

P R E S I D E N T ' S C A N C E R P A N E L

NATIONAL CANCER PROGRAM

NATIONAL CANCER INSTITUTE

NATIONAL INSTITUTES OF HEALTH

DEPARTMENT OF HEALTH AND HUMAN SERVICES

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Environmental Factors in Cancer January 27, 2009

The President's Cancer Panel held the fourth and final meeting in its 2008-2009 series, *Environmental Factors in Cancer*, on January 27, 2009, in Phoenix, Arizona. Participants were invited to address radiation exposures and related cancer risk. This included exposures to ionizing and non-ionizing radiation, as well as downwind exposure to nuclear fallout. Current research, knowledge gaps, and regulatory practices in this area were discussed.

There are a number of prevalent and potentially harmful radiation exposures in the environment that are understudied and unregulated. Non-ionizing radiation sources (e.g., cell phones, microwave ovens, television/radio, and power lines) are ubiquitous, yet their potential health dangers to the public remain largely unknown. There is particular concern over a possible link between mobile telephones and brain tumors; since the conversion of mobile phones from analog to digital signal in 2000, the number of users has risen rapidly. In 2007, there were 255 million cell phone subscribers in the United States. Available results from epidemiological studies show no associations between cell phones and brain tumor incidence. However, these results were based on usage information collected prior to the digital frequency conversion and the associated increase in consumer use. Since latency for brain cancer from environmental exposures is thought to be 20 to 30 years, comprehensive studies looking at longer-term human exposure are needed. Participants urged that a precautionary approach be taken with respect to the use of cell phones by children, who are more susceptible than adults to radiation risks.

Effects of low-dose, ionizing radiation are also difficult to ascertain but they present more definitive health risks. Ionizing radiation is known to induce DNA damage; cellular changes resulting from failure to repair this damage can lead to cancer. The rapid rise in medical imaging has raised concerns; the collective population dose of medical radiation has increased 700 percent since 1980. The United States has about 5 percent of the world's population but performs almost one-fourth of all diagnostic x-ray procedures. Approximately 70 million computed tomography (CT) scans are performed each year in the U.S.; 5 to 10 percent of those are performed on children. Medical radiation is the largest source of radiation exposure in the U.S. but it remains predominantly unregulated, even though doses could be reduced without sacrificing diagnostic accuracy.

The damaging health effects of ionizing radiation are more clearly illustrated through the risks associated with exposure to nuclear fallout. Studies by the CDC estimate that at least 212,000 people exposed to fallout in the United States are at elevated risk of developing thyroid cancer. Nuclear weapons testing began in the U.S. in the 1940s and continued into the 1960s. Roughly 80 percent of these nuclear tests were carried out in the Marshall Islands, a former U.S. Pacific Territory. Testing resulted in destruction of ancestral lands, direct radioactive fallout on residents (even those living on nearby islands), and other long-term radiation effects. On the U.S. mainland, populations exposed to nuclear radiation include families that lived and worked at the Hanford, Washington nuclear production complex and downwind from nuclear weapon testing facilities such as the Department of Energy "Nevada Test Site," where approximately 1,000 above-ground nuclear tests were carried out between 1952 and 1962. The harmful effects of Iodine-131 have been made clear; however, information on exposures (and related risk) from other radionuclide fallout and exposure is severely lacking. Affected individuals have no means of assessing or monitoring their personal health risks.

In recent years, the field of environmental health has been challenged to focus on a broader array and the cumulative effect of exposures, and to better understand the continuum from exposure to disease outcome. In addition to toxicity, other factors such as route, length of exposure, genetic polymorphisms, age of an individual, and co-exposures all affect whether exposure to a substance will lead to disease. In the future, developing a "systems biology" approach will be essential for understanding the impact of the environment on cancer.

The Panel will summarize findings and recommendations from this meeting along with the other meetings in the series in its 2008-2009 Annual Report to the President of the United States.