



[cancer.org](http://cancer.org) | 1.800.227.2345

---

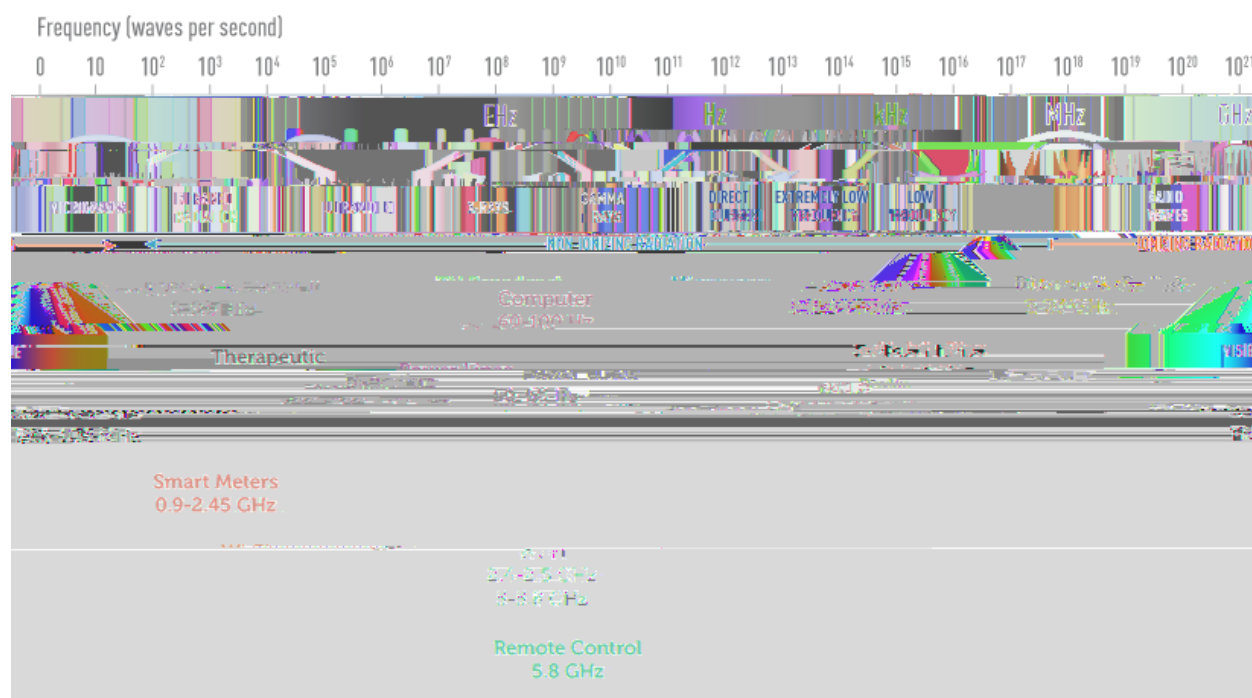
## Cellular (Cell) Phones

Cellular (cell or mobile) phones first became widely available in the United States in the 1990s. Since then, along with the large and still growing number of cell phone users (both adults and children), the amount of time people spend on their phones has also risen sharply.

[rays](#)<sup>3</sup>, and [ultraviolet \(UV\) rays](#)<sup>4</sup>. Ionizing radiation can break the chemical bonds in DNA, which might lead to cancer.

The electromagnetic spectrum illustration shows the possible frequencies of electromagnetic energy, ranging from extremely low frequencies (such as those from power lines) to exposures from extremely high frequencies (x-rays and gamma rays), and includes both non-ionizing and ionizing radiation.

## ELECTROMAGNETIC SPECTRUM



At very high levels, RF waves can heat up body tissues. But the levels of energy given off by cell phones are much lower, and are not enough to raise temperatures in the body.

### How are people exposed?

The RF waves come from the cell phone's antenna, which is part of the body of a hand-held phone. The waves are strongest at the antenna and lose energy quickly as they travel away from the phone. The phone is often held against the head when a person is on a call. The closer the antenna is to a user's head, the greater their expected exposure to RF waves. The body tissues closest to the phone absorb more energy from

RF waves than tissues farther away.

Many factors can affect the amount of energy from RF waves that a person is exposed to, including:

- **The amount of time the person is on the phone.**  
**Gr72 662.32 odver**





phone use and acoustic neuromas. There was again a suggestion of a possible increased risk in the 10% of people who used their cell phones the most, but this finding was hard to interpret because some people reported implausibly high cell phone use.

### ***The Danish cohort study***

A large, long-term study has been comparing all of the people in Denmark who had a cell phone subscription between 1982 and 1995 (about 400,000 people) to those without a subscription to look for a possible increase in brain tumors. The most recent update of the study followed people through 2007. Cell phone use, even for more than 13 years, was not linked with an increased risk of brain tumors, salivary gland tumors, or cancer overall, nor was there a link with any brain tumor subtypes or with tumors in

had some important limitations that make them unlikely to end the controversy about whether cell phone use affects cancer risk.

First, studies have not yet been able to follow people for very long periods of time. After a known cancer-causing exposure, it often takes decades for tumors to develop. Because cell phones have been widely used for only about 20 years in most countries, it is not possible to rule out possible future health effects.

Second, cell phone usage is constantly changing. People are using their cell phones much more than they were even 10 years ago, and the phones themselves are very different from what was used in the past. This makes it hard to know if the results of studies looking at cell phone use in years past still apply today.

Third, most of the studies published so far have focused on adults, rather than children. (One case-control study looking at children and teens did not find a significant link to brain tumors, but the small size of the study limited its power to detect modest risks.) Cell phone use is now widespread even among younger children. It is possible that if there are health effects, they might be more pronounced in children because their bodies might be more sensitive to RF energy. Another concern is that children's lifetime exposure to RF waves from cell phones will be greater than adults', who started using cell phones when they were older.

Finally, the measurement of cell phone use in most studies has been crude. Most have been case-control studies, which have relied on people's memories about their past cell phone use. In these types of studies, it can be hard to interpret any possible link between cancer and an exposure. People with cancer are often thinking about possible reasons for it, so they may sometimes recall their phone usage differently from people without cancer.

With these limitations in mind, it is important to continue to study the possible risk of cell phone exposure, especially with regard to use by children and longer-term use.

### **What do expert agencies say?**

**The American Cancer Society (ACS) does not have any official position or statement on whether or not radiofrequency (RF) radiation from cell phones, cell phone towers, or other sources is a cause of cancer.** ACS generally looks to other expert organizations to determine if something causes cancer (that is, if it is a carcinogen), including:

- The **International Agency for Research on Cancer (IARC)**, which is part of the

World Health Organization (WHO)

- The **US National Toxicology Program (NTP)**, which is formed from parts of several different government agencies, including the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), and the Food and Drug Administration (FDA)

Other major organizations also sometimes comment on the ability of certain exposures (such as cell phone use) to cause cancer.

Based on a review of studies published up until 2011, the **International Agency for Research on Cancer (IARC)** has classified RF radiation as “possibly carcinogenic to humans,” based on limited evidence of a possible increase in risk for brain tumors among cell phone users, and inadequate evidence for other types of cancer. (For more information on the IARC classification system, see [Known and Probable Human Carcinogens](#)<sup>6</sup>.)

More recently, the **US Food and Drug Administration (FDA)** issued a technical report based on studies published between 2008 and 2018, as well as national trends in cancer rates. The report concluded: “Based on the studies that are described in detail in this report, there is insufficient evidence to support a causal association between radiofrequency radiation (RFR) exposure and [tumor formation].”

So far, the **National Toxicology Program (NTP)** has not included RF radiation in its *Report on Carcinogens*, which lists exposures that are known to be or reasonably anticipated to be human carcinogens. (For more on this report, see [Known and Probable Human Carcinogens](#)<sup>7</sup>.)

According to the **US Federal Communications Commission (FCC)**:

“[C]urrently no scientific evidence establishes a causal link between wireless device use and cancer or other illnesses. Those evaluating the potential risks of using wireless devices agree that more and longer-term studies should explore whether there is a better basis for RF safety standards than is currently used.”

According to the **US Centers for Disease Control and Prevention (CDC)**:

“At this time we do not have the science to link health problems to cell phone use. Scientific studies are underway to determine whether cell phone use may cause health effects.”



## **How can I lower my exposure to RF waves from cell phones?**

It is not clear at this time that RF waves from cell phones cause harmful health effects in people, but studies now being done should give a clearer picture of the possible health effects in the future. Until more is known, there are several things that people who are

etc.).

5G networks (and the phones that use them) operate on some higher frequency (higher energy) RF wavelengths than older generation networks (although newer phones can typically still use the older networks as well). But the newer 5G signals still use RF waves, so they are still forms of **non-ionizing** radiation, which is not thought to have the ability to directly damage DNA.

The studies that have been done so far to look at possible links between cell phone use and cancer have focused on older generation (mainly 2G and 3G) signals. At this time, there has been very little research showing that the RF waves used in 5G networks are any more (or less) of a concern than the other RF wavelengths used in cellular communication. For more on 5G networks, see [Cell Phone Towers](#)<sup>10</sup>.

## What about cordless phones?

Cordless phones, commonly used in homes, have base units that are plugged into telephone jacks and wired to a local telephone service. They are not considered cell phones. Cordless phones operate at about 1/600 the power of cell phones, so they are much less likely to be a concern in terms of health effects.

## What about Bluetooth<sup>®</sup> devices (including earbuds)?

Many wireless devices now communicate over shorter distances using Bluetooth technology. For example, many phones now have the option of using wireless (Bluetooth) earbuds. Phones can also connect to other devices (tablets, laptops, car dashboard computers, etc.) using Bluetooth.

Bluetooth devices use RF waves in a similar wavelength range as those used for cell phones. But because the signals only need to travel a short distance (such as from the phone to a person's ears), they can operate at much lower power levels than those used by phones, which in theory might make them less of a health concern. But as with other devices that give off RF waves, possible health effects from these devices cannot be ruled out completely at this time.

## Hyperlinks

1. [www.cancer.org/cancer/risk-prevention/radiation-exposure/radiofrequency-](http://www.cancer.org/cancer/risk-prevention/radiation-exposure/radiofrequency-)

- [radiation.html](#)
2. [www.cancer.org/cancer/risk-prevention/radiation-exposure/cellular-phone-towers.html](http://www.cancer.org/cancer/risk-prevention/radiation-exposure/cellular-phone-towers.html)
  3. [www.cancer.org/cancer/risk-prevention/radiation-exposure/x-rays-gamma-rays.html](http://www.cancer.org/cancer/risk-prevention/radiation-exposure/x-rays-gamma-rays.html)
  4. [www.cancer.org/cancer/risk-prevention/sun-and-uv/uv-radiation.html](http://www.cancer.org/cancer/risk-prevention/sun-and-uv/uv-radiation.html)
  5. [www.cancer.org/cancer/types/brain-spinal-cord-tumors-adults.html](http://www.cancer.org/cancer/types/brain-spinal-cord-tumors-adults.html)
  6. [www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/known-and-probable-human-carcinogens.html](http://www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/known-and-probable-human-carcinogens.html)
  7. [www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/known-and-probable-human-carcinogens.html](http://www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/known-and-probable-human-carcinogens.html)
  8. [www.fcc.gov/general/specific-absorption-rate-sar-cellular-telephones](http://www.fcc.gov/general/specific-absorption-rate-sar-cellular-telephones)
  9. [www.fcc.gov/](http://www.fcc.gov/)
  10. [www.cancer.org/cancer/risk-prevention/radiation-exposure/cellular-phone-towers.html](http://www.cancer.org/cancer/risk-prevention/radiation-exposure/cellular-phone-towers.html)
  11. [www.cdc.gov/radiation-health/data-research/facts-stats/cell-phones.html](http://www.cdc.gov/radiation-health/data-research/facts-stats/cell-phones.html)
  12. [www.fcc.gov/consumers/guides/wireless-devices-and-health-concerns](http://www.fcc.gov/consumers/guides/wireless-devices-and-health-concerns)
  13. [www.fda.gov/radiation-emitting-products/home-business-and-entertainment-products/cell-phones](http://www.fda.gov/radiation-emitting-products/home-business-and-entertainment-products/cell-phones)
  14. [www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet](http://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet)
  15. [www.niehs.nih.gov/health/topics/agents/cellphones/index.cfm](http://www.niehs.nih.gov/health/topics/agents/cellphones/index.cfm)
  16. [www.niehs.nih.gov/health/materials/cell\\_phone\\_radiofrequency\\_radiation\\_studies\\_508.pdf](http://www.niehs.nih.gov/health/materials/cell_phone_radiofrequency_radiation_studies_508.pdf)

## Additional resources

Along with the American Cancer Society, other sources of information include:

**Centers for Disease Control and Prevention (CDC)** Frequently Asked Questions about Cell Phones and Your Health Website: [Facts About Cell Phones and Your Health | Radiation and Your Health | CDC](#)<sup>11</sup>

**Federal Communications Commission (FCC)** Wireless Devices and Health Concerns Website: <https://www.fcc.gov/consumers/guides/wireless-devices-and-health-concerns><sup>12</sup>

**Food and Drug Administration (FDA) Cell Phones**

Website: <https://www.fda.gov/radiation-emitting-products/home-business-and-entertainment-products/cell-phones><sup>13</sup>

**National Cancer Institute (NCI) Cell Phones and Cancer Risk**

Website: <https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet><sup>14</sup>

**National Institute of Environmental Health Sciences (NIEHS) Cell Phone Radio**

Frequency Radiation:

<https://www.niehs.nih.gov/health/topics/agents/cellphones/index.cfm><sup>15</sup> Cell Phone Radio

Frequency Radiation Studies:

[https://www.niehs.nih.gov/health/materials/cell\\_phone\\_radiofrequency\\_radiation\\_studies\\_508.pdf](https://www.niehs.nih.gov/health/materials/cell_phone_radiofrequency_radiation_studies_508.pdf)<sup>16</sup>

\* Inclusion on this list does not imply endorsement by the American Cancer Society.

**References**

Aydin D, Feychting M, Schuz J, et al. Mobile phone use and brain tumors in children and adolescents: A multicenter case-control study. *J Natl Cancer Inst.* 2011;103:1264-1276.

Cardis E, Armstrong BK, Bowman JD, et al. Risk of brain tumours in relation to estimated RF dose from mobile phones: Results from five Interphone countries. *Occup Environ Med.* 2011;68:631-640.

Christensen HC, Schuz J, Kosteljanetz M, et al. Cellular telephone use and risk of acoustic neuroma. *Am J Epidemiol.* 2004;159:277-283.

Centers for Disease Control and Prevention. Frequently Asked Questions about Cell Phones and Your Health. 2014. Accessed at [www.cdc.gov/nceh/radiation/cell\\_phones.\\_FAQ.html](http://www.cdc.gov/nceh/radiation/cell_phones._FAQ.html) on March 25, 2020.

Coureau G, Bouvier G, Lebailly P, et al. Mobile phone use and brain tumours in the CERENAT case-control study. *Occup Environ Med.* 2014;7:514-522.

Falcioni L, Bua L, Tibaldi E, et al. Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile

phone radiofrequency field representative of a 1.8GHz GSM base station environmental emission. *Environ Res.* 2018;165:496-503.

Federal Communications Commission (FCC). Specific Absorption Rate (SAR) For Cell Phones: What It Means For You. 2019. Accessed at [www.fcc.gov/guides/specific-absorption-rate-sar-cell-phones-what-it-means-you](http://www.fcc.gov/guides/specific-absorption-rate-sar-cell-phones-what-it-means-you) on March 25, 2020.

Federal Communications Commission (FCC). Wireless Devices and Health Concerns. 2019. Accessed at <https://www.fcc.gov/consumers/guides/wireless-devices-and-health-concerns> on March 25, 2020.

Federal Communications Commission, Office of Engineering and Technology. RF Safety FAQ. 2015. Accessed at <https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety> on March 23, 2020.

Food and Drug Administration. Do Cell Phones Pose a Health Hazard? 2020. Accessed at <https://www.fda.gov/radiation-emitting-products/cell-phones/do-cell-phones-pose-health-hazard> on March 25, 2020.

Food and Drug Administration. Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer. 2020. Accessed at <https://www.fda.gov/media/135043/download> on March 19, 2020.

Frei P, Poulsen AH, Johansen C, et al. Use of mobile phones and risk of brain tumours: Update of Danish cohort study. *BMJ.* 2011 Oct 19;343:d6387.

Hardell L, Carlberg M. Mobile phone and cordless phone use and the risk for glioma - Analysis of pooled case-control studies in Sweden, 1997-2003 and 2007-2009. *Pathophysiology.* 2015;22(1):1-13.

Hardell L, Carlberg M, Mild K. Case-control study on cellular and cordless telephones

Inskip PD, Tarone RE, Hatch EE, et al. Cellular telephone use and brain tumors. *N Engl J Med*. 2001;344:79-86.

International Agency for Research on Cancer. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Volume 102. Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields*. 2013. Accessed at: <https://publications.iarc.fr/126> on March 23, 2020.

International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP Note: Critical Evaluation of Two Radiofrequency Electromagnetic Field Animal Carcinogenicity Studies Published in 2018. *Health Phys*. 2019 Aug 27. [Epub ahead of print]

INTERPHONE Study Group. Acoustic neuroma risk in relation to mobile telephone use: Results of the INTERPHONE international case-control study. *Cancer Epidemiol*. 2011;35:453-464.

INTERPHONE Study Group. Brain tumor risk in relation to mobile telephone use: Results of the INTERPHONE international case-control study. *Int J Epidemiol*. 2010;39:675-694.

Lagorio S, Roosli M. Mobile phone use and risk of intracranial tumors: A consistency analysis. *Bioelectromagnetics*. 2014;35:79-90.

Lai H, Singh NP. Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells. *Bioelectromagnetics*. 1995;16:204-210.

Lonn S, Ahlbom A, Hall P, Swedish Interphone Study Group. Long-term mobile phone use and brain tumor risk. *Am J Epidemiol*. 2005; 161:526-535.

Malyapa RS, Ahern EW, Straube WL, et al. DNA damage in rat brain cells after in vivo exposure to 2450 MHz electromagnetic radiation and various methods of euthanasia. *Radiat Res*. 1998;149:637-645.

Muscat JE, Malkin MG, Thompson S, et al. Handheld cellular telephone use and risk of brain cancer. *JAMA*. 2000;284:3001-3007.

Muscat JE, Malkin MG, Shore RE, et al. Handheld cellular telephone use and risk of acoustic neuroma. *Neurology*. 2002;58:1304-1306.

National Cancer Institute. Cell Phones and Cancer Risk. 2019. Accessed at <https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones->

fact-sheet on March 25, 2020.

National Institute of Environmental Health Sciences. Cell Phone Radio Frequency Radiation Studies. 2019. Accessed at [https://www.niehs.nih.gov/health/materials/cell\\_phone\\_radiofrequency\\_radiation\\_studies\\_508.pdf](https://www.niehs.nih.gov/health/materials/cell_phone_radiofrequency_radiation_studies_508.pdf) on March 23, 2020.

The American Cancer Society medical and editorial content team  
(<https://www.cancer.org/cancer/acs-medical-content-and-news-staff.html>)

Our team is made up of doctors and oncology certified nurses with deep knowledge of cancer care as well as editors and translators with extensive experience in medical writing.

American Cancer Society medical information is copyrighted material. For reprint requests, please see our Content Usage Policy ([www.cancer.org/about-us/policies/content-usage.html](http://www.cancer.org/about-us/policies/content-usage.html)).

**cancer.org | 1.800.227.2345**