

3. Health Effects of RF Radiation

The proliferation of cellular antennas and other RF generating devices has led to concerns about the potential health effects from exposure to RF radiation. The short-term thermal effects of RF radiation on humans are well documented, but less is known about the long-term health effects.

The existing research has focused on the health risks associated with cell phone use and the public's exposure at ground level from RF radiation emitted from antennas located on rooftops, sides of structures, or towers. According to the American Cancer Society, "very few human studies have focused specifically on cellular phone towers and cancer risk." At this time, no available research has focused on occupational exposures to RF radiation among construction workers.

There are, however, several organizations that address the potential health effects of RF radiation, including:

- Occupational Safety and Health Administration (OSHA)
- Federal Communications Commission (FCC)
- World Health Organization – International Agency for Research on Cancer (WHO/IARC)
- Centers for Disease Control and Prevention (CDC)

While these organizations note that non-thermal health effects have not been fully explored, they have (individually or collectively) identified potential thermal and non-thermal effects, including:

- Thermal effects:
 - Blindness
 - Sterility
 - Heating of tissues – eyes and testes are particularly vulnerable
 - Burns
 - Electrical shocks
- Non-thermal effects including: alteration of body's circadian rhythms, immune system, and nature of the electrical and chemical signals communicated through the cell membrane
- *Possibly* carcinogenic to humans (Group 2B)
- Potential for other disorders
- Interference with medical devices such as pacemakers

3.1 Health Effects According to OSHA

According to OSHA: “At sufficiently high power densities, [RF radiation] can cause thermal effects that can cause blindness and sterility... [And] Non-thermal effects, such as alteration of the human body's circadian rhythms, immune system and the nature of the electrical and chemical signals communicated through the cell membrane have been demonstrated.”⁶

In its 2015 Request for Information on Communication Tower Safety, OSHA stated that: “General health effects reviews have found that high levels of exposure to radio frequencies may result in burns... [and] the link between exposure to radio frequencies and cancer, reproductive diseases, and neurological effects has not been thoroughly explored.”

3.2 Health Effects According to the Federal Communications Commission (FCC)

The FCC, which has regulatory authority over the telecommunications industry, relies on other agencies and organizations for guidance on health and safety. However, it acknowledges in its guidelines the potentially harmful thermal effects of RF radiation, noting that:

“[E]xposure to very high levels of RF radiation can be harmful due to the ability of RF energy to heat biological tissue rapidly [and]... two areas of the body, the eyes and the testes, are particularly vulnerable to RF heating.”

“When cellular and PCS antennas are mounted on rooftops, RF emissions could exceed higher than desirable guideline levels on the rooftop itself, even though rooftop antennas usually operate at lower power levels than free-standing power antennas. Such levels might become an issue for maintenance or other personnel working on the rooftop.”

The FCC also notes that pacemakers and other medical devices “could be susceptible to electromagnetic signals that could cause them to malfunction.” As such, individuals with pacemakers are encouraged to check with their doctor before performing work in areas where there is the potential to be exposed to RF radiation.

Sources:

- *FCC Policy on Human Exposure to Radiofrequency Electromagnetic Fields*, accessed April 28, 2016. <https://www.fcc.gov/general/radio-frequency-safety-0>
- *RF Safety FAQ*, accessed April 28, 2016. <https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety>
- *PPE and other Controls to Prevent RF Burns and Shock Hazards during Construction near an AM Radio Broadcast Antenna*, accessed April 28, 2016. <https://www.aiha.org/aihce07/handouts/rt214lamson.pdf>

⁶ *The Safety and Health Topics section of OSHA's website on radiofrequency and microwave radiation*, accessed April 28, 2016. https://www.osha.gov/dts/hib/hib_data/hib19900905.html

3.3 Health Effects According to the World Health Organization (WHO) – International Agency for Research on Cancer (IARC)

The World Health Organization’s International Agency for the Research on Cancer (IARC) has also been studying the potential health effects of exposure to RF radiation. The possible IARC classifications are listed in Figure 3-A. In 2011, IARC classified radiofrequency electromagnetic fields as Group 2B “possibly carcinogenic to humans based on an increased risk for glioma, a malignant type of brain cancer associated with wireless phone use.”

Figure 3-A

Group 1	Carcinogenic to humans
Group 2A	Probably carcinogenic to humans
Group 2B	Possibly carcinogenic to humans
Group 3	Not classifiable
Group 4	Probably not carcinogenic to humans

The Chairman of the IARC Working Group noted that while they are still accumulating evidence, the existing evidence “is strong enough to support” the 2B classification and the conclusion:

“...that there could be some risk, and therefore we need to keep a close watch for a link between cell phones and cancer risk... Given the potential consequences for public health of this classification and findings... it is important that additional research be conducted into the long-term, heavy use of mobile phones... Pending the availability of such information, it is important to take pragmatic steps...”

The IARC 2B decision, though largely based on studies of cell phone users, reportedly applies to all RF exposures regardless of the source.

A more recent study released in 2014, “Occupational Exposure to Extremely Low-Frequency Magnetic Fields and Brain Tumor Risks in the INTEROCC Study,” focused on ELF, which is another form of non-ionizing radiation. This study found a “positive association between ELF in the recent past and glioma.” As noted earlier, according to the CDC, “RF radiation is much higher frequency than ELF radiation and therefore potentially more harmful.”

As more research and studies are done, the IARC classification of a substance can change. For more information, visit: <http://monographs.iarc.fr/ENG/Classification/>.

Source: *Electromagnetic Fields (EMFs), Extremely Low-Frequency (ELF) and Radiofrequency (RF): What are the Health Impacts?*, accessed April 28, 2016.
<http://www.globalresearch.ca/electromagnetic-fields-emf-extremely-low-frequencies-elf-and-radio-frequencies-rf-what-are-the-health-impacts/5335801>

3.4 Symptoms of Overexposure

While there is uncertainty about the long-term health effects of exposure to RF, there is consensus around the thermal effects. Thermal effects occur when the body cannot deal with the heat buildup caused by the RF radiation quickly enough. This buildup is dependent on the frequency and intensity of the RF radiation fields as well as the length of time the worker is exposed and how close he or she is working from the source. Symptoms of overexposures include, but are not limited to:

- Labored breathing
- Perspiring – immediate sensation of intense heating of the parts of the body exposed
- Pain
- Headache
- Numbness
- Paresthesia – a tingling or numbness, skin crawling, or itching
- Malaise or an overall sense of feeling mentally or physically unwell
- Diarrhea
- Skin erythema – a reddening of the skin due to inflammation

In addition to these symptoms, workers who come in direct contact with an antenna may suffer severe burns since active RF antennas are energized (or *hot*). The resulting burns can be deep and may be worse than they appear. Any construction worker experiencing these symptoms should move to a new location immediately, and if the symptoms persist, see a doctor.

Sources:

- *City of Philadelphia, Safety Program Templates - Radio Frequency– September 2008, accessed May 3, 2016. <http://www.phila.gov/finance/units-riskmanagementtemplates.html> [available online as a document].*
- *Erythema Frequently Asked Questions, accessed April 28, 2016. https://rpop.iaea.org/RPOP/RPoP/Content/InformationFor/HealthProfessionals/5_InterventionalCardiology/erythema.htm*