

Epidemiologic evidence for a relationship between NIR and cancer - a controversial issue

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In 1979 Nancy Wertheimer and Ed Leeper published an article in the American Journal of Epidemiology that should become the starting point of a decade long controversy about the potential of electric, magnetic and electromagnetic fields (EMFs) to cause long-term health effects such as cancer. Their paper about the relationship between power frequency fields and childhood cancer threw doubts on the widely held belief that EMFs are only health threats due to immediate effects caused by induced currents in the low frequency range and by absorbed energy and heating in the high frequency range. In the 30 years after this seminal paper the issue has been studied intensively but a consensus has still not been reached. More than 20 epidemiological investigations about childhood leukemia and power frequency magnetic fields have been conducted in the Americas, Europe and Asia. Two pooled analyses have been published in 2000 combining the evidence from subsets of these investigations. These analyses indicated that the childhood leukemia risk increases monotonously with increasing average magnetic flux density. Based on this evidence the International Agency for Research in Cancer (IARC) classified power frequency magnetic fields as possible human carcinogen (Group 2B). Despite the low probability that the association revealed in epidemiological investigations is due to bias and confounding, lack of unambiguous evidence from animal and in vitro studies and of an accepted mechanism of action prolonged the controversy about a causal interpretation of this association. But even if the association is accepted to be causal some argue that still the attributable number of cases is low and, therefore, only very low cost measures are warranted that do not compromise the benefits from electric power. However, these considerations rely on questionable assumptions. A much higher proportion of childhood leukemia cases could be due to exposure from magnetic fields if no threshold is assumed. Applying a unit risk approach as is done for many other environmental carcinogens would result in a substantial reduction of exposure standards.

The exponential growth of mobile phone users after introduction of digital systems in the early 1990s led to an unprecedented situation: never before in history a substantial proportion of the population was exposed to such high levels of microwaves as are associated with mobile phone use. Therefore, scientific panels recommended investigating potential health effects in experimental and epidemiologic studies. In the past 10 years overall 25 epidemiological studies of mobile phone use and benign as well as malignant brain tumors were published. Because of long latencies of such tumors it was clear from the beginning that it would be impossible to study induction of brain tumors by mobile phone use, but the view was expressed in many publications that an effect on promotion and tumor growth could be detected from recent use should such an effect exist. However, this assumption is wrong. As long as the average exposure duration is short it is impossible to detect even substantial effects of exposure. Therefore, only data from long-term users are relevant. Furthermore, exposure can only exert an effect if the tumor is in the area of the radiation plume. Consequently, the most important results are those for long-term use of a mobile phone on the side of the head where the tumor was diagnosed. Meta-analytical estimates show increased risks for ipsilateral long-term mobile phone use for glioma, acoustic neuroma and to a lesser degree for meningioma. Analysis of biases reveals that rather an underestimation of the true risk may have occurred and only recall bias could have led to spuriously increased risks.