The Calcasieu Community Right-to-Know Coalition, a community-industry group formed to assess the impact of chemicals released to the air, water, or land by the major industries in the parish, recently sponsored a study by Dr. Bruce Wyman, McNeese State University. Dr. Wyman's report, "Industrial Air Toxics Cancer Risk in Calcasieu Parish, Louisiana", estimates the excess cancer risk associated with a lifetime air exposure to 1987 levels of 15 known or suspect carcinogens released by industrial participants in the Coalition. The risk estimates are produced by a U.S. Environmental Protection Agency (EPA) risk modeling system that includes air quality dispersion modeling, EPA risk factors, and Census Bureau population data for the parish study area. This is a summary of the full report.

Chemicals that are suspected of causing or contributing to human cancer are assumed by regulatory authorities to have no threshold, i.e., there is no safe level of exposure; any exposure increases one's lifetime risk of cancer. This no-threshold analysis is made in EPA assessments of cancer risks from water, air, and food chain exposures.

Methodology

The EPA modeling and risk assessment computer programs used in the study are called the PCGEMS system, which was created by the EPA for, among other things, use in assessing toxic chemical releases in communities. PCGEMS contains environmental fate and transport models with air, surface water, groundwater, and intermedia transfer capabilities.

The EPA air dispersion guideline model calculates annual ground level air concentrations at various distances and in each direction from the source of release using the source strength and information on wind direction, wind speed, and atmospheric stability compiled from five years of data from the National Weather Service station at the Lake Charles Regional Airport.

The population exposure calculations allow an output of the numbers of persons in the parish exposed to different levels of an air contaminant from one facility or a group of facilities. The parish population within the six mile radius of the center of the study area (the geographic center is inside the PPG Industries facility) totalled 103,587.

The air exposure risk is estimated by multiplying an EPA risk factor, the unit risk estimate, times the estimated annual average air

concentration of a chemical at a certain location. The product equals the estimated lifetime (70-year) risk of cancer associated with that exposure. This risk, times the number of persons residing at that location, gives the number of excess cancers in that population during the next 70 years. As recommended by EPA guidance, the risk from exposure to multiple air toxics, each with a different risk factor, is taken to be the sum of the individual risks.

The 1987 air emissions of the chemicals listed in Table 1 were used in the study. The 15 compounds represent 99.5% of the mass of all known or suspect carcinogens emitted in 1987 by Coalition participants.

The model input data, in pounds emitted, were checked against the 1987 emissions reports filed with the state and federal environmental agencies and released locally by the Right-to-Know Coalition. The facilities with emissions in the study are Certainteed Corporation, Citgo Petroleum Corporation refinery, Conoco Incorporated refinery, Firestone Synthetic Rubber & Latex Company, Occidental Chemical Company, Olin Corporation, PPG Industries, and Vista Chemical Company. A total of 574 individual emission points were used for the 15 chemicals. Each emission point was modeled with its individual source characteristics.

Results and discussion

The modeling results are presented as lifetime cancer risk, the estimated number of cancers associated with the industrial air toxics exposure in the study area population during the next 70 years. Assuming a constant, continuous exposure to the 15 chemicals, about 10 excess cancers are predicted to occur in the 103,587 persons during the next 70 years, or about one excess case per million people per year.

Table 1. Estimated excess lifetime cancers associated with 1987 air emissions from Coalition participants, by chemical.

1.	chromium (VI)	5.2
2.	1,3-butadiene	1.6
3.	1,2-dichloroethane	1.5
4.	vinyl chloride	0.57
5.	vinylidene chloride	0.24
6.	hydrazine	0.18
7.	chloroform	0.08
8.	benzene	0.074
9.	1,1,2-trichloroethane	0.069
10.	carbon tetrachloride	0.047
11.	1,1,2,2-tetrachloroethane	0.044
12.	trichloroethylene	0.01
13.	1,1,2,2-tetrachloroethylene	0.0066
14.	styrene	0.0012
15.	dichloromethane	0.00025
	Total	9.6

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The lifetime cancer risk estimated by this USEPA modeling method for the industrial air emissions of these 15 chemicals is in line with the results found in other air toxics risk studies around the United States. See Attachment 1.

Chromium, the chemical with the highest estimated risk among the 15 industrial air toxics, has been identified as a significant risk factor in other air toxics studies. This is largely explained by its large EPA-assigned risk factor, by far the highest among the chemicals modeled.

These results are best seen as a measure of the relative risk of the 15 chemicals, compared to the actual overall cancer rate and to each other. Note that the estimated 10 excess cancers during the next 70 years in the 103,587 persons living in the study area is only a small fraction (about 5 hundredths of one percent) of the roughly 25,000 cancers expected in this population during the same 70 years. Health statistics collected by the National Cancer Institute imply that approximately 25% of all persons develop cancer, excluding all skin cancers but melanoma. If the industrial air toxics risk estimate produced by this study is reliable, then other factors must be found to explain the remaining 99.9+ percent of the cancer incidence.

Other sources of carcinogens (excluded from this study) are smaller facilities such as gasoline service stations and dry cleaners; household emissions into the outdoor air from fireplaces, barbecue pits, and painting; and automobile emissions. Other personal exposures to carcinogens not considered in this study are: tobacco smoking; workplace exposures, other indoor air pollution; beer, wine, and liquor consumption; natural carcinogens, fat, and pesticide residues in the diet; and sunlight exposure.

A Data Oversight Committee reviewed the input data to the computer model and the raw and compiled output reports. The Committee has one representative from area industry, two from the City of Westlake and two interested citizens who are also members of the local environmental group, CLEAN. All information that was used as input to the model, all input data file printouts, and all tabulated and untabulated results are available for public inspection upon request. Write or call Dr. Bruce Wyman, McNeese State University Department of Biological and Environmental Sciences, P.O. Box 92000, Lake Charles, LA 70609; telephone 318-475-5669.

ATTACHMENT 1

Table 8. Results of U.S. air toxics risk studies

Study	Location(s)	Number of pollutants	Sources considered (see below)	Excess cancers per million people per year
Calcasieu Industrial Air Toxics Study	Calcasieu Parish, Louisiana	15	I	1–2
EPA Six Months Study (1)	Various	10–15	I, A, Sm	5–7
EPA Integrated Environmental Management Project	Philadelphia (2a) Baltimore (2b) Santa Clara, Calif.(2c) Kanawha Valley, West Virginia (2d)	10–20	I, A, Sm	1–18
Clark County Study (3)	Las Vegas, Nevada	11	A, Sm	4–9
South Coast MATES (4)	Los Angeles	20	I, A, Sm	15
EPA 5 City Controllability Study (5)	5 major urban areas	25	I, A, Sm	2–10
EPA Motor Vehicle Study (6)	U.S. urban areas	Various auto emissions	A	2–11 (urban areas)

I=large industrial, A=automobiles, Sm=smaller facilities & residential

(1) Haemisegger, (2a) USEPA–1986b, (2b) Manale, et al., (2c) Hinman, et al.
(2d) USEPA–1987a, (3) USEPA–1987b, (4) Shikiya, et al., (5) USEPA–1988, (6) Carey