Possible Link Studied Between Cancer and Trade Center Debris

An observational study was conducted in response to public concern regarding the release of both known and suspected environmental carcinogens following the terrorist attacks of September 11, 2001, at the World Trade Center (WTC) in New York, NY, and the potential increase of cancer incidence among exposed individuals. The study subjects were New York state residents enrolled in the WTC Health Registry from 2003–2004 (N = 55,778). The cohort was divided as rescue and recovery workers (n = 21,850) and those not involved in rescue and recovery (n = 33,928). All were followed through December 31, 2008. Standardized incidence ratios (SIRs) made adjustments for age, race and ethnicity, and gender; were computed with 2003–2008 New York state rates as reference; and focused on diagnosed cancers in 2007–2008 as most likely related to exposure during September 11, 2001, and the aftermath. The total and site-specific incidence rate differences per 100,000 person-years between the study population and the New York state population in 2007–2008 also were calculated.

The WTC attacks claimed more than 2,700 lives and exposed hundreds of thousands of individuals to dust, debris, exploded building materials, and toxic emissions that resulted in short- and long-term health-related effects. Environmental surveys have shown that smoke and aerosols emitted from the explosions were mixtures of volatile chemicals and particulate matter that contained known and suspected carcinogens such as asbestos, silica, benzene, hydrocarbons, volatile organic compounds, and metals.

This WTC Health Registry provided pivotal information as a cohort study designed specifically to monitor the health impact of the September 11 attacks among rescue and recovery workers and people who lived, worked, or attended school in lower Manhattan. The focus of this epidemiologic survey was to determine if the environmental pollutants that blanketed lower Manhattan following the WTC attacks were causative carcinogenic agents linked to an increase in cancer incidence amongst exposed individuals.

The study was one of the earliest attempts to document a link between environmental exposures to suspected carcinogens (polycyclic hydrocarbons, asbestos, benzene, and dioxins) that emanated from the WTC. No statistically significant increased incidence was noted for all combined cancer sites. Among rescue and recovery workers, it was found that multiple myeloma, prostate, and thyroid cancers were significantly elevated in a later time frame; however, they were not associated with WTC exposures.

Prostate and thyroid cancers are frequently detected during routine screening and are subject to surveillance bias. To address this bias, the researchers compared the proportion of individuals having a routine physical checkup within the preceding 12 months between those with and without subsequent cancer. The proportions were almost identical and, therefore, the respective cases of prostate and thyroid cancer that were stage I at diagnosis (85% and 66%, respectively) were similar to those of the general New York state population. This suggests that cancer cases in this study may not have received more thorough cancer screening than the New York state population in general. Hematologic cancers were of interest because they have a shorter latency period than solid tumors and are associated with certain chemicals, and could be early indicators of cancer risk. Later-period cases of multiple myeloma (n = 7) were observed among rescue and recovery workers, yielding a significantly elevated SIR of 2.85. Thyroid cancer can be caused by ionizing radiation; however, potentially carcinogenic levels of radiation were not documented at the WTC site. Multiple myeloma has been associated with a variety of occupational exposures such as firefighting, painting, and agricultural work. Few specific environmental agents, however, have been linked to myeloma, and the SIR for firefighters at the WTC was based on less than five cases of multiple myeloma and, therefore, was not statistically significant.

This study has tremendous significance as it represents the first WTC cancer incidence study including both genders, all ages and races, and rescue and recovery workers as well as those not involved in rescue and recovery. The cohort provided measurements of exposure to environmental hazards (some carcinogenic) to dose-response relationships.

The catastrophe of the WTC attacks promulgated despair in the lives of those immediately affected and led to profound national and global changes. This study, therefore, is pivotal as it was the first attempt to document that the etiology of three specific cancers (prostate, thyroid, and multiple myeloma) among rescue and recovery workers were not significantly associated with WTC exposures. The short follow-up and limited data on the medical history and screening of this cohort were among several study limitations. Although the link between WTC exposures and the identified cancers is unclear, longer follow-up is needed for select cancer sites with longer latency.

Cone, J.E., Kahn, A.R., Brackbill, R.M., Farfel, M.R., Greene, C.M., Hadler, J.L., . . . Stellman, S.D. (2012). Association between World Trade Center exposure and excess cancer risk. *JAMA, 308,* 2479–2488. doi:10.1001/jama.2012.110980

Nurses Must Educate Patients Regarding Diagnostic Radiation

The widespread use of diagnostic medical radiation has proliferated as the most common component of background radiation in Western countries. Diagnostic radiology, particularly the worldwide use of computed tomography scan, will continue this popular trend and the related potential for cancer induction from doses received during these procedures. This article provides an overview of current knowledge related to cancer induction from low doses of ionizing radiation. Estimation of cancer risk from low linear energy transfer (LET) ionizing radiation can enable prediction of cancer risk from low-dose

radiation emissions. Convincing epidemiologic evidence supports a relationship between radiation exposure and cancer induction. LET is a linear model for intermediate doses (0.15–1.5 Gy). A review of the linear no-threshold (LNT) model assumes a curvature at moderate doses, but linearity at low-dose rates. This model provides information for human cancer data, with the assumption that the rate-limiting event in low-dose radiation carcinogenesis is from "one-track action." In other words, dose in the LNT model is directly proportional to track number. This mode forms the basis of modern radiation protection policy, which is pivotal for the development of radiation policy protection standards.

Several mechanisms of radiobiologic and epidemiologic models were presented in this review that may impact resistance or susceptibility to radiation-induced cancer, such as individual immune response, radiosensitivity of tissue, DNA damage prevention, apoptosis and senescence, radioresistance, and genomic instability. In addition to the aforementioned models, the authors stress the importance of considering individual patient factors to predict potential risk of developing radiation-induced cancer. Key assessment domains that must be queried include age at exposure, patient comorbidities, and gender. In addition, environmental factors such as smoking tobacco (linked to lung and bladder cancers) also are noted and provide confounding variables.

A confounding issue that has been identified is the ability to derive accurate estimates of excess relative risk using the epidemiologic data available to predict patient-specific risk for developing cancer associated with diagnostic radiation use. If this could be accomplished, both patients and clinicians would be able to see the benefits of diagnostic radiology and be fully informed of accurate and, most importantly, realistic relative and individualized cancer risk.

The radiation protection community has identified the real risk associated with radiation-induced cancer given at the doses and dose rates from diagnostic radiation. To date, the evidence available is not strong in linking the precise shape of the dose-response curve at radiation doses of less than 0.15 Gy. A precautionary principle has been advised when subjecting patients to diagnostic studies using ionizing radiation. Safe and thorough patient care should be offered and enforced with detailed informed consent. A balance must be achieved when offering precise diagnostic tools to enable appropriate and prompt medical intervention. As explained in this review, the LNT model is the most appropriate for enabling decisions about medical radiation exposure versus cancer risk. In this way, patients would have access to clinical care based on safe parameters.

Shah, D.J., Sachs, R.K., & Wilson, D.J. (2012). Radiation-induced cancer: A modern view. *British Journal of Radiology, 85,* e1166–e1173.

These timely articles speak to the tremendous pressure placed on the patient population regarding worries and fears that are sometimes caused by environmental factors, both unpredictable and predictable. The press coverage of certain topics often contributes to the proliferation of public fear, in this case the linkage between environmental exposures such as that described at the WTC (noxious debris) with continuation into therapeutic practice (low-level radiation from medical imaging) and, ultimately, the impact on cancer incidence. This kind of sensational information can be harmful as individuals might choose to avoid diagnostic imaging that could detect early health aberrations and, ultimately, compromise timely medical intervention. Nursing professionals must be aware of external stress, real or imagined, on patients and must be fortified with evidence-based responses to support the patient population now and in the future.

Susan Weiss Behrend, RN, MSN, AOCN®, is an oncology clinical nurse specialist in the Department of Nursing at Fox Chase Cancer Center in Philadelphia, PA. No financial relationships to disclose. Behrend can be reached at swbehrend@comcast.net, with copy to editor at ONFEditor@ons.org.

Digital Object Identifier: 10.1188/13.ONF.295-296

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