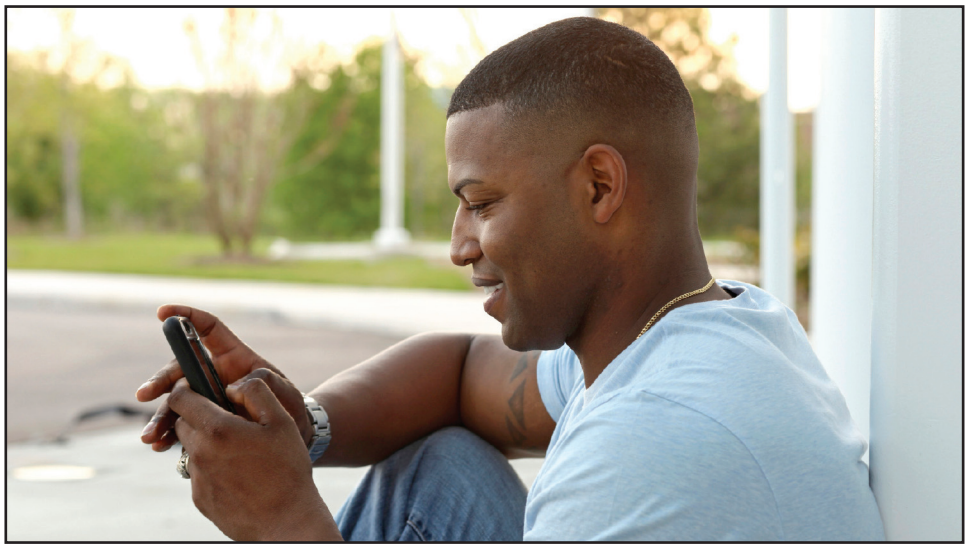
National Toxicology Program

Headquartered at the
National Institute of Environmental
Health Sciences NIH-HHS

# Cell Phone Radiofrequency Radiation Studies

Personal (cellular) telecommunications is a rapidly evolving technology that uses radiofrequency energy or radiation for mobile communication. Currently, wireless communication devices are used by more than 270 million Americans, or greater than 85 percent of the U.S. population[1]. Given this large number of users, if adverse health effects are shown to be associated with cell phone use, this could potentially be a widespread public health concern.



The nomination for the National Toxicology Program (NTP) to study cell phone radiofrequency radiation was made by the U.S. Food and Drug Administration (FDA) because of the following:

- Widespread human exposure.
- Current exposure guidelines are based largely on protection from acute injury from thermal effects.
- Little is known about potential health effects of long-term exposure to radiofrequency radiation.
- Sufficient data from human studies may not be available for several years.

## Overview of NTP Studies

Many people are concerned that cell phone radiation will cause cancer or other serious health hazards. While the weight of the current scientific evidence has not conclusively linked cell phones with any health problems, the NTP and other scientific organizations conclude that additional data are needed. The NTP has begun studies to help clarify any potential health hazards, including cancer risk, from exposure to cell phone radiation, and to pave the way to better protection for public health.

The NTP is in the initial stages of conducting toxicology and carcinogenicity studies in laboratory animals. The studies are designed to simulate the exposures of cell phone users in the United States.

Rats and mice will be exposed to radiofrequency radiation from the technologies Code-Division Multiple Access (CDMA) and Global System for Mobile (GSM) communications, and frequencies 900 and 1900 MHz, that are currently used in the United States. Cell phone radiation will be administered in 10-minute on/off cycles for 20 hours per day. The NTP anticipates the completion and reporting of all phases of the studies by 2014.

## Creating Cell Phone Radiation Exposure

Because of the technical complexity of studying cell phone radiation, the NTP staff is working closely with radiofrequency radiation experts from the National Institute of Standards and Technology (NIST).

The weight of scientific evidence has not conclusively linked cell phones with any health problems. Additional research is needed. The NTP is conducting studies on radiofrequency radiation emitted by cell phones.

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Through an interagency agreement, NIST scientists worked to develop an exposure system that would provide uniform exposures to radiofrequency radiation in rodents in the frequency bands of mobile communications. Suitability tests were conducted on various radiofrequency radiation exposure systems. These efforts demonstrated the feasibility of using specially designed reverberation chambers as the exposure system. The design allows for exposures for up to 20 hours per day. This system consists of 21 separate reverberation chambers that are essentially shielded rooms with a transmitting antenna radiating radiofrequency fields and rotating stirrers to generate a statistically uniform field.

## A Three-Phased Study Design

The NTP is conducting studies on radiofrequency radiation emitted by cell phones in three phases: (1) a series of pilot studies to establish field strengths that do not excessively raise body temperature; (2) subchronic toxicology studies where the rodents are exposed to various non-thermal field strengths for up to two months; and (3) chronic toxicology and carcinogenicity studies where the rodents will be exposed for 24 months.

Because human exposure to radiofrequency radiation is non-thermal or too low to cause an increase in body temperature, the NTP designed its studies to be in the non-thermal range. Phase one studies will evaluate various power levels of cell phone radiofrequency radiation to determine levels of exposure in both sexes of young and old rats and mice, and in pregnant female rats that do not cause thermal effects. Data from these studies will help identify maximal power levels for the phase two studies. The pilot studies are expected to be completed in November 2009.

The second phase studies, which are expected to begin in 2010, will investigate the subchronic toxicity of cell phone radiofrequency radiation and help to determine the appropriate power levels for each strain and species for the third phase of the studies. Exposure to radiofrequency radiation will start during gestation in rats and during adolescence in mice and will continue through young adulthood (subchronic) or for 2 years (chronic).

The final phase, which includes chronic or 2-year exposure studies, has been designed to determine the potential for cell phone radiation to be hazardous and/or carcinogenic to humans. These chronic toxicology and carcinogenicity studies are expected to start in late 2010 with an anticipated completion in 2012, with subsequent reporting and peer review of the data in 2013–2014.

Collectively, these NTP studies will provide critical information regarding the safety of exposure to radiofrequency radiation and strengthen the science base for determining any potential health effects in humans. These data could contribute to information used by the federal government, including the FDA, in making decisions with respect to radiofrequency radiation health issues consistent with the protection of public health and safety.

**Cell Phone Radiofrequencies**

### Where can I go for more information?

For more information on what other federal agencies are doing to determine whether radiofrequency radiation from cell phones affects human health, visit the following web sites:

National Cancer Institute

U.S. Food and Drug Administration

Centers for Disease Control and Prevention

[1] Cellular Telecommunications and Internet Association