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VINYL CHLORIDE. TIME BOMB ON THE PRODUCTION LINE

We have only begun to learn about this cheap, colorless gas which has caused the deaths of 11 American workers.

By Don A. Schanche

The "smoke shack" at the B.F. Goodrich Chemical Company's plant in Louisville, Kentucky used to be a regular social center. Because of the potentially explosive nature of vinyl chloride, the gas they work with, the men took their breaks in the shack, where they had a smoke and swapped stories about fishing and football and one another.

There are times now when the old, carefree spirit is gone from the shack; it's been replaced by different talk and other news. This is understandable because five of their fellow workers are gone . . . dead from angiosarcoma of the liver, a rare and almost inevitably fatal cancer.

Moreover, the survivors now know that this "bad luck" that took the lives of their friends resulted from exposure to vinyl chloride, the innocuous chemical—or so they had believed—to which they all are exposed every day. And since angiosarcoma is a cancer that takes years to develop, no longer in the smoke shack can be certain today that he is not carrying the disease—a veritable time bomb ticking away inside his body.

Additionally, the dangers of vinyl-chloride exposure may extend far beyond the smoke shack and the Louisville plant. Since early this year, when the first disclosures were made, investigators have found at least 20 American and foreign vinyl-chloride workers who have died from angiosarcoma; and the threat does not even end there. The medical inquiry is focusing now on persons living near the plants or those who might be exposed in other ways. In short, people like you and me.

As a result of the new and melancholy discoveries, an international campaign is under way to learn everything possible about the hidden dangers of vinyl chloride and to draw up safe and strict controls over this potentially lethal gas.

* * *

Until last January, not many Americans had ever heard of vinyl chloride and even fewer knew that it was deadly. The cheap, colorless gas is one of thousands of little-known substances that go into the making of industrial and consumer products.

You probably have encountered the gas unknowingly if you have used spray paints and insecticide aerosols, or if you used certain hair sprays, in which vinyl chloride served as a propellant. (However, a marketing ban has been imposed against these products.) A far more common use of vinyl chloride (VC) is as a base for solid and flexible plastics. Some 6,500 United States workers are involved in producing the gas and its polymerized form, polyvinyl chloride (PVC), which is a hard, granular resin. PVC is used in making about half of all our plastics—food wrappings, bottles, water pipes, blood storage bags and tubing, car upholstery, fabric coatings, wall and floor coverings, and thousands of other common objects. Unless you live in a plastics-free environment, you probably can reach out and touch a PVC-based product as you read this. But scientists have reassured the public that there appears to be no danger of toxic exposure from polyvinyl-chloride-based consumer products.

However, some Americans are not completely reassured. For example, there is Thomas Finn, 72, a retired railroad inspector in Niagara Falls, New York. He first heard about vinyl chloride last January 22 when news reports of its possible dangers were first broadcast. At the time, Finn was too distraught with grief to pay much attention. His 62-year-old wife, Kathryn, a lively grandmother who had never been seriously ill, had died only six days before. Cause of death was angiosarcoma of the liver, a cancer considered so rare her doctor refused for a time to believe his own diagnosis.

"We really didn't know the name of the disease until she was dying," said Finn. "Even then, it was such a strange word that I couldn't remember it."

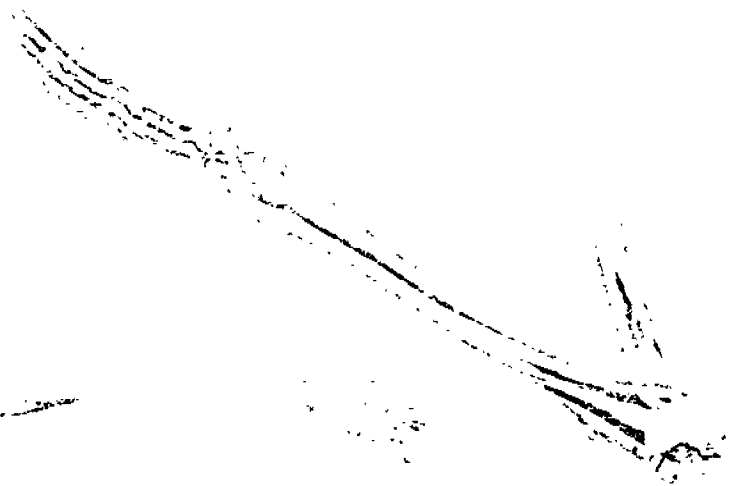
Raymond G. Gettelfinger, 42, of Louisville, has worked with vinyl chloride all his adult life. And, like Thomas Finn, he knew nothing of that hard-to-remember word: angiosarcoma. Until last January 22, that is; for on that day, the Goodrich company issued a press release stating that three of its VC workers in Louisville had died of the cancer.

John L. Creech, Jr., M.D., a local surgeon who helps oversee the health of Goodrich workers, had discovered the surprising "cluster" of rare cases in the polymerization plant where Ray Gettelfinger had worked for 20 years. The company announced it was investigating to see if the deaths "were related to occupational causes."

The victims all had been longtime employees at the plant. And all had been "pot cleaners" at one time in their ca-



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reers, the same job that Gettelfinger held for his first 10 years. As "pot cleaners," the men climbed into tanks measuring about 6 feet across and 10 feet high to chip polymer residue off the inside surfaces. Their only source of fresh air was a 2-foot opening at the very top of the deep tanks. The residue often contained pockets of vinyl-chloride gas, and when it was chipped the gas was released—oftentimes in the workman's face. Today, this cleaning practice is largely outmoded; when workers must enter the tanks, it is recommended they wear air-supplied respirators and special protective clothing.

For Gettelfinger, the father of six children, including a son who also works at the plant, confirmation that the deaths of his co-workers had, indeed, resulted from long occupational exposure to vinyl-chloride gas came the hard way. Dr. Creech had screened all 275 VC production workers, and then on the last day of February told Gettelfinger that he was carrying the bomb.

The surgeon also found another worker in the early stages of angiosarcoma, the disease which, up to now, has proven fatal. He further discovered two additional and previously unreported deaths, and in all cases the men had been pot cleaners. That brought the total number of victims of the "rare" cancer in this single, lightly manned plant to seven.

After the first report of Dr. Creech's findings, one of the most urgent medical inquiries in history began. Government and private health investigators in the United States and Europe started looking into the circumstances of VC and PVC production. The investigating groups in this country include:

- the Occupational Safety and Health Administration (OSHA) of the Department of Labor;
- the National Institute for Occupational Safety and Health (NIOSH);
- the Environmental Protection Agency (EPA);
- the Center for Disease Control (CDC);
- the National Institutes of Health (NIH);
- the American Cancer Society (ACS);
- the Environmental Science Laboratory, Mount Sinai School of Medicine, New York.

The dangers from vinyl-chloride gas, as interpreted by artist Bob Haydock, are depicted graphically on pages 17 and 18

After tracking down more than 4,000 current and former VC and PVC workers, investigators by July had raised the proven number of deaths from VC-induced angiosarcoma to 20: 5 deaths at the Goodrich Chemical plant in Louisville; 3 at Goodyear Tire & Rubber Company in Niagara Falls, New York; 2 at Union Carbide Corporation in South Charleston, West Virginia; and 1 at Firestone Tire & Rubber Company in Pottstown, Pennsylvania. In Europe, there were 9 reported deaths. All were men who had long-term exposure—from 12 to 27 years—to extremely high concentrations of vinyl chloride.

Still, other cases were turning up and they were even more disquieting. One involved a machinist who for 30 years processed plastic insulation materials in a General Electric Company plant. A company spokesman said the polymer the man worked with was "quite probably PVC." Although the death has not been linked with absolute certainty to VC, it raises the possibility that the several hundred thousand American men and women who form plastic goods from PVC might be exposed to dangerous gas concentrations "leached" during heat processing of their products. The Bendix Corporation Launch Support Division of Cocoa Beach, Florida, currently is conducting a government-financed survey to ascertain the danger, if any, in processing products containing PVC. Preliminary information will be available in four or five months.

Another cluster of cases which proved alarming centered in upstate New York. These were three angiosarcoma deaths apparently having no connection with occupational exposure to VC. All of the victims were women who lived in the Buffalo-Niagara Falls area. Investigators may never be sure why these women died, but the extraordinary coincidence of three such "rare cancer" deaths occurring in the same small area strongly suggests that they died simply from breathing the local air—air poisoned by VC gas escaping from a Goodyear factory.

Kathryn Finn was one of the victims. She lived virtually all her life in a small frame house four blocks from the Goodyear plant in Niagara Falls.

"When Kathryn and I used to sit on the screen porch in the evenings," her widower remembers, "it was hard to tell what we were breathing. We've got so many odors from so many factories around Niagara Falls."

According to the Environmental Protection Agency, about 300 million pounds of vinyl-chloride gas—out of a total of 5-to-6 billion pounds produced each year—escape into our atmosphere. But the EPA is working to establish stricter air quality and emission standards for the industry. By October, the Department of Labor expects to set new plant exposure levels for those who work with the gas and its resin. Still, there are those who say we have only begun to see the results of this chemical killer.

"The industry is a relatively young one and the effects of toxic exposures are only beginning to appear," says Irving Selikoff, M.D., director of the Mount Sinai Environmental Science Laboratory. "Most of our experience is ahead of us."

Medical scientists, such as Dr. Selikoff, generally are reluctant to speculate on the future. Nonetheless, Dr. Selikoff and others have urgently asked for strict controls governing the escape of the gas and the exposure levels in the industry.

"We have learned from other industrial carcinogens [cancer-causing agents] such as beryllium and asbestos that the hazard might not stop at the factory gate, that it might invade the workers' homes and the neighborhoods near the plants," explains Dr. Selikoff.

There are unfortunate parallels between the responses to the vinyl-chloride threat and a previous disclosure that asbestos was a carcinogen. For instance, several years ago when the asbestos danger was revealed, environmental health experts urged immediate steps to reduce exposure to asbestos fibers to as close to zero as possible. The labor unions also sounded the alarm, worrying over the health of their members. Meanwhile, industries that depended upon asbestos production argued against the imposition of stricter standards; and the federal government waited more than a year—until June 7, 1972—to set even an emergency exposure limit of five fibers per milliliter (fibers longer than five microns), which labor complained was more than twice as high as it should have been. A permanent standard of two fibers per milliliter is scheduled to take effect in 1976. Last April, however, the U.S. Court of Appeals for the District of Columbia ordered the secretary of labor to review the standard, recommending that where feasible the two fibers per milliliter limit be implemented before 1976.

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Vinyl Chloride

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Following the vinyl-chloride pronouncement, a similar pattern began to emerge; however, the government did set an emergency exposure level of 50 parts per million (ppm) for VC and PVC workers three months after Dr. Creech's report.

Within weeks of Dr. Creech's announcement, however, an Italian researcher, Cesare Maltoni, M.D., made it public in the United States that VC caused cancer in rats at levels of 50 ppm. Previously, Dr. Maltoni had demonstrated rats and mice contracted angiosarcoma after exposure to VC at concentrations of 250 ppm.

The reaction of Joseph Wagoner, Sc.D., director of the National Institute for Occupational Safety and Health Division of Field Studies and Clinical Investigations, in Cincinnati, Ohio, was typical of the medical investigators interviewed by *Today's Health*. Dr. Wagoner, who headed the agency's search for victims of VC-induced cancer and other diseases, and his colleagues at NIOSH already had urged the labor department to reduce its VC emergency standard permanently to "no detectable level."

"People who are knowledgeable about carcinogens can make no other recommendation," he said.

Although the labor department moved with more speed than it had concerning safe levels of asbestos, it wasn't enthusiastic about this NIOSH recommendation. Instead, it called public hearings in Washington last summer. Scheduled for one week, these hearings ran longer than three weeks, as 82 organizations sent 150

business, labor, government, and medical spokesmen to the stand.

Speaking for most of the industry, Anton Vittone, president of B.F. Goodrich Chemical Company (the division of Goodrich that makes PVC) said: "The proposed permanent standard [of no detectable level of VC] is not technologically feasible and, if adopted, would shut down the industry." He was not referring merely to the VC-PVC industry, but to the entire spectrum of the plastics business, raising the threat of a shutdown that would touch many of the world's nonplastic products.

Speaking for organized labor, Peter Bommarito, president of the United Rubber, Cork, Linoleum and Plastic Workers of America, threatened an industry shutdown if the proposed permanent standard of no detectable level is not adopted: "This country survived for nearly 200 years without polyvinyl chloride, and we can survive in the future without it."

Both government and private medical experts who testified at the public hearings generally supported organized labor's stand in favor of no detectable level of vinyl chloride. It seems likely, however, that the Department of Labor will decide upon a standard that is somewhere in-between the emergency 50 ppm and the no detectable levels and delay its enforcement for several years, allowing industry time to install equipment that will bring exposures down to around 10 ppm. That is the level which Vittone says is the best the VC-PVC industry can accomplish with current technology.

One leading company in the industry, however, already has bettered that level. V. K. Rowe, M.D., chief medical officer of Dow Chemical Company, told a New York Academy of Sciences meeting last May that his company has brought exposure levels down to as low as 1-to-5 ppm.

With few exceptions, the 27 companies producing VC and/or PVC in the United States have been slow to respond to the threat that their manufacturing processes pose for their workers.

"To call them sluggish would be about the most charitable thing I could say," says Peter J. Nord, Ph.D., an industrial hygienist with the Amalgamated Clothing Workers of America.

Perhaps the most vexing question raised by Dr. Nord and others is why industry and government waited until Dr. Creech's discovery before acting to control worker exposure to vinyl chloride.

Testifying in Washington, Herman F.

Kraybill, Ph.D., a biochemist and toxicologist from the National Cancer Institute, said both scientists and manufacturers of vinyl chloride have long known that the gas is a hazardous chemical. Moreover, the gas has been making workers sick ever since it went into commercial production, in 1938. Tom Gettelfinger, 20, says the men at his plant often talked of fainting or vomiting after exposure to vinyl chloride. And medical investigators have known for some time that fibrosis of the spleen, lungs, and liver, is characteristic of problems found among VC workers.

To the credit of the companies, they did try to hold exposure levels down to between 250 and 500 ppm in recent years. But at the Washington hearings, a spokesman for VC and PVC producers testified that men at the various VC plants were routinely exposed to concentrations as high as 4,000 ppm when they were cleaning the tanks or because of leaks.

Equally damning to the industry is the progression of clear warnings that preceded Dr. Creech's discovery, in Louisville, of the angiosarcoma victims. The first serious health alert concerning vinyl chloride came in 1949, when Russian researchers reported finding nonmalignant liver damage in 15 of 48 VC workers.

The first suggestion that VC also might cause cancer came in 1970, almost four years before the discovery at the Goodrich plant. Publio L. Viola, M.D., of the University of Rome, produced tumors in the bones, skin, and lungs of rats by exposing them for prolonged periods to 30,000 ppm of the gas. In 1971, Dr. Maltoni, from the Bologna Cancer Institute, confirmed Viola's findings and began to test animals at lower concentrations of the gas.

According to a respected senior medical investigator, who asked not to be identified, the European sponsors of Dr. Maltoni's research sent a confidential letter to the American Manufacturing Chemists Association (MCA) in August 1972. (At the time, MCA represented most VC and PVC producers in the United States.) The investigator says the letter disclosed for the first time that Dr. Maltoni had produced angiosarcoma in the livers of rats by exposure to vinyl chloride. A few months later, a delegation of American industry experts visited Dr. Maltoni's laboratory.

The authoritative trade journal, *Chemical and Engineering News*, has

reported that on January 30, 1973, the experts made a "brief oral progress report" on Maltoni's work to an MCA meeting.

The industry responded by funding its own animal research program, conducted at Industrial Bio-Test Laboratories, Inc., in Northbrook, Illinois. Although the study, which lasted slightly more than a year, revealed that exposures of 50 ppm could cause angiosarcoma in mice, the industry apparently did nothing

that unless they suspected something wrong?"

Looking for scapegoats and rehashing the past is a pointless exercise, of course. "At this stage, it's hard to blame anyone for what happened to Kathryn," says Thomas Finn. "I guess during all those years nobody knew how dangerous the stuff was. But I'd like to see them get to the bottom of it now so things like this won't happen to other people."

ing to alert the agencies responsible for occupational and environmental health.

"NIOSH learned only after the three deaths from angiosarcoma were reported in January 1974," says Marcus M. Key, M.D., assistant U.S. surgeon general and director of the National Institute for Occupational Safety and Health.

Thus, for more than a year, there was extremely strong evidence suggesting that vinyl chloride not only was more

In Louisville, Raymond Gettelfinger was asked if he was bitter about his condition. "A little bit," he said; "any man would be. But I don't hold it against Goodrich. It's nobody's fault."

Gettelfinger and the other living victim in Louisville are receiving chemotherapy in an attempt to arrest their cancers. Both have responded well to treatment, according to a Goodrich spokesman, and because the disease was found

dangerous than previously believed, but was carcinogenic. Perhaps the industry leaders were unconvinced. If so, then another industry move almost a year before Dr. Creech's discovery is inconsistent with the reluctance to accept—and act upon—the Maltoni findings.

"In March 1973, the industry suddenly stopped supplying cosmetic aerosol firms with vinyl chloride," says Dr. Wagoner, of NIOSH. "Why did they do

early, there is hope they may become the first victims to survive angiosarcoma.

"We have a lot of hope," says Gettelfinger's son, but regardless of his father's fate, young Tom Gettelfinger has no intention of changing jobs. "I don't think there is near the danger that there was when my Dad started in the 50s. It's a good job with good benefits. But I'd feel better if they brought the exposure down—to zero, if possible."