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## **Studies of Atomic Bomb Survivors of Hiroshima and Nagasaki Provide Insights Into Long-Term Radiation-Related Health Effects**

CHICAGO -- The long-term health studies of the survivors of the atomic bombings of Hiroshima and Nagasaki may provide some insight into the radiation-related effects that potentially may occur for current day residents in Japan who are dealing with the aftermath of the earthquake that created a nuclear accident. A review article in the latest issue of *Disaster Medicine and Public Health Preparedness*, a journal published by the American Medical Association, looks at risk estimates and summarizes what has been learned from following the survivors for 63 years. This article, as well as all of the articles in the special issue, *Nuclear Preparedness*, is open access and can be viewed at *Disaster Medicine and Public Health Preparedness* journal's website <http://www.dmph.org>.

“Approximately 40 percent of the A-bomb survivors, but about 80 percent of those exposed before age 20 years, are alive today,” the authors note. President Harry Truman approved the original directive to study the biological and medical effects of the atomic bomb on humans. In 1947, the Atomic Bomb Casualty Commission (ABCC) was created, and later restructured in 1975 to become the Radiation Effects Research Foundation (RERF), to continue to research the health effects of the atomic bomb survivors and their children with financial and scientific support from the Japanese and U.S. governments. A unified study program, called the Life Span Study, was instituted in 1955 for continuing epidemiological follow-up for mortality and cancer incidence of a sample of about 120,000 atomic bomb survivors and control subjects. There are several special studies in smaller cohorts examining various health-related factors.

“ABCC/RERF scientists have used primarily two types of risk calculations to describe the magnitude of health effect associated with radiation exposure in epidemiological studies. The excess absolute risk rate (EAR) refers to the difference in the rate of occurrence of disease between an exposed population and a comparable population with no exposure. The relative risk is the ratio of the occurrence rate in the exposed population to that in the nonexposed population,” the authors write. The excess relative risk (ERR) is “a measure of the strength of the effect of exposure and may have biological significance, whereas the EAR is a measure of the absolute size of the effect, which may be of public health or clinical significance.”

The researchers have found increased risks of leukemia among the atomic bomb survivors, as well as a gradual increase in solid cancers starting several years after the bombings. “Because the A-bomb survivors received whole-body exposures from the penetrating radiation, excess cancer risks (ERR and EAR) have been estimated for a large number of organ sites. Dose responses are significant for cancers of the oral cavity, esophagus, stomach, colon, liver, lung, nonmelanocytic skin, female breast, ovary, urinary bladder, brain/central nervous system, and thyroid.”

There were also psychological and neurological effects and a reduction in life span. “Median (midpoint) loss of life was about two months for those with doses less than 1 Gy (gray = dose of radiation) and 2.6 years for those with doses greater than 1 Gy. It was estimated that at 1 Gy, the proportion of total life lost was roughly 60 percent from solid cancer, 30 percent from diseases other than cancer, and 10 percent from leukemia,” the authors write.

“The ERR for people exposed to the bombs at a younger age is higher than those exposed at an older age. The risk is about twice as high after exposure at age 10 than at age 40. For all ages at exposure, the ERR declines over time (with increasing attained age). Contrarily, the EAR increases rapidly with age, with no apparent indication of abating, suggesting that the radiation-related excess risk may persist throughout one’s lifetime, and this trend is seen for most of the cancer sites,” the authors explain.

In conclusion, the authors write: “The lessons learned from establishing the cohorts and the pioneering analyses by ABCC and RERF scientists should serve as a legacy for future generations who experience occupational, medical, or environmental radiation exposures.”

(*Disaster Med Public Health Preparedness*. 2011;5:S122-S133. Available at [www.dmph.org](http://www.dmph.org))

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