U.S. Army Public Health Command (Provisional)
formerly U.S. Army Center for Health Promotion and Preventive Medicine

24-003-0410

Just the Facts...

Radio Frequency Radiation from Cellular/Mobile Telephones

Introduction:

Cellular or mobile telephones (cell phones) have been in use in the United States since 1984 when approximately 100 thousand were being used. Cell phone usage has continually risen with well over 100 million subscribers nationally and over 2 billion worldwide. Most cell phones are of the hand-held variety. Since their introduction, there continues to be concern about health risks associated with cell phone use, especially with regard to cancer. Are there health risks associated with the radio frequency radiation (RFR) from cell phones? Do cell phones cause brain cancer?

What is radio frequency radiation?

Radio frequency radiation is the propagation of electromagnetic energy through space in the form of varying electric and magnetic fields. Visible light is another example of electromagnetic energy that everyone is familiar with. These electromagnetic waves are propagated at the frequency of the cellular phone frequency bands. Cellular phones in the U.S. and internationally transmit and receive in the 800-900 MHz and 1800-1950 MHz frequency ranges which are in the ultra-high frequency band of the electromagnetic spectrum.

How Does a Cell Phone Work?

Cell phones work almost exactly like conventional land-line phones except that they use RFR instead of wires to transfer information. This enables the user to communicate from anywhere, rather than from a specific location. The cell phone unit is actually a low-power "radio." Cell phone networks have been deployed nearly everywhere to provide immediate mobile access to the national telephone network. The cell phone system is divided into prescribed "cells." Each cell site is linked to the conventional telephone network and consists of a radio base station and associated antenna tower. The cell phone radio base station antennas are usually installed at heights on the order of 150 feet above ground level, thereby providing line of sight communication with your cell phone antenna. Each phone tower typically covers a "cellular area" of approximately 10 square miles or 3 miles in all directions. Once a cell phone user moves to the outer edge of the cell, the call automatically transfers to another cell site. As long as cell sites are within communication distance of the cell phone, communication will continue seamlessly. When the RFR arrives at the cell-site receiver, the information is converted and transferred to the national telephone network. Conversely, information coming back from the network is transmitted by the cell-site transmitter (radio) and is propagated to the cellular phone receiver where the information is again converted for use by the cell phone user.

Does RFR cause cancer?

Scientific evidence from the most current research confirms that exposure RFR from cell phones does not cause cancer. RFR is categorized as nonionizing radiation because it cannot ionize atoms, i.e., cannot break chemical bonds, which can cause genetic damage or cell mutations that can lead to cancer. There is no known-mechanism by which RFR could cause cancer, although scientists are continually exploring this issue.

What about the reports of brain cancer and cellular phone users?

Stories of individuals that have used cell phones and are diagnosed with brain cancer may alarm us. Regrettably, some individuals will get cancer whether or not they use cell phones. However, the primary issue is whether the overall incidence of brain cancers has increased among all cell phones users. Scientists have performed epidemiological studies to determine whether there is a

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cause effect relationship between cell phone usage and various types of cancers. Cancer cases, or even expected clusters of cases, do not prove a cause-effect relationship between cancer and cell phone usage. Statistically, the annual incidence of brain cancer in the United States is 7 cases per 100,000 people. Therefore, we can anticipate that approximately 7,000 of the 100 million cell phone users will be diagnosed with brain cancer annually. Since some cell phone users will be diagnosed with brain cancer, many of us likely know cancer victims who have used cell phones. Epidemiological studies have consistently found that the incidence of brain cancer among cell phone users has not increased.

Who decides whether cell phones are safe?

Subject matter experts from the Food and Drug Administration (FDA), the Federal Communications Commission (FCC), the Environmental Protection Agency, the National Cancer Institute, the Department of Defense, the Institute of Electrical and Electronics Engineers (IEEE) and others periodically review the research data to see if there are any potential health effects from RFR. These experts also meet and produce exposure standards and guidelines for manufacturers and users of cell phones to assure their safety. These agencies have declared publicly that cell phones conform to published standards and are safe.

What are the RFR standards for cellular phones?

The exposure standards are based on the specific absorption rate (SAR) to RFR, which is specified in terms Watts per kilogram (W/kg). The IEEE and FCC general public exposure limit (often referred to as "uncontrolled environment" limit) for this frequency range is 1.6 W/kg in any one gram of tissue and 0.08 W/kg for the entire body. This limit assures that no overheating of tissue will occur. The power output of the transmitting device is related to the SAR. Power outputs of less than 0.7 W from the cell phone antenna do not produce SARs exceeding 1.6 W/kg, the general public limit. This is true even if operated continuously (typical phones transmit 50 percent of the time and receive 50 percent of the time). Virtually all cell phone manufacturers limit their phones to less than 0.7 W output. Also, they are likely to further reduce the power output of new phones to extend the life of the batteries. All cell phones prior to being sold to the general public in the United States must demonstrate compliance with this SAR limit. This same standard is used internationally. To check your individual cell phone for SAR compliance, go to: www.fcc.gov/cgb/sar .

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