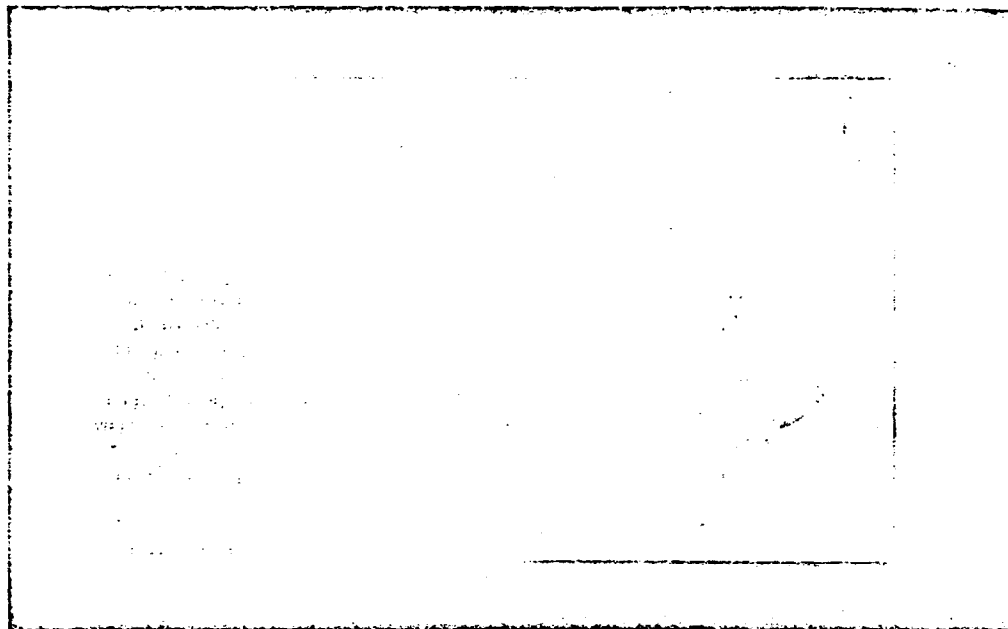


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INDUSTRIAL MEDICINE



New materials—and perhaps some old ones—harbor new dangers

When Assistant Secretary of Labor John H. Stender, head of the Occupational Safety and Health Administration, ordered a review of work place hazards and accidents several months ago, he wasn't prepared, he conceded, for some of the "gruesome examples" of electrocutions, suffocations, burns, and fatal falls the agency's regional offices turned up.

"The hazards that working men and women are facing today as they go about their work are as unnecessary as the damage I suffered working on boilers 30 years ago," declares Assistant Secretary Stender, who has a hearing loss to remind him of his years as a factory worker.

But a menace not included in those reports was about to surface. The widely used industrial chemical vinyl chloride (VC) was linked unmistakably early this year with the rare—or previously rare—angiosarcoma of the liver.

Once considered for use as an anesthetic, the gaseous substance now has awakened deep concern in physicians, and members of labor, industry, and government. The 11 cases confirmed in the U.S. (and a 12th in England) had harsh implications for thousands of workers, for industry facing the immediate need to change production methods, and for public health officials.

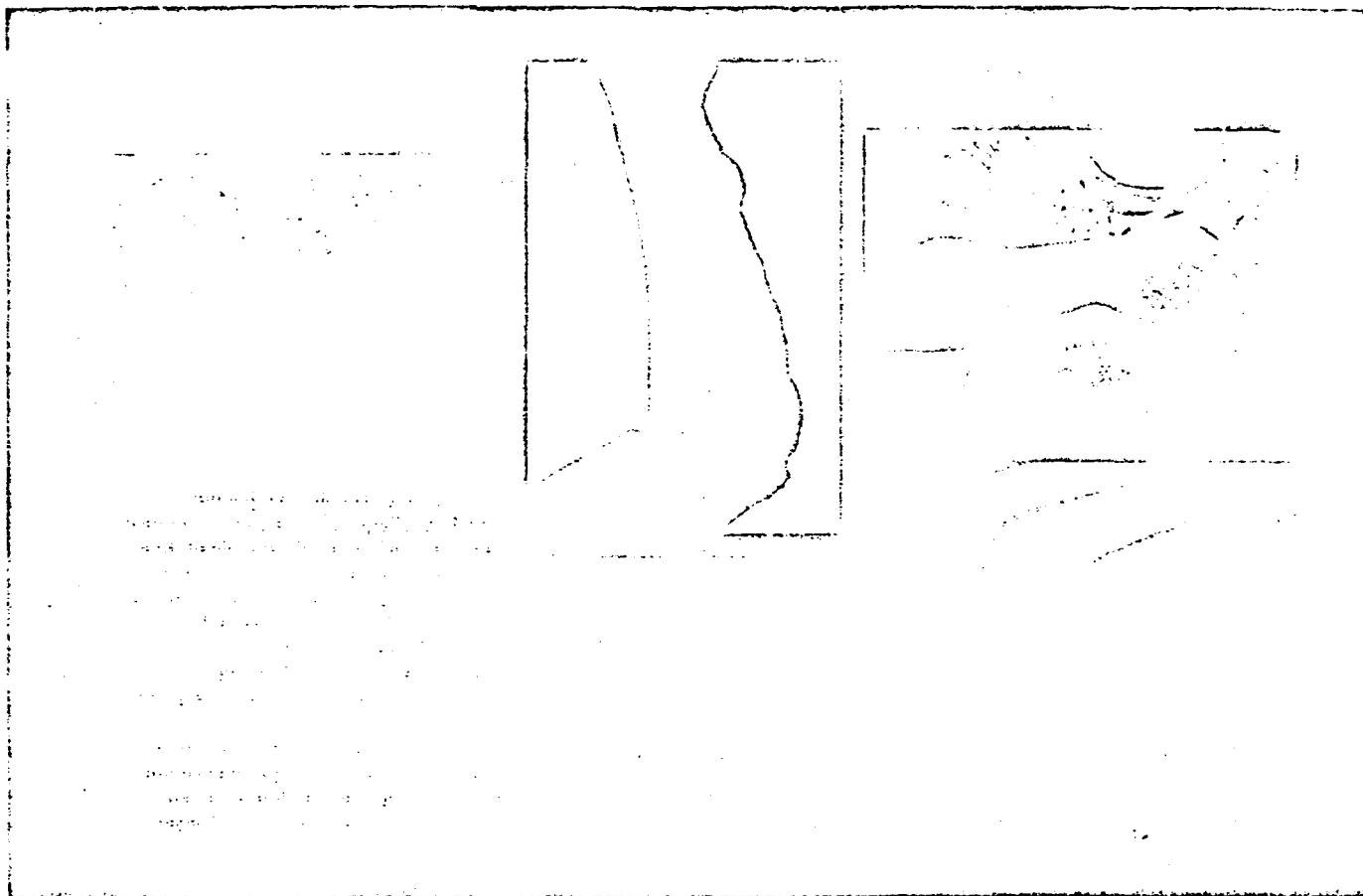
VC's carcinogenic potential was conceded early by John O'Neill, chief of the division of health standards in the Occupational Safety and Health Administration (OSHA), the Department of Labor's agency responsible for setting and enforcing safety codes. "There is no use denying it," he says. "We are faced with a new occupational disease."

The public announcement of the VC hazard came in January after officials of the B. F. Goodrich plant in Louisville, Ky., alerted by plant physician John L. Creech, informed government officials that four liver angiosarcoma deaths had occurred among former employees involved in producing polyvinyl chloride

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(PVC) from VC. Physical examinations and a search of medical records there and at other plants soon gave the total: five deaths and two workers with the disease but still alive at Louisville; three deaths at the Goodyear plant in Niagara Falls, N.Y.; and one death at the Union Carbide plant in South Charleston, W.Va.

In mid-February, at a standing-room-only OSHA hearing in Washington, D.C., a 43-year-old Italian researcher, Dr. Cesare Maltoni, director of Bologna's Institute of Oncology, presented results of his animal studies that showed—for the first time—that VC produced angiosarcoma of the liver in rats. Moreover, it did so at levels (250 ppm) many had considered safe. Although Dr. Maltoni's research did not prove VC caused the liver cancer in human beings, it did provide strong circumstantial evidence.

Also testifying was Dr. Irving J. Selikoff, director of the environmental sciences laboratory at Mount Sinai School of Medicine in New York, who found the hearing something of a paradox. Although it appeared that a new problem had been identified and steps taken to meet it, he said: "It is equally true that there has been evidence of potentially serious disease among vinyl chloride-polyvinyl chloride (VC/PVC) workers for 25 years that has been incompletely appreciated and inadequately approached by medical scientists and by regulatory authorities."

The first four cases of angiosarcoma of the liver from

Louisville were confirmed at the National Cancer Institute by Dr. Louis Thomas, chief of pathology, and Dr. Hans Popper, former Mount Sinai dean and now a Fogarty scholar at NIH. They also have come up with a clue that potentially, at least, holds out hope for reversing or retarding the disease process.

Shortly before the disclosures about VC were made at the OSHA hearing, Dr. Popper received a report from colleagues at the University of Bonn in West Germany of a peculiar liver lesion seen in some 50 VC workers there. Early in February, during a visit to Bonn on another medical matter, he obtained slides and photos of "this peculiar fibrosis—chronic toxic fibrosing liver lesions." Studying these at the NCI, Drs. Thomas and Popper noted similarities between the liver lesions in the German VC workers and liver biopsy material taken from one of the Louisville victims before the angiosarcoma had developed.

"This has increased our suspicions that exposure to VC will lead to this lesion, which will lead to angiosarcoma," says Dr. Popper. "This is not yet proved but is highly suspicious—and very important. Why? Because if we can catch it at that stage, perhaps we can prevent development of the cancer by removing a worker from exposure."

But at the Goodyear plant in Niagara Falls, where a team of environmental scientists from Mount Sinai Medical School spent three days doing intensive mass medical

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examinations of workers, Frank Micale, president of the 300-member Local 8-277 of the Oil, Chemical, and Atomic Workers Union (OCAW), wasn't feeling too encouraged.

"I'm 39 years old and I have five kids. I've worked here 21 years, right out of high school. What do we know about the chemicals we work with, what they can do to us? There have always been fumes in the plant. We never wore masks. Sure, guys are thinking about quitting, but if you quit, you go to another plant, with other hazards. I just don't know."

If some were unsure of what to do first, others were not. Considering the potential impact of the VC threat, the consumer-oriented Health Research Group, a Nader affiliate, called on the Food and Drug Administration, the Environmental Protection Agency, and the Consumer Product Safety Commission to order the recall of aerosol sprays—among them hairsprays and pesticides—using VC propellant. Otherwise, the group said, "consumers may be subjecting themselves to a significant risk of cancer."

The FDA and EPA have asked manufacturers to voluntarily pull their VC-propelled products from the nation's store shelves. In New York, Dr. Edward Ferrand of the city's environmental protection unit began analyzing hundreds of consumer products for VC and PVC content. And the Manufacturing Chemists Association hired a California firm to study morbidity and mortality rates among VC/PVC workers, while an animal study it funded earlier now has shown that mice, when exposed to only 50 ppm of VC, can develop angiosarcoma of the liver.

Meanwhile, the National Institute for Occupational Safety and Health (NIOSH), which serves as OSHA's research arm but is within HEW, had already begun its own industry-wide study of VC/PVC workers, visiting six polymerizing plants from which it will select former employees for follow-up.

And next week, leading scientists from Germany, Italy, Rumania, England, and other countries will attend a two-day meeting in New York, arranged by the American Cancer Society and the New York Academy of Sciences, to review what now is known about VC—and what to do about it.

Union leaders have readied their own battle plans. Louis Beliczky, director of industrial hygiene for the Rubber, Cork, Linoleum & Plastic Workers, AFL-CIO, states flatly that health and safety now are key issues in labor relations, contract talks, and the union's own projects. He notes that the rubber workers have contracts with the schools of public health at Harvard and the University of North Carolina and six rubber companies for long-term studies of the plants and the workers, including VC/PVC handlers. The cost to the union: roughly \$1 million.

The VC situation is just the latest chapter in the steady awakening of workers to the nature of occupational hazards hanging over their heads, says Anthony Mazzocchi, legislative director of OCAW. That 180,000-member union represents some 1,200 VC/PVC workers.

"The men at Niagara Falls are caught. They're in a dilemma. What's their option? Work and eat today so they

can die 20 years from now. Today it's angiosarcoma. Tomorrow—who the hell knows.

"Look, we're on the brink of a revolution in the delivery of medical care, and occupational health will be in the forefront. The private practitioner, who may be feeling pretty smug now, is going to be left behind unless he wakes up. The doctors the men have been seeing haven't been the ones who diagnose their occupational diseases.

"Being called by your first name doesn't count. They're going to want to know that when they walk into the doctor's office, he'll know what to look for, what to ask about; that he knows something about the real world, the world of work; and that if he sees two or three guys with the same type of symptoms, he'll have the guts to yell about it, out loud."

Mazzocchi's challenge to the private practitioner is not so easily met. For example, Dr. John Peters, occupational and environmental disease specialist at the Harvard School of Public Health, says he was asked by the manager of a small textile plant in New England to look into an outbreak of respiratory problems among the workers some months ago. The manager himself had suffered severe chest pains. He had been hospitalized with a diagnosis of myocardial infarction, spent several days in the ICU, a total of three weeks in the hospital, and three more weeks at home before returning to work. Other employees also had experienced chest pains, cough, malaise. One of the women workers had been hospitalized twice. The diagnosis: acute viral illness.

The textile manufactured was a crushed velvet synthetic material used for couches, coats, and the like, recounts Dr. Peters. "I looked at the process used, but I found nothing that would explain the symptoms. They used a fluoropolymer, an antistain, water-repellent material. It is known to produce a toxic fume when heated to high temperatures. But no high temperatures were involved in the process. So, I was stuck there."

Next, he questioned all 14 workers involved in the operation. Seven had no complaints. The other seven gave almost identical stories. They arrived at work feeling fine, had no problems for about two hours, then noticed the onset of dry throat, chest pain, cough, weakness, especially in the legs, then fever and chills. "Their cigarettes—these seven were smokers—tasted awful," says Dr. Peters. "They went home feeling terrible, went to bed feeling terrible, but woke up feeling better and went back to work."

The clue, of course, was the smoking. The polymer on their hands was transferred to the workers' cigarettes, which burn at a sufficiently high temperature to produce the fumes. "And that's what they had," states Dr. Peters—"polymer fume fever." It is exactly like flu that lasts 24 hours, sometimes longer. The only treatment needed: "Wash your hands before smoking." Dr. Peters concedes that a physician seeing the patient in his office would have had little to go on to make the correct diagnosis. "I am convinced that there is a lot of unrecognized occupational disease in the crowded waiting rooms," he adds.

None of those cases of polymer fume fever would have been on the lists compiled by the Bureau of Labor Statistics or the National Safety Council. The council, a private

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organization, estimates that more than 2.4 million workers suffered disabling injuries on the job, resulting in lost work days, in 1972. Preliminary BLS data for that year, based on different criteria, show 5.6 million recordable injuries and illnesses, whether or not work time was lost.

But some are convinced the "standard estimate" of 14,000 job-related deaths and two million injuries each year falls far short of reality. Dr. Lorin E. Kerr, president of the American Public Health Association, cites a federally financed report that indicates 20 to 25 million injuries and 25,000 deaths a year are closer to the true figures. Others, including some government officials, have estimated 100,000 deaths—but nobody really knows.

Health hazards peculiar to certain occupations and in-

dustries have been recognized since well before the age of plastics. In 1546, miners in the Erz Mountains of Central Europe were known to have an unusually high frequency of fatal lung disease, determined four centuries later to be bronchogenic carcinoma associated with high radiation levels from uranium-bearing ore.

The *British Medical Journal* (1:590, '74) cites the scrotal cancer found among chimney sweeps in the 18th century and the observations of bladder cancer induced by aromatic amines in the 19th. And in the early 20th century, radium poisoning considerably shortened the lives of women who painted luminous dials on watches and clocks. Dipping their brushes into the radium-containing paint, then moistening the brushes with their lips to make a fine tip was the *mors morit*.

Despite occasional outcries for reform, like those following the 1911 Triangle Shirtwaist factory fire in New York City in which 146 women sweatshop workers died, there

was little pressure for strong occupational health and safety legislation.

"Industry was happy with the voluntary approach to occupational hazards," says Dr. Marcus M. Key, NIOSH director. "Labor was more interested in hazard pay than in the prevention and control of hazards. And we in the Public Health Service were satisfied with the holy trinity of research, training, and technical assistance to states."

Sheldon W. Samuels, director of health, safety, and environmental affairs for the AFL-CIO's Industrial Union Department, notes that in one Midwestern industrial state, "not a single case of occupational cancer was reported for the entire year of 1970 and the first three months of 1971," despite widespread use of known industrial carcinogens. To him, this was "gross and obvious underreporting."

And the federal government's arm was hardly stronger. A 1970 report noted that although inspectors discovered hazards in more than 90% of factories entered, only about 1% of the companies were called to account and barely one in a thousand penalized. Labor Department records show that from 1963 to 1968, safety and health complaints were filed against 154 companies.

The passage of the Occupational Safety and Health Act of 1970, which became effective April 23, 1971, and established the NIOSH as OSHA's research arm, was the culmination of many events. Key among them was passage of the Federal Coal Mine Health and Safety Act of 1969.

That landmark legislation, stimulated by such mine cave-ins as the 1963 Farmington, W.Va., disaster in which 78 miners were killed and by the black lung scourge, marked the first federal "coming to grips" with an occupational disease.

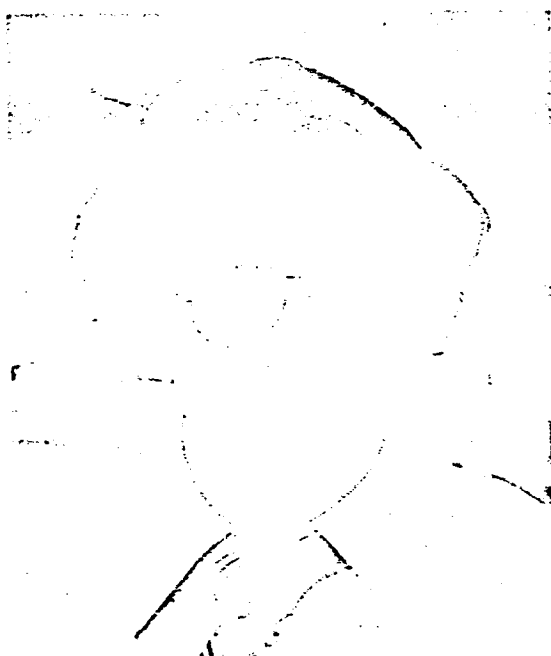
The 1969 coal mine act provided federal funds to indemnify some of its victims and their widows and set standards aimed at disease detection, prevention, and control. With 1972 amendments adding benefits averaging \$300 a month for diseases resulting from coal dust inhalation, some \$1 billion a year is being paid to 235,000 totally disabled men and to 140,000 widows and dependents.

Further, every working miner—some 100,000 underground coal workers in 23 states—will be x-rayed regularly by NIOSH as part of a National Study of Coal Workers' Pneumoconiosis. This study is the first to assess the extent of anatomical disease in a national industry. Based on early findings, Dr. Kerr, also director of the Mine Workers of America's occupational health department, expects 15% to 20% to have x-ray evidence of pneumoconiosis.

Dr. Kerr stresses that the law calls for—and that existing technology could achieve—elimination of this disease. "It can be wiped out in one generation. It can be made as rare as typhoid. The way to do it is get rid of the dust, which we've known how to do since at least 1948—you ventilate and use water."

Awareness of an industrial hazard by no means implies that something will be done about it. Dr. Joseph K. Wagoner, director of the division of field studies and clinical investigations for NIOSH, notes that the first reports

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OCAW's Legislative Director Mazzocchi demands doctors who recognize occupational ills and yell about them.

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of bladder cancer in dye industry workers came in 1893. "The British showed in 1962 that upward of 68% of people exposed to beta-naphthylamine and 23% of those exposed to benzidine were developing bladder cancer. But in the U.S., as late as 1968, journals could still report that out of 360 workers in one facility, 98 had developed that cancer and 47 died of it."

NIOSH has the right of entry into any plant—but for research, not enforcement purposes. It also numbers among its undermanned forces a more outspoken breed of official, less willing to countenance delays.

A high point of the NIOSH's young career was the forcing into the open the story of unsafe working conditions at the Pittsburgh Corning Corporation's asbestos insulation plant in Tyler, Tex. A key role in that action was played by Dr. William Johnson, a young public health physician, who found in old files reports of earlier surveys that showed counts of asbestos particles far above the outmoded threshold levels. These surveys also gave no warnings of the health hazards and, most damaging, showed a total absence of follow-up.

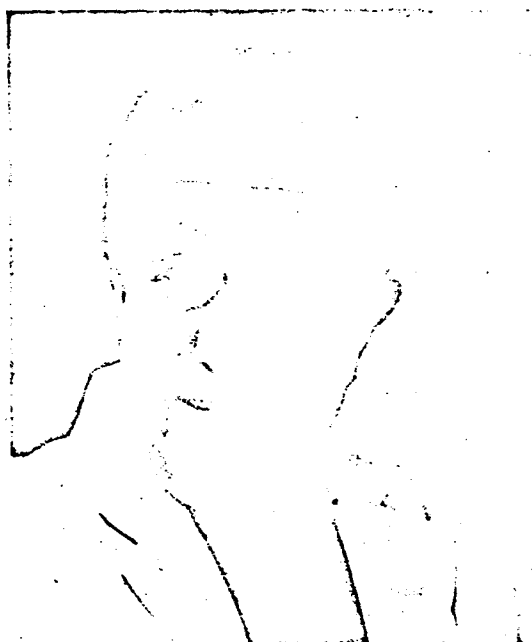
A quickly scheduled NIOSH inspection in 1971 disclosed "a ventilator system so clogged we knocked chunks of asbestos out of the ducts with a broom." The unshielded cafeteria was adjacent to the production area, and workers were so totally unaware of the asbestos hazard they used air hoses to blow fibers from one another's clothes.

A small (\$210) fine imposed by OSHA was followed by outraged protests from workers and their union, OCAW. This led to reinspection, a larger fine (\$7,990), and threats of additional penalties if violations remained. The company decided, instead, to close the plant. It removed its machinery and equipment and buried underground what it didn't take.

A \$100-million class-action suit has been filed against the corporation by a group of former workers. But meanwhile, under contract with the NCI, a long-term follow-up study of all 878 former PCC employees is being undertaken at the East Texas Chest Hospital, a 230-bed state facility in Tyler, roughly a mile from the front door of the plant. The building, its present owner unknown, now is being used as a warehouse.

Grady Faulk, administrator of technical programs at the hospital, who will also administer the Tyler Asbestos Workers Study, says 691 men are known to be alive, and 23—including three of the seven long-term workers—are known to be dead, with 164 still to be located. He estimates that some 750 to 800 men will be examined twice yearly. Asbestosis, mesotheliomas, and lung cancers often take 20 years or more to develop. The Tyler plant opened 20 years ago in 1954.

Some of the unhappiness with OSHA, particularly that of unions, stems from the rapid pace the agency has set in turning back enforcement powers over health and safety regulations to the states. The AFL-CIO's Samuel refers to the possibility of "50 mini-plans, all of them different. We object to the federalization of the 1970 Act on the basis of paper promises and without uniform stringency,"



Dr. Selikoff's opinion of OSHA's asbestos standard 'would have to be written on asbestos-coated paper.'

he says. The union has done more than talk. Last month it filed suit in federal court to prevent OSHA from approving any more state plans and to rescind approvals that had already been given.

The law provides for returning enforcement powers to the states if their proposed programs are judged "at least as effective" as the federal. These powers now have been returned to 16 states, and the plans of nine others have been approved.

However, not all states want to take back this responsibility. Kansas, Louisiana, Nebraska, Ohio, and South Dakota chose not to submit proposals; Georgia, North Dakota, New Hampshire, and Pennsylvania, which had submitted them, later pulled them back. Thus, the OSHA inspection force of 800 compliance officers and industrial hygienists will retain this overwhelming assignment: total surveillance and enforcement power over at least nine and perhaps 25 states and continued "overseeing" responsibility in all other states.

OSHA also has been criticized for seeking what some believe is a middle ground between safety levels proposed by labor and environmental scientists such as Dr. Selikoff and standards argued for by industry. The divergence was particularly sharp during OSHA's 1972 hearings in Washington that led to the agency's first new standard, the one affecting asbestos. Some 100,000 to 200,000 individuals work directly with that fibrous, metallic silicate, and several million more work with it indirectly.

The standard in 1972 was a maximum of 5 fibers per cc, as a time-weighted average for an eight-hour day, with peaks not to exceed 10 fibers. Industry sought to retain that. The NIOSH had proposed a 2-fiber standard with a two-year delay in enforcement. Dr. Selikoff argued that only a zero level could be considered safe. The OSHA decision: a 2-fiber standard but starting four years later, in 1976. It also rejected the NIOSH recommendations for

outside medical surveillance of asbestos workers and for tough warning labels on asbestos products.

Said an outraged Dr. Selikoff, whose long-term studies of asbestos workers have shown strikingly high incidences of asbestosis, lung cancer, and mesotheliomas: "My opinion of that decision would have to be written on asbestos-coated paper."

Dr. Homayoun Kazemi, director of the U.S. Beryllium Case Registry, does not object so much to the standard for that metal, which has been in effect since 1949 (a maximum average of $2 \mu\text{g}/\text{m}^3$ of particulate beryllium over eight hours and a peak below $25 \mu\text{g}/\text{m}^3$). But with more than 30,000 workers potentially exposed to beryllium fumes and dust in four major refineries and 8,000 processing plants, Dr. Kazemi vigorously protests the failure of management at many plants to maintain that level—and the failure of OSHA to police them.

"People are still being exposed to very high levels, and the plant owners know it," declares Dr. Kazemi, chief of the Massachusetts General Hospital pulmonary unit.

In recent years, some new patients have been "neighborhood cases," not beryllium workers but those living near a plant using the metal. And new beryllium hazards have been reported even more recently: It appears that the mantles of gas camping lanterns and dental alloys release potentially dangerous amounts of beryllium. The risks would extend not just to campers, dentists, and dental laboratory technicians but possibly to dental patients requiring extensive work.

The U.S. Beryllium Case Registry, a voluntary listing, now stands at about 840 cases and increases slowly but steadily by two or three a month. Dr. Kazemi wonders about cases not reported and is even more concerned about those in whom berylliosis goes unrecognized.

But diagnosing and dealing successfully with occupational ills can be negated by failure to probe deeply enough—or, occasionally, by probing too deeply. The APHA's Dr. Kerr tells the story of a 62-year-old bus driver with "hot belly" who underwent an exploratory laparotomy in an unsuccessful effort to pinpoint the cause of his persistent abdominal pains.

"Several days later, a member of the house staff who visited the patient learned he had been a bus driver only a few months," says Dr. Kerr. "For most of his working life he had done bridge demolition work. Using an acetylene torch, he cut through metal—and layer after layer of the red lead paint applied to prevent rusting. What he had was the lead colic that goes with severe lead poisoning. The unnecessary operation could have been avoided if someone had asked, 'How long have you been a bus driver?' A new idea? Hardly. Bernardino Ramazzini, the father of occupational health, urged that approach in 1700."

Of all occupational hazards, dermatoses are not the most serious but they are the most common. NIOSH estimates that skin disorders from chemical, mechanical, and biological causes account for 50% to 75% of all industrial diseases and affect from 600,000 to 750,000 people.

But new forms of industrial cancer and other diseases are likely to be a recurrent problem until some way is

found to screen the thousands of old substances now in industrial use and the thousands more that enter manufacturing processes, and the environment, each year.

Faced with the massive task of dealing with the thousands of substances handled, touched, or inhaled by workers, OSHA—with recommendations from NIOSH—pulled together all existing federal health standards into one package covering some 500 toxic substances. Next, it set up the Target Health Hazards Program, directing enforcement first toward plants where workers are exposed to asbestos, lead, silica, cotton dust, and carbon monoxide.

But admittedly, these standards—and the available inspectors—are not enough. In March, OSHA announced a 30-month, \$3.5-million project to speed the issuance of rules governing some 400 toxic substances. These rules will deal with plant monitoring, control methods, medical requirements, and other activities; they will not change the threshold limit values to which workers are exposed. But is there any way that the vast array of chemicals in use, and to come into use, can be checked for danger?

To provide the necessary legislative machinery, Congress is considering several versions of a toxic substances bill to cover agents now regulated by other laws. Still unclear is who pays for the testing of an existing chemical, how trade secrets will be protected, and who will be considered responsible for various misuses.

While Congress debates, is anyone trying to pinpoint industrial dangers?

"No one else is formally responsible, so we have taken the initiative," declares NCI's Dr. Umberto Saffiotti, associate director for carcinogenesis, division of cancer cause and prevention. Of the \$36 million allotted to the carcinogenesis program, some \$7 million now is being used in a major bioassay program. As of March, he reports, some 450 chemicals were being screened for carcinogenicity.

More than 20 laboratories are taking part in the program and most chemicals are tested by a protocol that includes preliminary toxicity studies followed by lifetime tests on groups of 50 animals. In addition to long-term studies, the program now is testing the reliability of short-term bioassay systems based on chemical reactivity, such as DNA binding, mutagenic activity, and in vitro neoplastic transformation.

But despite all the investigations, despite standards being evolved and emergency rules issued, thousands of workers—assured by the Occupation Safety and Health Act of 1970 of "safe and healthful working conditions" and "no diminished health, functional capacity, or life expectancy as a result of his work experience"—are still all too often involuntary players in the game of industrial Russian roulette.

Dr. Selikoff, noting that the government-medical-industrial reaction to the VC threat was a response to an already present hazard, puts it this way: "It is sobering to realize that there may be other agents sitting in the wings, which we do not now suspect and which we still do not really know yet how to anticipate. We can't see them—but we hear them moving about in the forest." ■