

## Wireless Phones and Brain Cancer

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Cordless phones similar to mobile phones for increased risks to brain tumours, especially for the young, where the risks are five times for users compared with controls. Dr. Mae-Wan Ho

Latest evidence from Sweden confirms risks of wireless phones

Lennart Hardell's group at University hospital, Orebro, Sweden, have been investigating the brain cancer risks of mobile phones since the late 1990s, and conducted several case-control studies in which cancer cases were compared with matched controls in terms of exposure to microwaves from mobile phones and more recently, also cordless phones. The group has consistently found that wireless phones increase the risks of brain tumours, both malignant and benign, especially on the side of the head where the mobile phone is used.

The most persuasive results came from two large case-control studies on brain tumours assessing the use of mobile phones and cordless phones. These were done by a standardized questionnaire mailed out to people, and answered in total by 905 (90 percent) of cases with malignant brain tumours, 1 254 (88 percent) cases with benign tumours and 2 162 (89 percent) population-based matched controls. A pooled analysis of the data from these two studies confirmed the association of mobile and cordless phone use with brain tumours.

The highest risk for both malignant and benign brain tumours was found for the same side of the head of those who have used wireless phones for more than 10 years. Significantly, the risks are several times greater for the youngest group: people who started to use mobile phones when they are less than 20 years old.

Sweden one of the earliest countries to use mobile phones

Sweden was one of the first countries in the world to adopt mobile phones, starting with the analogue phones in the early 1980s. From 1981 to the end of 2007, NMT (Norway Mobile Telephone) 450 MHz phones were used; and NMT 900CMHz operated during 1986-2000. The digital GSM (Global System for Mobile Communication) from 1991 operated with a dual band of 900 and 1 800 MHz. The third generation of mobile phones, 3G or UMTS (Universal Mobile Telecommunication System) using 1 900 MHz was introduced worldwide a few years ago, in Sweden in 2003. The fourth generation (4G) system is now in the planning stage.

The desktop cordless phones DECT (Digital Enhanced Cordless Telecommunication) have been used in Sweden since 1988, at first operating on analogue 800-900 MHz, but since the early 1990s, the digital 1 900 MHz system is used.

Most studies on the association between the use of wireless phones and brain

tumours are hampered by insufficient years of use, as the latency period of cancer is long in comparison. As Sweden was one of the first countries to adopt the technology, it offers the best opportunity for finding an early association. So far, the main results are from the Hardell group and from the Interphone study group. Interphone is a research programme set up in 2000 involving 13 countries to investigate the association between mobile phone use and cancer risk, particularly brain, head or neck, and coordinated by the international Agency for Research on Cancer (IARC), part of the World Health Organisation [2].

### Case-control studies

The Hardell group carried out 3 case control studies, all by mailed questionnaires. The first study covered the period 1994-1996, and included 209 cases (90 percent) and 425 controls (91 percent) that answered the questionnaire. This was followed by two larger studies using the same methods, over the time period 1997-2003. These studies included cordless phones and more questions on, for example, occupational exposures. The information was supplemented over the phone when necessary. The side of the head that had been most used during phone calls was assessed by separate questions: >50 percent of the time for one side, or equally both sides. This information was checked during the supplementary phone calls. Tumour localisation was based on information in medical records and all tumour types were defined using histopathology reports. The use of the wireless phone was defined as ipsilateral (tumour on the same side as phone use >50 percent of the time) and contralateral (<50 percent). From information on the time period of use and average number of minutes per day during that period, the latency time (to tumour development), and cumulative use in hours over the years were calculated. Use in a car with external antenna was disregarded as well as use of a hands free set. The minimum latency period for tumours was set at one year. Only living subjects were included in the studies.

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