CANCER CORRIDORS AND TOXIC TERRORS—IS IT SAFE TO EAT AND DRINK?

FREDERIC T. BILLINGS III

BATON ROUGE, LOUISIANA

ABSTRACT

This is a general discussion of the “toxic terrors” (1) Love Canal and Hinkley, California, and a more specific, in-depth, evaluation of the extent and the significance of the industrial and petrochemical cancer risks to the people of Louisiana in the so-called “Cancer Alley” between Baton Rouge and New Orleans. Has the birthright been exchanged for a mess of “chemical potage?”

“. . . and a great star fell from heaven, blazing like a torch, and it fell on a third of the rivers and on the springs of water. The name of the star is Wormwood. A third of the waters turned bitter, and many people died from the waters that had become bitter.” Revelation 8:10–12.

Two miles away from my house flows the Mississippi River, which swells with water from well over one-third of the rivers and streams of the continental United States.

Current Mississippi River Statistics (2)

- **Length:** 2,350 miles from its Minnesota source to its mouth at the Gulf of Mexico.
- **Drainage Area:** 41 percent of the United States mainland.
- **Average Daily Flow:** 470,000 cubic feet per second; 304 billion gallons of water pass the New Orleans gauge daily.
- **Sediment Carried in the River:** 160 million tons annually.

The April 1990 cover of the *Journal of the Louisiana State Medical Society* suggested cancer oozing from the shores (3). The newspapers are rife with headlines about cancer incidence, cancer clusters and cancer death rates. All point an accusing finger at the petrochemical industry. The plants are big, powerful and profitable and, therefore, an easy target. The media responded by labeling the region “Cancer Alley.” Is there a deadly bitterness in the river?

This paper will concern itself primarily with the incidence of cancer

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in Louisiana, its relationship to the industries of the state and to the lifestyle of the people. Before examining the data for Louisiana, I will discuss briefly “toxic terrors” of some significant national prominence: Love Canal and Hinkley, California.

In 1892, William T. Love came to Niagara Falls, New York with the dream of building a model city of 600,000 people whereby he would harness the power of the falls by constructing a large canal. The direct current of Thomas Edison required the consumer of electricity to be close to the source of its generation. Unfortunately, two years later, the country entered an economic recession, and Nikola Tesla developed alternating current, which allowed electricity to be transmitted over long distances economically. Love went bankrupt, and the partially dug canal was used as a swimming hole.

In 1941, Hooker Electrochemical Company and the United States Army began using the unfinished, clay-lined canal for legally disposing of chemical wastes. In 1950, Hooker agreed to donate the property to the school board of Niagara Falls for one dollar, warning that it should not be excavated. The school board sold the land for residential development. In 1976, following excavations and the laying down of sewers and water mains, residents began to complain and reported hearing disorders, rectal bleeding, skin problems, sinus and respiratory illnesses, headaches, asthma, urinary disorders, suicides, spontaneous abortions, epilepsy, and cancer.

In August of 1978, Governor Hugh Carey announced that 236 families would be relocated and subsequently President Jimmy Carter relocated more than 700 additional homeowners at a cost of more than $30 million. In October of 1980, a blue ribbon panel appointed by Governor Carey and chaired by Lewis Thomas, M.D. of Memorial Sloan-Kettering concluded that there had been no demonstration of health effects linked to the exposure of hazardous waste at the Love Canal site. This was corroborated by a careful study reported by Heath, et al., that the frequency of chromosomal aberrations did not significantly differ between the residents of Love Canal and controls (4).

In 1992, Erin Brockovitch and Ed Masry were hired by a citizen of Hinkley, California, and won a $333 million settlement from Pacific Gas and Electric Company for an acknowledged contamination of the town’s ground water with chromium-6, which causes nasopharyngeal carcinoma (in the aerosolized form). Gastric acid, however, converts chromium-6 to chromium-3, which is harmless and is present in many multivitamins as chromium acetate, chromium chloride, and chromium picolinate.

There is no cancer cluster in Hinkley. Despite this, I learned last
month from Dr. John Morgan, the epidemiologist for Hinkley and San Bernadino County, that Erin Brockovitch has been invited to speak before the American Public Health Association in Washington, D.C. in November (5).

With these “toxic terrors” as background, what is the status of Louisiana and its industrial corridor, alluded to as “Cancer Alley,” and what risk does that corridor pose for the citizens of that area?

Figure 1 reveals the location of the industrial corridor, which includes seven parishes—East Baton Rouge, West Baton Rouge, Ascension, Iberville, St. James, St. Charles, and St. John the Baptist. Located in these parishes are 87 plants and refineries including such giants as Alcoa, ChevronTexaco, Dow, Dupont, and ExxonMobil. The ExxonMobil refinery is the second largest refinery in the world.

Louisiana has a population of just under 4.5 million with the United States as a whole having a population of 281 million (Table 1). The state has 2.5 times the minority population of the rest of the country and almost 40 percent more of the citizens living below the national poverty level (6). Eighteen thousand new cancer cases are reported in Louisiana per year.

FIG. 1. Map of Louisiana illustrating seven-parish industrial corridor along the Mississippi River.
The data I am about to show is unpublished data from the Louisiana Tumor Registry and was updated in September of 2004.

Table 2 and Figure 2 show that the incidence of lung cancer is higher for the state as a whole than in the Industrial Corridor (7). Unfortunately, the incidence of lung cancer is also higher than the national

<table>
<thead>
<tr>
<th></th>
<th>Louisiana</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>4,446,976</td>
<td>281,421,906</td>
</tr>
<tr>
<td>White</td>
<td>65.1%</td>
<td>81.7%</td>
</tr>
<tr>
<td>African-American</td>
<td>32.9%</td>
<td>13.0%</td>
</tr>
<tr>
<td>Other</td>
<td>2.0%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Poverty</td>
<td>18.0%</td>
<td>13.0%</td>
</tr>
<tr>
<td>&lt;18 y/o in poverty</td>
<td>28.0%</td>
<td>22.0%</td>
</tr>
<tr>
<td>New cases of cancer/yr.</td>
<td>18,278</td>
<td>1,368,030</td>
</tr>
</tbody>
</table>

* 95 percent confidence interval.

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Table 2 and Figure 2 show that the incidence of lung cancer is higher for the state as a whole than in the Industrial Corridor (7). Unfortunately, the incidence of lung cancer is also higher than the national
idence. This data would imply that factors other than the petro-
chemical industry and toxic exposures may be responsible.

Table 3 and Figure 3 show that for the state as a whole and for the
Industrial Corridor, the incidence of prostate cancer is lower than the
national average, although this does not reach statistical significance (7).

In Table 4 and Figure 4, the incidence of breast cancer for white
females is lower in both the Industrial Corridor and the state. Black
females appear to have a higher incidence in the Industrial Corridor
when compared to the national average; however, this data does not
reach statistical significance (7).

Table 5 and Figure 5 show that cancers of the colon and rectum are
not statistically different in the three groups (7).

How does Louisiana compare to the Love Canals and the Hinkley,
Californias? Louisiana produces approximately one-quarter of the na-
tion’s bulk commodity chemicals and leads the United States in release
of toxic chemicals into the environment (8). The seven-parish indu-

TABLE 3
Prostate Cancer Incidence Rates, 1997–2001
Average Age Adjusted per 100,000 Population (2000 U.S. Standard)

<table>
<thead>
<tr>
<th></th>
<th>WM</th>
<th>C.I.*</th>
<th>BM</th>
<th>C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA</td>
<td>157.8</td>
<td>154.8, 161.0</td>
<td>227.6</td>
<td>220.9, 234.5</td>
</tr>
<tr>
<td>Ind. Corr.</td>
<td>170.7</td>
<td>161.7, 180.3</td>
<td>253.8</td>
<td>235.0, 273.9</td>
</tr>
<tr>
<td>U.S.</td>
<td>171.2</td>
<td>170.0, 172.4</td>
<td>274.3</td>
<td>269.0, 279.7</td>
</tr>
</tbody>
</table>

* 95 percent confidence interval.
Trial corridor has the highest density of petrochemical industries in the nation and possibly the world.

The incidence rates of cancer for this region are either similar to, or statistically significantly lower than, the national incidence for most common cancers, including prostate, breast, colon and rectum. The only glaring exception is lung cancer in males, which accounts entirely for the overall elevated cancer incidence in the state (9).

TABLE 4
Average Age Adjusted per 100,000 Population (2000 U.S. Standard)

<table>
<thead>
<tr>
<th></th>
<th>WF</th>
<th>C.I.*</th>
<th>BF</th>
<th>C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA</td>
<td>125.8</td>
<td>123.4,128.2</td>
<td>115.7</td>
<td>111.9,119.5</td>
</tr>
<tr>
<td>Ind. Corr.</td>
<td>132.8</td>
<td>125.8,140.0</td>
<td>121.2</td>
<td>111.5,131.6</td>
</tr>
<tr>
<td>U.S.</td>
<td>143.2</td>
<td>142.2,144.2</td>
<td>118.6</td>
<td>115.9,121.3</td>
</tr>
</tbody>
</table>

* 95 percent confidence interval.

TABLE 5
Colorectal Cancer Incidence Rates by Race and Gender, 1997–2001
Average Age Adjusted per 100,000 Population (2000 U.S. Standard)

<table>
<thead>
<tr>
<th></th>
<th>WM C.I.*</th>
<th>BM C.I.</th>
<th>WF C.I.</th>
<th>BF C.I.</th>
<th>C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA</td>
<td>72.4</td>
<td>70.2,74.5</td>
<td>77.6</td>
<td>73.7,81.6</td>
<td>47.3</td>
</tr>
<tr>
<td>Ind. Corr.</td>
<td>68.3</td>
<td>62.4,74.7</td>
<td>78.1</td>
<td>67.9,89.7</td>
<td>47.1</td>
</tr>
<tr>
<td>U.S.</td>
<td>64.4</td>
<td>63.6,65.2</td>
<td>73.1</td>
<td>70.3,76.0</td>
<td>46.8</td>
</tr>
</tbody>
</table>

* 95 percent confidence interval.

The incidence rates of cancer for this region are either similar to, or statistically significantly lower than, the national incidence for most common cancers, including prostate, breast, colon and rectum. The only glaring exception is lung cancer in males, which accounts entirely for the overall elevated cancer incidence in the state (9).
This elevated lung cancer incidence in men was first noted in 1937, has persisted to the present, and is disturbing. Contributing factors are speculated to be early tobacco use, heavy tobacco use and possibly genetic proclivity. However, although the incidence of lung cancer in men is higher in Louisiana as a whole than in the United States, it is not higher in the Industrial Corridor than in the remainder of the state.

Louis Sullivan, M.D. stated in November of 1990 in an address at Yale University,

"The harsh truth is that a high percentage of disease and disability afflicting the American people is a consequence of unwise choices of behavior and lifestyle.

"The decision to smoke...is responsible for one in every six deaths in America each year. The cumulative toll is 390,000 deaths per year.... Smoking costs our society over $52 billion annually." (10)

Therefore, smoking, not smokestacks, is to blame. Van Gogh in his painting of 1886 had it right (Figure 6) (11).

These "toxic terrors" and the myth of Louisiana's "Cancer Alley" are examples of the 'belief in the law of small numbers' of Nobel Laureate Daniel Kahneman and Amos Tversky compounded by media hype, politics and greed (12, 13). It is assumed that the pattern of a large population will be replicated in the small subsets. This is not true. Love Canal, Hinkley, California and the Louisiana Industrial Corridor are three examples where "clusters" and small numbers are misleading.
What about the water? The Sewerage and Water Board of New Orleans recently reported that the tap water conformed with all Environmental Protection Agency (EPA) requirements throughout 2003 with no violations (14). The New Orleans Sierra Club gave a “good” rating to New Orleans tap water. New Orleans was one of five cities out of 19 to receive the rating in the environmental group’s study on tap water. Only Chicago earned an “excellent” rating (15). This water comes from the middle of the Mississippi River after it has passed through the Industrial Corridor.

New Orleans, however, is famous for drinks other than its water: the Hurricane of Pat O’Brien’s, the Sazerac of the Sazerac Coffee House, and Absinthe of The Old Absinthe House. Now outlawed because it is highly intoxicating and addictive, absinthe is made by adding spirits to coriander seeds, fennel, anise and essential oils of wormwood.

However, there are real environmental hazards, and one must not become apathetic.

The disaster at Chernobyl on April 26, 1986, was clearly an issue of corporate/government irresponsibility resulting in the release of radioactive materials into the atmosphere over a 10-day period. The accident

*Fig. 6. Skull of a Skeleton with Burning Cigarette, Vincent van Gogh, oil on canvas, 1885–86.*
occurred during a shutdown for routine maintenance and a simultaneous test of the capability of the plant to provide enough electricity to operate the reactor core cooling system. A sudden power surge caused violent explosions resulting in almost total destruction of Unit 4 and also a fire in the graphite moderator, which could not be extinguished. The plume, because of the prolonged release of radioactive materials, affected the entire northern hemisphere. This radioactive decay will last for 300 years because of the half-life of cesium—a dramatic climatological catastrophe.

The effects of the Chernobyl disaster resulted in 31 people dying acutely, 140 suffering acute radiation illness, increased thyroid malignancies in infants, children and young adults. However, as of yet, there was no increase in other solid tumors, leukemias, congenital abnormalities, or adverse events with pregnancy (16).

The issue of contamination of the land for grazing and row crops still exists. Contamination of the water was of concern, but presently there are no restrictions on drinking water. However, fish from lakes in both Sweden and Switzerland have a radioactive content that is higher than allowable for sale (16). This was not a case of “small numbers.”

Chernobyl is, when literally translated, the Russian word for wormwood (Figure 7) (17).
ACKNOWLEDGMENTS

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REFERENCES

DISCUSSION

**Fleishman**, New York: Thank you very much for that really masterful presentation. It is an example of the limits of our present day epidemiologic work. It strikes me that although clusters and small numbers may be misleading, they provide certain opportunities. I wonder if you would comment on the issue of genetic-environmental interactions, and the potential perhaps to take those opportunities to more carefully analyze those affected with the given outcome as to whether they really are unique subsets.

**Billings**, Baton Rouge: I will agree completely that subsets are important clues. In 1775 Percival Potts was the first to recognize that, in chimney sweeps, the young boys in London, who were scampering up and down the smoke stacks to clean them, often did so nude because the smoke stacks were tight and it was difficult to do without getting stuck. These boys ended up with scrotal carcinoma. The association between chimney tar and scrotal cancer was previously unknown. In Turkey there are areas where the concentration of asbestos in the soil is over 1,000 times the norm. Because of this elevated level of asbestos there is a cluster of patients who have a many fold increase of mesothelioma. So there are instances where subsets make a difference. With cancer however, it’s very, very difficult to find a “clean” subset situation because of the problem of cancer’s being a “multiple hit” disease. Unlike in an infectious disease such as polio or any other infectious outbreak, cancer incidence is woven into the complexity of the concentration of the incriminated agent, the genetic background, the local issues, and the epidemiological problems. Although Louisiana does not have a higher cancer incidence of cancer than in other states, it does have an extraordinarily high cancer death rate. Louisiana has the third highest cancer death rate in the country. This increased death rate is thought to be caused by inadequate early screening and inadequate access to care resulting in diagnosis of patients at the late stage of disease. Genetically we are slightly unique in some areas of the state. Many know of our Acadian population and its connection to Canada. This group of French Catholics was forced to leave Canada in 1755. Unfortunately, we do not have good information on the genetic proclivity. Some think that the “let the good times roll” attitude with its lifestyle choices has resulted in a very high incidence of obesity, diabetes, and tobacco related problems. Like I said before, we are second only to Mississippi. So it’s hard to know the answer to the question.

**Schiffman**, Providence: Frederic, that was a wonderful talk. I was wondering if you could comment on the twenty or thirty year lag time that often exists between exposure to a carcinogen and development of malignancy. How do the data you have presented allow us to either implicate or exonerate a potential carcinogen?

**Billings**: People who smoke do not get cancer the following week. They get it twenty or thirty years later. And, it may well be the suggestion that chronic exposure to an industrial carcinogen could be in part to blame. In Louisiana as a whole, as the data has shown, we do have an increased incidence of lung cancer when compared to the United States, but in the industrial corridor there is statistically significantly less lung cancer than in the state as a whole. This fact may exonerate the Dows, the Exxon-Mobils, the Chevrons-Texacos and those other large plants from the industrial finger pointing. Prolonged exposure is bad if it’s from the sun, and, I presume, probably if it’s from the efflux of the plants.