Zurich, who designed and built the exposure system used by both labs, wants to rule out one last possible artifact before endorsing these findings. "I am still somewhat concerned about vibrations," he said in an interview.

The possible impacts, if any, of vibrations on strand breakage will be investigated later this year, Dr. Franz Adlkofer of the Verum Foundation in Munich told *Microwave News.* Adlkofer is coordinating the EC's REFLEX research project, which includes the Austrian and German efforts.

EMF-induced DNA breaks were first reported in 1995 by Drs. Henry Lai and N.P. Singh of the University of Washington, Seattle. They analyzed the brain cells of rats that had been exposed *in vivo* to continuous 60 Hz fields (see *MWN*, N/D95). "The new results provide solid support for our earlier work and have important implications for future animal and epidemiological research," Singh told *Microwave News.*

DNA Breaks from Intermittent EMFs



Exposure (μT): 15 hours, 5 minutes on/10 minutes off

Source: Dr. Hugo Rüdiger; reprinted with permission.
Notes: "Comet Tail Factor" is a measure of DNA damage. To convert microtesla (μT) to milligauss (mG), multiply by 10.

Jahn and Rüdiger found that when the field was cycled on for five minutes and then off for ten minutes over a 24-hour period, fibroblasts (connective tissue cells) had statistically significant higher levels of DNA breaks at exposures as low as 700 mG. They also found a dose-response trend with increasing field intensity. (The chart below is for a 15-hour exposure.)

They obtained similar results with both the neutral comet assay, which detects damage only when both DNA strands are broken, and the alkaline assay, which can also spot damage limited to a single strand.

"We did not see anything with continuous exposures," Rüdiger said at the Bioelectromagnetics Society's (BEMS) annual meeting in Quebec, Canada, in June. In their paper, Jahn and Rüdiger suggest that continuous exposures "may induce adaptive mechanisms," such as DNA repair, which intermittent exposures might fail to trigger.

The importance of intermittent exposures was a chance finding, Rüdiger said in Quebec. They repeated the experiment many times with different exposure schedules. While 5 minutes on/10 minutes off yielded the largest increases in DNA breaks, other combinations produced less pronounced, but still significant, changes. But some (for example: 5 minutes on/20 minutes off) had no effect.

At the BEMS meeting, Rüdiger pointed out that he saw no effects in blood lymphocyte cells. The differing responses point to cell type as a variable that "could explain the highly divergent results" from different labs studying genotoxic effects of ELF EMFs, he suggested.

Lai agrees. "I think that cell type is a key factor," he told *Microwave News*, explaining that some types of cells might be more susceptible to damage from continuous exposures, while others might be affected more by intermittent fields.

Lai said that he has unpublished data that show DNA damage at levels as low as 100 mG for exposures of 24 hours. When he extended the exposures to 48 hours, he saw even more damage.

Indeed, Jahn and Rüdiger note in their paper that not all fibroblast cells responded uniformly to the exposures. The fibroblasts from the two volunteer donors in the experiment had different levels of DNA damage (although the increases were significant for both).

At BEMS, Rüdiger also reported observing more micronuclei in cells exposed to intermittent EMFs, as well as an "immediate additive effect" of intermittent EMFs on DNA breaks in cells exposed to ultraviolet radiation.

Three other labs have observed increased DNA damage following exposure to power-frequency EMFs. In the U.S., Dr. Jerry Phillips investigated human lymphoblastoid cells (see *MWN*, N/D98). Dr. Yog Raj Ahuja in India used human blood cells, and Sweden's Dr. Britt-Marie Svedenstål examined brain cells from mice (see *MWN*, N/D98).

Researchers at Battelle were the first to look for DNA damage following exposure to ELF EMFs. In 1988, they reported

finding no effect in ovarian cells of Chinese hamsters. (A member of the team, Dr. Rick Jostes, is now a project officer on the National Research Council's study on the PAVE PAWS radar; see *MWN*, N/D01.)

In the February issue of *Bioelectromagnetics (23,* pp.106-112, 2002), Dr. Kim O'Neill reported that human HL-60 cells—but not Raji cells—take longer to repair DNA damage after exposure to a 1.5 G, 60 Hz field (see "Hot Papers," *MWN*, M/A02).

« Power Line Talk »

"I was gobsmacked by the lack of press coverage" of **IARC**'s designation of power-frequency EMFs as possible human carcinogens, Dr. **Michael Repacholi** told *Microwave News* during a coffee break at the August radio science (**URSI**) meeting in Maastricht, the Netherlands (see *MWN*, J/A01). (For newcomers to British slang: He was amazed.) "There is something about cancer in children that is very emotive," and these fields are "everywhere," which makes the news media's reaction all the more surprising, he added. Despite this media indifference, Repacholi vowed to continue pushing for more research: "I am not going to let it go. I honestly think that it's important." His EMF project, based in Geneva, is "reviewing every possible mechanism," because "we need to explain the epidemiological evidence." In his invited talk at the weeklong conference, Repacholi promoted a somewhat different view. He pointed out that under the scheme devised by the International Agency for Research on Cancer, "possible" is the weakest of three classes of carcinogens. This designation is at a "much lower level" than IARC's known or "probable" categories. (There are two other classes: "unclassifiable" and "probable noncarcinogen.") Repacholi speculated that the IARC decision is being misinterpreted and causing excess anxiety because in a number of languages there is no distinction between "possible" and "probable," leading people to exaggerate EMF health risks. We caught up with Repacholi after his talk and asked him which languages he had in mind. "Japanese, French, Spanish and Chinese," he replied. Dr. **Joe Wiart** of France Telecom was sitting nearby, so we sought his linguistic opinion. There is a distinction between the two, he said, but the difference is smaller in French than in English. But then again, Repacholi himself believes that the difference between the two is "subtle" even in English.

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The **IEEE** has a new set of exposure limits for EMFs in the 0-3 kHz frequency range. On September 12, the IEEE's Standards Board approved the **ELF standard**, which was written by a subcommittee of **ICES** (formerly SCC-28), chaired by **Kent Jaffa** of PacifiCorp. The new standard, designated C95.6, addresses acute hazards only—because none of the "major reviews" of health effects research "concluded that any hazard from long-term exposure has been confirmed." At 50 and 60 Hz, the limits are 5 kV/m and 9.04 G for the public and 20 kV/m and 27.1 G for those who are in a "controlled environment." Exposures of arms and legs can exceed 63 G and still be in compliance. Work on the EMF standard began in 1991 but stalled out, and then started again in 1999 (see *MWN*, N/D91 and N/D99). *Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields* will be available soon from <shop.ieee.org/store>.

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The Australian Radiation Protection and Nuclear Safety Agency (**ARPANSA**) has decided to develop its own ELF exposure standard. Dr. **Andrew Wood** of Swinburne University has been asked to chair a working group to draft limits for frequencies up to 3 kHz, according to Dr. **John Loy**, the CEO of ARPANSA. The other members have not yet been chosen. Wood said he did not know whether his panel would follow the **ICNIRP** guidelines. "They are now several years old and we will need to address some more recent developments," he told *Microwave News.* He pointed to ICNIRP's own assessment of EMF epidemiology, which indicates a link between magnetic fields and childhood cancer that is "unlikely to be due to chance," and to the fact sheet issued by WHO's EMF project that endorses prudent avoidance (see *MWN*, J/F02 and S/O01, respectively). Wood is planning to hold his first meeting later this year. ARPANSA recently completed an RF/MW radiation standard that was based on the ICNIRP guidelines (see *MWN*, M/J02).

Leak: EMF–Childhood Leukemia Link Also Found in Japan

Preliminary results of a large epidemiological study show that Japanese children exposed to magnetic fields of more than 4 mG from power lines and appliances had twice the expected rate of leukemia, *Asahi Shimbun*, one of Japan's leading national newspapers, reported on August 26.

These results were leaked to the press—very unusual in Japan. If confirmed, they would give added support to two well-regarded meta-analyses that indicate a childhood leukemia risk above 3-4 mG (see *MWN*, S/O00).

Dr. Michinori Kabuto of the National Institute for Environmental Studies in Ibaraki, who is leading the study team, declined to comment on the accuracy of the *Asahi* story. "The results will be submitted shortly," he told *Microwave News.*

Kabuto planned to include 1,000 leukemia and 500 brain tumor cases among children under the age of 15 (see *MWN*, M/J99). A final report was due last spring.

Asahi Shimbun noted that the EMF issue has been largely ignored in Japan. The Gauss Network, a citizens' group based in Tokyo, is concerned that corporate and government officials will downplay the results by insisting that the WHO EMF limits are being met, even though they are close to a thousand times higher than the observed threshold for an increased cancer risk, according to Tetsuo Kakehi, the president of the network.

The Japanese study is the last major epidemiological effort to investigate the EMF–childhood cancer link. Many observers believe that Japan is an ideal place to study it because exposures tend to be higher there.

Sweden's Lennart Hardell: Under Attack from All Sides

Dr. Lennart Hardell's two papers on brain tumor risks from mobile phones have now been published (see excerpts from the abstracts at right). Both he and the papers are under attack from all directions. Here is a brief rundown of who is saying what:

• The two papers, which had been circulating for over six months, are the centerpiece in a U.S. brain tumor case. (Hardell also testified in court.) In a strongly worded opinion, Judge Catherine Blake finds that Hardell's work has "serious flaws" (see p.1 and excerpts from her decision on p.5).

• In a report for the Swedish Radiation Protection Authority (SSI) in Stockholm, two American epidemiologists present a detailed critique of Hardell's work, pointing to "questionable and inconsistent statements throughout [the *European Journal of Cancer Prevention*] paper" (see also p.9). Drs. John Boice Jr. and Joseph McLaughlin, both with the International Epidemiology Institute in Rockville, MD, also conclude that: "Overall, the epidemiologic and laboratory studies to date have ruled out with a reasonable degree of certainty that cellular telephones cause cancer, at least for durations of use up to 5 years." Boice and McLaughlin were coauthors, with Drs. Christoffer Johansen and Jørgen Olsen of the Danish Cancer Society in Copenhagen, on two epidemiological studies that found "no support" for an association between mobile phones and brain and eye cancer (see *MWN*, M/A01 and M/A02). Dr. Kjell Hansson Mild, a coauthor on the Hardell papers, told *Microwave News* that they are preparing a response to the SSI report. "In our view," he said, "a consistent picture is emerging from these studies that a causal association between use of cellular phones and brain tumors *cannot* be ruled out."

• Members of the Swedish cancer establishment continue to wage a campaign against Hardell. In an interview with *Svenska Dagbladet (SvD)*, a leading national newspaper (August 21), Dr. Magnus Ingelman-Sundberg, the vice chair of the Karolinska Institute's Institute of Environmental Medicine in Stockholm, called Hardell's paper in the *European Journal of Cancer Prevention* "alarmist" and "irresponsible." He also characterized the *European Journal* as a "fifth-rate" publication. Then on September 2, Ingelman-Sundberg took another shot in a letter to *SvD*, under the headline "Fantasies About Mobiles." Over the last year, he has repeatedly attacked Hardell's concerns over phone safety (see *MWN*, S/O01 and J/A02). Meanwhile, one of Hardell's critics has come under scrutiny. Dr. Hans-Olov Adami, also of the Karolinska Institute, is being pressured to explain his work as a consultant to the chemical industry on the risks posed by dioxin.

Hardell and Mild have another paper in press. "Vestibular Schwannoma, Tinnitis and Mobile Phones" has been accepted by *Neuroepidemiology*, Hardell told *Microwave News* ("neuroma" is often used interchangeably with "schwannoma"). "This is an expansion of the acoustic neuroma issue with some case reports of tinnitis among mobile phone users," he said, pointing out that tinnitis may be a precursor of acoustic neuroma. In an interview, Mild noted that in his study of headaches among Scandinavian users of mobile phones some people complained of one-sided tinnitis (see *MWN*, M/J98 and J/A00).

Despite the best efforts of Hardell's critics, a majority of the Swedish public believes that mobile phones present a health risk, according to informal polls run by Sweden's two major newspapers. Following the release of the *European Journal* paper, 64% of some 8,000 who voted on the *Dagens Nyheter* Web site said that they think using a mobile phone is harmful. In a similar poll on *SvD*'s site, close to half of 1,285 voters said that they are either worried about their use of mobile phones or are using them less.

And Ingvar Oldsberg, a TV personality whom some describe as the most familiar face in Sweden, reacted to Hardell's new study with, "It's not surprising," adding that he has long had doubts about the safety of mobile phones and limits his use of them.

The Hardell Abstracts

L. Hardell, A. Hallquist, K. Hansson Mild, M. Carlberg, A. Påhlson and A. Lilja, "Cellular and Cordless Telephones and the Risk for Brain Tumors," ***European Journal of Cancer Prevention, 11,*** **pp.377-386, August 2002.**

"...We included in a case-control study 1,617 patients aged 20-80 years of both sexes with brain tumor diagnosed between 1 January 1997 and 30 June 2000. They were alive at the study time and had histopathologically verified brain tumor....Exposure was assessed by a questionnaire that was answered by 1,429 (88%) cases and 1,470 (91%) controls. In total, use of analog [phones] gave an increased risk with an OR=1.3 (95% CI=1.02-1.6). With a tumor induction period of >10 years the risk increased further: OR: 1.8 (95% CI=1.1-2.9). No clear association was found for digital or cordless telephones....[T]he risk was increased for tumors located in the temporal area on the same side of the brain that was used during phone calls; for analog cellular telephones the OR was 2.5 (95% CI=1.3-4.9). Use of a telephone on the opposite side of the brain was not associated with an increased risk for brain tumors. With regard to different tumor types, the highest risk was for acoustic neurinoma (OR: 3.5, 95% CI=1.8-6.8) among analog cellular telephone users."

L. Hardell, K. Hansson Mild and M. Carlberg, "Case-Control Study on the Use of Cellular and Cordless Phones and the Risk for Malignant Brain Tumors," ***International Journal of Radiation Biology, 78,*** **pp.931-936, October 2002.**

"A case-control study was performed on 649 patients... Exposure was assessed by a questionnaire answered by 588 (91%) cases and 581 (90%) controls. Phone usage was defined as 'ever use' and usage starting within 1 year before diagnosis was disregarded. Overall, no significantly increased risks were found: analog cellular phones yielded an OR: 1.13 (95% CI=0.82-1.57), digital cellular phones OR: 1.13 (CI= 0.86-1.48) and cordless phones OR: 1.13 (CI=0.85-1.50). For ipsilateral (same side) RF exposure, analog mobile phones gave OR: 1.85 (CI=1.16-2.96) for all malignant brain tumors. For astrocytoma, this risk was OR: 1.95 (CI=1.12-3.39). For all malignant brain tumors, digital mobile phones yielded OR: 1.59 (CI=1.05-2.41) and cordless phones yielded OR: 1.46 (CI=0.96-2.23) in the analysis of ipsilateral exposure. *Conclusion*: The ipsilateral use of an analog cellular phone yielded a significantly increased risk for malignant brain tumors."

Judge: Mobile Phone Cancer Evidence Flawed *(continued from p.1)*

Baltimore attorney Joanne Suder, who originally filed the Newman suit two years ago and who has six other claims pending and even more clients waiting in the wings (see *MWN*, S/O 00, N/D01 and M/J02), is also not ready to quit. "We have enough solid scientific evidence to establish a link between cell phone use and brain cancer," she said following Blake's decision.

Nevertheless, the ruling casts doubt on the viability of other similar suits that have been filed across the country. In late July, a panel of federal judges in Washington issued a preliminary order transferring nine of the pending cases to Blake's court (see *MWN*, J/A02). The panel is expected to issue a final decision later this year.

In another victory for the industry, an Illinois court of appeals has affirmed the dismissal of Robert Kane's brain tumor case against Motorola. Here again, the courts cite the lack of scientific evidence. Kane told *Microwave News* that his lawyers will continue to pursue this case (see *MWN*, J/F94 and J/A00).

The wireless industry immediately hailed the Newman decision. It should send "a strong message" to others who may be thinking of filing their own claims, read a statement on Motorola's Web site: "Dr. Newman's lawyers had the resources to search far and wide for reliable evidence to buttress their claims, but came up short." The Angelos firm has won many millions of dollars in litigation against the asbestos and tobacco industries.

In her strongly worded 22-page opinion, Blake details why the testimony of Newman's experts fails to meet the *Daubert* standard, which, under a 1993 Supreme Court decision, requires that scientific evidence be "reliable and relevant" in order to be admitted in federal court (see *MWN*, M/A02).

The epidemiological studies of Dr. Lennart Hardell of Sweden's Örebro University, who has shown higher rates of cancer among some phone users, are crucial to the plaintiff's case. Blake asserts that they are needed to "support a theory of cancer causation in humans" but that the work suffers from "serious flaws."

While acknowledging that Hardell is qualified to offer an expert opinion in the fields of oncology and epidemiology, Blake writes that, " The validity and relevance of [his results are] subject to serious criticism" due to recall bias, the lack of dose-

Excerpts from Judge Blake's "Serious Criticism" of Hardell's Work

Dr. Hardell supports his theory of causation, however, with his purported findings of an increased association between development of malignant brain tumors, including astrocytoma, and "ipsilateral" phone use...The validity and relevance of this finding is subject to serious criticism...

Applying the *Daubert* factors, it is first important to note that neither of these papers had been accepted for publication in a peer-reviewed journal as of the time of the hearing in February 2002. Indeed, the manuscript was rejected for publication by *The Lancet*, a well-respected British medical journal, based on substantial criticism by the peer reviewers, including concerns about the "large confidence intervals" and that "the overall message of the paper was written much too forcefully."...

The fact of publication, of course, does not eliminate the need to examine the results and methodology of the study...On the issue of relevance, as noted, neither paper shows any statistically significant increased risk for the development of malignant brain tumors based on analog cell phone use. The plaintiffs rely instead on the increased risk for all brain tumors, obtained by including the category of benign acoustic neuroma, which is not applicable to Dr. Newman's case and was not observed in Dr. Hardell's 1999 paper. They also rely on the association of astrocytoma with ipsilateral use. The validity of these results is suspect for several reasons.

First is the problem of recall bias. Dr. Hardell's questionnaire necessarily relied on persons who had developed a brain tumor on one side of their head being asked to recall on which side of the head they had used their cell phones. Dr. Meir Stampfer, professor of medicine at Harvard Medical School and chair of the department of epidemiology at the Harvard School of Public Health...persuasively stated the reasons for finding that recall bias likely had affected Dr. Hardell's results. One of the most significant of those reasons was that the study found an increased risk of tumor with ipsilateral use for all phones—analog, digital and cordless—even though there is otherwise no scientific claim that cordless phones cause brain cancer....Another is the pattern of decreased risk on the contralateral side, averaging out to an overall "null" finding (no association).

Second is the lack of any demonstrated dose-response relationship, which Dr. Hardell agrees is one of the most important factors to prove causality. Fairly read, his papers, deposition and hearing testimony do not support finding a scientifically valid dose-response relationship for mobile phone use and brain cancer, particularly not for astrocytoma.

Third are the significant problems with relying on an ipsilateral association as evidence of causation when there is no underlying evidence of an association between cell phone use and development of malignant brain tumors. As explained by a review [by Kenneth Rothman] in *The Lancet* commenting on Dr. Hardell's 1999 paper, his ipsilaterality theory is inherently flawed: "[S]ince there had been no increase in the overall risk of tumor, an association between side of tumor and side of telephone use requires the implausible inference that telephone use does not affect the risk of whether a brain tumor will occur but only its location." That criticism is particularly applicable as to the papers resulting from Dr. Hardell's later studies, where the numbers involved were sufficiently large to show an increased risk for malignant brain tumors if such risk existed.

Fourth, Dr. Hardell puts overdue emphasis on the positive findings for isolated subgroups of tumors. As Dr. Stampfer explained, it is not good scientific methodology to highlight certain elevated subgroups as significant findings without having earlier enunciated a hypothesis to look for or explain particular patterns, such as dose-response effect. In addition, when there is a high number of subgroup comparisons, at least some will show a statistical significance by chance alone. In Dr. Hardell's study, there is no overall showing of increase in a significant number of the subgroups. While Dr. Richter disagrees with this analysis, I find Dr. Stampfer more persuasive.

Dr. Hardell's methodology for testing laterality has not been used by any other scientist proffered to the court. Nor has it been replicated. The Inskip and Muscat studies, which tested laterality by other means and admittedly with a smaller number of people, do not show increased risk.

Arrayed against Dr. Hardell's findings are the numerous studies published in peer-reviewed journals and by international scientific and governmental bodies...

Footnotes are omitted. The full text of Blake's decision in the Newman case is available at: <www.mdd.uscourts.gov/Opinions152/Opinions/newman0902.pdf>.

response and the absence of independent replication (see excerpts p.5; also p.4).

Blake also discounts the experiments of Dr. Henry Lai of the University of Washington, Seattle, linking RF/MW radiation to DNA breaks because he used 2450 MHz radiation rather than the 824-848 MHz frequency band of analog mobile phones. Lai's work does not "fit" in this case, according to Blake.

Blake leaves little doubt that she is unimpressed by the testimony of Dr. Jerry Phillips of the Biological Sciences Curriculum Study in Colorado Springs, CO, and Dr. Elihu Richter of Hebrew University in Jerusalem.

In contrast, Blake, who was trained at Harvard, describes the scientists offered by the defense as an "array of established, experienced and highly-credentialed experts." She cites with approval the testimony of Drs. Eugenia Calle of the American Cancer Society, Mark Israel of Dartmouth Medical School, John Laterra of Johns Hopkins Medical School and Meir Stampfer of Harvard University.

The experts on both sides testified at a week-long "*Daubert* hearing" last February (see *MWN*, M/A02).

On November 1, Blake will hear oral arguments on motions to dismiss a group of cases—some of which were filed by the Angelos firm—that seek to require that headsets be provided with all cell phones (see *MWN*, N/D00, M/J01 and J/A02).

Radiation Sickness or the Flu? U.K. RF Workers Lose in Court

A U.K. judge has rejected the claims of two tower workers that their persistent health problems were caused by FM radio radiation. After an appeals court upheld the ruling, the plaintiffs must now decide whether to file a final appeal with the House of Lords.

Alan Davis and John Docherty became ill in July 1996, soon after beginning to install TV antennas on a BBC tower in Cornwall (the southwestern tip of England). Both reported severe headaches, dizziness, nausea, diarrhea, fatigue and pain, numbness and tingling sensations. Neither has fully recovered or been able to return to tower work.

In 1999, they went to court seeking compensation from the BBC, the telecom company NTL and the engineering firm Balfour Kilpatrick, their former employer.

Dr. Chris Schilling, an occupational physician consulting for NTL, examined Davis and Docherty in August 1996 and concluded that they were suffering from radiation sickness. He published a case report in *Occupational Medicine (50,* pp.49-56, 2000). Schilling suggested that a metal cable running down the center of the tower could have acted as a secondary antenna, causing unusually high exposures. In the same case report, he described how two other men who worked on the same tower had complained of similar—though less severe—symptoms (see *MWN*, J/A00).

Dr. Colin Blakemore, a neurologist at Oxford University, testified for the defense that Davis and Docherty's exposures to the 100 MHz radio radiation had not exceeded 70 V/m (1.3 mW/cm^2)—below the 100 V/m (2.7 mW/cm^2) guideline specified by the U.K.'s National Radiological Protection Board (NRPB) to protect against thermal injury.

In a joint statement submitted to the court, Blakemore and Dr. Bruce Hocking, a Melbourne-based occupational physician who served as an expert for the plaintiffs, agreed that the workers' symptoms did not fit the characteristic profile for thermal tissue damage from RF/MW radiation.

Blakemore suggested that the two men were suffering from a viral infection and insisted that there is "simply no evidence" that lasting damage from RF/MW radiation "can happen without tissue heating." Blakemore has long been a member of NRPB's Advisory Group on Non-Ionizing Radiation and also sits on the Independent Expert Group on Mobile Phones, chaired by Sir William Stewart (see p.14 and *MWN*, M/J00).

Hocking countered that a different mechanism could have been responsible. "There is reason to be cautious in assuming we understand all the ways that RF radiation may interact with the nervous system," he wrote. Hocking is a former chief medical officer of the Australian national telecom company, Telstra.

Following the week-long trial in March 2001, Judge Sean Overend of the civil court in Exeter concluded that it is no more than "a remote possibility" that lasting damage could result from RF/MW radiation at the levels to which Davis and Docherty were likely to have been exposed—not enough to sustain their claims.

Explaining why he saw no reason to reverse Overend's ruling, Lord Justice Tuckey of the civil court of appeal in London called Blakemore "a distinguished physiologist," and commented that Overend was "not surprisingly...impressed by his expertise." Tuckey's opinion was issued on May 23 of this year.

According to Schilling, who still consults for NTL, broadcasters have become more cautious following a rash of health

Germans Make It Official: Cell Phones Do Not Raise Blood Pressure

Dr. Stefan Braune and coworkers have officially conceded that GSM signals do not raise blood pressure.

In 1998, Braune of Germany's University of Freiburg made international headlines by publishing a research letter in *The Lancet* announcing that mobile phone radiation could affect the cardiovascular nervous system. But last year he told *Microwave News* that he believed that his initial observations had nothing to do with electromagnetic radiation (see *MWN*, J/A98 and J/A01).

Details on Braune's follow-up experiment, which failed to reproduce the original findings, appear in the September issue of *Radiation Research (158*, pp.352-356, 2002). He now concludes that his findings are consistent with previous efforts that also failed to see nonthermal effects.

complaints among tower workers—including Davis and Docherty's. "They have been advised to operate under a principle of, 'If in doubt, stop and check,'" Schilling told *Microwave News.*

Chinese Delegation Tours Europe Seeking Advice on SAR Limits

A delegation of Chinese officials traveled to Europe in August to meet with research scientists as well as representatives of industry and government. Their mission is to help the Chinese government decide whether to adopt a 1 W/Kg SAR standard for mobile phones or to follow the more lenient limits set by ICNIRP or the IEEE.

The ten-member delegation was led by Sun Xiaokang of the Standardization Administration of China (SAC). The other nine are members of the Joint Working Group (JWG), according to Michael Milligan of the Mobile Manufacturers Forum (MMF), who helped plan their trip. The JWG is charged with making the SAR decision (see *MWN,* M/J02).

The Chinese began their tour in Finland, where they visited the Nokia research center and the Finnish Institute of Occupational Health (FIOH). The following week they attended a workshop at the University of Bordeaux's electromagnetic research lab and then went north to Paris for meetings with French health and industry representatives. The last stop was Brussels, for a discussion on safety standards at the offices of the European Commission (EC).

"We hope the meeting will lead to true global harmonization of safety standards for EMFs," Mark Bogers of the EC's Directorate-General (DG) Enterprise told *Microwave News.* The objective of the DG Enterprise is to promote economic growth and free trade.

In an interview, MMF's Michael Milligan commented that, "We remain hopeful that the Chinese will see the benefits of international harmonization of standards and in particular that they see the value of the WHO-recommended ICNIRP guidelines." The MMF, an association of companies that make radio equipment, including mobile phones, is based in Brussels.

Dr. Maila Hietanen of FIOH and Bernard Veyret of the University of Bordeaux, both of whom are members of ICNIRP, were among those who met with the Chinese officials.

A second, smaller delegation from China is planning to come to the U.S. in November. Dr. C.K. Chou of Motorola in Plantation, FL, is helping organize that trip. On the agenda, Chou said, are meetings with the executive committee of the IEEE's ICES standards group in Piscataway, NJ, FCC officials in Washington and the staff at the Motorola labs in Plantation. At the end of September, Chou told *Microwave News* that the November trip had yet to be confirmed.

Wang Xilin of the SAC, the chair of the JWG, was a member of the delegation that went to Europe. Among the other Chinese government groups represented in the party were the Airspace Medical Institute, Center for Disease Control and Prevention, Environmental Protection Agency, Ministry of Information Industry and National Institute of Metrology, according to Milligan.

International EMF Panel with Precautionary View in Formation

A group of European and U.S. researchers has taken the first step toward establishing an international commission to protect public health and to promote EMF research. The panel will base its outlook on the precautionary principle, according to a resolution adopted at a meeting in Catania, Sicily, in mid-September (see below).

Many of those who were in Catania had also signed the Vienna Resolution, which states that low-level RF/MW effects have been established (see *MWN,* N/D98).

The Catania Resolution

The scientists at the international conference *State of the Research on Electromagnetic Fields – Scientific and Legal Issues*, organized by Italy's National Institute for Prevention and Work Safety (ISPESL), the University of Vienna and the City of Catania, and held in Catania, Italy, September 13-14, 2002, agree to the following:

1. Epidemiologic and *in vivo* and *in vitro* experimental evidence demonstrates the existence of EMF-induced effects, some of which can be adverse to health.
2. We take exception to arguments suggesting that weak (low intensity) EMFs cannot interact with tissue.
3. There are plausible mechanistic explanations for EMF-induced effects which occur below present ICNIRP and IEEE guidelines and exposure recommendations by the EU.
4. The weight of evidence calls for preventive strategies based on the precautionary principle. At times the precautionary principle may involve prudent avoidance and prudent use.
5. We are aware that there are gaps in knowledge on biological and physical effects, and health risks related to EMFs, which require additional independent research.
6. The undersigned scientists agree to establish an international scientific commission to promote research for the protection of public health from EMFs and to develop the scientific basis and strategies for assessment, prevention, management and communication of risk, based on the precautionary principle.

*Signers**: Drs. ***Fiorella Belpoggi***, Ramazzini Foundation, Bologna, Italy; ***Carl Blackman***, Environmental Protection Agency, Research Triangle Park, NC, U.S.; ***Martin Blank***, Columbia University, New York City, U.S.; ***Emilio Del Giudice***, National Institute of Nuclear Physics, Milan, Italy; ***Livio Giuliani***, University of Camerino, Italy; ***Settimio Grimaldi***, National Research Council, Rome, Italy; ***Lennart Hardell***, Örebro University, Sweden; ***Michael Kundi***, University of Vienna, Austria; ***Henry Lai***, University of Washington, Seattle, U.S.; ***Abraham Liboff***, Oakland University, Rochester, MI, U.S.; ***Wolfgang Löscher***, Hannover Veterinary Institute, Germany; ***Kjell Hansson Mild***, National Institute of Working Life, Umeå, Sweden; ***Wilhelm Mosgoeller***, University of Vienna, Austria; ***Elihu Richter***, Hebrew University, Jerusalem, Israel; ***Umberto Scapagnini***, University of Catania, Italy; ***Stanislaw Szmigielski***, Military Institute of Hygiene and Epidemiology, Warsaw, Poland.

* Institutional affiliations are for identification only and do not necessarily indicate endorsement of the resolution.

EPA: Current RF Limits Are Adequate for Thermal Risks

Responding to pressure from the wireless industry, the U.S. Environmental Protection Agency (EPA) has reaffirmed its support for the Federal Communications Commission's (FCC) exposure standards for RF/MW radiation.

"It remains EPA's view that the FCC exposure guidelines adequately protect the public from all scientifically established harms," states Frank Marcinowski, the director of the agency's radiation protection division, in a September 15 letter to the Cellular Telecommunications and Internet Association (CTIA). "However," he points out, there is "continued scientific uncertainty" about "possible nonthermal effects, such as those due to chronic exposure."

This language is consistent with previous comments from EPA officials on RF/MW exposure standards (see box at right).

Marcinowski's letter was prompted by a request for "clarification" from Jo-Anne Basile, a CTIA vice president in Washington. Basile's September 6 letter was, in turn, a reaction to a letter from EPA's Norbert Hankin to the EMR Network, a grass roots activitist group. Basile was concerned that Hankin had failed to fully endorse the FCC limits and asked Marcinowski for "written confirmation" that the EPA had not changed its position, in order to "dispel any misconceptions."

In his three-page letter to the network, dated July 16, Hankin noted the uncertainties related to current exposure limits and detailed the possible implications if nonthermal effects were to be confirmed (see excerpt at right).

Janet Newton, the president of the EMR Network in Marshfield, VT, set the stage for all these letters in January by asking the EPA and five other federal agencies whether they agree with FCC's reliance on the IEEE and NCRP standards.

Dr. Ken Olden, director of the NIEHS, replied on February 21 that "additional research is needed" into possible effects of long-term exposures. Both OSHA and NIOSH responded that they are monitoring research on nonthermal effects. The FDA and the NTIA did not reply.

The network, an organization concerned with possible health effects of electromagnetic radiation, has posted the correspondence on its Web site, <www.emrnetwork.org>. Previously, it had mounted an unsuccessful challenge to the FCC guidelines in court (see *MWN*, M/A00) and failed to convince the FCC to reconsider its exposure limits (see *MWN*, J/F02).

According to the trade publication *RCR Wireless News* (September 2), Basile's letter followed a request by CTIA's attorneys at Arnold & Porter in Washington for a meeting with EPA officials to discuss the agency's position on the FCC limits.

On September 30, Dr. Robert Adair entered the fray with a strongly worded letter to EPA Administrator Christine Whitman. He expressed his "strong dissatisfaction" with Marcinowski and Hankin's letters. Adair lambasted EPA's work on EMFs as being marked by "incompetence and worse in a field marred by documented scientific dishonesty." He closed by citing his credentials, including having held a chair in physics at Yale University and his membership in the National Academy of Sciences.

EPA on Nonthermal Effects

The Letter at the Center of a Storm

The July 16 letter from EPA's Norbert Hankin to the EMR Network is excerpted below. The full text is at <www.emrnetwork.org>.

"I believe it is correct to say that there is uncertainty about whether or not current guidelines adequately treat nonthermal, prolonged exposures...[T]here are reports that suggest that potentially adverse health effects, such as cancer, may occur. Since EPA's comments were submitted to the FCC in 1993, the number of studies reporting effects associated with both acute and chronic low-level exposure to RF radiation has increased.... Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposure standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given to sensitive populations, are often considered. Incorporating information on exposure scenarios involving repeated short duration/nonthermal exposures that may continue over very long periods of time (years), with an exposed population that includes children, the elderly and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines."

A Consistent View over a Decade

Since the early 1990s, EPA officials have repeatedly stated that the FCC's exposure limits, which are based on those set by the National Council on Radiation Protection and Measurements (NCRP) and the IEEE, do not address nonthermal effects.

***November 9, 1993**, Margo Oge, Director, Office of Radiation and Indoor Air (ORIA), Washington, to the FCC*: "The thesis that the 1992 ANSI/IEEE recommendations are protective of all mechanisms of interaction is unwarranted because the adverse effects level in the [IEEE] standard is based on a thermal effect." (See *MWN*, J/F94.)

***October 8, 1996**, Norbert Hankin, ORIA, to David Fichtenberg*: "Both the NCRP and ANSI/IEEE standards are thermally based and do not apply to chronic, nonthermal exposure situations. The statement referring to 'adequate protection' pertains to thermally related effects." (See *MWN*, M/J97.)

***April 30, 1999**, Robert Brenner, Acting Deputy Assistant Administrator for Air and Radiation, to the FCC*: "The FCC guidelines expressly take into account thermal effects of RF energy but do not directly address postulated nonthermal effects, such as those due to chronic exposure."

***June 17, 1999**, RF Interagency Working Group, to IEEE SCC-28, signed by seven federal officials, including Hankin and EPA's Dr. Joseph Elder, Health Effects Research Lab, Research Triangle Park, NC*: "The past approach of basing the exposure limits on acute effects data with an extrapolation to unlimited chronic exposure durations is problematic....For lower-level ("nonthermal"), chronic exposures, the effects of concern may be very different from those for acute exposure..." (See *MWN*, J/A99.)

« Wireless Notes »

Frustrated by the lack of answers to questions about mobile phone safety, editors at two large-circulation magazines want the wireless industry and the government to **step up the research**. "Simply not enough is known to say whether cell phones are safe," writes **David Kirkpatrick** in his "Fast Forward" column (August 28) posted on the ***Fortune*** Web site, <www.fortune.com/technology>, and distributed free by e-mail. Kirkpatrick points out that, despite industry assurances, most of the Wall Street analysts at a recent Nokia presentation were using hands-free kits. It's "shameful," he contends, that no top wireless executive "will step up and admit that there is a credibility gap between users and the companies that must be addressed" through a more aggressive research effort. Kirkpatrick allows that the "marvelous efficiencies" made possible by mobile phones "could even be worth some minor health risks," but, he adds, "We ought to know what we're getting into." A somewhat different and shorter version of Kirkpatrick's column appears in the September 30 issue of *Fortune*. **Suzanne Kantra Kirschner**, a technology editor at ***Popular Science***, offers a similar view on the safety question in the magazine's September issue. "Despite countless studies...we still don't know if cell phones are dangerous," she writes. With more than 130 million mobile phone users in the U.S. and new broadband technologies on the way, Kirschner advises, "It's time to put this issue to rest, and only the government's deep pockets can do so." She calls on the FDA to "develop a plan to definitively study the long-term effects of cell phone use."

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Shook, Hardy & Bacon has joined the many law firms defending the wireless industry against brain cancer claims. Shook, Hardy is well known for its efforts on behalf of **tobacco** companies—it represented Philip Morris in the first trial of a personal injury case alleging the health hazards of smoking half a century ago. The firm is representing **Sprint** Corp., a service provider named as a defendant in a lawsuit filed by David Keller in a Washington, DC, court earlier this year (see *MWN*, M/A02 and J/A02). Keller, who claims that radiation from his mobile phone caused him to develop a brain tumor, is represented by **Morganroth & Morganroth** in Detroit. Shook, Hardy, which has offices in the U.S. and Europe, is also defending Sprint against several suits that seek to force the wireless industry to provide hands-free kits with every mobile phone (see *MWN*, N/D00 and M/A01).

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Levi Strauss & Co. is using high-tech features to market its Dockers line of **trousers** to European men. Its new S-Fit pants boast a special "**anti-radiation**" **pocket** for a mobile phone. "Our intention is not to cash in on consumer fears but provide the consumers with what they want," a Levi's spokesperson told Reuters (September 12). The shielded pocket will also keep the phone from sending or receiving a signal, a letter to Scotland's *Herald* noted four days later. "The same effect can be achieved with any trousers," the canny reader wrote: "Turn off the phone before placing it in your pocket."

« Eye on Europe »

School, day care and hospital officials in **Berlin**, as well as those who serve other "sensitive" members of the population, now have some control over the placement of **wireless antennas**. Under the *Principles for the Siting of Base Stations* enacted by the city's senate on September 10, they can veto proposed sites on nearby city property. The guidelines also stipulate that antennas on municipal buildings and land must be three times farther away from populated areas than is currently allowed by federal regulations—effectively making the limits ten times stricter than **Germany**'s ICNIRP-based standards. "We view this as a pilot regulation," Harald Wolf, the sponsor of the new ordinance, told the *Berliner Morgenpost* (September 11). Although not required to do so, managers of Berlin's "huge" public housing system will also be encouraged to follow the new guidelines, a spokesperson for Wolf, who is a deputy mayor and member of the Democratic Socialist Party, told *Microwave News*. Last December, in exchange for a promise from federal regulators not to tighten exposure limits, Germany's wireless carriers pledged to give local officials a greater say in siting antennas near schools and kindergartens—without saying how they would do so (see *MWN*, J/F02). Berlin, the German capital, is joining a number of other cities across Europe—including Brussels, Salzburg and Zurich—that want rules that are tougher than their national standards (see *MWN*, S/O00, J/A00 and N/D00, respectively).

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The **Swedish Radiation Protection Authority** (SSI) is increasing its work on non-ionizing radiation—UV and solar radiation and low- and high-frequency EMFs. The new report on cellular phones and cancer (see p.4) is one example of its new priorities. In June, the SSI set up an independent scientific advisory group, chaired by Dr. **Anders Ahlbom** of the Karolinska Institute in Stockholm. The other members are: Drs. **Eduard David** (Germany), **Malcolm Harrington** (U.K.), **Jukka Juttilainen** (Finland), **Leeka Kheifets** (WHO), **Bernard Veyret** (France) and **Harri Vainio** (IARC). Dr. **Lars-Erik Paulsson**, a principal scientist in SSI's non-ionizing radiation department, said that Ahlbom's panel will file a report each year describing the main scientific developments on EMFs. While Paulsson spends the bulk of his time on UV and solar radiation, SSI's **Gert Anger** works on EMF issues full time.

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The Austrian wireless industry's feud with health officials in **Salzburg** continues. In announcing the launch of the country's first nationwide **3G** system, service provider **Mobilkom** said that it cannot offer the service in Salzburg because of the city's 1 μW/cm^2 precautionary limit, the September 26 *Salzburger Nachrichten* reported (see *MWN*, J/A00 and N/D01). Earlier this year, **FMK**, which lobbies on behalf of Austria's wireless industry, described Salzburg's nonbinding limit as "political PR, not reality" (see *MWN*, M/J02). Salzburg has not yet been left behind, however. Even though the new base stations are up and ready, 3G mobile phones will not be available for several months.

Now, five years later, Kuchel and Utteridge of the Institute of Medical and Veterinary Science (IMVS) in Adelaide say that they have failed to reproduce Repacholi's experiment—that they saw no significant increase in lymphoma among *Pim*-1 mice following long-term exposure to GSM radiation.

"[Our] study throws water on the concerns about the potential deleterious effects of mobile phones," Kuchel told the Australian Broadcasting Corp. in an August 30 interview. Kuchel declined to respond to questions for this report.

"This was a failure to replicate," said Dr. Mays Swicord, who heads Motorola's program on electromagnetic energy and health in Plantation, FL. The CTIA, the lobbying arm of the U.S. cell phone industry, has taken a similar position.

"The paper is chock full of contradictions."
—Dr. Q. Balzano

In a review for the Swedish Radiation Protection Authority, two U.S. epidemiologists state that the Repacholi study "has been refuted" (see p.4).

Others disagree. Dr. Q. Balzano, the former director of Motorola's Florida research lab and now a part-time consultant to Motorola, was sharply critical of the new paper. "It's not carefully reviewed or well-written," he told *Microwave News.* "It's obvious. It's chock full of contradictions."

Dr. Ron Melnick, a toxicologist at the National Institute of Environmental Health Sciences (NIEHS) in Research Triangle Park, NC, said that he would not have accepted the paper as written, but added, "I would probably not have accepted Repacholi's paper either. I am not convinced that either one has shown a lot."

"It is impossible to compare the two studies," commented Dr. Alexander Lerchl of International University Bremen in Germany. Lerchl said that he was astonished that the Utteridge-Kuchel paper had been published in its current form: "Who in heaven reviewed the manuscript?"

Both Melnick and Lerchl are working on their own animal experiments to explore the possible RF–cancer link. Melnick is helping design the animal studies that are being planned by the U.S. National Toxicology Program (see *MWN*, M/J01). Lerchl was recently awarded a grant by Germany's Federal Radiation Protection Office to run his own GSM–cancer experiment using leukemia-prone mice (see *MWN*, J/A02).

When *Microwave News* asked Repacholi for his opinion, he demurred. "I'll wait until the second replication," he said. Repacholi later added that the Australian paper, in its current published form, does not "refute, quash or demonstrate an inability to replicate" his results. Repacholi now leads the WHO's EMF program in Geneva (see p.3).

The second attempted replication, which is being carried out by Dr. Germano Oberto at RBM Bioscience in Colleretto Giacosa, near Ivrea, Italy, got under way last October.

A 74% Lymphoma Rate Among the Control Mice

The new Australian paper does not lend itself to simple interpretations. The key complication is that the *Pim*-1 mice that served as controls developed lymphoma at a very high rate—more than three times the rate among Repacholi's controls.

Utteridge and Kuchel's published data show that 74% of their control mice had lymphoma by the end of the experiment, compared to 22% of Repacholi's control mice. (The control mice were treated differently in the two experiments.)

Replication or New Experiment?

The new GSM–*Pim*-1 transgenic mouse study by Drs. Tammy Utteridge and Tim Kuchel is widely regarded as an attempt to replicate the 1997 Repacholi *Pim*-1 study. But there are important differences between the two experiments:

- Utteridge's weekly exposures were 29% shorter than Repacholi's. Her mice were exposed for one hour a day, five days a week. Repacholi exposed his mice for one hour a day, seven days a week.
- Utteridge exposed her mice for one hour in a single session. Repacholi exposed his mice for half an hour at 12-hour intervals.
- Utteridge exposed the mice individually in a fixed orientation in a Ferris wheel apparatus. This setup was designed to give the mice a more precise dose of radiation than Repacholi gave his animals. In Repacholi's experiment, the mice lived and were exposed in their cages—with five unrestrained mice in each cage.
- Utteridge had four different exposure groups (0.25, 1, 2, and 4 W/Kg) with 120 mice in each group; there were also 120 sham-exposed mice and 120 cage controls. Repacholi had 100 mice, each exposed to a wide range of levels: 0.008-4.2 W/Kg, averaging 0.13-1.4 W/Kg. It was not clear how much radiation each mouse received. He also had 100 free-running control mice.
- Utteridge was planning to expose her mice for two years, while Repacholi stopped his experiment after 18 months. The vast majority of Utteridge's *Pim*-1 mice died after 17 months of exposure, however, so the two experiments turned out to have very similar exposure periods.
- Repacholi discarded any mice that were "clinically healthy" after the 18-month exposures. Utteridge autopsied all the mice used in her experiment.
- Utteridge exposed both *Pim*-1 and wild type mice. Repacholi used only *Pim*-1 mice.

Alexander Lerchl in Bremen summed it up this way: "This is an independent experiment, not a replication of the Repacholi study." Motorola's Mays Swicord offered a different opinion: "I think [the new study] responds to its objective of addressing the original study."

Tammy Utteridge et al., "Long-Term Exposure of Eμ-*Pim*-1 Transgenic Mice to 898.4 MHz Microwaves Does Not Increase Lymphoma Incidence," *Radiation Research, 158,* pp.357-364, September 2002.

Michael Repacholi et al., "Lymphomas in Eμ-*Pim*-1 Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields," *Radiation Research, 147,* pp.631-640, 1997.

Utteridge and Kuchel do not discuss this anomalously high rate of cancer in their paper. They do not even cite the 74% number, although it can be easily derived from the data presented.

"If you have a 74% background rate, it's going to be very difficult to see an increase," Melnick said. "There is something different between the two sets of sham-exposed [control] mice and the question is why are they so different," he added. "It's a little disturbing."

Kuchel, the head of veterinary services at IMVS and the lead biologist on the study team, refused to explain how, with such a high cancer rate among the controls, he could conclude that his experiment showed no increased cancer risk. Indeed, Kuchel did not answer any questions from *Microwave News* over a four-week period, despite a number of assurances that he would do so.

Utteridge sent detailed replies to a large number of questions from *Microwave News*, but she referred the question about the elevated cancer rate among the controls to Kuchel. Utteridge, who served as the project manager, was trained in applied physics.

"I'll wait until the second replication."
—Dr. Michael Repacholi

Although the Utteridge-Kuchel study is widely seen as a replication of the Repacholi experiment, there are many differences between the two (see box on p.10). One of the most important changes is in the way the mice—both the exposed and the controls (the shams)—were handled and irradiated.

In the Repacholi study, the mice were allowed to roam free in their cages, even when they were being irradiated. Utteridge and Kuchel, on the other hand, kept each mouse in a fixed position inside a plastic tube for a one-hour microwave or sham exposure in order to give it a more precise dose of radiation. Forty of these plastic tubes were arranged around an antenna in a Ferris wheel configuration. The exposure equipment was supplied by Motorola.*

Utteridge and Kuchel's control mice were also placed in plastic tubes while Repacholi's controls ran free. It is this difference between the two sets of controls that might explain the difference in their lymphoma rates.

"If animals are restrained, they are stressed. This is common knowledge among biologists," said Lerchl, adding that stress can cause a lot of parameters to change, including hormones that can influence malignant tissue.

As part of the RF animal experiments he carried out for Motorola at the VA Hospital in Loma Linda, CA, Dr. Ross Adey found that rats immobilized in a similar, though different, exposure system showed significant signs of stress after two hours of confinement in loose plastic tubes.† Adey concluded that stress "could significantly mask" potential RF effects. "The possible impacts of stress appear to have been ignored in the Utteridge paper," Adey said in an interview.

Prof. Michael Kundi of the University of Vienna, one of the first to spot the high rate of lymphoma in the controls, suggested that the title of the paper should have been: "Immobilization Stress Obscures the Effect of Microwave Exposure in Eμ-*Pim*-1 Transgenic Mice."

Both Lerchl and Melnick said that they are planning to use free-running animals in their own exposure studies.

Utteridge and Kuchel were certainly aware of the stress problem. To test for this possibility, they had 120 free-moving *Pim*-1 mice which were never placed in the Ferris wheel apparatus. But the lymphoma rates for these "negative," or "cage," controls are not presented in their *Radiation Research* paper.‡

Here again, Kuchel refused to discuss the lymphoma rate among the cage control mice. (Utteridge said that she did not have ready access to those data.) In an e-mail exchange with another researcher, which was obtained by *Microwave News*, Kuchel wrote that, "There was no difference between the cage control and the sham-exposed groups." But in the same message, he also stated that, "At 18 months old our mice showed the same pattern of disease, including lymphomas, as the Repacholi study"—a statement that appears to be contradicted by what Kuchel published in *Radiation Research.*

Motorola's Swicord doubts that the high rate of cancer among the sham-exposed mice is due to stress. Instead, he believes that over the last five years the *Pim*-1 mice became genetically different from those used by Repacholi. "We are in uncharted territory," he said.

Donna Gulezian of Taconic Transgenics in Germantown, NY, which supplied Kuchel's *Pim*-1 mice, told *Microwave News* that, "Taconic's procedures attempt to minimize the potential genetic variability," but she allowed that, "This does not guarantee that there is no genetic variability over time."

Dead Mice Weigh In?

The most startling inconsistency in Utteridge and Kuchel's paper is that in one graph (Figure 1B) they show that all the *Pim*-1 mice had died at an age of approximately 19 months, after 17 months of radiation or sham exposure. Yet on the same page, they present weight data for the same *Pim*-1 mice up to the age of 28 months (Figure 2B).

Utteridge explained that some of the weight data were based on only one surviving mouse of the 120 originally assigned to a given exposure group at the beginning of the experiment. "The survival curves were thus very close to zero and the lines may have been indistinguishable from [zero]," she told *Microwave News.* NIEHS' Melnick commented that it made no sense to keep the experiment going with one animal when the other 119 had died.

The new study was designed to last six months longer than

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*The Ferris wheel exposure system was designed by Q. Balzano and was built, maintained and paid for by Motorola. "It cost us between half a million and a million dollars," Balzano said. See: *IEEE Transactions on Microwave Theory and Techniques, 48,* pp.2040-2049, 2000.

† *Radiation Research, 155,* pp.584-592, 2001.

‡In his paper, Repacholi states that the breeder of the *Pim*-1 mice, GenPharm International, told him that 15% would develop lymphoma spontaneously within 18 months. Donna Gulezian of Taconic Transgenics, which subsequently bought GenPharm, could not substantiate this 15% rate.

Repacholi's, which ran for 18 months. This decision is perplexing, because no one else has ever used the *Pim*-1 strain for such a long experiment. Repacholi was the first, and to date the only one, to even go as long as 18 months.

At a meeting convened by Repacholi in Erice, Italy, in 1999, Motorola's Swicord warned that experts on transgenic animals were "horrified" that anyone would use *Pim*-1 mice for any exposure study longer than 6 months, the length of time the strain was designed to be used to test cancer agents.

In an interview, Dr. Ray Tennant, a leading expert on transgenic experimental animals at the NIEHS, commented, "The basic principle is that studies with transgenic mice should be completed in a short time period." Tennant, the director of NIEHS' National Center for Toxicogenomics, was among those consulted by Kuchel in designing his experiment.

Another area of concern is how much radiation the mice actually received. Utteridge and Kuchel present specific absorption rates (SARs) for the mice as single precise numbers for each exposure group. But there were substantial variations.

There are two complicating factors in estimating the actual SARs. First, the mice grew as the experiment progressed (some doubled in weight), but no adjustments were made to increase the power. As the mice became heavier, the SARs decreased, Balzano explained. He said that the power levels were set so that 28 g mice would have the specified SARs. Since many of the mice weighed over 30 g after reaching 7 months of age and then continued to grow, the published SARs are higher than the mice actually received for most of the experiment. Some of the *Pim*-1 mice weighed close to 40 g—at that weight, the actual SARs would be approximately 70% of those given in the paper.

A second complication arises as the result of interactions among the mice in adjoining compartments in the Ferris wheel. According to Balzano, this could cause an added variation in SAR by a factor of about two. Others, like Adey, believe that the variations could be even larger. For the Italian *Pim*-1 experiment, the Ferris wheel was modified to reduce such interactions.

Once Again, the Data Point to RF Inhibiting Cancer

The new Australian data, whose validity remains open to doubt, show that weak mobile phone radiation can inhibit cancer. The study lends support to a number of previous animal studies that also indicate a protective effect of RF/MW radiation.

Drs. Tammy Utteridge and Tim Kuchel found that *Pim*-1 mice exposed at SARs of 0.25 W/Kg had a 70% lower incidence of lymphoma—a statistically significant reduction. They also see what appears to be a dose-response relationship—more cancer with higher exposures—though the trend lacks significance.

Some observers are comparing the new Australian results with those of Dr. Ross Adey, showing a reduction of central nervous system tumors in rats exposed to digital cell phone signals (see *MWN*, M/J96, J/A96 and S/O99). The Australians do not make this connection and do not even include the Adey paper among their references.

Adey clearly sees a link. "This new study does not close the book on cell phones and cancer," he said in an interview. "Rather, it opens it wider than ever." He is at the Loma Linda University School of Medicine in California.

Drs. Bernard Veyret of France's University of Bordeaux and Christian Bartsch of Germany's University of Tübingen have each found some, albeit inconsistent, support for the proposition that low-level GSM radiation can protect against breast cancer.

DR. BERNARD VEYRET IS TRYING TO IDENTIFY THE MOST BENEFICIAL SIGNAL

In an initiation-promotion study using the known carcinogen DMBA, Veyret saw fewer tumors in restrained rats exposed at SARs of less than 1.4 W/Kg—and a slight increase in tumors at SARs above 1.4 W/Kg. This work, which was first presented in 1999, has been submitted to *Radiation Research* (see *MWN*, J/A 99).

"Our goal in our lab is to try and identify the type of signal that would be most beneficial," Veyret said in an interview following the release of the Australian paper. "We are currently working on this at low SARs."

Bartsch, who ran a similar study, but with free-moving rats, found a highly significant delay in the development of breast tumors at whole-body SARs of 0.0175-0.07 W/Kg. But he failed to see the same reduction in two subsequent efforts to repeat the experiment (see *MWN*, N/D00 and M/A02).

"The work of Utteridge is very interesting and underlines that it may be important to work at relatively low SAR values," Bartsch told *Microwave News*.

Utteridge herself would like to pursue her finding of a lower cancer rate. "We were interested in the reduction in those mice," she told *Microwave News*, "But the NHMRC is not giving out any more funding for animal studies."

In the *Radiation Research* paper, Utteridge and Kuchel report that the National Health and Medical Research Council (NHMRC), which paid for their experiment, "has decided that the issues involved in *in vivo* laboratory animal investigations have been fully addressed by this study of Eμ-*Pim*-1." They say the council's decision is based on a "report from the WHO meeting in Erice."

"I don't know where they got that from," said WHO's Dr. Michael Repacholi, who organized the Erice meeting, held in 1999. The statement in the Utteridge-Kuchel paper is not referenced and the report on the Erice meeting on the Web site of the WHO's EMF Project makes no mention of such a decision.

Utteridge referred questions about the NHMRC's decision on pursuing the observed reduction in lymphoma to David Clarkson. He did not respond to requests for comment.

Repacholi does not, however, believe it is a true effect. "I think that it's an artifact," he said, "but it is something worth following up because of the other studies showing positive results. We really have to take a look."

Dr. David McCormick of IITRI in Chicago, who has carried out a large number of animal studies, including some with the *Pim*-1 mouse, attributes the observed lower rate of lymphoma to variability among the animals. "With one data point, you cannot say that it is real," he said, although he conceded that the 70% reduction was greater than he had found in tests of two chemical lymphoma inhibitors on *Pim*-1 mice.

DR. FRANK PRATO: IS THERE HORMESIS WITH NON-IONIZING RADIATION?

This is the second time in a year that the NHMRC has shown no interest in pursuing an unexpected finding associated with RF/MW exposure. In last November's *Radiation Research*, Dr. Pamela Sykes reported fewer than expected changes in DNA after exposure to GSM radiation, but when she tried to secure funding to follow it up with a larger number of animals she came away empty-handed (see *MWN*, N/D00 and N/D01; also p.15).

Sykes of Flinders University in Adelaide told *Microwave News* that the reduction in lymphoma observed by Utteridge is "fascinating," but that it would have to be repeated with a larger number of animals and at lower doses to be convincing.

Sykes drew a parallel between the possible beneficial effects of RF/MW radiation and those found with low doses of ionizing radiation—a protective phenomenon known as hormesis.

Dr. Frank Prato, a medical biophysicist at the University of Western Ontario in London, Canada, also raised the possibility that a hormesis-like effect might occur with non-ionizing radiation. "We should look for and expect to see both beneficial and detrimental effects if there are biological effects at low doses of non-ionizing radiation," he said. Prato is the president of the Bioelectromagnetics Society (see also p.16).

FROM THE FIELD

Letters to the Editor

Motorola Is "Open and Objective"

September 12, 2002

To the Editor:

On behalf of Motorola, I want to object in the strongest terms to the tone and substance of your July/August editorial "Motorola's Junkyard Dog." Mean-spirited and personal attacks of this kind should be out of bounds and out of character for a publication that purports to encourage sound science and constructive dialogue. Your comments about Dr. Joseph Morrissey, a dedicated and talented research scientist, were unfair and unwarranted. Your comments about Motorola were unjustified and inaccurate. Motorola has a longtime position of prominence in bioelectromagnetics. We take pride in that fact and consider it an extension of our commitment to global corporate responsibility. We believe Motorola's efforts over many years have made significant contributions to the scientific knowledge base and to promoting the principle that new research findings receive critical review in the full light of day. We resent any suggestion that Motorola has been anything but open and objective in this regard.

Industry, government, science and the media have a shared responsibility to help see that research findings are viewed and communicated in proper context. *Microwave News* can do its part by taking a higher road than the one reflected in your July/August issue. It is one thing to use your editorial pages to provoke debate. It is quite another to malign the motives of Motorola or its employees. Such behavior serves only to generate contrived controversy that distracts us from what should be a common goal of assuring that considerations of serious issues benefit from diverse and open scientific discourse.

Norman D. Sandler
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Morrissey Responds

September 30, 2002

To the Editor:

The comments made by *Microwave News* in the July/August 2002 editorial titled "Motorola's Junkyard Dog" were offensive and unprofessional. I welcome a chance to respond.

During an open scientific session at the recent BEMS meeting in Quebec, I voiced my opinion to Dr. Dariusz Leszczynski that extrapolation of his *in vitro* findings to possible human health effects without clearly incorporating available results from more relevant human and animal studies into his theory was inappropriate. I further had concerns that his *in vitro* system seemed to indicate peak SARs during exposure that may have reached 5 W/Kg or more (depending upon the method of exposure characterization), and that a non-RF heat control had not been performed for comparison. I apologize for any offense that Dr. Leszczynski or any of the other attending research scientists may have taken to the delivery of my questions, although the questions themselves *stand* and remain unanswered.

My concerns may prove to have been unfounded if additional research validates Dr. Leszczynski's findings. Conversely, further research may address my concerns and show that the initial findings were spurious. In any event, these questions were appropriate at that time and place, and should be sifted out by a scientific process involving qualified scientists. That process should not be impeded or prejudiced by attempts to incite buzz or conflict to tantalize the readers of *Microwave News*.

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Meeting Notes

• During the second week of November, **U.K.** and **COST** committees on **mobile phone** research will hold back-to-back meetings at the Royal Society in London. The U.K. seminar, the first since the **Mobile Telecommunications and Health Research Program (MTHR)** announced its grants last January (see *MWN*, J/F02), will feature a talk by Sir **William Stewart**, who chairs the MTHR advisory panel and who led the expert group that recommended this research effort (see *MWN*, M/J00). Among the other speakers are Gerd Friedrich, Dr. Maila Hietanen, Dr. Kjell Hansson Mild, Dr. Mays Swicord, and Dr. Bernard Veyret, according to a draft agenda posted at <www.mthr.org.uk>. Only a limited number of places are available and these will be allocated on a first-come, first-served basis. The following day, while the MTHR hosts "small informal meetings for invited participants," COST281 will open its own seminar in the same location to try to hash out the differences between thermal and nonthermal effects. The two-day meeting, which is open to the public, will "discuss the results of experiments that have included a subtle temperature increase, and also those that have been reported to be 'nonthermal,' analyzing and discussing the real process of energy absorption," according to a statement posted on the COST Web site. Dr. David de Pomerai's experiments showing a stress response in worms following low-intensity microwave exposure are sure to be a major topic of conversation. The agenda was not available as we went to press. COST281 has also announced its next workshop, ***Mobile Communication Base Stations and Health***, which will be held in **Dublin**, May 15-16. The September edition of the COST281 newsletter features summaries of the last two workshops—on *Emerging Technologies* and *Mobile Phones and Children*—held in Rome in May (see *MWN*, M/J02*)*. The newsletter and other workshop documents are available at <www.cost281.org>.

New Listings

November 11: **Research Seminar on Mobile Telecommunications and Health**, Royal Society, London, U.K. Contact: Mobile Telecommunications and Health Research Program (MHTR), c/o National Radiological Protection Board (44+1235) 831600, Fax: (44+1235) 822650, E-mail: <mthr@nrpb.org> Web: <www.mthr.org.uk>.

November 12-13: **Subtle Temperature Effects of RF-EMFs: A COST281 Seminar**, Royal Society, London, U.K. Contact: Gerd Friedrich, FGF, Rathausgasse 11a, D-53111 Bonn, Germany, (49+228) 726-220, Fax: (49+228) 726-2211 E-mail: <info@fgf.de>, Web: <www.cost281.org>.

November 25-27: **Genetic and Cytogenetic Aspects of RF-Field Interaction**, Löwenstein, Germany. Contact: Gerd Friedrich, FGF. See above.

• The September issue of ***Health Physics*** features a collection of 11 papers that were first presented at an **EPRI** workshop on EMF exposure guidelines held in Brussels in June 2000 (see *MWN*, J/F00). Dr. **William Bailey** of Exponent in New York City served as the editor for this special issue of the journal.

• In November 2000, **Germany**'s Federal Institute for Occupational Safety and Health (FIOSH) organized a workshop in Berlin, ***Is Central Nervous Information Processing Influenced by Electromagnetic Fields of Mobile Phones?*** (see *MWN*, J/A01). The proceedings of that meeting are now available from FIOSH for €19.50 (US$19.15). Some of the papers are in English and some are in German—but even those include abstracts in English. Order from <www.baua.de>; this Web site has text in either German or English. Or contact the publisher, Wirtschaftsverlag, at Fax: (49+471) 945-4488. Order volume No. Tb122.

"MICROWAVE NEWS" FLASHBACK

Years 20 Ago

• ANSI adopts a new safety standard for RF/MW radiation with limits as much as ten times lower than the previous 10 mW/cm^2 standard. Its approval comes on the heels of a new, stricter exposure limit of 200 μW/cm^2 for the general public in Massachusetts.

• Women exposed to fluorescent light at work were twice as likely to develop skin cancer in a study from Australia's Sydney Hospital and the London School of Hygiene and Tropical Medicine. A smaller study of men found a similar increase.

Years 10 Ago

• In Sweden, Dr. Anders Ahlbom and Maria Feychting report that the risk of leukemia was four times higher among children exposed to 3 mG or more at home, and Dr. Birgitta Floderus finds that men with similar exposures at work had triple the expected rate of leukemia. The Swedish government responds that it will now "act on the assumption" that EMFs are linked to cancer.

• The U.S. Congress directs NIOSH to do a study of cancer among police officers who work with traffic radar.

• A childhood leukemia cluster near the U.S. Navy's Lualualei antenna farm is not due to chance, EPA and Hawaiian health officials find—but they stop short of naming RF/MW as the cause.

Years 5 Ago

• "Low radiation is better!" proclaims Germany's Hagenuk, maker of a low-SAR mobile phone. Its marketing campaign is the first to use health concerns to sell phones.

• Radiation from antitheft devices can interfere with many cardiac pacemakers, U.S. and German researchers announce.

• A cluster of birth defects among children of servicemen aboard the *Kvikk* prompts the Norwegian navy to investigate a possible link to the ship's radar and communications systems.

Hot New Papers

Patrick Levallois, "Hypersensitivity of Human Subjects to Environmental Electric and Magnetic Field Exposure: A Review of the Literature," *Environmental Health Perspectives, 110,* supp.4, pp.613-618, August 2002.

"Hypersensitivity to exposure to electric and magnetic fields (EMFs) has been reported for nearly 20 years; however,...[t]he result of the literature review is rather meager. Few studies have been published on the subject of HSEMF in peer-reviewed journals. Most of the studies published on HSEMF come from Nordic countries and are concerned with nonspecific skin disorders related to VDUs. Few studies have been conducted in other countries and almost nothing comes from North America. The evidence of the existence of a more general syndrome associated with HSEMF (including such different nonspecific symptoms of the nervous system as fatigue, dizziness, headache and depression) is still very weak....Globally, the largest amount of the evidence pleads against a role of EMFs in the reported symptoms and, moreover, its existence in North America has yet to be demonstrated....In conclusion, I found no substantial grounds on which to build a framework for helping a risk assessor to take into account the alleged 'HSEMF syndrome.' Our knowledge of the nature of the problem seems too vague to integrate it into an EMF risk assessment protocol. But there are certainly grounds for further research to assess more carefully its nature and its possible burden in North America."

See also: "Hot Papers," *MWN,* N/D99; and Patrick Levallois, Raymond Neutra, Geraldine Lee and Lilia Hristova, "Study of Self-Reported Hypersensitivity to Electromagnetic Fields in California," *Environmental Health Perspectives, 110,* supp.4, pp.619-623, August 2002.

Reprints: Dr. Patrick Levallois, University of Quebec, Beauport, Canada, E-mail: <patrick.levallois@msp.ulaval.ca>.

Xiaomei Ma, Patricia Buffler et al., "Critical Windows of Exposure to Household Pesticides and Risk of Childhood Leukemia," *Environmental Health Perspectives, 110,* pp.955-960, September 2002.

"A total of 162 patients (0-14 years old) with newly diagnosed leukemia were rapidly ascertained during 1995-1999, and 162 matched control subjects were randomly selected from the birth registry. The use of professional pest control services at any time from 1 year before birth to 3 years after was associated with a significantly increased risk of childhood leukemia (odds ratio (OR): 2.8, 95% confidence interval (CI)=1.4-5.7), and the exposure during year 2 was associated with the highest risk (OR: 3.6, 95%CI=1.6-8.3)....Insecticide exposures early in life appear to be more significant than later exposures, and the highest risk was observed for exposure during pregnancy. Additionally, more frequent exposure to insecticides was associated with a higher risk. In contrast to insecticides, the association between herbicides and leukemia was weak and nonsignificant.

Reprints: Dr. Xiaomei Ma, School of Public Health, University of California, Berkeley, E-mail: <xmma@uclink4.berkeley.edu>.

Neil Cherry, "Schumann Resonances, a Plausible Biophysical Mechanism for the Human Health Effects of Solar/Geomagnetic Activity," *Natural Hazards, 26,* pp.279-331, July 2002.

"A large number of studies have identified significant physical, biological and health effects associated with changes in solar and geomagnetic activity (S-GMA).... A key scientific question is, what factor is it in the natural environment that causes the observed biological and physical effects? The effects include altered blood pressure and melatonin, increased cancer, reproductive, cardiac and neurological disease and death. Many occupational studies have found that exposure to ELF fields between 16.7 Hz and 50/60 Hz significantly reduces melatonin levels. They are also associated with the same and very similar health effects as the S-GMA effects....It is found that the Schumann Resonance signal is extremely highly correlated with S-GMA indices of sunspot number and the Kp index. The physical mechanism is the ionospheric D-region ion/electron density that varies with S-GMA and forms the upper boundary of the resonant cavity in which the Schumann Resonance signal is formed. This provides strong support for identifying the Schumann Resonance signals as the S-GMA biophysical mechanism, primarily through a melatonin mechanism. It strongly supports the classification of S-GMA as a natural hazard."

Reprints: Dr. Neil Cherry, Lincoln University, Canterbury, New Zealand, E-mail: <neil.cherry@crc.govt.nz>.

New Research Projects

• The **U.S. Air Force** Office of Scientific Research has awarded Dr. **Charles Tseng** of Purdue University Calumet, IN, $2.5 million to investigate the possible **genetic effects of RF/MW radiation**. "We are going to survey the entire scope of human genes, as well as total genes of two bacterial species," Tseng said. He will use the powerful new tools of proteomics to see whether RF/MW radiation can alter gene expression in human myeloid cells and in *E. coli* and *Bacillus subtilis.* Tseng's approach will be different than that of Finland's Dr. Dariusz Leszczynski (see *MWN,* J/A01, M/J02 and J/A02). "We are trying a new approach in terms of the RF sources, cell types [and] subcellular information," Tseng told *Microwave News.* In addition to several Purdue Calumet colleagues, Tseng's team includes Dr. **San Ming Wang** at the University of Chicago and Dr. **Chung Lee** at Northwestern University Medical School, also in Chicago. The study will run for three years, with a possible two-year extension.

• Australia's National Health & Medical Research Council (**NHMRC**) is planning to set up a **Center of Research Excellence** to investigate possible health effects of **mobile phone and base station radiation**, with an annual budget of about US$280,000. In addition to doing research, the NHMRC wants the center to foster collaboration across disciplines—including biology, medicine, physics and engineering. Another objective is training scientists for work in the field so that Australia "is well prepared for future and related research in this important area." The NHMRC is encouraging proposals "from investigators who would not normally apply," noting that its expert committee on electromagnetic energy is "disappointed" by "the apparent limited pool of researchers" addressing the issue in Australia. A total of Aus$2.5 million (approximately US$1.4 million) has been allocated for a five-year period. The deadline for expressions of interest is October 28.

UPDATES

BROADCAST RADIATION

AM Radiation Under Scrutiny in Korea... Cancer rates among children exposed to AM radio radiation warrant further investigation, according to a small case-control study by a team of Korean researchers. At the *14th Conference of the International Society for Environmental Epidemiology* (ISEE), held August 11-15 in Vancouver, Canada, Dr. Mina Ha of Dankook University in Cheonan reported that brain tumor and leukemia risks were greater than expected among those 15 years old or younger living within 2 km of AM transmitters with an output power of 100 kW or more. But these associations are based on very few cases and must therefore be interpreted with caution, Ha said. Children living near 50-100 kW transmitters did not have higher rates of cancer. Ha's abstract is in the July issue of *Epidemiology (13,* p.S197, 2002); a paper has been submitted for publication. In an interview with *Microwave News,* Ha said that the study period is being extended to include more cases and RF measurements are planned. Elevated cancer rates have previously been found in the vicinity of TV and radio transmitters in Australia, Italy and the U.K. as well as in the U.S. (Portland, OR, and Honolulu, HI) (see *MWN,* N/D95, S/O01, J/F97, J/F82 and M/J87, respectively). Ha can be reached at: <minaha@dku.edu>.

MECHANISMS

Radical Pair Recombination... Dr. Brian Brocklehurst of the U.K.'s University of Sheffield presents a detailed review of the effects of magnetic fields on the recombination of radical pairs (RP) in the September issue of *Chemical Society Reviews (31,* pp.301-311, 2002). He notes that, "It is not yet clear whether [the RP mechanism] is relevant to human biology." Most of his analysis is on high-field interactions—in the millitesla-to-tesla range (10-10,000 G), but he also addresses low-field effects. "One might well conclude that small fields cannot possibly be dangerous, but one must not forget that birds navigate using the geomagnetic field (0.05 mT [500 mG]) and many other organisms use it to aid orientation," he writes. Brocklehurst adds that, "[B]iological systems are full of surprises. Reaction mechanisms are far from simple and it is possible that very small effects can be amplified." His e-mail address is: <b.brocklehurst@sheffield.ac.uk>.

PEOPLE

Dr. **Gro Harlem Brundtland** announced on August 23 that she will step down as director-general of the WHO next July at the end of her first five-year term. She cited age (she will be 64 next summer) as a major factor in her decision not to seek reappointment. Brundtland, a physician and a former prime minister of Norway, favors a precautionary approach to mobile phone radiation and advises children not to use them (see *MWN,* M/A02 and J/A02)....At the general assembly of the Union of Radio Science (URSI) held in Maastricht, the Netherlands, in August, Dr. **Frank Prato** of the University of Western Ontario in London, Canada, was elected vice chair of Commission K on Electromagnetics in Biology and Medicine. At the meeting, Dr. **Bernard Veyret** of the University of Bordeaux moved up from vice chair, replacing Dr. **Shoogo Ueno** of the University of Tokyo as the

head of Commission K. Prato will in turn replace Veyret at the next general assembly, which will be held in New Delhi in October 2005. Ueno is the president-elect of the Bioelectromagnetics Society (BEMS) and he will take over from Prato, the current president, next June. In other URSI news, Dr. **Q. Balzano**, formerly of Motorola and now a consultant based in Annapolis, MD (see p.10), is the new chair of Commission A on Electromagnetic Metrology....Dr. **Raymond Neutra,** the head of the California EMF Program, has been presented the **John Goldsmith Award** by the International Society for Environmental Epidemiology (ISEE) for his "sustained and outstanding contributions to the knowledge and practice of environmental epidemiology." In a lecture delivered at the ISEE's awards ceremony in Vancouver on August 14, Neutra described how the California EMF program used novel techniques to clarify the reasoning behind its conclusions. At press time at the end of September, the final report of the EMF program had not yet been released (see *MWN*, J/A02)....Dr. **Jutta Brix** has left Germany's Federal Office for Radiation Protection, where she headed the unit on the effects of non-ionizing radiation at the Institute of Radiation Hygiene. Brix, a biologist, has joined the Bavarian health ministry in Munich, where her responsibilities include monitoring the health impacts of mobile phones. No replacement has yet been named....**Richard Strickland** has launched RF Safety Solutions, a consulting firm based in South Setauket, NY, which advises clients on how to minimize RF exposure risks and comply with exposure guidelines. Strickland was long the director of product development at Narda Safety Test Solutions in Hauppauge, NY, a leading manufacturer of radiation meters. His new Web site is <www.rfsafetysolutions.com>.

PROTECTIVE DEVICES

QLink Affects EEG... Clarus Products International in San Rafael, CA, claims that the low-power microwaves emitted by its QLink pendant can "strengthen your immunities to cell phone, computer and workplace EMFs." Now, researchers in Australia and the U.K. report that the QLink produced changes in brain function in their tests. A team led by Dr. Rodney Croft of Australia's Swinburne University monitored the electroencephalogram (EEG) of 16 male and eight female volunteers, ages 19-48, over a one-hour period during which they performed cognitive response tests. When exposed to GSM digital phone signals, subjects had elevated neural activity in response to auditory stimuli, but when the QLink was switched on at the same time (without the subjects' knowledge) this effect was attenuated, Croft writes in the August *Journal of Alternative and Complementary Medicine (8,* pp.427-435, 2002). The QLink also appears to have reduced the effect of phone signals on EEG during rest periods between tests. But Croft cautions that the study could not determine "whether the response was beneficial," and added that, "It is possible that the influence was due to the DC or 50 Hz power source" of the device, rather than its 7.4 GHz signal. Clarus sponsored the study. This paper can be downloaded free from the journal's Web site, <www.liebertpub.com/pagedisplay/Toc.asp?id=26>. (See also *MWN*, J/A02). The basic QLink model costs $129. A version in gold is also available for $799.

Keeping Current: Follow-Up on the News

◆ The California EMF Program's final report, which contains the strongest warning to date on EMF health risks (see *MWN*, J/A02), has not yet been released. The program's director, Dr. Raymond Neutra of the state's Department of Health Services, had predicted that it would be released by the end of the summer, but in a September 27 letter he told the state's Public Utilities Commission that the report is "still undergoing final review."

◆ Research proposals in response to the CTIA's solicitation under the second phase of its CRADA with the FDA are due by October 31 (see *MWN*, N/D99 and M/J01). The CTIA is interested in ideas to improve exposure assessment in relation to past and future epidemiological studies.

◆ Both ICNIRP and the WHO International EMF Project have revamped their Web sites: <www.icnirp.de> and <www.who.int/peh-emf/en/>. The WHO site now includes a searchable database of exposure standards from around the world. ICNIRP guidelines, published in *Health Physics*, can be downloaded for free.

◆ Blue Angel, the product-labeling offshoot of Germany's Federal Environment Ministry, has translated the commentary explaining its requirements for certifying low-SAR mobile phones into English (see *MWN*, J/A02). It is available at: <www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm>.

◆ The requirement that U.S. wireless companies offer analog phone service will lapse following a five-year transition period, the FCC announced on August 8. Commissioner Michael Copps faulted his fellow commissioners for failing to insist that phone makers develop hearing-aid compatible digital models before the analog service is dropped.

◆ In its September issue, the German consumer magazine *ÖKO-TEST* reports on radiation levels from the base stations of 1.9 GHz DECT digital cordless phones. At a distance of 1 meter, the levels ranged from 0.9 to 2.1 μW/cm^2 for the 13 models tested. Noting that DECT base stations transmit at all times, even when the phones are not in use, *ÖKO-TEST* judged all but two phones "unsatisfactory." A summary of the report, in German, is at <www.oekotest.de/cgi/ot/otgs.cgi?doc=28467>.

◆ On August 27, the U.S. Army extended the U.S. Air Force's permit to occupy the land on Cape Cod, MA, where the PAVE PAWS radar is located for an additional 20 years. The permit is now good through September 30, 2026.

VIEWS ON THE NEWS

A Massive Failure of Peer Review

The new Australian animal study may or may not show that mobile phone radiation is safe, as Tim Kuchel claims (see p.1). His and Tammy Utteridge's paper in *Radiation Research* is so full of mistakes and omissions that we cannot offer an opinion until they provide more data.

But one thing is already clear: There has been a massive failure in the peer-review process.

Many of those we interviewed want to know who reviewed the paper. This is, of course, cloaked in secrecy. John Moulder, the senior editor at *Radiation Research* who handles RF manuscripts, would not say whether he had shepherded it through peer review, but he is handling the letters that are flowing in.

It seems just possible that the reviewers were lenient on the Australians because they agreed with the paper's conclusions. How else could they have failed to notice that some of the mice were dead according to one figure but were still being weighed according to another figure on the same page? How could they have failed to notice that the rate of lymphoma among the controls was abnormally high and that the cancer data for the cage control mice were missing?

The paper appears to have been rushed into print with only minimal editing. There are undefined columns of numbers floating in three different figures. There are even two typographical errors in the title.

How do we account for those who are blithely touting the Utteridge-Kuchel paper as evidence that cell phones do not promote cancer? Or those who are using it to attack Lennart Hardell's epidemiological studies? (See p.4 and p.10.) We suspect that few of them have actually read beyond the abstract. Their biases are all too apparent.

"I thought that nothing in this area of research/politics could surprise me any more," Germany's Alexander Lerchl told us after reading the paper. "I was wrong."

One final note: Kuchel's refusal to answer questions, both ours and those of others, is disgraceful. If he is willing to sound an all clear on television, he should be willing to talk to people who have actually read his paper.

Things Do Change

On Sunday morning, September 22, we opened the *New York Times Magazine* and noticed something that made our day. Accompanying an article on Deputy Secretary of Defense Paul Wolfowitz is a picture of him working at his Pentagon desk. In the background is a flat-panel computer screen with the telltale round, green-and-red TCO'95 sticker indicating that it is a *low-radiation* display meeting the standards set by the TCO, Sweden's white-collar union. When *Microwave News* began publishing more than 20 years ago, we were repeatedly chided for asking questions about VDT radiation. Today, shielded terminals are everywhere.

In Search of a Few Revolutionaries

Hans-Albert Kolb in Hannover lost a bottle of champagne betting that relatively weak EMFs cannot induce DNA breaks (see p.2).

To his credit, Kolb ran the experiment despite his initial skepticism and proved himself wrong. By repeating the work of Vienna's Oswald Jahn and Hugo Rüdiger, Kolb's lab becomes the sixth to show that magnetic fields can disrupt genetic blueprints. Taken together, these studies make the epidemiology linking EMFs to childhood cancer more credible. (Now there are reports that this same link has been found in a Japanese study; see p.3).

The standard response from physicists is that this work cannot be right because power-frequency EMFs do not have the energy to break chemical bonds. Some even suggest that the experimenters must be incompetent or dishonest (see p.8).

Anyone who has taken high school chemistry will agree that bonds are not being broken, but that does not mean these experiments are flawed. The researchers may not yet understand the subtle changes that lead to genetic damage—the important thing is that magnetic fields have repeatedly been shown to cause such damage.

These labs have not been wasting time and resources pursuing phantom science, as the critics claim. On the contrary, we should step up the search for an explanation for these genetic changes. Identifying the mechanism of interaction would help us interpret the epidemiological evidence. On a deeper level, it would advance an ongoing scientific revolution. Electrobiology promises a host of new medical therapies and other benefits, in addition to controlling unnecessary risks to public health.

Observations that run against the grain of establishment science promise the greatest rewards. A few individuals with some good ideas and money in their pockets, together with the confidence to brave the inevitable jeers from the old guard, could integrate these new laboratory findings into a coherent biological model.

We'll bet a magnum of champagne on that.

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