

# Cancer and the World Trade Center Health Program

## **Moderator**

**Elizabeth M. Ward, PhD**

Senior Vice President

Intramural Research

American Cancer Society

Atlanta, Georgia

Developed as part of a Medscape education activity, *Cancer and the World Trade Center Health Program*, supported by the National Institute for Occupational Safety and Health (NIOSH)

## **Panelists**

### **Michael A. Crane, MD, MPH**

Director

WTCHP Clinical Center

Associate Professor, Preventive Medicine

Selikoff Centers for Occupational Health

Mount Sinai Hospital

New York, New York

### **David J. Prezant, MD**

Chief Medical Officer

Fire Department of New York

Special Advisor

Fire Commissioner for Health Policy

Co-Director

WTCHP - FDNY

New York, New York

### **Mark Farfel, ScD**

Director, WTC Health Registry

New York City Department of Health

& Mental Hygiene

New York, New York

# Learning Objectives

- Explain why the WTCHP added cancer to the List of WTC-Related Health Conditions under the James Zadroga 9/11 Health and Compensation Act of 2010 (Zadroga Act)
- Recognize what cancers and screenings are covered by the WTCHP
- Identify the process for determining the WTC-relatedness of a disease in a patient with cancer suspected to be due to WTC exposure

# WTCHP

## STAC

- The STAC was established by the James Zadroga 9/11 Health and Compensation Act of 2010. The Act specifies 3 general areas of contributions to the WTCHP from the STAC:
  - The Act requires the Administrator to seek advice from the STAC with regard to additional eligibility criteria for responder and survivor membership in the Program.
  - The Act requires the Administrator to consult the STAC with regard to identifying research needs for the Program.
  - The Act provides that the Administrator may consult with the STAC regarding whether a particular health condition should be added to the List of WTC-Related Health Conditions.

# STAC Recommendations Regarding Addition of Cancer to the List of WTC-Related Health Conditions

- Exposures resulting from the collapse of the buildings and high-temperature fires likely increased the probability of developing some or all cancers
  - Conclusions based primarily on:
    - Presence of approximately 70 known and potential carcinogens in the smoke, dust, volatile, and semi-volatile contaminants
    - Fifteen classified by the IARC as known carcinogens and 37 classified by the National Toxicology Program as reasonably anticipated to cause cancer in humans
  - Although exposure data are extremely limited:
    - High prevalence of acute symptoms and chronic conditions as well as qualitative descriptions of exposure conditions provide highly credible evidence that significant toxic exposures occurred
    - Salient biological reaction underlying many recognized WTC-related health conditions – chronic inflammation – may underlie the development of some cancer

# Primary Chemical Constituents of WTC Dust

- Combustion products of jet fuel
- Combustion products of plastics, metals, woods, insulation, fluorescent lights, and computer and video monitors
- Particulate matter
  - Calcium sulfate (gypsum)
  - Calcium carbonate
  - Crystalline silica
- Fibers
  - Fibrous glass
  - Gypsum fibers
  - Chrysotile asbestos
- Organic pollutants
  - Polycyclic aromatic hydrocarbons
- Hydrocarbons
  - Naphthalene
  - Polychlorinated biphenyls
  - Dioxins
  - Benzene
- Heavy metals
  - Mercury
  - Lead

## Alkaline pH 9-11

The larger-size fractionated particles were more alkaline than smaller ones

# Examples of WTC Exposure Includes Known Carcinogens

Carcinogenic Agent	Strong Association	Suspected Association
Aromatic amines	Bladder	Prostate
Metals	Bladder, lung, skin, soft tissue sarcoma, nasal, nasopharynx	Brain/CNS, renal, liver, biliary, prostate, pancreatic, stomach
Natural fibers/dust	Laryngeal, lung, nasal, nasopharynx	
Petrochemicals and combustion by-products	Lung, NHL, soft tissue sarcoma, skin	Bladder, breast, esophageal, multiple myeloma, prostate
Reactive chemicals	Leukemia, lung, NHL, laryngeal, liver, biliary, soft tissue sarcoma	Breast, nasal, nasopharynx
Solvents	Leukemia, NHL, liver, biliary, renal	Brain/CNS, lung, MM, rectal, Hodgkin, bladder, esophageal

# STAC Recommendations Regarding Which Cancers to Add

- Generate a list of cancers potentially related to WTC dust exposures from 3 sources:
  - Epidemiologic studies in WTC responder and survivor populations
  - Cancer sites considered by IARC to have limited or sufficient evidence for carcinogenicity in human studies for known or probable carcinogens in WTC dust
  - Cancers arising from regions of the respiratory and digestive tracts where inflammatory conditions, such as GERD, have been documented
- Additional STAC comments:
  - Results of new epidemiologic studies should be reviewed and list of cancers modified as appropriate
  - WTCHP should provide funding and guidelines for screening and early detection



# WTC Administrator's Methods For Adding Cancer Sites to the List

- Method 1: Epidemiologic Studies of 9/11 Exposed Populations
  - A type of cancer may be added to the list if published, peer-reviewed epidemiologic evidence supports a causal association between 9/11 exposures and the cancer type
- Method 2: Established Causal Associations
  - A type of cancer may be added to the list if there is a well-established causal association between that cancer and a condition already on the list of WTC-Related Health Conditions
- Method 3: Review of Evaluations of Carcinogenicity in Humans
  - Specified criteria for exposure assessment and establishing cancer sites (IARC)
- Method 4: Review of additional information provided by the WTCHP STAC

# What Cancers Are Covered by the WTCHP?

- Childhood cancer – any type of cancer diagnosed in a person < 20 yrs of age
- Malignant neoplasms:
  - Blood and lymphoid tissue
  - Digestive system
  - Eye and orbit
  - Female breast
  - Female reproductive organs (ovary)
  - Head and neck
  - Respiratory system
  - Skin (melanoma/non-melanoma)
  - Soft tissue
  - Thyroid
  - Urinary system
- Mesothelioma
- Prostate (added in 2013)
- Rare cancers – any type of cancer that occurs in < 15 cases per 100,000 persons per year in the United States

# Rare Cancers Eligible for Certification

- All types of cancer that are not individually named and that meet the threshold incidence rate of less than 15 cases per 100,000 persons per year based on age-adjusted 2005-2009 average annual data in United States are considered rare cancers and are eligible for certification by the program.
- The following slides list cancer types that have been determined to meet the threshold incidence rate for rare cancers.
- Other types of cancer that meet the definition of a rare cancer but which are not on the list or identified in subsequent slides may also be considered for certification.

# Rare Cancers Eligible for Certification

*Includes but is not limited to the following:*

- Malignant neoplasms of the:
  - adrenal gland and other endocrine glands and related structures
  - anus and anal canal
  - bone and articular cartilage
  - breast among men
  - gallbladder and other parts of biliary tract
  - meninges, brain, spinal cord, cranial nerves, and other parts of central nervous system
  - pancreas
  - penis and testis
  - placenta
  - small intestine
  - thymus
  - vulva, vagina, and cervix uteri (invasive only)

# Rare Cancers Eligible for Certification (cont)

- Malignant neuroendocrine neoplasm, including carcinoid tumors
- Myeloid neoplasms, including myelodysplastic syndromes, myeloproliferative neoplasms, myelodysplastic/myeloproliferative neoplasms, and myeloid malignancies associated with eosinophilia and abnormalities of growth factor receptors derived from platelets or fibroblasts

# WTC Cohort Cancer Studies

- FDNY. Zeig-Owens R, et al. 2011<sup>a</sup>
- WTC Health Registry (NYCDOH). Li J, et al. 2012<sup>b</sup>
- WTC Consortium (Mount Sinai). Solan S, et al. 2013<sup>c</sup>
- Methodological differences, including recruitment strategies heterogeneity of the populations, length of follow-up, and population overlaps, complicate direct comparisons of results of the three studies and argue against meta-analysis
- The studies arrived at similar conclusions regarding certain cancer sites (excess thyroid and prostate) but differed regarding other sites (melanoma)
- Cohort researchers agreed to take an early look at the data and update their analyses periodically. These early results are what follows.

a. Zeig-Owens R, et al. *Lancet*. 2011;378:898-905; b. Li J, et al. *JAMA*. 2012;308:2479-2487; c. Solan S, et al. *Environ Health Persp*. 2013;121:699-704.

# Review of Epidemiologic Studies

## *FDNY Study*

- Observational study of 9853 men who were employed as firefighters on January 1, 1996. Examined cancer incidence and its potential association with exposure in the first 7 years after 9/11 in firefighters with health information before 9/11.
- Compared with the general US male population, the SIR was 1.10 (95% CI: 0.98-1.25) in WTC-exposed firefighters. When compared with non-exposed firefighters, the SIR in WTC-exposed firefighters was 1.32 (95% CI: 1.07-1.62).
- Modest excess of cancer cases, but authors are very cautious in their interpretation of findings due to short time frame from 9/11 exposure.

# Review of Epidemiologic Studies

## *WTC Health Registry Study Results*

- Observational study of 55,778 NY state residents enrolled in the Registry in 2003–2004; n = 21,850 responders and n = 33,928 nonresponders (survivors)
- In 2007-2008, the SIR among registrant "responders" was elevated and statistically significant for prostate cancer (1.43 [95% CI: 1.11-1.82]), thyroid cancer (2.02 [95% CI: 1.07-3.45]) and multiple myeloma (2.85 [95% CI: 1.15-5.88]).
- Authors conclude that longer follow-up for long-latency cancers and attention to specific cancer sites are needed.



# Review of Epidemiologic Studies

## *WTC Consortium Study*

- Cancers among 20,983 WTCHP members were identified through state tumor registries in NY, NJ, CT, and PA
- 575 cancers were diagnosed in 552 individuals
- SIRs were: 2.39 [95% CI: 1.70-3.27] for thyroid cancer; 1.21 [95% CI: 1.01-1.44] for prostate cancer; 1.36 [95% CI: 1.07-1.71] for combined hematopoietic and lymphoid cancers; 2.26 [95% CI: 1.13-4.05] for soft tissue cancers
- Authors conclude: Results should be interpreted with caution given the short follow-up, long latency period associated with most cancer types, and the small numbers of observed or expected cases

# Despite Differences, SIRs for WTC-Exposed Are Similar Across WTC Cohorts<sup>\*,†</sup>

Cancer Site	WTC Health					
	N	FDNY <sup>a</sup> (PY = 61,884)	N	Registry <sup>b</sup> (PY = 41,280)	N	WTC Consortium <sup>c</sup> (PY = 153,077)
All sites	263	1.10 (0.98-1.25)	223	1.14 (0.99-1.30)	575	1.15 (1.06-1.25)
Lung	9	0.42 (0.20-0.86)	13	0.65 (0.35-1.12)	43	0.89 (0.64-1.20)
Melanoma	33	<b>1.54 (1.08-2.18)</b>	10	1.32 (0.63-2.43)	20	0.93 (0.57-1.43)
Prostate	90	<b>1.49 (1.20-1.85)</b>	67	<b>1.43 (1.11-1.82)</b>	129	<b>1.21 (1.01-1.44)</b>
Thyroid	17	<b>3.07 (1.86-5.08)</b>	13	<b>2.02 (1.07-3.45)</b>	39	<b>2.39 (1.70-3.27)</b>
Non-Hodgkin lymphoma	21	<b>1.58 (1.03-2.42)</b>	11	1.15 (0.57-2.06)	38	1.36 (0.96-1.87)
Multiple myeloma	≤ 5	1.49 (0.56-3.97)	7	<b>2.85 (1.15-5.88)</b>	9	1.41 (0.64-2.67)

\*Selected cancers; †Results show unrestricted cohort.

a. Zeig-Owens R, et al. *Lancet*. 2011;378:898-905; b. Li J, et al. *JAMA*. 2012;308:2479-2487;

c. Solan S, et al. *Environ Health Persp*. 2013;121:699-704; d. Kleinman EJ, et al. *J Occup Environ Med*. 2015;57:e101-e113. Erratum in: *J Occup Environ Med*. 2015;57:e160.

# Cancer Certification in the WTCHP

- The individual must be enrolled in the WTCHP
- The member's condition must be "certified" as a WTC-related condition to receive treatment. Certification requires:
  - The member have a cancer on the List of WTC-Related Health Conditions
  - A determination by a WTC physician that the individual's exposure at the WTC event is substantially likely to be a significant factor in aggravating, contributing to, or causing the cancer
  - The Administrator reviews the WTC physician's certification request and approves or denies certification of the condition as WTC-related

# Determining WTC-Relatedness – Minimum Exposure Assessment for Certification: *NYC Area*

<b>Eligible Time Intervals</b>	<b>Minimum Exp. Duration Tier 1 (Highest Exposure)</b>	<b>Minimum Exp. Duration Tier 2 (Middle Exposure)</b>	<b>Minimum Exp. Duration Tier 3 (Lower Exposure)</b>
9/11/2001-9/14/2001	≥ 4 hours or caught in dust cloud	≥ 8 hours	≥ 20 hours
9/15/2001-9/30/2001	≥ 24 hours	≥ 48 hours	≥ 120 hours
10/1/2001-7/31/2002	≥ 80 hours	≥ 160 hours	≥ 400 hours

Howard J. *Policy and Procedures for Adding Types of Cancer To the List of WTC-Related Health Conditions.*

# Determining WTC-Relatedness – *Minimum Latency Assessment for Certification*

Category of Cancer	Minimum Latency Time, Years	Rationale From Scientific Literature
Mesothelioma	11	Direct observation after exposure to mixed forms of asbestos
All solid cancers	4	Low estimates used for lifetime risk modeling for low-level ionizing radiation
Leukemias and lymphomas (L&L)	0.4 (146 days)	Low estimates used for lifetime risk modeling for low-level ionizing radiation
Thyroid cancer	2.5	Low estimates used for lifetime risk modeling for low-level ionizing radiation
Childhood cancers (excluding leukemia and lymphoma)	1	National Academy of Sciences findings

# Cancer Screening

## *WTCHP Currently Covers Lung, Breast, Cervical, and Colorectal Cancer Screening*

- Follows Guidelines of the US Preventive Services Task Force
  - Accepts for coverage any cancer screening recommendations that are rated Grade A or Grade B by US Preventive Services Task Force
  - In addition to graded recommendations for each screening test, specific eligibility requirements based on age, sex, risk level or other factors are prerequisites for some tests
  - If suspicious abnormalities are found by cancer screening tests approved by the WTCHP, the program will provide coverage for diagnostic workup using National Comprehensive Cancer Center Guidelines
  - WTCHP also provides coverage for follow-up testing of certain precursor or premalignant conditions

# WTC Health Registry Treatment Referral Program

- Goal: Respond to health needs and concerns by connecting Registry enrollees to the WTCHP
- Core elements:
  - Personalized outreach to encourage eligible Registry enrollees to apply to the WTCHP based on the most recent Registry health survey
  - Dedicated staff trained in motivational interviewing
  - Address barriers to care (eg, lack of knowledge about WTC programs, mental health stigma)
  - Collaboration with the WTCHP
- The treatment referral program expanded in July 2013 to include responders and survivors in and outside NYC
- Became major source of WTCHP applications from both responders and survivors (> 3200 to date)

# Key Messages

## *Lessons Learned*

- Based on the presence of carcinogens, some members may develop cancer from their exposures.
- Because many cancers have long latency periods, WTCHP members should continue to be monitored and research continued. Even if your patient is not currently a member, he or she should apply to the WTCHP to be eligible to receive cancer screening.
- Approved cancer treatment is covered by the WTCHP when a member has been certified by the WTC Program Administrator for a specific cancer and the treatment is provided by a WTC physician.



# Resources

- **WTCHP<sup>a</sup>**  
[www.cdc.gov/wtc](http://www.cdc.gov/wtc) or 1-888-982-4748
- **September 11<sup>th</sup> Victim Compensation Fund<sup>b</sup>**  
[www.vcf.gov](http://www.vcf.gov) or 1-855-885-1555
- **WTC Health Registry<sup>c</sup>**  
<http://www.nyc.gov/html/doh/wtc/html/registry/about.shtml>  
or 866-692-9827

a. CDC. WTC Health Program; b. September 11<sup>th</sup> Victim Compensation Fund website;  
c. City of New York website.

# Abbreviations

CI = confidence interval

GERD = gastroesophageal reflux disease

IARC = International Agency for Research on Cancer

NIOSH = National Institute of Occupational Safety and Health

NYC = New York City

PY = patient years

SIR = standardized incidence rate

STAC = Scientific and Technical Advisory Committee

WTC = World Trade Center

WTCHP = World Trade Center Health Program