

Mobile Phones and Cancer

Origin of the controversy

Over the past 20 years, mobile phone use has become an everyday part of many people's lives.

Mobile phones are low-powered radio devices that transmit and receive microwave radiation. They operate at frequencies between 450 and 2,700 MHz with peak powers in the range of 0.1 to 2 watts.¹ Concerns have been raised that mobile phones cause cancer – specifically brain tumours, as they are held close to the head when they are used.

There is clear evidence that high-energy (ionising) radiation – such as x-rays, and (gamma) γ-rays – cause cancer, genetic defects and weaken our immune system. So it is only natural that the media and public would also be wary of low-energy radiation such as extremely-low-frequency (ELF) radiation (electricity), radiofrequency (RF) radiation and microwaves. As a result, mobile phones and their base stations, as well as power lines, are major areas of public concern.²

Current evidence

Mobile phones

In the last 20 years, a large number of studies have investigated whether mobile phones are a health risk. Many studies have been conducted on mobile phone use and its link to cancers of the head and brain – such as meningioma, glioma and acoustic neuroma. Brain function – such as changes in cognitive performance or brain activity – has also been examined.

Case-control Studies

Most studies to date have been case-control studies, where researchers compare mobile phone use among people with and without cancer. These studies are retrospective; they rely on people remembering how often and for how long they used their mobile phone in the past.

The largest case-control study to date is the INTERPHONE study, which included over 5,000 people with head and neck cancer from 13 countries. The study started in 2000 and results were published in 2010 and 2011.^{3, 4} The researchers found that mobile phone users had no increased risk of glioma or meningioma. There was some suggestion that glioma risk was increased slightly amongst the heaviest users of mobile phones, but the elevated risk may have been the result of chance, reporting bias or confounding. Similar results were found by a smaller French case-control study in 2014.⁵

Cohort (Prospective) Studies

Prospective studies are considered more reliable than case-control studies because they don't rely on people's memories about their exposure.

In October 2011, a very large Danish study of over 350,000 people found no link between mobile phone use and risk of any type of brain tumour.⁶ This study followed healthy mobile phone subscribers from 1982, the year mobile phones were introduced into Denmark, to see how many developed cancer. People were followed for an average of around 10 years. This result was confirmed in 2014 by a prospective study of nearly 800,000 UK women.

December 2018

which found that mobile phone use was not associated with an increased incidence of brain cancers.⁷

In 2011, the International Agency for Research on Cancer (IARC) evaluated all scientific research investigating the health effects of mobile phones and, somewhat controversially, classified mobile phone use – and other radiofrequency electromagnetic fields – as ‘possibly carcinogenic to humans’ (IARC Group 2B).⁸ This means there is limited evidence that radiofrequency radiation causes cancer in humans and animals. This evaluation was influenced largely by the INTERPHONE study discussed above.

Ecological Studies

In 2018, an Australian study examined trends in the incidence of brain tumours over the periods 1982-1992, 1993 – 2002 and 2003 – 2013. The researchers then used modelling to determine whether the number of brain cancer diagnoses was higher than expected during those periods. The authors found that overall brain tumour rates remained stable during all three periods. When mobile phone use was high between 2003 and 2013, there was no increase in glioma of the temporal lobe. This is the part of the brain that is closest to the ear, so most exposed when using a mobile phone. This study concluded that there has been no increase in any brain tumour type that can be attributed to mobile phones.⁹

Base stations

Mobile phones communicate by transmitting radio waves through a network of fixed antennas called base stations. Base stations emit radio frequency (RF) waves at high power levels. The strength of the RF field is the greatest near its source, and drops off greatly with distance. Hence the antennas are positioned high up and surrounds are often fenced off. Public access is highly regulated where field strength may exceed safety limits.¹⁰

The strength of the RF fields must comply with safety limits imposed by the Australian Communications and Media Authority (ACMA). These limits are based on Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) recommendations. RF signal levels in all areas of public access are within guidelines, by a factor of 100 or more.¹¹

A review by the World Health Organization on the effects of RF fields from base stations showed no increase in the incidence of cancer in both animals and humans.¹²

Summary

Mobile phones are in widespread use and so it is important to continue to investigate and monitor any potential public health impact. Although there remains some uncertainty, current scientific evidence indicates that a link between typical mobile phone use or mobile base stations and cancer is unlikely. There is inconsistent evidence to suggest that very heavy users of mobile phones may have a slightly increased risk of cancer.

Further reading

- Mobile telephones and health. Radiation Protection, Australian Radiation Protection and Nuclear Safety Agency <http://www.arpansa.gov.au/mobilephones/index.cfm#>
- Electromagnetic fields and public health: mobile phones, World Health Organization, <http://www.who.int/mediacentre/factsheets/fs193/en/index.html>

References

1. World Health Organization (WHO). *Electromagnetic fields and public health: mobile phones*. October 2014; Fact sheet N°193]. Available from: <http://www.who.int/mediacentre/factsheets/fs193/en/>.
2. Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). What is radiation? . 2012 ; Available from: <https://www.arpansa.gov.au/understanding-radiation/what-is-radiation>.
3. Group, T.I.S., *Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study*. International Journal of Epidemiology, 2010. **39**(3): p. 675-694.
4. Group, T.I.S., *Acoustic neuroma risk in relation to mobile telephone use: Results of the INTERPHONE international case-control study*. Cancer Epidemiology, 2011. **35**(5): p. 453-464.
5. Coureau G, Bouvier G, Lebailly P et al. *Mobile phone use and brain tumours in the CERENAT case-control study*. Occupational and Environmental Medicine. 2014; **71**:514-522.
6. Frei, P., et al., *Use of mobile phones and risk of brain tumours: update of Danish cohort study*. BMJ, 2011. **343**.
7. Benson V, Pirie K, Schuz J et al. *Mobile phone use and risk of brain neoplasms and other cancers: prospective study*. International Journal of Epidemiology. 2013; **42**:792-802.
8. Baan, R., et al., *Carcinogenicity of radiofrequency electromagnetic fields*. The Lancet Oncology, 2011. **12**(7): p. 624-626. See also International Agency for Cancer Research (IARC) *Non-ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields*. Volume 102. 2013. Lyon, France.
9. Karipidis K, Elwood M, Benke G, et al. Mobile phone use and incidence of brain tumour histological types, grading or anatomical location: a population-based ecological study. *BMJ Open* 2018; 8:e024489. doi:10.1136/bmjopen-2018-024489
10. Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Mobile phone base stations and health. August 2016; Available from: <https://www.arpansa.gov.au/sites/default/files/legacy/pubs/factsheets/MobileT elephoneBaseStations.pdf>.
11. Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). *Mobile phones and health*. March 2015 Available from: <https://www.arpansa.gov.au/sites/default/files/legacy/pubs/factsheets/MobilePh onesandHealth.pdf>.
12. World Health Organization (WHO). *Electromagnetic fields and public health*. May 2006; Available from: <http://www.who.int/mediacentre/factsheets/fs304/en/index.html>.