INVESTIGATION OF CANCER INCIDENCE IN THE AREA OF THE VANDERHORST SITES, TOWN OF OLEAN, CATTARAUGUS COUNTY, NEW YORK, 1993-2002

Prepared by the:

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Background

In December 2002, the Cancer Surveillance Program of the New York State Department of Health (NYSDOH) received a request for a cancer incidence investigation from the NYSDOH Center for Environmental Health. Of interest was the area around the former Van Der Horst Corporation electroplating plants, which consists of two sites located in the Town of Olean, Cattaraugus County, New York.

A prior cancer incidence investigation, conducted in response to concerns about exposures from the Van der Horst plants, was completed in 1990 (NYSDOH 1990). This prior investigation included cases diagnosed from 1976 through 1986 in the City of Olean. The prior investigation found no statistically significant elevations of any type of cancer among males or females in the City of Olean. A respiratory health survey of the population living near the plants was completed by the NYSDOH Center for Environmental Health in 1989 (NYSDOH 1989). The survey results were not conclusive but suggested possible effects from airborne exposures for residents living near the Van Der Horst sites.

Due to the history of potential exposures, cancer latency, and ongoing community concerns, a second cancer investigation for the years 1993-2002 was determined to be warranted. This report describes the findings of the Cancer Surveillance Program's investigation of cancer incidence among residents living near the plants, in the small area included in the respiratory survey investigation, for this more recent time period, 1993-2002.

The Van der Horst Corporation operated two electroplating plants in Olean, Cattaraugus County, from the 1940s until 1987. Airborne emissions of arsenic, lead and chromium from Plant #1 led to contamination of residential surface soil which was removed during 1994 and 1995. Plant #2 operations led to contamination of on-site soil with chromium and barium near homes and areas used by children. Groundwater also was contaminated with chromium, lead and volatile organic compounds, but there were no residents using private wells near the site. (NYSDEC 1996)

These contamination issues led to both plant sites being listed on New York State's Inactive Hazardous Waste Site Registry. Most of the site clean-up activities were completed by 1997. The contaminant of primary concern was chromium, and to a lesser degree, arsenic. Exposures to chromium and other contaminants may have occurred from breathing contaminated air, primarily during plant operations through 1987; and from skin contact and ingestion of contaminated soil while playing or gardening, prior to the remediation completed in 1997. (NYSDEC 1998)

These types of exposures have been studied primarily in occupational groups exposed to high levels of contaminants. Chromium exposures (via inhalation) and lung cancer have been linked in

many studies (ATSDR 2000). Other types of cancers that show associations with chromium exposure in some occupational studies include stomach, primary liver, nasal, oral cavity, and bladder cancer (ATSDR 2000). Animal studies show that long-term oral exposures to hexavalent chromium cause colon (intestinal) cancers. (ATSDR 2000) Increased incidence of lung and stomach cancer were found among residents living in a community contaminated with chromium compounds from a nearby alloy plant (Zhang and Li 1997).

Arsenic exposures among occupational groups have also been consistently associated with increased lung cancer incidence (ATSDR 2008). Some occupational studies have shown associations between arsenic exposure and colorectal cancer, bone cancer, stomach, sino-nasal and liver cancer (ATSDR 2008). Studies of human exposures to arsenic in drinking water show links with colon cancer. Studies of communities exposed to arsenic from nearby copper smelters have shown elevated incidence of lung cancer, childhood cancers (all types combined), and skin cancer (ATSDR 2008).

Methods

Study Plan This investigation was designed to determine whether the number of cancers arising among people residing in the study area was unusual. In order to do this, the number of cancers actually diagnosed among all residents in the study area was compared with the number of cancers one would expect to find, if cancer rates in the study area were the same as in similar areas of the state.

Study Areas and Time Period The study area consisted of block groups 3 and 4 of Block Numbering Area 9615.00 and block group 1 of Block Numbering Area 9617.00 (see the attached map). The time period for the investigation of cancer incidence was 1993 through 2002, the most recent 10-year period for which cancer reporting was considered complete for analysis within small geographic areas at the time work on the study was initiated.

Identification of Observed Incident Cancers In order to proceed with the investigation, it was necessary to identify all cases of cancer diagnosed among people residing in the study area during the time period of the study. The source for these data was the New York State Cancer Registry. The Cancer Registry contains information on all cases of cancer reported to the NYSDOH, as mandated by law. The computerized Cancer Registry files are continuously updated to reflect information gained from multiple reports on the same cancer. Cancer incidence data presented in this report represent cancer cases diagnosed from 1993 through 2002, with information on these cases updated as of June 2005.

Variation in cancer incidence among different geographic areas reflects not only true differences in cancer incidence, but also differences in how cancer is diagnosed, treated, and recorded in different areas of the state. The completeness and accuracy of the Cancer Registry depend upon reporting from hospitals. Cancer Registry data has met the combined quality criteria

established by the North American Association of Central Cancer Registries since 1998 and has been certified as more than 95% complete (Ellison et al. 2005).

In order to identify all cancer cases within the study area, a listing of all cancer cases diagnosed in the ZIP Code serving the study area was obtained from the Cancer Registry. Each street address was then examined individually to determine whether that individual lived in the study area at the time of diagnosis. All cases with an address located within the study area were then grouped by age, sex and type of cancer. These are referred to as the "observed" cases.

Calculation of Expected Incident Cancers In order to determine whether the number of observed cases was unusual, it was necessary to calculate the numbers of cancer cases that would be expected in the study area. This calculation takes into account the population size and the age and sex distribution of the study area. The expected numbers of cancer cases for the study area were calculated by applying cancer incidence rates by age and sex for a reference area to the estimated population of the study area by age and sex. The reference area selected for this investigation was New York State, exclusive of New York City. The population of the study area for 1993 through 2002 was estimated using the 1990 and 2000 United States Censuses.

Types of Cancer (Anatomic Sites) Studied Seventeen of the most common types of cancer were examined among males, including lung, colorectal, prostate, and bladder cancers, and lymphomas and leukemias. Nineteen of the most common types were examined among females. In addition to the sites examined for males (except prostate), cancers of the breast and female reproductive organs were examined for females.

Statistical Testing The probability that chance alone could explain an increase or decrease in the observed number of cancer cases compared to the expected number was evaluated based on the Poisson distribution (Molina 1973). (In statistics, the Poisson distribution describes a process where a rare event occurs in a large population.) If the probability of observing an excess or deficit was 0.025 or less for any cancer site, the result was considered to be statistically significant. Non-significant excesses or deficits were considered to represent random variations in observed patterns of disease.

Results

A total of 102 cancers were identified among all males and females residing in the study area between 1993 and 2002. For all anatomical sites of cancer combined, 50 cases of cancer were observed in males and 41 cases of cancer were expected. Among females, 52 cases of cancer were observed while 51 cases were expected. Neither of these differences was statistically significant, meaning they could easily have occurred due to random variation. In addition, when cancers cases were combined for males and females, there were no statistically significant elevations or deficits for total cancers or for specific cancer types.

Results for all of the cancer types examined are shown separately for males and females in the attached table. Some related types have been grouped in the table, although statistical testing was conducted for each type individually. The most common types of cancer observed among males included colorectal, with 10 cases observed (five cases expected); prostate, with nine cases observed (12 cases expected); and lung and bronchus, with eight cases observed (six cases expected). Fewer than six cases were observed for several types of cancer that are not shown in the table, including cancers of the oral cavity and pharynx, stomach, pancreas, testis, urinary bladder, kidney and renal pelvis, brain and other parts of the nervous system, lymphomas and for leukemias. (To protect patient confidentiality, for cancer types with fewer than six observed cases, the specific numbers of observed cases have not been indicated.) There were no cases of cancer observed for cancers of the esophagus, liver/intrahepatic bile duct, larynx, thyroid, and for multiple myeloma. No specific site of cancer among males, including those not shown on the table, showed a statistically significant difference in the number of cases observed from the number expected. Two types of cancer show elevations among males that are close to being statistically significant, colorectal cancer and oral cavity/pharynx cancer. (The total number of oral cavity/pharynx cancers is fewer than six, so is not shown in the Table.)

The most common types of cancer observed among females included breast, with 19 cases observed (14 cases expected); lung and bronchus, with nine cases observed (seven cases expected); and colorectal, with fewer than six cases observed. In addition to colorectal, fewer than six cases were observed for cancers of the stomach, pancreas, cervix uteri, uterus, ovary, kidney and renal pelvis, brain and other parts of the nervous system, thyroid, lymphomas and for multiple myeloma. There were no cases of cancer observed for cancers of the oral cavity and pharynx, esophagus, liver and intrahepatic bile duct, larynx, urinary bladder and for leukemias. No specific site among females, including those not shown in the table, showed a statistically significant difference in the number of cases observed from the number of cases expected. No types of cancer among women showed elevations that were close to being statistically significant.

Discussion

This study was done to examine cancer incidence among people living in the area of the Van der Horst sites. Results show the total number of cancers diagnosed among males residing in the study area was more than expected but the difference was not statistically significant. The total number of cancers diagnosed among females was similar to the number expected. These findings suggest there were no individual cancers diagnosed in greater (or lesser) numbers than would be likely to occur purely due to random variation.

Regarding the types of cancer known to be associated with chromium and/or arsenic exposures, this investigation did not show statistically significantly elevated lung cancer incidence. The number of lung cancer cases was slightly higher than expected for both males and females, with a total of 17 observed versus 14 expected, a difference that is likely due to chance. The number of colorectal cancer diagnoses observed among males was twice the expected number and the number

of oral cavity/pharynx cancers among males was more than twice the expected number, but these differences were not statistically significant. The other types of cancer associated in some studies with chromium and/or arsenic exposures, which include stomach, primary liver, nasal, bladder, bone, and sino-nasal cancer, were not elevated among males or females in this investigation.

Study limitations In drawing conclusions from these data, several aspects of the methodology need to be addressed. First, since there were 38 individual tests of significance, (17 among males, 19 among females, one each among males and females overall, as well as 17 among males and females combined), it was anticipated that one or two results might appear statistically significant even though the differences between observed and expected events were due entirely to random fluctuations in the data. In this particular investigation, however, no statistically significant differences were found.

The second aspect is the power of the statistical test, that is, the probability that a true departure from the expected number can be detected by significance testing. The power of a significance test varies with the number of expected cases. For example, using the statistical test described above, the probability of detecting a true doubling in cancer incidence over the expected value will be 80% or higher when the expected number is at least 12. For this investigation, the power of detecting a doubling, if one were present, was high for the total number of cancer cases for each sex.

An additional limitation is that migration, that is, movement of people in or out of the study area, could not be taken into account. Cancer cases were identified among persons who both resided in the study area and were diagnosed with cancer during the period 1993 through 2002. Former residents of the study area who moved away prior to being diagnosed with cancer could not be included, while persons developed cancer shortly after moving into the area were included.

General cancer information Cancer may result from either genetic or environmental influences or an interaction of both genetics and environment. Examples of possible environmental influences include diet, smoking, and other lifestyle factors and occupation, as well as natural and man-made cancer-causing substances in the air, food or water. The development of cancer is usually a lengthy process. For many types of cancer, symptoms do not occur until 10 to 30 years after exposure to cancer-causing agents. An agent that promotes the uncontrolled growth of cancer cells may cause cancer symptoms to be recognized in less time.

Cancer, unfortunately, is a common disease. One of every two men and one of every three women will develop cancer during his/her lifetime (ACS 2002). Cancer occurs at all ages, but most often in middle-aged and older people. The number of people diagnosed with cancer is increasing in most communities. Most of this is because more people are living to the older ages, where cancer is more common.

Much more research is necessary before the causes of cancer are well understood. Current knowledge, however, suggests that the leading preventable cause of cancer is cigarette smoking.

Dietary practices, such as excessive alcohol consumption and the eating of high fat foods, as well as physical inactivity are also believed to be important. In fact, tobacco use has been estimated to account for about 30% of all cancer deaths (Doll and Peto 1981) and recent evidence suggests that one third of cancer deaths may be due to unhealthy diet and insufficient physical activity (Byers et al., 2002). Other avoidable risk factors include excessive exposure to sunlight, ionizing radiation, and various occupational exposures to cancer-causing agents.

It is important to realize that many cancers can be effectively treated if they are diagnosed at an early stage. Screening for cancers of the breast, cervix, rectum, colon, and prostate, for example, helps to identify these diseases before the onset of symptoms and at a time when they are usually the most curable. Many persons could reduce their chances of developing or dying from cancer by adopting a healthier lifestyle and by visiting their physician for a cancer-related checkup.

Interpretation

This study showed no statistically significant elevations of cancer incidence among people living in the area of the Van der Horst sites between 1993 and 2002. Although certain cancers were diagnosed more or less frequently than expected, the differences were within ranges that can occur due to random fluctuation. These results do not indicate the need for further investigation.

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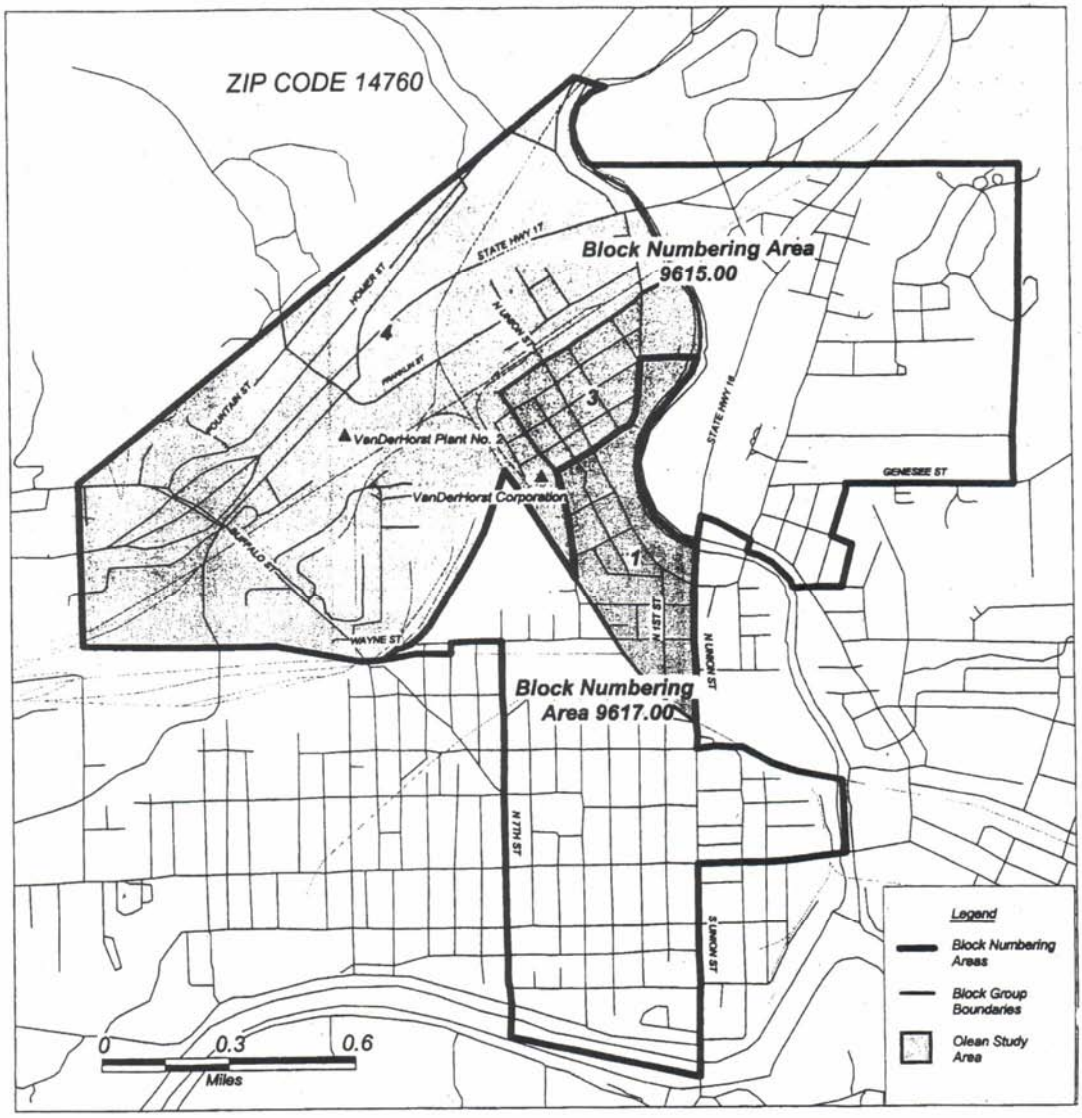
OLEAN STUDY AREA (VANDERHORST SITES)
CATTARAUGUS COUNTY, NEW YORK



BUREAU OF CHRONIC DISEASE EPIDEMIOLOGY AND SURVEILLANCE
NEW YORK STATE DEPARTMENT OF HEALTH

Observed and Expected Numbers of Incident Cancer Cases,
Block Numbering Areas: 9615.00 (Block Groups 3 & 4) and 9617.00 (Block Group 1)
Cattaraugus County, New York, 1993-2002
New York State exclusive of New York City Standard 1993-2002

SITES (ICD-O-2)[a]	MALES		FEMALES	
	Observed[b]	Expected[c]	Observed[b]	Expected[c]
All Sites[d]	50	41	52	51
Colorectal	10	5	–[e]	7
Lung / Bronchus	8	6	9	7
Female Breast			19	14
Female Genital System: Cervix uteri Corpus Uterus / Uterus NOS Ovary			6	6
Prostate	9	12		

[a]Classification of site is based on ICD for Oncology, 2nd Edition.
[b]Data were obtained from the New York State Cancer Registry (database as of June 2005).
[c]Expected numbers are based on standard cancer incidence rates by age and sex for New York State, exclusive of New York City. Standard rates are applied to the total 1993-2002 study population (8,910 males, 10,103 females) to obtain expected numbers of cases.
[d]Includes observed and expected numbers of cases at sites of cancer not listed below.
[e]The number of cases is not shown to protect patient confidentiality.