THE EMR NETWORK
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For Immediate Release

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Mobile Phones and Cancer: Is the Popular Media Doing Its Job?

The vast majority of the public relies on the popular media for accurate information on scientific and medical developments relating to their everyday lives. This puts a significant burden on the popular media to do their homework and to refrain from making broad generalizations about health and safety risks that are not supported by the scientific literature.

The question at hand is adverse health effects from human exposure to radiofrequency (RF) radiation from mobile phone technology. As the number of mobile phone users grows, the global public health implications cannot be ignored.

The following item appeared late in August, 2002 on the MSN web site (www.msn.com) and gave this minimal report about one of two long-awaited studies on mobile phone radiation exposure and the risk of cancer:

> **Study Says Cell Phones Don't Cause Cancer**
> *A study [Utteridge[1]] conducted by Adelaide's Institute of Medical and Veterinary Science [IMVS] found that cell phones do not cause cancer. Researchers exposed 1600 genetically modified and normal mice to various levels of mobile phone radiation over a two-year period, for an hour each day. The study found no increase in the cancer rate of the exposed mice. The study was undertaken to replicate a 1997 Australian study [Repacholi[2]] which found a doubling of cancer in transgenic mice.*

In a letter to the editor in the September 23, 2002, issue of *RCR Wireless News*, Cellular Telecommunications and Internet Association's (CTIA) Vice President for External and Industry Relations Jo-Anne Basile echoes the position that the Utteridge study reliably refutes the findings in Repacholi:

> *As is standard practice in the scientific community, the 1997 study was replicated to ensure that its findings were reproducible and not an aberration.* ***After correcting for deficiencies in Repacholi's original study****, including the utilization of more stringent control conditions, the new study found that RF from cell phones caused no increase in the occurrence of cancer.* (Emphasis added.)
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> *The IVMS [sic IMVS], the scientific group that carried out the Australian study wrote, "The result of this large double-blind study agrees with all the other animal studies and corroborates the paucity of reproducible evidence of deleterious health effects in humans.*

Has the CANCER question been answered?

In comparing the results of research studies, the question to be raised is whether the research protocol followed in the new Utteridge study is truly a replication of the protocol designed for the earlier Repacholi study. Both studies were published in the journal Radiation Research. Were the materials and methods

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[1] Utteridge, TD, Gebski, V, Finnie JW, Vernon-Roberts, B, and Kuchel TR, Long-term exposure of E*u-PIM1* transgenic mice to 898.4 MHz microwaves does not increase lymphoma incidence. *Radiat Res* **158**:357-364, 2002.

[2] Repacholi, MH, Basten, A, Gebski, V, Noonan, D, Finnie, J, Harris, AW, Lymphomas in E mu-Pim1 transgenic mice exposed to pulsed 900 MHZ electromagnetic fields. *Radiat Res* **147**(5):631-640, 1997.

used in the second study a replication of those used in the first? If there were differences, what significance could they predictably have on the outcome? Based on that analysis, is it then accurate for MSN, various other popular media outlets that published similar reports, and the CTIA to state that the Utteridge study found that: "**cell phones do not cause cancer?**"

Are the methods and materials in Utteridge a replication of Repacholi?
Ms. Basile's letter points out that the Utteridge study "correct[ed] for deficiencies in Repacholi's study." Indeed, in its Introduction section, the Utteridge report states:

> *While this Australian study set out to test the same central hypothesis as that of the study of Repacholi* et al., ***refinements were included*** *to overcome perceived shortcomings in that study, which had always been conceived as a pilot study.* (Emphasis added.)

For Utterdige to accomplish a two-fold goal, i.e., to replicate Repacholi while at the same time redesigning aspects that were seen as shortcomings, multiple sets of control animals are required. Repacholi's RF exposure methods would have to be duplicated with exposed and control animals in his type of cages along with the improved exposure method and its own control group.

The Utteridge team cannot "have it both ways." They set out to replicate Repacholi yet did not follow his protocol exactly by exposing a control group in the same type of cages he did. At the same time, they sought to improve upon the technical aspects of uniformly exposing their animals, i.e., in tube restraint cages. Their data as presented do not adequately address both exposure schemes by the methods outlined in the study. It appears that cage controls in the Utteridge study did not form part of the statistical analysis.

Results Reported in the Popular Media
The popular media reports would have been accurate when stating that the Utteridge study did not show the increase in cancer that occurred in the Repacholi study had they pointed out that lymphomas were the cancers studied in these two reports, not all cancers as they have implied. The popular media reports have been critically misleading when stating that Utteridge is a replication of Repacholi. "Refinements" and "corrections" as described in Utteridge itself, without a parallel control group following Repacholi's exact protocol, rule this study out as a replication.

The Adelaide Institute of Medical and Veterinary Science, the scientific group that carried out the Australian study, has stated that, "**The result of this large double-blind study agrees with all the other animal studies and corroborates the paucity of reproducible evidence of deleterious health effects in humans."**

"It is the position of The EMR Network, said President Janet Newton, " that the conclusion of IMVS is unwarranted."

For further analysis see below:

DO CELL PHONES CAUSE CANCER?

REPLICATION: REPACHOLI 1997 and UTTERIDGE 2002

Peer Review

The EMR Network sought an informal "Peer Review" comparison of the two studies from two internationally-recognized RF researchers: Dr. Ross Adey, Distinguished Professor of Physiology, Loma Linda University School of Medicine, and Henry Lai. Ph.D., Research Professor, Department of Bioengineering, University of Washington.

"You ask whether this is a replication of the original Repacholi study. The answer is that it incorporates aspects of the original study, but **differs profoundly in methods**," Dr. Adey points out. "This has been an extremely careful experiment, conducted with meticulous attention to detail. It is therefore disappointing that a number of controllable and testable factors may have reduced its significance."

Professor Lai characterizes Utteridge as "a very well performed experiment," but underscores the following differences:

- The exposure system and procedures are different from the Repacholi study. Repacholi's animals were freely moving at all times whereas the Utteridge's mice were restrained during exposure sessions. Utteridge's control animals were restrained for a parallel time period even though they were not exposed to RF radiation.
- Repacholi exposed his animals daily in two 30-minute sessions. Utteridge did her exposure in one daily 60-minute period.
- Utteridge states that she purchased her animals from the same source as Repacholi. However in her paper she states that the mice were obtained from Taconic Farms, NY. Repacholi states that his animals were purchased from GenPharm International in Mountainview, CA.

What difference do these differences make?

1. Strain and supplier of test animals

Utteridge states, "Both studies have used mice from the same E*u-Pim1* strain used by Repacholi *et al*. and from the same supplier (Taconic Farms, New York)." Repacholi states that his mice came from GenPharm International of Mountainview , California. Lai notes that the same animal strain from different suppliers may react differently to RF exposure.

2. Free-moving mice in cages vs. tube-restrained immobile mice

The tube-restraint method during exposure was chosen in Utteridge to overcome the wide variation in RF exposure levels (Specific Absorption Rate [SAR] 0.008-4.2 W/kg) in Repacholi. His mice could move about in their groups of five per cage, sometimes huddling together, so that the SAR level varied throughout the half-hour exposure sessions.

Both Adey and Lai point out that the restraint caging used in Utteridge and not in Repacholi is itself a stressor, so even the sham exposed group that was not exposed to RF in Utteridge did experience a factor, not present in Repacholi, that could increase the incidence of lymphoma. Lai notes that Utteridge's control animals (restrained but not exposed) had a higher incidence of both kinds of lymphoma studied than the controls in Repacholi, which makes it more difficult to detect an increase in cancer when compared to Utteridge's exposed animals.

Adey calls attention to an earlier study he worked on, also published in *Radiation Research* (Stagg *et al*., *Radiat Res* **155**:584-592, 2001). This study showed that even loose tube restraint in rats, comparably exposed to the mice in Utteridge, constitutes a continuing stress ignored in the Utteridge experiment. Stagg *et al*.concluded that "a significant stress response, indicated by a transient increase in core body temperature, ACTH and corticosterone, occurred in animals placed in even the mild loose-tube immobilization for near-field RF exposure. **Failure to adequately characterize and control this immobilization response with appropriate cage control animals, as described previously, could significantly mask any potential effects mediated by the RF field on these and other stress related parameters."** (Emphasis added.)

3. Two half-hour vs. one hour-long exposure period

Repacholi's mice were exposed for two half-hour periods per day while Utteridge's mice were exposed for one hour-long period. Adey cites three studies (Uckun *et al*., 1995; Ruediger, 2002; Murphy *et al*., 2002) that give evidence that gene expression switching a cell between differentiation and proliferation (crucial to tumor growth) is vitally dependent on the duration of specific cell surface messenger enzyme activation in periods of minutes' duration, including the action of environmental electromagnetic fields. Segmentation of the exposure also mimics more accurately the real-life operation of mobile phones.

4. RF Exposure levels

Repacholi's mice were exposed to one exposure level of 900 MHz RF radiation whose power density varied across the area of the cages between 2.6-13 W/m2 and SAR of 0.008-4.2 W/kg, averaging 0.13-1.4 W/kg. Utteridge's mice were exposed to four different levels of 898.4 MHz RF radiation, i.e., SARs of 0.25, 1.0, 2.0, and 4.0 W/kg. The tube restraint exposure system allowed for precise determination of the SAR and

therefore to look for a dose response to the different exposure levels which Repacholi was not able to detect. Utteridge was also able to verify that the exposures were all below the threshold of thermal effects whereas Repacholi was not.

Reported Results

Repacholi reported that long-term intermittent exposure to 900 MHz RF radiation demonstrated a two-fold increase in incidence of non-lymphoblastic lymphomas when compared to sham irradiated animals. All animals were kept in cages that allowed for free movement.

Utteridge reported that long-term exposure to 898.4 MHZ RF radiation at SAR's of 0.25, 1.0, 2.0, and 4.0 W/kg had no significant effects when compared to sham-irradiated animals. A statistically significant dose response was not detected. Utteridge's sham irradiated animals were restrained for the same time periods as were the irradiated animals.

Adey sees a deficiency in Utteridge's statistical analysis. He notes that, "Effects of RF exposure should be compared with cage-controls (not restrained, not exposed) as well as with sham-exposed (restrained but not exposed), since sham exposure also requires tube restraint (Adey *et al., Cancer Research* 60:1857-1863.) It appears that the cage controls in the Utteridge study did not form part of the statistical analysis of RF exposure effects."

Utteridge reports a significant reduction in tumor incidence (70% lower risk) of lymphoblastic lymphoma in the RF-exposed mice at 0.25 W/kg, the lowest exposure level.. She states:

> *. . .We do not wish to suggest that exposure is protective since there was only one significant P value (at 0.25 W/kg). While it would be nice to investigate lower levels of exposure and see if significant results were also obtained, at lower levels,* ***this is most unlikely to happen in practice in the foreseeable future. This is because the NHMRC [National Health and Medical Research Council] has decided that the issues involved in vivo laboratory animal investigations have been fully addressed in this study of Eu-Pim1 mice, because the report from the WHO [World Health Organization)] meeting in Erice said that it had been fully addressed.*** (Emphasis added.)

Lai notes that this finding is not an isolated one. Adey reported a decrease in brain tumors in RF-exposed rats in a study published earlier in the same journal (Adey *et al., Radiat Res* **152**(3):293-392, 1999), also at a nonthermal exposure level. Yet Utteridge does not include Adey's report in her list of references.

Utteridge states that her improved exposure methods and equipment assure that her experiment was conducted at nonthermal levels of exposure, and that reduction of tumor incidence was observed at the lowest of those exposures. A statistically significant incidence of a nonthermal biological effect was observed, i.e., reduction of lymphoblastic lymphoma. Adey's study published three years earlier in this same journal reported a similar finding for brain tumors in rats that had been treated with ethylnitrosourea (ENU), a neurocarcinogen. Why have WHO and NHMRC decided that all issues have been "fully addressed?" An effect related to tumor formation observed at an SAR of 0.25 W/kg challenges the mindset that only thermal effects have biological significance.

Adey points out that inspection of Utteridge's Figure 3 (Tumor incidence) **indicates a dose-dependent trend towards nonlymphoblastic lymphomas in the exposed animals.** He notes, "Even if such a difference was nonsignificant (statistically) when tested in the individual groups, it appears that no trend analysis for these aggregate findings is presented. The original Repacholi study focused on this nonlymphoblastic class of lymphomas, with onset beyond the age of 10 months, as the group susceptible to microwave exposure. **Moreover, such a trend analysis was performed on the early lymphoblastic lymphoma incidence."**

Remember that in the Repacholi study, the statistics of all exposed animals were treated together because he used only one exposure scheme and then averaged the SAR value over the entire area of each exposure cage. Utteridge looks at her statistics by separate exposure groups to determine if there is a dose response at play. But examining dose response is only one of the stated goals of her study. Adey questions why it was not deemed important to look at the statistics of all the exposure level groups combined to approach a treatment of the data more similar to Repacholi's statistics.

What can be concluded based on a comparison of these two studies?

- Without studying groups under conditions that exactly followed the protocol in Repacholi, for exposed animals, sham exposed animals, and non-exposed animals, Utteridge does not study the same exposure conditions as Repacholi.
- Without test animals coming from the same supplier as Repacholi as well as from the same genetic strain, the study lacks the assurance that the animals in the two studies began at the same "starting point."
- Without looking at the data for the differing exposures groups as an aggregate as well as separately, Utteridge accomplishes an examination of dose response, but does not replicate an examination of the statistics of the test animals as was done in Repacholi

One does not expect Utteridge's results to replicate Repacholi's due to the differences outlined above.

The Adelaide Institute of Medical and Veterinary Sciences (IMVS), the scientific group that carried out the Australian study, has stated that, "**The result of this large double-blind study agrees with all the other animal studies and corroborates the paucity of reproducible evidence of deleterious health effects in humans."**

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