Investigation of Cancer Incidence
Community Adjacent to Coronet Industries
Plant City, Florida

Florida Department of Health
Division of Environmental Health
Office of Environmental Public Health and Medicine

March 2004

TABLE OF CONTENTS

INTRODUCTION

The Office of Environmental Public Health and Medicine in collaboration with the Health Assessment Program, Division of Environmental Health conducted this investigation in response to a request for assistance from the Hillsborough County Health Department. Using US census and Florida Cancer Registry data, incidence rates were calculated for certain cancers in the population residing adjacent to Coronet Industries. Substances that might have contaminated air or water include arsenic, cadmium and radium 226/228.

BACKGROUND

Coronet Industries and its predecessors mined and/or processed phosphate rock southeast of Plant City for nearly 100 years. Until the 1960s, they mined phosphate rock from areas mainly north of the plant using a shallow excavation technique (less than 25 feet below land surface). After all usable phosphate rock was mined from the site; phosphate rock was shipped to the plant on railroad cars from other areas. Coronet uses the phosphate rock to manufacture alpha tricalcium phosphate, a thermally defluorinated phosphatic animal feed supplement. Coronet also produces a boron-related product (potassium fluoborate).

Recently, citizens became concerned that pollution from Coronet might be harming their health. The company's long operational history as well as its highly visible working smokestacks and documented releases of arsenic-tainted wastewater into nearby creeks contributed to the perception that the industry was harming human health in the area.

In 2003, a local resident petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, claiming that mined areas later filled in with garbage were negatively impacting health in the communities west of the former mine. The Florida DOH prepared a brief scoping report for the ATSDR in 2003 that documented environmental releases and potential exposure sources for the communities surrounding the plant. Other community members also accused the plant of harming their health.

POTENTIAL EXPOSURE PATHWAY

In 2003, Florida Department of Environmental Protection (DEP) and the Hillsborough County Health Department (CHD) found arsenic, cadmium, and radium in a number of nearby residential drinking water wells within a quarter mile radius of the Coronet plant. Approximately 28 of about 146 tested wells showed concentrations exceeding the Maximum Contaminant Levels (MCL) for arsenic, cadmium and/or radium 226/228.

Of approximately 146 tested wells, twelve showed arsenic higher than the MCL value (10 ug/l), fourteen showed radium 226/228 higher than the MCL value (5 pCi/l) and two showed cadmium higher than the MCL value (5 ug/l).

Past reports indicate that open-pit phosphate rock mining at this site spread dust over the surrounding area. This dust likely reflected the composition of the phosphate rock. Among other substances, phosphate rock contains arsenic, cadmium, and radium. In addition, processing of phosphate rock at this site also creates dust. The Hillsborough County Environmental Protection Commission estimates Coronet Industries released about 200 tons of dust per year from total stack and fugitive emissions*. Although past data are not available for chemicals in air, a potential exposure pathway for nearby residents may have been inhalation of dust from both phosphate rock-mining and processing.

Purpose of Investigation

This investigation addresses the possibility that long-term exposure of arsenic, cadmium and radium 226 in water or air may have increased the rate of associated cancers in the population adjacent to Coronet Industries. Florida DOH reviewed local rates of the cancers that have been shown in prior studies to be associated with arsenic, cadmium and radium 226. According to the ATSDR's toxicological profiles: long-term exposures to high enough levels of arsenic may be associated with cancers of lung and bronchus, liver, bladder, kidneys, prostate and skin; long term exposures to high enough levels of cadmium may be associated with cancers of lung and prostate; long term exposures to high enough levels of radium 226/228 may be associated with cancers of breast and bones.

Area and Time Period of Investigation

The area of concern was defined to include a large enough population to enhance the reliability of the analysis, while maintaining proximity to the plant and not extending too far geographically, in order to maintain the plausibility of exposure. The area extends more east to west than it does north to south to accommodate the prevailing wind directions. The area of concern in this report is referred to as the "Coronet area" and it includes the census tracts and census block groups of some census tracts from both Hillsborough and Polk counties of Florida as listed below:
(Please refer to page # 9 for the investigation area map).
Block Group 2, Census Tract 101.08, Hillsborough County, Florida
Block Group 2, Census Tract 101.06, Hillsborough County, Florida
Block Group 3, Census Tract 101.06, Hillsborough County, Florida
Block Group 4, Census Tract 101.06, Hillsborough County, Florida
Block Group 1, Census Tract 101.07, Hillsborough County, Florida
Census Tract 125.02, Hillsborough County, Florida
Census Tract 125.01, Hillsborough County, Florida
Census Tract 126, Hillsborough County, Florida
Census Tract 127.01, Hillsborough County, Florida
Census Tract 127.02, Hillsborough County, Florida
Census Tract 128, Hillsborough County, Florida
Census Tract 129, Hillsborough County, Florida
Census Tract 130.01, Hillsborough County, Florida

Census Tract 130.02, Hillsborough County, Florida
Census Tract 130.03, Hillsborough County, Florida
Census Tract 130.04, Hillsborough County, Florida
Block Group 2, Census Tract 111, Polk County, Florida
Census Tract 119.02, Polk County, Florida
Census Tract 119.05, Polk County, Florida
Census Tract 120.01, Polk County, Florida
Census Tract 120.02, Polk County, Florida
Census Tract 120.03, Polk County, Florida
Census Tract 120.04, Polk County, Florida

We used eleven years of data (1990 to 2000) to increase the number of cases investigated and to improve the reliability of statistical analysis. This is necessary when the cancers of rare incidence are being studied in a relatively small population.

METHODS

Investigation Population

We obtained 1990 through 2000 cancer incidence data from the Florida Cancer Data System (FCDS). Population information for Hillsborough County, Polk County and the state of Florida were obtained from the official state estimates provided annually to FCDS. For the census tracts and census block groups, population for inter-census years were estimated from the values for the 1990 census and 2000 census using linear interpolation.

Analysis of Data

For the cancers of concern, the observed number of cases occurring in the investigation area during the period of 1990-2000, were compared with the expected number of cases in the area for the same time frame assuming that the incidence rate was the same as for the rest of the state (Table-A). For each race, the expected numbers of cases were calculated for each type of cancer. For each cancer type, the age-specific rate was calculated for the State of Florida minus the area of concern, for the period of eleven years. Next, the population of each group of race in the area of concern for the same time period was multiplied by the age-specific rates of appropriate race calculated earlier. Then, the addition of the generated numbers for each specific race separately provided the age-adjusted expected numbers of cases for a particular type of cancer for a specific race.

Standardized Incidence Ratios (SIR) were calculated by dividing observed number of cases by the expected number of cases for that particular cancer type and race group for the area of concern as calculated above. To assess the statistical significance, 95% confidence intervals (CI) were calculated for each standardized incidence ratio (SIR).

Similar statistical calculations were performed for Table-B except that the expected numbers were calculated using Hillsborough and Polk counties minus the investigation area for the same time period assuming that the incidence rates were the same as for the combined counties.

Data Table-A.

Coronet Investigation Area[1] Number of Cancers Observed and Expected[2] by Cancer Site and Race, 1990-2000 (Using rates for State of Florida minus investigation area).

Cancer Sites	Whites					Non-Whites				
				95% Confidence Interval					95% Confidence Interval	
	Observed	Expected [2]	SIR	Lower	Upper	Observed	Expected [2]	SIR	Lower	Upper
Bones	3	6.9	0.4	0.1	1.3	0	1.0	0.0	N/A	N/A
Bladder	116	188.6	0.6	0.5	0.7	0	6.9	0.0	N/A	N/A
Melanoma	120	106.6	**1.1**	0.94	1.35	0	1.1	0.0	N/A	N/A
Liver	15	24.6	0.6	0.3	1.0	2	3.9	0.5	0.1	1.9
Kidneys	66	84.3	0.8	0.6	1.0	6	7.1	0.8	0.3	1.8
Breast	351	489.1	0.7	0.6	0.8	21	41.3	0.5	0.3	0.8
Lung and Bronchus	452	605.8	0.7	0.7	0.8	36	47.8	0.8	0.5	1.0
Prostate	334	565.9	0.6	0.5	0.6	39	62.5	0.6	0.4	0.8

Notes:
1. Coronet Investigation Area comprises the 2000 Census tracts or Census block groups from both Hillsborough and Polk Counties.
2. Expected number of cases were calculated using age specific rates from State of Florida minus investigation area.
3. Standardized Incidence Ratio (SIR) equals Observed divided by Expected.

Source:
Office of Environmental Public Health and Medicine
Department of Health
Florida Cancer Data System

Summary: Data Table-A.

Reviewing all different types of cancers of concern for the investigation area during the time interval of 1990 to 2000 and comparing with the expected numbers (estimated based on the state rates); among non-Whites, none of the cancer types have elevated SIR (Standardized Incidence Ratio). Among whites, only melanoma has an increased SIR, however this increase is not statistically significant.

Data Table-B.

Coronet Investigation Area[1] Number of Cancers Observed and Expected[3] by Cancer Site and Race, 1990-2000 (Using rates for Hillsborough and Polk counties minus investigation area).

Cancer Sites	Whites					Non-Whites				
				95% Confidence Interval					95% Confidence Interval	
	Observed	Expected	SIR	Lower	Upper	Observed	Expected [3]	SIR	Lower	Upper
Bones	3	7.4	0.4	0.1	1.2	0	1.2	0.0	N/A	N/A
Bladder	116	189.4	0.6	0.5	0.7	0	7.3	0.0	N/A	N/A
Melanoma	120	135.5	0.9	0.7	1.1	0	0.9	0.0	N/A	N/A
Liver	15	21.6	0.7	0.4	1.1	2	3.3	0.6	0.1	2.2
Kidneys	66	87.8	0.8	0.6	1.0	6	7.4	0.8	0.3	1.8
Breast	351	586.8	0.6	0.5	0.7	21	48.1	0.4	0.3	0.7
Lung and Bronchus	452	683.6	0.7	0.6	0.7	36	56.7	0.6	0.4	0.9
Prostate	334	562.6	0.6	0.5	0.6	39	63.6	0.6	0.4	0.8

Notes:
1. Coronet Investigation Area comprises the 2000 Census tracts or Census block groups from both Hillsborough and Polk Counties.
2. Standardized Incidence Ratio (SIR) equals Observed divided by Expected.
3. Expected number of cases calculated using Age specific rates for Hillsborough and Polk Counties minus investigation area.

Source:
Office of Environmental Public Health and Medicine
Department of Health
Florida Cancer Data System

Summary: Data Table-B.

Reviewing the same types of cancers of concern as in table-A, for the investigation area during the time interval of 1990 to 2000 and comparing with the expected numbers (estimated based on the rates of Hillsborough and Polk counties combined); among both whites and non-Whites, none of the cancer types have elevated SIR (Standardized Incidence Ratio).

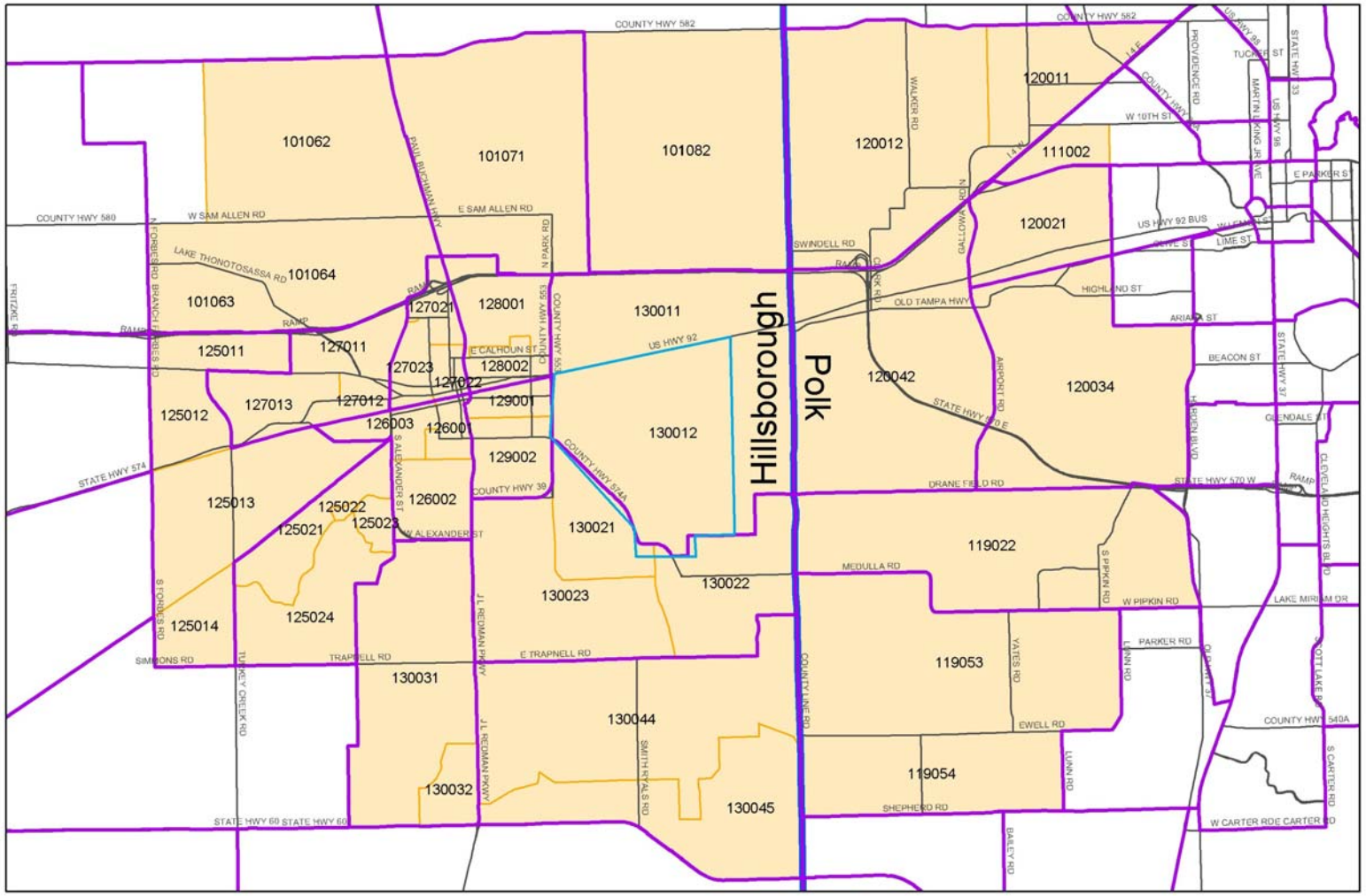
CONCLUSION

A long operational history, highly visible working smokestacks and periodic releases of arsenic-tainted wastewater into the nearby creeks generated health concerns in the community near Coronet Industries. Based on the health concerns voiced by the community, potential exposure to dust from phosphate rock-mining and processing and identification of arsenic, cadmium and radium 226/228 in several drinking water wells, a review of cancer incidence data for the area was performed. Review of ATSDR's toxicological profiles for arsenic, cadmium and radium 226/228 guided the selection of lung, bronchus, liver, kidney, bladder, prostate, breast, melanoma and bone cancers for the analysis.

Calculation of SIRs (Standardized Incidence Ratios) was accomplished based on observed and expected cases for each cancer type selected. None of the SIRs were found to be elevated except for melanoma among whites; however, this increase was not statistically significant. In summary, for the cancers analyzed during the time period studied, there was no statistically significant increase in the number of observed cancer cases in community adjacent to the Coronet Industries when compared to the expected number of cases. The expected numbers of cases were based on the cancer rates for the state or the cancer rates for Hillsborough and Polk counties combined.

REFERENCES

- ATSDR's Toxicological Profiles on CD-ROM, Version 3:1, 2000.
- Breslow, N.E. and Day, N.E.: Statistical Methods in Cancer Research, vol.II, IARC, Lyon 1987
- Applied Statistics Training Institute: "Small Area Data Analysis" G.E.Alan Dever, 1997-CDC.
- * Personal Communication between Jerry Campbell, Hillsborough County Environmental Protection Commission to Randy Merchant, Florida Department of Health. February, 2004.



DISCLAIMER

THIS PRODUCT IS INTENDED FOR REFERENCE PURPOSES ONLY AND IS NOT TO BE CONSTRUED AS A LEGAL DOCUMENT. ANY RELIANCE ON THE INFORMATION CONTAINED HEREIN IS AT THE USER'S OWN RISK. THE FLORIDA DEPARTMENT OF HEALTH AND ITS AGENTS ASSUME NO RESPONSIBILITY FOR THE USE OF THIS INFORMATION OR ANY LOSSES RESULTING THEREFROM.

Legend

- Coronet Boundry
- 2000 Census Tracts
- County Boundaries
- 2000 Census Blockgroups

Plant City Cancer Rate Investigation

N W E S

0 0.4 0.8 1.6 2.4 3.2 Miles