



Health Effects

Are Radio Frequency or Cell Phone Fields Possibly Carcinogenic to Humans?

■ James C. Lin

The public domain and scientific community's response to the recent International Agency for Research on Cancer (IARC) announcement that, while incomplete and limited, the evidence is sufficiently strong to support a classification of possibly carcinogenic to humans for RF electromagnetic fields was mixed, to say the least. Although IARC's conclusion was not entirely unanimous, it acknowledged published scientific papers reporting an increased risk for gliomas (a type of malignant brain cancer) and acoustic neuromas (a nonmalignant tumor of the auditory nerve on the side of the brain) among heavy or long-term users of cellular mobile telephones [1]–[3].

A published summary of the IARC working group appears to suggest that while hundreds of scientific articles

were reviewed, four papers played the most influential role in its conclusion [4]. The papers include the Interphone



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study [5], [6], Swedish pooled analysis [7], and an acoustic neuroma study from Japan [8]. The Interphone study reported increased risks of 40% for gliomas, and they tended to be greater in subjects who reported usual phone use on the same side of the head as their tumor than on the opposite side of heavy users. A 270% increase in risk was found in the Swedish pooled analysis for the most common type of glioma, astrocytoma, for mobile phone use longer than ten years. A similar conclusion was reached from these two studies for acoustic neuroma, although the case numbers were substantially smaller than for glioma. The study from Japan found some evidence of an increased

risk (from 10 to 300%) for acoustic neuroma associated with the use of mobile phones on the same side of the head.

Although it is acknowledged that these human epidemiological studies are susceptible to bias or other methodological limitations, such as detection or recall, error and selection prejudice for participation. The working group concluded that the findings could not be dismissed as reflecting bias alone and that a causal interpretation between exposure to mobile phone RF electromagnetic field and glioma or acoustic neuroma is possible.

However, what epidemiology gives, it also may take away.

Some other epidemiologists or groups of epidemiologists, reviewing the same data or papers, have concluded that the increased risk was entirely explicable by various biases or errors, believing that there is little possibility that mobile phone use could increase the risk of glioma or acoustic neuroma in users.

For example, within the span of a month after IARC's announcement, the International Commission for Non-Ionizing Radiation Protection (ICNIRP's) Standing Committee on Epidemiology, which includes two members from the

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Interphone group, published a lengthy commentary on the risk of gliomas [9]. With a particular focus on the recent publication of the Interphone study, the commentary concluded that within about 10–15 years after the first use of mobile phones there is unlikely to be a material increase in the risk of gliomas in adults. It is important to recall from brain tumor incidence trends that the latency of brain tumor development is considerably longer than 10–15 years. Furthermore, the commentary's focus on the most recent publications of the Interphone study was spotted on one of them [10] and unfortunately missed the other related Interphone study with the same objective [11].

It is interesting to note that in these recent studies, two separate analyses [10], [11] from different members of the Interphone study group appeared in print shortly after publication of the ICNIRP commentary. The objective of both analyses was to evaluate whether gliomas occur preferentially in the areas of the brain having the highest RF energy absorption from mobile phone exposure. Indeed, these were the first papers to report estimates of absorbed RF energy at the center of brain tumors in mobile phone users.

One analysis included 888 gliomas between 2000 and 2004 from seven European Interphone study countries: Denmark, Finland, Germany, Italy, Norway, Sweden, and Southeast England [10]. The tumor midpoints were defined by neuroradiologists on a three-dimensional grid based on radiological images obtained from computerized X-ray tomography or magnetic resonance imaging. The results did not indicate that gliomas in mobile phone users are preferentially located in the part of the brain with the highest deposition of RF fields from mobile phones.

In the other analysis were patients with brain tumors from the Australian, Canadian, French, Israeli, and New Zealand components of the Interphone study [11]. Brain tumors localized by neuroradiologists were analyzed. The analysis included 553 glioma cases and 1,762 controls. The mean age of glioma cases was 47.2 years, and 62% were men. The total cumulative specific RF energy

absorbed (in J/kg) at the tumor's estimated center was estimated by taking into account multiple RF exposures. An increased risk of glioma was seen at higher specific RF absorptions, above 3,500 J/kg, corresponding to individuals with long-term and heavy uses of mobile phones. The relative risk for glioma was 1.35 in subjects with a localized tumor and 1.66 in subjects with tumor centers estimated by a neuroradiologist. These results are suggestive of an increased risk of glioma in long-term mobile phone users with high RF exposure. However, there are methodological and protocol uncertainties associated with tumor center localization, RF energy absorption estimation, and the sample size, which argue for caution regarding a causal interpretation of these results at the present time.

This of course is very perplexing, if not mystifying, even though there are methodological differences in these analyses. How is it that the same Interphone study produces two separate or different reports, in tandem, on the same subject matter that conflicts with each other? Why two reports instead of one that combines and analyzes all the collected data? Are the mobile phones in use in Denmark, Finland, Germany, Italy, Norway, Sweden, and Southeast England different from those popular in Australia, Canada, France, Israel, and New Zealand? Or are the brains or heads of Danes, Finlanders, Germans, Italians, Norwegians, Swedes, and Southeast Englanders collectively different from that of Australians, Canadians, French, Israelis, and New Zealanders?

The skeptic may argue that science has become partisan. And the corollary, if science becomes partisan, is it science or politics, or would it be political science?

That argument aside, the interval of observation (10–15 years) between the subject's use of mobile phones and the occurrence of tumors might have been too short to allow detection of an effect, if there is one. Could it be unfair to ask or even expect these epidemiological studies to yield any authoritative conclusion given the well known long developmental latency for brain tumors?

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