



## Radiofrequency Radiation from Cellular Telephones



Cellular telephones have been in use in the United States since 1984 when approximately 100 thousand were subscribed to nationally. By 1993, the tally had surpassed 10 million with almost 10 thousand new **cellular** telephone customers added daily. About 5 million of these units are of the hand-held variety. These hand-held cellular telephones have recently been associated with causing cancer, particularly brain cancer.

### How does a hand-held cellular telephone work?

Cellular telephones work almost exactly like conventional home telephones except that they use radiofrequency radiation (RFR) instead of wires to transfer information. The hand-held cellular phone unit is actually a low-power radio set operating in the 800-900 MHz RFR band (part of the TV RFR band). Cellular telephone systems have been developed, primarily in metropolitan areas, to provide immediate mobile access to the national telephone network. The metropolitan area serviced by the cellular telephone system is divided into prescribed "cells." Each cell site is equipped to link the telephone network to individual cellular phone users. Industry leaders predict that the next generation of personal communication services will equip individuals to communicate voice and data from anywhere using a hand-held communicator with only one personalized number. The cellular telephone is a big part of that concept.

### What is RFR and how does it link the phone to the network?

RFR is the movement or propagation of nonionizing energy through space, from an RF transmitter to RF receiver, in the form of varying electric (E) and magnetic (H) fields. The RF energy and voice information contained in the RFR from the transmitter (cellular phone) is stored in these E and H fields. When the RFR arrives at the cell-site receiver, it is converted to RF voltage and current in the receiver, where the information is removed and transferred into the national telephone network. Conversely, information coming back from the network is transmitted by the cell-site transmitter and is propagated to the cellular phone receiver where the information is removed and heard on the phone.

### Does RFR cause cancer?

No. There is no scientific evidence, even from the most current research, to suggest that RFR causes cancer. Hand-held cellular phones in the United States transmit and receive at 824-850 MHz, which is in the ultra-high frequency (UHF) band of the electromagnetic spectrum. Scientists categorize RFR as nonionizing radiation, because it cannot ionize chemicals (chemical ionization can cause genetic damage or cell mutations, which can cause cancer). Some have suggested that prolonged exposure to low-level RFR produced by cell phones can cause cancer. However, there is no known mechanism by which RFR could initiate cancer at any level. Scientific investigations continue to explore this issue.

- Cellular Telephone
- ◆ Radiofrequency Radiation
- ◆ Cancer

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

Statistically, the incidence of brain cancer in the United States is 7 cases per 106,000 people. Therefore, we can anticipate that approximately 350 of the 5 million hand-held cellular phone users will be diagnosed with brain cancer annually. It should be no surprise that some cellular phone users will be diagnosed with brain cancer or that some of the cancer victims will know that other cellular phone users are among that 350 expected cancer victims. Such anecdotal evidence of cancer cases, or even expected clusters of cases, does not prove a cause-effect relationship between cancer and cellular phone usage. People should be wary of such conclusions.

## **Who decides whether cellular phones are safe?**

Subject matter experts from the Food and Drug Administration (FDA), the Federal Communications Commission, the Environmental Protection Agency, the National Cancer Institutes, the Department of Defense, the American National Standards Institute and others continually review the research data to see if there are any potential negative health effects from any physical agents, including RFR. These experts also meet and produce a variety of exposure standards to provide RFR exposure guidelines for manufacturers and users of such devices to assure their safety. Spokesmen for these agencies have all declared publicly that the cellular telephones conform to published standards. Further, the FDA has the authority to regulate these devices if it seems appropriate to do so in the interest of public safety. For instance, microwave ovens have performance standards regarding RFR leakage to protect the user from possible burns from microwave radiation. There is no such action pending by the FDA at this time for cellular phones.

## **What are the RFR control levels, if any, for cellular phones?**

In the frequency range of cellular telephones (800-900 MHz), there are consensus exposure standards based on the specific absorption rate (SAR) for RFR. This SAR is specified in terms of Watts per kilogram (W/kg). The exposure limit for this frequency is chosen to keep the SAR at less than 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.

Another RFR control parameter that is related to SAR is the power output of a transmitting device. If a cellular phone power output is limited to less than 0.7 W, then it cannot produce RFR which will exceed the uncontrolled environment permissible exposure limits (PELs) or SAR limits, even if operated continuously (typically phones are transmitting 50 percent of the time and receiving 50 percent of the time). Virtually all phone manufacturers limit their phones to less than 0.6 W output. Also, they are likely to further reduce the power output of new phones to extend the life of batteries. Because of these low power output requirements and the incentive to extend battery life, cellular phones do not produce RFR levels which exceed the existing consensus exposure standards for uncontrolled environments. There are, therefore, no health-related RF restrictions or controls necessary for hand-held cellular telephones. This same standard is used in the United States, the European Economic Community, Japan, Australia, and other nations.

## References

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