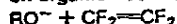


Letters

CHEMICAL SAFETY

Explosive reaction warning

SIR: The following reaction has been described in U.S. Patent 2,917,548* and in several books on organic fluorine chemistry:



We would like to inform anyone wishing to repeat this work or to use the products that the compound $\text{CH}_3\text{OCF}=\text{CF}_2$ has considerable explosive potential. Igniting it either by a hot wire or an electric spark causes it to decompose violently with a substantial and rapid temperature and pressure rise. Under equivalent initial conditions of loading, this gas appears to have a far greater explosive potential than does acetylene. It should therefore be treated with extreme caution.

Although the products made from high alkoxides have not been tested for similar instability, we recommend that they be considered to be potentially hazardous until proved otherwise.

Arthur W. Anderson
Manager, R&D Division, Du Pont Co., Wilmington, Del.

* Perfluorovinyl ethers. Stanley Dixon (to E. I. du Pont de Nemours & Co.), U.S. 2,917,548, Dec. 15, 1959. Perfluorovinyl ethers are prepd. from the reaction of tetrafluoroethylene and a metal alkoxide in an inert solvent. NaOPr (27 g.) in 53.1 g. ether is heated with 50 g. C_2F_4 and 0.5 g. terpene inhibitor in a 400 ml. stainless steel bomb at 80°. After a pressure drop the bomb is heated to 110° until the pressure remains const. After cooling, the contents are added to H_2O and neutralized with HCl. Extn. with ether followed by drying and distn. of the ether soln. yields 4.5 g. propyl trifluorovinyl ether, b. 83°. Other trifluorovinyl ethers similarly prepd. are (alkyl radical, g. Na alcoholate, g. yield, b.p.): Bu, 25, 16, 90-5°; 4-pentenyl, 29.5, 5.4, 54-7°/86 min.; CF_3CH_2 , 25, 16.8, 40-1.5°; Me, 33.3, 19, 10.5-12.5°. Butyl trifluorovinyl ether adds Br in CS_2 to produce butyl 1,2-dibromo-1,2,2-trifluoroethyl ether, b. 152°. The methyl ether also adds Br readily and decolorizes KMnO_4 soln. Trifluorovinyl ethers are monomers.

PVC industry

SIR: Your issue of March 8 (page 5) reports on a "stern warning" served on the chemical industry by Dr. Morton Corn, new head of the Occupational Safety & Health Administration. Corn joins others in making the accusation that the polyvinyl chloride industry "cried wolf" on the occasion of the original vinyl chloride hearing in 1974. As he put it, "... the tone has been set for your industry by the vinyl chloride hearing. It was stated by several corporations that the proposed standard would put the industry out of business."

The industry still believes that the proposed standard would have, in effect, put it out of business. The industry survives today because

the proposed standard, which had called for a "no-detectable" level of vinyl chloride in work areas, was changed under the permanent standard of Oct. 5, 1974, to permit levels in specified areas of 1 ppm for 8 hours and 5 ppm for 15 minutes on the basis of time-weighted averages.

This change and other significant changes in the proposed standard incorporated in the permanent standard in effect today were far reaching and essential to the continued health of our industry.

Corn went on, according to your report, to talk of "strident promotional cries." We commend to his attention recent comments by Dr. Irving Selikoff of Mount Sinai School of Medicine in New York who sees "... the case of vinyl chloride as a 'success story.' He says it was a 'success for science in having defined the problem; success for labor in the rapid mobilization of concern; success for government in urgently collecting data, evaluating it, and translating it into necessary regulations; and success for industry in preparing the necessary engineering controls to minimize or eliminate the hazard.'"

Ralph L. Harding Jr.
President, Society of the Plastics Industry, New York City

More credence to many

SIR: Dr. Selbin in a recent letter to C&EN suggested that, "... when people with families to support resign secure positions for uncertain futures ... we must pay very careful attention." My scientific training, however, also suggests that the 10,000 or so scientists and engineers who continue to do a very fine job deserve more credence than the few who, for whatever reasons, have renounced or will renounce their former employment.

W. Carl Gottschall
University of Denver, Colo.

Recommendation letters

SIR: I would appreciate it very much, if you kindly publish this letter in C&EN because I feel that many people might be facing the same problem that I am in connection with satisfying the demand of employers to make the applicant arrange for recommendations.

First of all, I think it is highly unnecessary and inappropriate to seek recommendations from every applicant. No matter how many people are applying for the position, I feel that recommendations should be sought from only the small number of applicants who are under serious consideration. Even in that case, the recommendations should be requested by the employer from the references.

No matter how much you want somebody to get a good job and how much you know that somebody deserves a good job, the referee starts to lose interest after sending a few letters for his subject, and that can be very harmful to the subject. It is possible to print résumés and send it with the applications, but sending recommendations will not serve any constructive purpose in this respect.

I am one of the unfortunates who has to struggle hard to find a suitable position. This means writing to hundreds of places to find a job. I have requested my references so many times

during the past that it is becoming more and more embarrassing to request them to send more. I therefore feel that this practice of asking for recommendations from each and every candidate should be discontinued and should be only exercised for a small number of people that are under sincere consideration. This will save a lot of trouble for a lot of people, including the poor secretaries.

H. V. Navangul, Ph.D.
Northeast Missouri State University, Kirksville

Safety of cyclamates

SIR: The March 15 article on the health hazard of cyclamates (page 6) should outrage anyone concerned about the scientific effort of the federal government. We like to believe that in technical matters the government maintains proper scientific objectivity and impartiality. Yet, in the case of cyclamates, the National Cancer Institute has been unable to demonstrate carcinogenicity and still refuses to accept this result.

Safety studies in animals are designed to provide extreme exposure to the test material in order to demonstrate safety at normal exposure levels. One might still question the validity of a statistically significant incidence of ill effects at such extreme exposure levels. However, when the incidence of ill effects does not reach a statistically significant level, the meaning of the study must be very clear. Within the intent of the experiments, no health hazard has been found.

When a government agency hedges on the results of an experiment because the results do not fit those desired, this is a travesty of scientific objectivity, and I for one believe our government is capable of much better scientific effort.

Bernard R. Neustadt, Ph.D.
Bloomfield, N.J.

Mutual needs

SIR: I was disturbed by the sharp separation between pollution facilities on the one hand, and goods and services on the other, which appeared in Texaco vice president Coppac's statement in the March 8 issue (page 3) of C&EN: "There is no reason to believe that more jobs would be provided in constructing pollution facilities than would be created if the capital were spent on alternative investments in facilities producing goods and services."

I take no side in the job issue. But the statement, I submit, raises two fundamental questions:

1. Does industry produce a service if it diminishes, to a reasonable or measurable degree, the extent to which the land, water, and air are polluted through its activities?
2. If the purpose of goods and services is to provide a fuller life for the targeted consumer, doesn't success need to weigh in the adverse effects of pollution—especially on a long-range basis—on his life too?

I don't believe that the critical need for both a healthy economy and a healthy environment should be handled on a confrontation basis. The needs are mutually imperative, and in my view, full cooperation represents the only constructive approach for dealing with them.

A. M. Gessler
Cranford, N.J.

—Flame-Retardant Sleepwear: Is There a Risk of Cancer?—

By NADINE BROZAN

With manmade factors increasingly blamed as cancer-causing agents, controversy has come to rest lately on a seemingly harmless consumer product: children's sleepwear.

Pajamas and cancer? The suspected link between them is a chemical compound called tris(2,3-dibromopropyl) phosphate, popularly known as Tris. It is the substance most commonly used to make children's sleepwear flame retardant.

The scientific evidence available so far indicates that Tris is mutagenic: that means it has the capability of altering the genetic material in living cells. Although not every mutagen is carcinogenic, it strongly raises the possibility, for the majority of carcinogens tested have been shown also to be mutagens.

Several years ago, the Consumer Product Safety Commission issued regulations mandating that all children's sleepwear in sizes 0 to 14 be flame retardant. Since then, the agency has received reports from burn treatment units showing a substantial reduction in burn incidents among children who had worn the treated sleepwear. The commission is now studying the feasibility of requiring that all clothing in all sizes be flame retardant. Although it can issue such regulations, its authority does not extend to controlling the technology of flame retardancy.

"The standards set a limit on how much flame can spread in sleepwear, but in no way do we tell the manufacturers how to meet that limit," said Charles Flinner, a commission spokesman.

Although any direct connection between Tris and cancer has yet to be established, experiments on microorganisms have generated considerable concern in Government and scientific circles. And consumer advocates believe that it is not too early to bring the issue to the public.

Dr. Robert Harris, associate director of the Environmental Defense Fund's toxic chemicals program, said, "The suggestion of potential harm to some 45 million children is so great that we believe the consumer must have this information. Who are we to keep it to ourselves?"

Last month, the fund and Dr. Harris, in the name of his infant son, Alexander Samuel, filed a petition with the Consumer Product Safety Commission asking for action on Tris.

The petition asked the agency to require the labeling of every garment containing more than 100 parts per million of Tris on its surface with a tag reading, "Contains the flame retardant Tris. Should be washed at least three times prior to wearing."

"Test so far indicated that Tris-treated fabrics contain far more than 100 parts per million surface concentrations, although not all fabrics have been tested," Dr. Harris said.

The petition stated, "Two samples of different polyester fabric had 70,000 parts per million and 37,500 parts per million of surface Tris before, and 35 parts per million and 100 parts per million of surface Tris after washing, respectively."

The effect of triple laundering is still in question because it would not remove the chemical contained inside the fabric. It will not reduce the flame retardancy because the regulation specifies that flame retardancy must be able to withstand 50 washings.

The petition also asked the commission to request manufacturers to test the extent to which Tris can be absorbed into the body, to conduct tests on potential cancer-causing capabilities by painting the chemical on the skin of animals and to investigate possible substitutes and their safety. It also urged the speeding up of experiments now being conducted by the National Cancer Institute.

Richard O. Simpson, chairman of the Consumer Product Safety Commission, who discussed the controversy at a forum of the American Apparel Manufacturers Association in Arlington, Va., this week, said, "I have instructed our staff to review all the technical references in the petition and to treat it as a high priority. Based on what I've examined and on discussion with our biomedical science experts, I would doubt that there is a problem. There is a great leap from the tests [cited in the petition] to a conclusion that the chemical is a carcinogen."

"And I am skeptical when a petition which raises the specter of cancer suggests the remedy of a label

asking people to wash the clothes three times before wearing. If there is a real problem, there should be a b. n. not a label."

The petition did not ask for an outright ban on Tris because, Dr. Harris explained, "We can't be sure that the alternatives to Tris are safer, so by banning it we might be going from the fire to the frying pan."

Much of the evidence causing worry was generated by the research on salmonella bacteria conducted by Dr. Bruce N. Ames, professor of biochemistry at the University of California at Berkeley. Dr. Ames is the inventor of a mutagenicity test that bears his name. The test is considered by many to be very reliable, inexpensive and efficient. It does not determine that a chemical is carcinogenic but is regarded as highly suggestive.

"I had long been suspicious of Tris because its structure is related to known cancer-causing chemicals," Dr. Ames said the other day. "That alone is not proof, but when it came up positive on the Environmental Protection Agency tests and subsequent on our own, I became even more suspicious."

"There is a high probability that if something shows up as a mutagen in our system, it will be carcinogenic, too. We have tested 175 chemicals that have been found to cause cancer in animals and 90 percent have shown up to be mutagens."

Asked whether the findings in microscopic salmonella bacteria used in his test could be applied to people, Dr. Ames answered, "The genetic material is the same in all living things. About a dozen chemicals can cause cancer in people, and we get positive results with almost all of them in our salmonella bacteria system."

In addition, Dr. Ames's test combines the bacteria for measuring genetic damage with liver samples taken from rat or human autopsies. That recreates the way that chemicals, not in themselves cancer-causing, can be converted into carcinogens by the human metabolic system.

Dr. Herbert Rosenkranz, who began tests for the Environmental Protection Agency last fall when he was a professor of microbiology at Columbia University's College of Physicians and Surgeons and is con-

Some scientists said that for their own children they were borrowing old sleepwear manufactured before the flame retardant regulations were promulgated.

tinuing them at New York Medical College, came up with the same results in three different tests, including the Ames method. Now, he has moved on from study of the pure chemical to the textiles containing Tris.

"We want to learn if it can be absorbed through the skin and if we can detect mutagenic effects in the body by studying the urine of infants who wear the garments," he said. Although the textile research is still in its initial phase, "The fabrics have already been shown to contain mutagenic activity," Dr. Rosenkranz said. Echoing the statements of all the scientists interviewed, he added, "We haven't tested for cancer, so we don't know, if it is cancerous."

The National Cancer Institute is confronting that question head on by putting Tris into the feed of rats and mice, but conclusions are not expected until the summer of 1977.

A study on animals conducted at the New York University Medical Center will be discussed at a scientific meeting later this month. The research showed that when Tris was painted on the skin of mice, it showed the ability to promote growth of tumors. According to this report, Tris is not a potent carcinogen, but may have a weak cancer-provoking effect.

Inconclusive though the findings may be for the moment, the current use of Tris raises all sorts of chemical, philosophical and practical issues.

As Dr. Ames put it, "Here we are trying to keep children from being burned up, and we're doing it by using a mutagenic compound that has not been tested for carcinogenicity."

Dr. Sidney Wolfe, director of the Public Citizens Health Research Group, the health wing of Ralph Nader's consumer advocate network,

said, "The burden of proof for safety should be with industry, not with the American public after the fact of massive marketing of a chemical. Why doesn't the chemicals industry screen its products before they go into massive use?"

That question may be resolved if the Toxic Substances Control Act, recently passed by the Senate, is also passed by the House and signed into law. The legislation would give the Environmental Protection Agency the authority to require testing on the authority to require testing on both chemicals already in use and on ones not yet marketed that are believed to be hazardous to human health or the environment.

In the meantime, the industry is awaiting more information.

Dr. Fred Kerst, vice president of research and engineering for the Michigan Chemical Corporation in Chicago, a leading producer of Tris, said, "We believe the potential hazards are extremely minimal, and we think further studies will bear us out."

The company, which has conducted toxicological tests in the past—it has been making Tris for 20 years—has now begun its own experiments on mutagenicity and carcinogenicity, he said.

Without proof one way or the other, what is the parent, who can buy nothing but flame retardant sleepwear, to do?

Some scientists said that for their own children they were borrowing old sleepwear manufactured before the flame retardant regulations were promulgated, dressing them in thermal underwear or stocking up on cotton pajamas when they traveled abroad.

Dr. Harris had another suggestion, "Surely the ability to sew hasn't been lost to this generation," he said. "And we all have mothers and grandmothers who remember how to sew. . . ."

Issue and Debate

Deciding What Is a Carcinogen

By BAYARD WEBSTER

Eighteen months ago the Environmental Protection Agency banned the use of the pesticides aldrin and dieldrin, saying that they were cancer-causing substances. Last Christmas Eve most uses of the agricultural pesticides heptachlor and chlordane were suspended by the agency because of an "imminent cancer risk" to humans.

A month later, an agricultural-scientific group took exception to these decisions, arguing that the Government agency's procedures for determining cancer-causing substances were based on faulty assumptions.

These opposing views have highlighted a growing controversy over the scientific approaches to determining whether a substance is or is not a carcinogen (cancer-causing agent).

Described as Hazardous

On one side of the argument are Government and independent scientists and cancer researchers who feel that almost any substance that can cause change in cell structure (mutagenesis) or that can cause tumors, even though benign, are usually carcinogens, and therefore hazardous.

In the late 1960's these scientists' views came to be accepted as "principles of carcinogenicity" by several Federal health and regulatory agencies, including the Environmental Protection Agency, which considered them in banning the insecticide DDT in 1970 and other chemicals in later years.

These guidelines, or criteria, for determining carcinogenicity included the broadly stated main principle: Any chemical that is found to cause tumors in animals or living tissue should be characterized as a carcinogen and a hazard to man.

A corollary principle stated that the concept of a threshold exposure level for any cancer-causing agent was impossible to determine and, therefore, there should be a zero exposure level for the chemical.

On the other side of the argument are agricultural trade groups, farm and garden chemical manufacturers and a number of independent scientists. They are generally of the opinion that the regulatory agency's criteria for determining whether a substance is a carcinogen are ambiguous and too strict and that they should be relaxed or disregarded.

This difference of opinion has come at a time when the growing weight of evidence seems to demonstrate that cancer caused by toxic substances in the environment is one of the most pervasive health problems in the world. According to the World Health Organization, from 60 to 90 percent of all cancers are caused by such substances.

Background

From the time man discovered fire, whose smoke produced hydrocarbons and tarry byproducts, he has introduced a host of carcinogens into the human environment. Since the Industrial Revolution in the latter 18th century, more than 30,000 chemicals have come into commercial production and each year the list grows by some 1,000 new compounds.

According to Russell Train, head of the environmental agency, only a few thousand of the more than 2,000,000 known chemicals have been tested for carcinogenicity. Of these, 1,000 have been shown to cause cancer in animals and nearly 200 have been demonstrated to cause cancer in humans.

As the number of toxic chemicals proliferated, the environmental cancer problem intensified and began to be studied more closely by concerned scientific groups who came up with the informal guidelines, or so-called "principles," for defining carcinogens.

For Less Control

Most chemical and pesticide makers and the agricultural industry contend that the guidelines are not wholly proven and are too restrictive for the billion-dollar industries that greatly influence the nation's welfare and economy.

The Council for Agricultural Science and Technology, a consortium of United States farm research and trade organizations, argues in a recent report that the guidelines fail to make a distinction between types of tumors. The report states: "All cancers are tumors, but most tumors are not cancers—some tumors become cancers, but most do not."

The council also argues that substances that cause cancers in animals do not necessarily cause them in humans. The group also says that the concept of zero exposure to any environmental substance is impractical and almost impossible to achieve.

Last month an editorial in *Lancet*, the British medical journal, stated that the Environmental Protection Agency's cancer principals "vary from the innocuous to the absurd" and added that few experts would accept the proposition of the World Health Organization and others that cancer was mainly caused by environmental factors such as chemicals.

For More Control

Dr. Russell W. Peterson, chairman of the President's Council on Environmental Quality, last month addressed the annual meeting of the Society of Toxicology in Atlanta and supported the environmental agency's use of its principles of carcinogenicity.

"It is a social value judgment," Dr. Peterson said. "And because certain induced tumors transform into malignancies, and because we can seldom predict which tumors will become malignant and which will not, we should regard all tumorigens [tumor-causing agents] as possible carcinogens."

He added that it was "obviously unacceptable to wait from 15 to 40 years [the range of cancer latency periods] to find out whether a suspect chemical will produce cancer in man." He said that "every chemical that induces cancer in animals" must be regarded "as a potential carcinogen in humans."

In a recent letter to *Chemical and Engineering News*, a publication of the American Chemical Society, Dr. Sidney Weinhouse, director of the Fels Research Institute in Philadelphia, stated: "There are no strict, quantitative criteria that differentiate benign from malignant tumors. So-called 'benign' tumors simply grow more slowly than malignant tumors."

Dr. Harold Stewart, retired chief of pathology at the National Cancer Institute and now a consultant for that agency, also points out the difficulty in distinguishing between tumors and cancers. "You can't really separate the two terms," he said. "We know that if tumors are untreated they will very often metastasize (spread)."

Outlook

In the argument over the proper definition of carcinogenicity and in the tangled thicket of scientists, legislative bodies, Federal agencies, industrial groups and other organizations concerned with the problem, there is little evidence that a solution acceptable to industry and environmentalists, to doctors and lawmakers, to farmers and consumers, is around the corner. But the following actions have been initiated:

¶The National Cancer Institute is preparing new criteria as suggested guidelines for defining an agent as cancer-causing. These are expected to be made public sometime this summer.

¶The Environmental Protection Agency is preparing its own guidelines for determining environmental carcinogens using a benefit/risk approach based on the health risk to humans of a substance in the environment matched against its overall benefit to mankind.

¶A national clearinghouse

on environmental carcinogens is being set up by the National Cancer Institute. It would act as an information center and an early warning network for scientists, industry, Federal agencies and other concerned groups.

New, simple and inexpensive ways of testing chemicals for their cancer-causing properties, using bacteria instead of animals, are being examined by the Government's scientific and regulatory departments. Such tests, though not as definitive as the vastly more expensive and time-consuming animals tests, are regarded as promising for ultimately being able to screen substances and determine where or not they have enough harmful potential to merit being examined more closely.

But despite these developments, the road toward establishing accepted definitions of carcinogenicity in the near future seems filled with obstacles, according to most observers.

The National Cancer Institute's latest draft of its new guidelines, for example, is reported to be quite similar to the Environmental Protection Agency's present criteria, which will make the environmentalists happy but which are unacceptable to much of the chemical and agriculture industry.

The promise of simpler test procedures, even if they hold true, are not expected to bear fruit for the next four or five years because it will take that long to thoroughly assess the scope and accuracy of the new methods.

A Possible Approach

One possible approach to the problem of identifying cancerous substances has been proposed by William D. Ruckelshaus, the first Administrator of the Environmental Protection Agency. In an interview in the journal, *Science*, Mr. Ruckelshaus said that whenever a new "devilish" substance was discovered it should be surveyed by an independent research program prepared by everyone involved—industry, labor, Government and concerned citizens. A review group of scientists of "unquestioned integrity" would then design a research program.

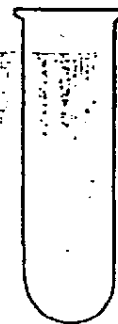
In this way, Mr. Ruckelshaus believes, research data could be generated that everyone could agree on and the matter of acceptable risks—the benefit/risk factor—could then be determined.

But even if such a comprehensive program is begun, many scientists believe it will be years before inexpensive and accurate testing procedures can be developed that can quickly identify cancer-causing substances in man's environment. And it may be equally as long before the various groups concerned come to agree on the proper definition of a cancer-causing agent.

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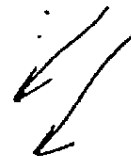


MRAK CALLS ON FOOD SCIENTISTS TO TAKE STAND ON ISSUES

Scientists should come from behind their fortresses of scientific certainty, and be willing to take leadership in giving advice based on their expert knowledge, Dr. Emil M. Mrak, Chancellor Emeritus of the University of California (Davis), told the American Chemical Society's centennial meeting in New York (See FOOD CHEMICAL NEWS, April 12, Page 2).

In delivering the W. O. Atwater Memorial Lecture, Mrak urged scientists to speak out, explaining:

"It appears to me that responsible scientists are well aware that perfection in science, and especially in biological science, is a rarity, if at all existent. Realizing this limitation, they testify with uncertainty and always indicate the need for more research. On the other hand, those who may be advocates, biased, ill-informed or even completely uninformed, testify with a positiveness that leaves no doubt in the mind of the politician or the average citizen. How then is the politician or news media to know who is correct and responsible, and who is irresponsible?"



Encouraging positive responsiveness, he warned against "paranoic defensive behavior," and suggested: "It must be made clear that there are limits to perfection."

Lawmakers, implementers, and enforcers must be educated into an understanding that a scientist who says something is probable but who refuses to speak in terms of absolutes "is more to be trusted than the biased advocate who speaks with specious certainty," Mrak continued.

"It is the duty of the food scientist in the future to assume the leadership of the country in answering problems of food safety as well as in solving the problems of food quantity and quality," he said.

In a separate speech on food safety, Mrak was critical of what he called "new and young regulators endowed with ideals, but deficient in scientific training." He opined:

"These regulators seem inclined to respond to pressures more than to sound scientific facts and, understandably, this has caused in some instances adverse feelings on the part of scientists in the same agencies."

