

TOXICOLOGY & HAZARD COMMUNICATION NEWS



August 1987

Volume 5, Number 2

Cutting Fluids

In the mid-1970s, it was recognized that cutting fluids containing nitrites and amines may also contain N-nitrosamines. Nitrosamines can be carcinogenic to animals and there was concern for potential exposure to workers. For safety reasons, nitrites were removed from the formulations.

A new study has evaluated the prevalence of cancer in male machine workers exposed for at least one year to cutting fluids containing nitrites and amines. The results indicated no increases in cancer or decrease in life expectancy. In this study, a group of 219 workers was compared to the general population of Gothenburg, Sweden, (population of 400,000) where the workers were employed. Exposure to oil averaged 3 mg/m³ in 1978 but before 1965, it was probably 5 mg/m³ or more. Every worker was followed up to December 1983. No increases in cancer (gastrointestinal, lung, urinary bladder, prostate, or total cancer) or decrease in life expectancy were found.

Asbestos

Lawsuits involving asbestos continue to make news. Asbestos is a fibrous silicate mineral found in mineral deposits (iron ore, talc, etc.). Asbestos is heat resistant and chemically inert so it is useful in insulators, brake liners, gaskets, roofing materials, paint fillers, filters, reinforcing agents in rubber or plastics, etc. Stability and fiber size are thought to be important for asbestos-related lung damage or cancer (lung and mesothelioma). Because of these potential health hazards, OSHA has proposed lowering the asbestos workplace standard from 2 fibers/cc to 0.5, 0.2, or 0.1 fibers/cc.

The Canadian government is funding research aimed at reducing the health hazards of asbestos and making it safer for industrial use. This could help with the use of asbestos in industry.

Asbestos Substitutes

Overexposure to asbestos has been blamed for thousands of deaths and for affecting the health of even more people; asbestos exposure has been linked with lung disease, lung cancer, and mesothelioma (a rare type of cancer). Furthermore, asbestos-related lung cancer is enhanced by smoking rettes.

Asbestos substitutes such as glass fiber, mineral wool, and ceramic fibers have been commercial successes. However,

recent animal studies indicate that some asbestos substitutes may also pose a health hazard.

Many scientists believe that any fiber that is long, thin, and durable may have the potential to be a health hazard if inhaled in sufficient quantities. Dr. Philip Enterline, a renowned epidemiologist, says that several types of insulation fibers may be potentially carcinogenic, but are less toxic than asbestos. Dr. Enterline is presently studying workers who were exposed to glass fiber and mineral-wool fibers.

Ceramic fibers have been tested in two rat inhalation studies; one study showed a carcinogenic effect, while the second study showed no such effect. As a precautionary measure, the U. S. Navy has banned the use of ceramic fibers during ship construction or maintenance.

In June 1987, a scientific review was sponsored by the World Health Organization to consider health-effect issues of asbestos. OSHA is also debating whether to recommend stricter workplace exposure limits for asbestos substitutes. Both industry and academic institutions are planning new studies on fiber insulation safety. If asbestos substitutes are judged to affect human health, the result could cause more government regulations and lawsuits. The final chapter of this saga has yet to be written.

Clarified Slurry Oil/Reformulated Products

Shell Oil recently informed EPA that it reformulated three products that formerly contained clarified oil; the products were dust suppressant road oils, an asphalt emulsification agent, and an asphalt recycling product. Clarified oil was replaced with light catalytically cracked distillate (CAS No. 64741-59-9). This reformulation was made because animal skin painting studies had shown that repeated overexposure to clarified oil caused liver damage and skin tumors. Note that in the animal skin painting studies, the clarified oil was applied daily and never washed from the skin.

Nickel Catalysts

Refineries use nickel catalysts and it is possible that nickel subsulfide (NiS₂) accumulates during use of the catalyst, even though one oil company believes the concentration is below 10 ppm. Overexposure to nickel subsulfide is believed to cause human lung cancer, while animal studies show it to be the most potent metallic carcinogen. Worker exposure should be minimized to reduce potential health effects; the workplace exposure limit (TLV) is 1 mg/m³.

Formaldehyde

Formaldehyde is a large volume chemical used in polymers, particle board, and as a preservative in consumer and industrial products. In 1979, a rat inhalation study showed that formaldehyde might be carcinogenic. Since then, at least 10 epidemiology studies involving over 20,000 workers failed to show any excess nasal cancer. In 1986, the National Cancer Institute completed another epidemiology study of over 26,000 workers who had been exposed to formaldehyde in the workplace. This study suggested that formaldehyde does not cause cancer in humans at levels experienced in the workplace and that "when compared to the general U.S. population, deaths from all causes and from all cancers among the exposed workers were about as expected." These epidemiology studies do not show the carcinogenic effect seen in the 1979 rat inhalation study wherein irritant concentrations of formaldehyde caused an increased incidence of nasal tumors.

Reproductive Hazards

Potential reproductive hazards in the workplace are a continuing concern to industry. Recently, the electronics industry has had several class-action lawsuits where workers allege their jobs have caused them to have miscarriages, hysterectomies, and children born mentally retarded or with learning disabilities. These workers claim they have been exposed to more than 500 toxic chemicals, including heavy metals, organic solvents, acids, epoxies, plastics, and gases such as chlorine and arsine. The workers also contend that worker protection was inadequate: gloves, masks, and ventilation were not adequate.

A new study of workers in the electronic industry indicated an increased incidence of reproductive abnormalities.

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However, OSHA officials say the reproductive hazards may not be work-related since the study does not account for life-style (smoking, etc.), planned abortions, etc. These epidemiological studies are not easy to conduct and must be thoroughly reviewed for variables (comparison bias, degree and type of exposure, etc.) that could affect the interpretation of any findings.

This issue of reproductive hazards emphasizes the importance of a corporate health and safety program to include hazard evaluation of purchased products, intermediates, and finished products; worker training; utilization of adequate workplace protection devices; exposure assessment; and medical surveillance. Also, life-style variables must be known to properly assess their influence on worker health.

Air Pollution

Homes are now constructed to conserve energy and this has reduced the amount of fresh air circulated through the house. A recent EPA report suggests that *indoor* air pollution may be a greater health risk than previously thought. Indoor air pollutants include chloroform (from heating chlorinated water), dichlorobenzene (air fresheners), and benzene (cigarettes).

The main source of exposure to benzene is cigarette smoke. Smokers have 10 times the exposure to benzene compared to nonsmokers. However, nonsmokers living with smokers have elevated levels of benzene in their blood. Chronic exposure to high concentrations of benzene can cause blood disorders and leukemia. Recently, two studies have shown that children who live with smoking parents are more likely to have leukemia.

TOXICOLOGY & HAZARD COMMUNICATION NEWS

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INDUSTRIAL HYGIENE & TOXICOLOGY NEWS



December 1983

Volume 1, Number 1

This document is the first issue of the Conoco Medical Division's Newsletter entitled "Industrial Hygiene and Toxicology News." The Medical Division is attempting to develop a format for dissemination of information which pertains to substances in the operating department's work areas. This deserves a high level of awareness by company personnel to ensure that employee safety and health is protected. Medical Division will also use the newsletter for updates on pertinent medical and health-related regulatory issues.

This newsletter should reach appropriate personnel within the operating departments. We solicit your interest in listing those employees in your department who should receive this publication.

If you have comments concerning the newsletter or the content of specific subjects included, please feel free to call Medical Division at your convenience.


C. L. Whetstone, M.D.
Manager
Medical Division

HAZARD COMMUNICATION

The final OSHA rule on Hazard Communication was published on November 25, 1983. This rule establishes uniform requirements which ensure that hazards of all chemicals produced or imported within the manufacturing sector are evaluated and that hazard information is transmitted to affected employers and employees. The goal of the standard is to reduce the incidence of chemically-related illnesses and injuries in the manufacturing industries.

Manufacturers, importers, and distributors are required to be in compliance with the rule by November 25, 1985, whereas all aspects pertaining to employers have to be completed within an additional six months from that date. Employers are required to have a written hazard communication program which specifies the methods used to inform employees about the hazards of chemicals to which they are exposed. This program will include container labeling, other forms of warning, Material Safety Data Sheets, and employee training. Copies of the Material Safety Data Sheet for hazardous chemicals are to be accessible to employees in the workplace. (Contact M. A. Chance for a copy of the regulation.)

API stated that if the rule had been delayed, they would have sent a communication to the Office of Management and Budget indicating API support of the standard and a desire for its expeditious promulgation. One reason for API's support is that the regulation preempts the increasing state and local hazard labeling laws. Currently, 17 states have passed chemical labeling "Right-to-Know" laws; 8 of these were passed in states in 1983. Also, 34 local communities have adopted their own programs; 22 ordinances were passed during 1983. Additional state and local laws and ordinances are pending.

Occupational Exposure to Ethylene Dibromide (EDB)

EDB is a lead scavenger in leaded gasoline (ca. 1000 ppm) and is a pesticide. Du Pont is a manufacturer and Conoco uses EDB in leaded gasoline. Recent animal studies have shown that, as with many halogenated hydrocarbons, EDB is a potent intoxicant (less than or equal to 10 ppm) and poses risks of carcinogenicity, mutagenicity, spermatotoxicity, reproductive toxicity, and damage to numerous internal organs. A Federal Register proposal on October 7, 1983, by OSHA would lower the average workplace exposure limit to 0.1 ppm (present limit is 20 ppm) with a ceiling of 0.5 ppm. The proposal also restricts skin exposure and sets requirements for personnel monitoring, methods of control, personal protective equipment, hygiene practices, medical surveillance, and employee training and education. The proposal does not apply to automotive service stations or the distribution, storage, or bulk handling of leaded fuel since OSHA has data showing these areas have worker exposure levels below 0.01 ppm. Analytical detection is at least 0.00001 ppm. However, operations that will be regulated include those dealing with the production, blending, and packaging of products containing EDB, such as regular gasoline. Thus petroleum operations personnel should review potential exposures to EDB, especially where concentrated forms of EDB are used (i.e., additive formulations for preparation of leaded gasoline). More information on this regulation can be obtained from Ms. M. A. Chance, Medical Division.

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REPRODUCTIVE UPDATE

Refinery Waste Treatment/ Reproductive Hazards

Exxon recently reported that wives of workers at a wastewater treatment facility (Baton Rouge) had an abnormally high incidence of spontaneous abortions and that the effect may be related to their husbands' exposure to chemicals or heavy metals at the refinery. However, government officials could not verify a significant health effect but the officials encouraged the use and proper maintenance of seals and other devices that reduce exposures to potential toxic materials.

Birth Defects/ Biological Mechanism

Approximately 2 percent of newborn infants have birth defects. To better understand this problem, the Chemical Industry Institute of Toxicology (CIIT) is studying how birth defects (teratogenesis) occur. Animal and human cell culture techniques are being used to determine how teratogens, like thalidimide, cause birth defects. A popular theory is that tissue growth is controlled by cell-to-cell communi-

cations via gap junctions which allow exchange of chemical messengers; this process is called "metabolic cooperation" and may be important in explaining birth defects, as well as cancer.

Glycol Ethers/ Reproduction Toxicity

Glycol ethers are solvents used in the petroleum industry and worker exposure is a distinct possibility. Animal studies have recently shown that glycol ethers, such as Cellosolve®, Methyl- and Butyl-Cellosolve®, cause dose-related reproductive toxicity in both sexes (birth defects, sterility, etc.); these effects are not seen at levels of 10 ppm or less. Haskell Laboratories (Du Pont) has lowered the acceptable exposure level (AEL) of the various cellosolves by approximately fivefold to now be 1-25 ppm. Skin contact should be avoided, and operating personnel should determine whether glycol ethers are used in the workplace and ensure that exposures are minimized.

Toxicology Studies With Gasoline

Recent studies supported by the American Petroleum Institute, API, involved mice and rats being exposed to unleaded gasoline vapors at concentrations of 67, 292, and 2056 ppm for 6 hours a day, 5 days a week for two years. Remember, the U.S.A. exposure standard for gasoline is 300 ppm. The most significant result was that male rats had an increased incidence of damage and tumors in the kidney. In July, an industry-supported workshop concluded that this new information did not, by itself, mean that gasoline was a significant health hazard; a review of the toxicity, human exposure, and human medical records do not indicate that gasoline poses a significant health hazard. However, API is conducting a thorough research program to fully assess the potential health effects of gasoline.

Conoco personnel are very much involved in the above API activities. Conoco has also prepared precautionary literature that has been distributed to employees through pay envelope stuffers and is available to customers at Conoco-operated service stations. Also available for distribution is an article in *Conoco World*, wherein Dr. C. L. Whetstone, Medical, explains API and industry research and assessment of gasoline health hazards. Conoco North American Marketing has developed health warning decals for gasoline pumps and portable containers. A product information telephone number (405-767-6000) has been reserved by the Medical Division in Ponca City so that inquiries can be answered promptly.

Asbestos

For the past three months OSHA has oscillated between publishing an emergency temporary standard, ET, or preparing a regular 6(b) rulemaking. The ETS, published November 4, 1983, reduces the workplace standard from 2 fibers/cc to 0.5 fiber/cc. Compliance shall be achieved by any feasible combinations of engineering controls, work practices, and personal protective equipment and devices. The asbestos industry won a court stay temporarily blocking these new tougher limits, pending a hearing on January 12. OSHA was to have a final standard out within six months.

Respiratory Toxicity of Asbestos and Fibrous Glass Insulation:

Asbestos is a good insulator but the fibers are known to cause lung disease and abdominal tumors (mesotheliomas). Fibrous glass is being used as a substitute for asbestos, but fewer toxicity studies with fibrous glass have been conducted. Some types of glass fibers have produced abdominal tumors in exposed rodents but, as with asbestos, the fiber diameter and length determine carcinogenic potency. Asbestos is more toxic to the lungs than glass fibers and this is probably related to the greater durability of asbestos. Interestingly, recent reports show that both short-term test tube assays and 3-12 month animal studies can be used to demonstrate the potential health effects of natural or synthetic fibers. Regardless, Conoco management should evaluate workplace exposures and practices involving insulation materials containing asbestos or fibrous glass.

Hearing Conservation Program

One of the requirements for the hearing conservation program is the completion of baseline audiograms by March 1, 1984, as per OSHA regulations. All coordinators are to comply with the regulation. If you have problems with compliance, please needs assistance, please call Mukherjee at 405-767-5489.

CARCINOGENESIS HIGHLIGHTS

Carcinogenic Study 1 Acrylamide

Acrylamide is used in the production of polyacrylamide polymers which are used as drilling mud additives, chromatographic and photographic media, mining flocculants, and friction reducers. An industry-supported study has shown that acrylamide, known to cause nerve damage, dissolved in the drinking water of rats (2 ppm) caused tumors in the brain, spinal cord, mammary gland, uterus, mouth, pituitary gland, and thyroid gland. Tissue from lower dose groups still needs to be evaluated and a final report is being prepared. The workplace exposure limit is 0.3 mg/m³ (0.1 ppm), but skin exposure must be avoided.

ZEOLITES/CANCER RISK

Zeolites are natural mineral or synthetic materials that refineries use in catalytic operations. Recent animal studies suggest that zeolites cause cancer and lung disorders similar to effects used by asbestos or silica. A final scientific or hazard assessment has not been determined; many natural zeolites and most synthetic zeolites are not fibrous and thus seemingly not capable of causing asbestos-like toxicity. Regardless, Conoco personnel should evaluate overall utilization of and exposures to zeolites and act to minimize potential health hazards.

Mineral Oils/International Agency for Research on Cancer (IARC)

Scientists representing IARC, academia, and industry concluded recently that the carcinogenicity of mineral oils (distilled oils, acid-treated oils, solvent-refined oils, hydrotreated oils, white oils, petrolatum and aromatic oils) depends on the degree of refinement; untreated or mildly treated solvent refined oils are carcinogenic, whereas severely refined oils are not carcinogenic, probably because high molecular weight aromatics have been removed. The data is mostly from animal studies but a few epidemiology studies also show a carcinogenic response. Thus, management should assess workplace and products for the potential health hazards of petroleum liquids.

ALCOHOLS/MUTAGENESIS AND CARCINOGENESIS

The EPA has reported on animal studies showing that n-propyl and isobutyl alcohol are mutagenic in bacteria and carcinogenic in rats. The EPA is assessing whether these chemicals pose a significant health hazard based on toxicity and exposure data.

Cost-Effectiveness of Cancer Research

Dr. M. C. Weinstein, Harvard, has evaluated several areas of cancer research and calculated the cost-effectiveness of each. An example was a comparison of recent studies where: (a) p-dichlorobenzene was bioassayed for carcinogenicity in mice and rats and (b) Vitamin A was evaluated in human trials for cancer prevention effects. Estimates of cost-effectiveness were \$11,000 for the p-dichlorobenzene studies and \$91 for the Vitamin A studies. Dr. Weinstein's conclusion is that most cancer research is informative but the studies should reflect cost-effectiveness. Conoco should remind the government of this philosophy when commenting on proposed regulations.

Titanium Dioxide/Unexpected Carcinogenesis

Du Pont is a major producer of TiO₂, a material used for whitening and opacifying paints, paper, and plastics. Conoco uses many of these products in everyday operations. The workplace exposure standard is 5 mg/m³ (respirable dust) but unexpected toxicity was seen when Du Pont recently completed rat inhalation studies (10, 50, or 250 mg TiO₂/m³; 6 hrs/day, 5 days/week for 2 years). The low and mid-dose groups showed no signs of toxicity, but the high-dose group had dust-filled lungs and increased incidence of benign and malignant lung tumors. Du Pont stated that it plans further studies, but there are no reports of respiratory disease concerning the more than 50 years of TiO₂ production. Note that a rodent ingestion study in 1974 conducted by the U.S. government showed no adverse effects.

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Du Pont believes the present workplace standard of 5 mg/m³ provides adequate protection, but Conoco managers should assess worker exposure to products containing TiO₂.

Formaldehyde/Epidemiology Study

Formaldehyde is estimated to be involved with 8 percent of the U.S. gross national product, and ~~Conoco uses it as an antimicrobial in petroleum products and drilling operations.~~ Animal studies recently showed that formaldehyde caused nasal tumors in exposed rats, and government regulations have been anticipated which would limit industrial use and worker exposures.

No increased cancer risk was seen in recent epidemiology studies involving European or U.S. workers (Du Pont study). Also, the Consumer Product Safety Commission, CPSC, has reversed themselves and agreed to approve the use of urea-formaldehyde foam for insulation purposes. This decision by CPSC was partially the result of animal and epidemiology studies that more completely evaluated potential health hazards of formaldehyde.

Conoco operations should be aware of potential exposures to formaldehyde since the chemical is very reactive and poses a potential health hazard as reflected by the workplace standard of 1 ppm (1.5 mg/m³).

New Benzene Regulations in Canada

The Ontario government has proposed new occupational exposure regulations for benzene (1 ppm time-weighted average, TWA, and a 5 ppm ceiling). The present U.S.A. standard is 10 ppm (TWA) but OSHA will soon propose a much lower standard, perhaps in the range of 0.1-1 ppm. Benzene activities in the U.S.A. have included publication by OSHA of a regulatory timetable (proposed workplace standard in November 1983, public hearings in February of 1984, and a final rule by June 1984).

An international conference on benzene was held in New York City on November 3-4 and was attended by W. D. Broddle, Ph.D., Medical. Studies reported showed benzene is more potent (blood and solid tissue tumors, immune deficiencies, etc.) than previously thought, and OSHA will be under pressure to propose more strict workplace regulations.

A review of the conference is available, but the data reported should give OSHA sufficient justification to lower the 10 ppm benzene standard. No specific indication was given as to what OSHA will propose.

Conoco Medical will stay abreast of these activities to keep you informed.

OKAY TO SAY THIS! Skin Absorption of Solvents

Human studies involving tetrachloroethylene, 1,1,1 trichloroethane, xylene, styrene and toluene showed that absorption of solvent vapors through undamaged skin is minimal (0.1-2 percent of amount absorbed from the respiratory tract). However, damaged skin may be more absorptive. Conoco operations use these solvents and employees should be warned of this possibility of skin absorption.

Dioxins/Health Hazards

Dioxins are chlorinated polycyclic-like hydrocarbons that are contaminants or products of processes utilizing chlorination in some form and in the presence of organic matter. Dioxins are very toxic (lethal dose, mcg/kg range) to laboratory animals and a government-sponsored panel of scientists concluded that dioxins pose a potential carcinogenic risk to humans. However, more research is needed to make a more definitive conclusion. For sure, dioxins are potent irritants.

Conoco personnel should contact Medical Division if they believe dioxins are involved in workplace exposures or in any of Conoco's industrial wastes.

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This newsletter will be published periodically to summarize recent health-related information that appears to be of potential interest to Conoco personnel. The subject matter will not be exhaustively researched but only briefly reviewed; material will be included because of general interest or possible importance to past, present and future Conoco operations. Contact Ms. M. A. Chance, Medical Division, for more details; comments on the newsletter will always be appreciated.

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INDUSTRIAL HYGIENE & TOXICOLOGY NEWS



March 1984

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Federal Hazard Communication Versus State Right-to-Know — Federal Courts to Decide

The Federal Hazard Communication Standard published in November of 1983 took nearly a decade to evolve into a final standard and has been referred to as the most significant regulatory action ever taken by OSHA.

The standard applies to chemical manufacturers and importers in SIC codes 20 through 39 (for Conoco, this includes Refining, Chemicals, Conoco Specialty Products Inc., laboratories, and distributors of Conoco products). The regulation requires that materials manufactured and used must be assessed and Material Safety Data sheets developed and distributed. Warning labels must be affixed to containers of hazardous materials distributed and to containers used in the

workplace. A written hazard communication program must be developed including an inventory of hazardous chemicals at each site. Employee training must be conducted where hazardous chemicals are used.

No sooner was the standard published than the United Steelworkers sought judicial review. They have been joined by the AFL-CIO, Public Citizen, Inc., and three states which have enacted right-to-know laws. Interveners on OSHA's side include CMA, API, and National Paint and Coatings Association. Substantial issues raised are the limited application of the standard to certain SIC codes, trade secrets, and whether OSHA can delegate to industry the authority to determine what is hazardous.

Perhaps the toughest legal question facing OSHA and other parties is whether, or to what degree, the OSHA standard preempts the state and local right-to-know laws that have been enacted in 16 states and several cities during the last few years. (See related map.) If Conoco operating departments have been excluded from the federal regulation, their operation could still be covered by the state right-to-know laws.

The decisions will be made in the courts, but either way, we shall be seeing industry activity in the areas addressed by the standard.

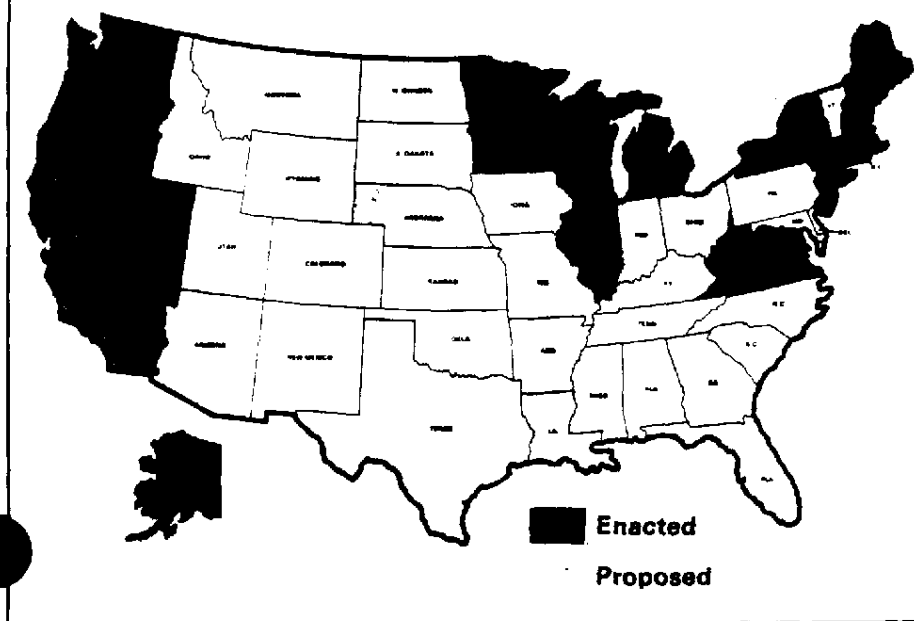
HEAD OF OSHA RESIGNS

Thorne G. Auchter, Assistant Secretary of Labor for the Occupational Safety and Health Administration (OSHA) is resigning his post effective March 31, 1984. Patrick R. Tyson, Deputy Assistant Secretary, will become Interim Assistant Secretary.

New "Product Information" Telephone Service

Do you have health-related questions on Conoco products? If so, call the newly developed "Product Information" telephone number which has been established in the Conoco Medical Division in Ponca City. The number is ETN 442-6000 or 405-766-6000. For calls coming in after the normal business hours, an answering service is available. Requests may be left on the recording and will be answered as soon as possible. Emergency calls coming in after normal work hours will be referred to another number where a medical call is used to obtain an immediate response.

States With Active or Proposed Right-To-Know Statutes
March 15, 1984



PCBs/Human Health Risks

The Federal Register (December 8, 1983) contained a proposed EPA rule to exclude regulation of certain inadvertently generated PCBs and the processing, distribution, and recycling of PCBs. The EPA is proposing this rule based on a risk-to-benefit analysis and represents the agency's most recent appraisal of potential health effects of PCBs. The review concludes that PCBs may cause reproductive toxicity, cancer, and contact irritation. Health risks depend on toxicity, potency, and degree of exposure; EPA notes that the PCB content of Americans' fat tissue is decreasing, probably due to governmental regulations which have reduced exposure to PCBs.

This proposed rule demonstrates that EPA is willing to consider the societal benefits of a chemical before proposing regulations that would more rigidly control the health hazards of a commercial product.

Asphalt Industry Health Committee

In 1980, the Asphalt Roofing Manufacturers Association organized an Industry Health Steering Committee to provide industry's response to (1) OSHA's deliberations on whether to exclude asphalt from the cancer-like regulations called the Coal Tar Pitch Volatile (CTPV) standard and (2) a NIOSH-supported study, reported in 1981, that showed asphalt fume condensate was carcinogenic in a mouse skin painting study. Regardless, OSHA subsequently exempted asphalt from the CTPV standard based on differing health effects of asphalt compared to CTPVs. OSHA still considers asphalt to present a hazard to exposed employees, but appropriate workplace practices will minimize this potential hazard.

The asphalt health committee is presently reviewing the need for further animal experimentation which would more fully assess potential health

Formaldehyde and Cancer Risks

Formaldehyde is a widely used industrial chemical, and much attention has been given to animal inhalation studies that showed increased incidence of nasal tumors. Department of Labor's OSHA administrators recently decided *not* to initiate emergency rule-making since the evidence *does not suggest* that formaldehyde poses a "grave health risk" to workers. EPA has also rescinded its 1982 decision to regulate formaldehyde as a toxic substance. Quantitative risk assessment (QRA) by OSHA projected that the cancer risk for most exposed workers was 1.5 per 10,000 employees and that this level is far below the 1 in 1,000 risk which the Supreme Court has noted a reasonable person "might" conclude warranted permanent rule-making. This decision is noteworthy since it demonstrates a portion of OSHA's risk assessment philosophy—particularly as it relates to a Supreme Court decision.

hazards of asphalt. The committee is also monitoring ongoing NIOSH research with asphalt and is funding a study survey to determine if an epidemiology (worker health) study is feasible for asphalt roofing workers.

In March of this year, a European-based organization, The International Agency for Research on Cancer (IARC), evaluated published studies dealing with carcinogenicity of asphalt and concluded that there is only "limited" animal test data showing asphalt is carcinogenic. Related to this activity is a decision by the Asphalt Institute to form an Ad Hoc Technical Task Force on Health Aspects of Asphalt (Dr. T. J. Chester, Medical, is a member). This task force will review the status of activities within governmental agencies concerning environmental and health aspects of asphalt and, if needed, recommend action to be taken by the Asphalt Institute.

OSHA's Emergency Asbestos Standard

The U.S. Court of Appeals for the Fifth Circuit March 7 struck down the OSHA emergency temporary standard (ETS) governing the permissible workplace exposure to asbestos because the record failed to show a "grave" risk as defined by the agency or that the ETS is "necessary" as the term is used in the Occupational Safety and Health Act. The Appeals Court had granted a temporary stay of the standard, which reduced the time-weighted permissible exposure level (PEL) for ambient asbestos fibers 2 f/cc (fibers per cubic centimeter) to 0.5 f/cc, pending judicial review of the rule.

The Circuit Judge said, "No new data or discovery leads OSHA to invoke its extraordinary ETS powers and lower the asbestos PEL." The court further stated that this finding should not be construed as a prediction that a lower asbestos PEL would fail under judicial scrutiny if OSHA promulgates it pursuant to proper notice-and-comment rulemaking procedures.

Polychlorinated Biphenyls (PCBs) Storage for Disposal Regulations

In the Federal Register of November 17, 1983, EPA announced its policy on storage for disposal of PCBs (40 CFR Part 761). The regulations prescribe a one-year time limit on storage of PCB articles or PCB containers prior to their eventual disposal. EPA reminds the regulated community of the one-year time limit on storage which began on January 1, 1983, and is enunciating its policy to insure adherence to the regulations. The agency will not extend the one-year time limit to allow PCB waste generators or disposal facilities additional time to store and dispose of PCB waste. EPA will allocate liability between the waste generator and the disposer for failure to meet the one-year disposal deadline.

The Implications of Genetic Testing

Progress made in the field of genetic engineering within the last decade is changing scientific thinking in numerous areas of the biological and physical sciences. Some applications of these scientific advances may directly affect workplace practices.

For example, based upon the genetic material at birth, scientists are now able to predict the likelihood of some types of disease, and perhaps monitor for occupational toxicity in adult life. However, one must remember that scientists disagree on interpretations of data derived from genetic testing in humans.

A worker's susceptibility to disease from exposure to toxins on the job may be predictable, in part, from the genetics of the individual. These advances may have far-reaching implications for human resource management.

There are two potential human resource management applications of genetic testing:

1. *Genetic screening* is a one-time testing procedure to determine whether a job applicant carries genetic traits that could predispose them to adverse health effects when exposed to certain chemicals. The usual means of obtaining genetic information is by analyzing the blood or urine.
2. *Genetic monitoring* is the routine testing of an employee working with potentially toxic substances to detect any changes in the genetic material of the exposed employee. Evidence of genetic impairment could indicate the need to assess workplace exposures, practices, processes, and engineering controls.

There are only isolated examples of companies using genetic tests. The only source of information on genetic screening and genetic monitoring is a recent survey published by the Office of Technology and Assessment. Of 366 respondents to the survey (including CEOs of 100 companies, the directors of 100 utilities and unions), 6 companies (1.6 percent of the respondents) were presently using genetic tests, while 59 (16.1 percent) were contemplating genetic testing in the next five years.

Causes of Cancer

Many industry critics receive much publicity when they suggest that a high proportion of cancers is caused by industrial exposures. However, many reputable scientists refer to a 1975 publication in *Lancet* by Blot and Fraumeni that shows the following estimates:

Proportion of Cancer Deaths in the United States

Factor	Best Estimate, %	Range, %	Cancer Deaths
Tobacco	30	25-40	120,000
Alcohol	3	2-4	12,000
Diet	35	10-70	140,000
Food Additives	1	-5*-2	4,000
Sexual Behavior	7	1-13	32,000
Occupation	4	2-8	16,000
Pollution	2	<15	8,000
Other	18	—	72,000

*Animal studies show that some food additives (antioxidants, etc.) are anticarcinogenic.

These data demonstrate that the best estimates for causes of cancer are (a) variable within a numerical range, (b) highly dependent on lifestyle, and (c) not greatly related to occupational exposures. Regardless, industry will continue to minimize workplace exposures, control health hazards, and maintain a healthy work force.

While these survey results should be interpreted cautiously, they do appear to indicate a growing interest for the introduction of genetic testing into the workplace.

Used Motor Oil— Chemical Advisory

EPA has published a Chemical Advisory on used motor oil based on a 1981 API skin painting study in which mice treated with used motor oil developed malignant and benign tumors. As the first risk warning issued by EPA under the Toxic Substances Control Act, the notice underwent extensive agency review prior to approval.

This "Notice of Potential Risk" contains a list of "dos" and "don'ts." The notice warns service station workers, engine mechanics, and others who handle motor oil to "avoid skin contact with used oil, and promptly remove any used oil from their skin."

The health warning states that test mice "developed skin cancer after their skin was painted with used motor oil twice a week, without being washed off, for most of their life span. While this study is not conclusive, substances found to cause cancer in laboratory animals may also cause cancer in humans."

The EPA may consider the use of advisories for other materials, particularly if data indicate the substance may cause a health hazard and exposure can be limited. "Underground Storage Tanks" and "Cutting Oil" may be topics for upcoming advisories. Copies of the Used Motor Oil Advisory are available through Mary Jo Chance, Medical Division, Ponca City (442-2140).

Aquatic Toxicity of Aromatic Hydrocarbons

Some petroleum and coal-derived process liquids contain high concentrations of aromatic hydrocarbons (AHCs). The refining of these materials and consumer use of the derived products increase the possibility of environmental exposure to these AHCs. Thus it is of interest that recent published data show that there is a structure-activity relationship (SAR) for the aquatic toxicity of AHCs. The studies involved trout, bass, sunfish, and goldfish. Aquatic toxicity for the AHCs increased with (a) the number of aromatic rings, (b) the substitution of nitrogen into the aromatic ring, and (c) the percent chlorination. Aquatic toxicity also correlated directly with fat solubility. These data have allowed scientists to construct mathematical models that enable the use of computer-assisted predictions of toxicity.

Reproductive Hazards

The U.S. Department of Health and Human Services has estimated from a 1980 survey that 17 percent (314,000) of working women who were employed during pregnancy were potentially exposed to teratogenic (birth deforming) agents.

In this regard, Du Pont recently issued a review on reproductive hazards that relate to the following items of interest:

- The workplace can present reproductive hazards to a man, woman, or fetus. The woman is unique since she can become pregnant and carry the fetus into the workplace.
- Critics, especially women's groups, believe that companies sometimes use reproductive issues to discriminate against the female worker. However, some studies indicate that reproductive toxins can also affect the male. Animal studies can indicate if the chemical is a reproductive hazard to either sex and/or the fetus.
- Reproductive hazards can be controlled through the use of training programs that explain potential health hazards, utilization of engineering

controls, proper work practices, and use of personal protective equipment. A last resort may be the exclusion from the workplace of expectant mothers or women who are of child-bearing age.

- Very few chemicals pose a reproductive hazard; for example, Du Pont has only 7 chemicals out of some 25,000 substances that require special controls because of potential reproductive hazards. Only 0.5 percent of the domestic work force is affected.
- Animal studies are the best approach to evaluating reproductive toxicity (growth retardation, deformities, behavioral or genetic problems, etc.).

While some chemicals pose reproductive hazards, precautionary measures can minimize adverse health effects.

Contributing authors include:
W. D. Broddle, Ph.D.
M. A. Chance
O. D. Steffey, Ph.D.

Hazard Certification Of Metalworking Fluids

Conoco markets metalworking fluids such as cutting fluids. The American National Standards Institute (ANSI) recently proposed that products like these should be certified by passing several animal toxicity tests.

Workplace exposures can occur for these products. In the past, formulations have contained nitrites and amines which can form carcinogenic nitrosamines. The American Petroleum Institute is monitoring this ANSI proposal which is progressing quite slowly.

Newsletter Binders

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INDUSTRIAL HYGIENE & TOXICOLOGY NEWS



October 1984

Volume 2, Number 2

WORKPLACE REVIEWS

Hydrocarbons and Nerve Damage

Reports from Europe indicate that excessive exposure to hydrocarbons (solvents for glues, paints, etc.) has the potential to cause nerve damage in humans. However, exposure levels were sometimes quite high, even to the point of obstructing vision and causing unconsciousness. American industry is evaluating the reports and possible similar hazards in the U.S., even though workplace exposures are thought to be adequately controlled.

The American Petroleum Institute's Medicine and Biological Sciences Department has an ongoing research program which is evaluating potential neurotoxic effects of petroleum materials. In early 1985, API will sponsor a symposium on neurobehavioral research. The symposium is intended to promote a better understanding of neurotoxic health effects and allow future research to be more productive.

Noise Control Handbook For Mine Equipment

A handbook published by the Department of Interior Bureau of Mines describes how to protect mine workers against excessive noise and what such protection costs. The 87-page handbook provides information on current and evolving noise control technology for mine equipment. A copy of the handbook, *Mining Machinery Noise Control Guidelines*, 1983, is available without charge from the Publications Distribution Office, Bureau of Mines, 1000 Forbes Avenue, Pittsburgh, Pennsylvania 15213 (Telephone 412-621-4500, Ext. 342).

NIOSH and Health

Safety and health personnel may find it helpful to utilize a mathematical model recently devised by NIOSH (National Institute for Occupational Safety and Health). The model identifies workers most likely to be exposed to toxic chemicals. Data is correlated from two NIOSH sources: the *Registry of Toxic Effects of Chemical Substances* (RTECS) and the *National Occupational Hazard Survey* (NOHS). The correlation between toxicity and exposure allows NIOSH to rank potential health risks. A report is available from NIOSH entitled, "A Model for Identification of High Risk Occupational Groups Using RTECS and NOHS Data;" contact W. D. Broddle, Medical Division, for further information.

Safety Symbols Recommended By Bureau of Mines

The Department of Interior's Bureau of Mines has issued a report which recommends pictorial hazard-warning and safety signs. Although the signs were developed specifically for the minerals industry, the Bureau says the symbols might also be useful in other industrial applications. The use of signs is not required by law; the Bureau recommends them as an effective and low-cost way to promote health and safety. Copies of the report "Use of Hazard Pictorial/Symbols in the Minerals Industry" (PS 84-165 877) can be purchased from the Commerce Department's National Technical Information Service, 6285 Port Royal Road, Springfield, Virginia 22161 (Telephone 703-784-4650) for \$17.50.

Conoco Material Safety Data Sheets

The Hazard Communication Standard, which was finalized on November 25, 1983, is regarded as a standard that will take a great deal of effort with which to comply. The Conoco Medical Division has begun an effort, as required by the regulation, to update Material Safety Data Sheets (MSDSs) for all Conoco products and generate new ones where needed. An MSDS is a technical bulletin which contains information about a product, such as chemical and physical characteristics, health and safety data, and precautions for safe handling and use. A corporate review committee has been formed to utilize expertise in various areas. This committee includes the Operating Department producing the product, Safety Division, Legal Department, Transportation Department, Environmental Conservation, and the Medical Division.

There are approximately 400 Conoco product MSDSs that must be reviewed or generated before November 25, 1985. After this date, MSDSs must be sent either prior to, or at the time of initial shipment, of each Conoco product which is considered hazardous. Conoco will be providing MSDSs for all its products. An effort will also be made to generate MSDSs for all intermediate streams and make these available for employee training prior to May 1986.

The distribution for all MSDSs, being coordinated by the Medical Division in Ponca City. Any request for Conoco MSDSs should be sent to M. A. Chance, Medical Division, Ponca.

CANCER UPDATES

EPA Cautions the Use of An Amine Salt in Metal-Working Fluids

Conoco manufactures several types of metal-working fluids. On June 14, EPA banned the mixing of any nitrosating agents, such as nitrites, with a new chemical which was a triethanolamine salt. This amine was to be used in metal-working fluids. A company had notified the EPA of impending commercialization of this new product. Amines can be nitrosated to form carcinogenic nitrosamines, and in past years this reaction has occurred in metal-working fluids (i.e., cutting fluids).

Cancer Genes in Normal Cells

Scientists have recently discovered that normal cells contain cancer genes (oncogenes) that are usually inactive but can be activated to cause cancer. These oncogenes can be stimulated by factors such as viruses or chemicals. Future research will attempt to discover how oncogenes influence the cancerous process. This research should help explain why the body does not control the growth of cancer cells and, thereby, allow scientists to design better cancer therapeutics or even prevent cancer.

Carcinogenicity of Petroleum Distillates Used as Lubricants

Mouse skin-painting studies conducted by the American Petroleum Institute and Amoco have shown that normal solvent refining (phenol, N-methylpyrrolidone, furfural, etc.), severe hydroprocessing (3000 psi hydrogenation), or moderate solvent refining followed by mild hydroprocessing eliminate carcinogenic activity of petroleum lubricant base stocks. Note that the common use in refining with the solvent, methyl ethyl ketone, MEK, removes only paraffinics and not the carcinogenic polynuclear aromatics.

HEALTH HAZARDS

Risk Assessment of Health Hazards

William Ruckelshaus, EPA Administrator, recently stated that EPA needs to strengthen their risk assessment capabilities. A series of risk assessment guidelines for various health effects are being prepared by EPA for release this year. The guidelines can be used as a part of risk management to control health hazards like cancer, reproductive toxicity, etc. Hopefully, this information can be used by industry and government to better educate employees and the public about control of health hazards. However, it is important to remember that we do not live in a risk-free society and that health regulations should be analyzed for benefits and costs. The fact that society is not risk-free was emphasized by Dr. Bruce Ames, a renowned scientist who prepared a review article summarizing the many carcinogens and anticarcinogens found at low concentrations in natural foods.

Du Pont health professionals have recently decided to evaluate their effectiveness in responding to regulatory initiatives that rely on quantitative risk assessment (QRA) of health risks posed by exposure to chemicals (i.e., carcinogens, reproductive toxins, etc.). The company's plans are two-fold: (1) facilitate coordination among various disciplines pertaining to QRA and (2) encourage research that will reduce some of the scientific uncertainty of QRA. A recommendation has been made that a permanent committee be formed, on which Conoco would be represented, to facilitate interdepartmental coordination on QRA issues.

OSHA's New Asbestos Standard

OSHA has proposed a new asbestos standard of 0.5 or 0.2 fibers per cubic centimeter of air (current standard, 2 fibers per cubic centimeters). Public hearings are in progress, and a final standard is due by July 1985. Regardless, EPA plans to ban all uses of asbestos in the U.S. over the next 10 years.

LANDSCAPE WORKERS

Groundskeeping personnel work with many chemicals (insecticides, herbicides, fungicides, etc.) and noise-producing equipment that can be potential health hazards. Product warning labels should be consulted. Health professionals within the Medical Division can provide assistance concerning these potential health hazards.

Revised Drinking Water Standard

The EPA proposed, as of October 5, 1983, new drinking water standard for selected chemicals, microbial contamination, and radionuclides. Acceptable contaminant levels are set by considering potential health effect or esthetic values. Safety factors of 10,000 or 1,000 are applied, depending on whether the most pertinent data involves limited versus valid human and animal data (WDB).

Sensitization — A Safe Dose?

Sensitization is an allergic response such as some people experience following a bee sting or exposure to penicillin, nickel, chromium, tin, formaldehyde, etc. The response is known to occur at extremely low exposure levels, but recent animal studies on isocyanates (polyurethane coating component) showed that, for the first time, a no-effect level exists for nasal or inhalation sensitization. Minimizing exposures to known sensitizers may prevent allergic reaction responses.

MCD 000017931

CANCER UPDATES

Scientific Review of Carcinogenic Principles

Scientists of U.S. federal agencies have released a draft document (Federal Register, 5-22-84) that reviews current understanding of cancer and how to interpret data from animal or human studies. The following principles were published for the purpose of obtaining public comments, by 8-1-84, as follows:

- Cancer is a multistage phenomenon that can be influenced by age, diet, hormones, species specificity, tissue damage (sun burn, alcoholism, etc.), and saturation of detoxification or genetic-repair processes.
- Short-term, test-tube genetic tests can be used to predict carcinogenic activity seen in animals (but the correlation is not more than 70-80 percent).
- Animal carcinogens are considered "suspect" human carcinogens. It is appropriate to use high doses in animal studies to avoid false negative responses and achieve adequate biological and statistical interpretations.
- Significance of a carcinogenic response in animals is influenced by factors such as reproducibility, dose response, multiple sites of tumors, etc.
- Epidemiology (human) data is the only direct method to assess carcinogenic risk in man.
- Exposure data in animals and humans is important.
- Assessment of human risk depends on the strength of the carcinogenic data, exposure data, human susceptibility, etc.

Overall, this draft document points out the difficult task of evaluating carcinogenic hazards and the degree to which controls or regulations are needed.

SILICA, SILICOSIS, AND CANCER

Silica is a crystalline fiber and may represent a potential health hazard similar to asbestos. For this reason, a symposium was recently held on possible health effects of silica. Several industry epidemiology studies indicate that high silica exposures may be associated with lung cancer while there is a stronger correlation with the lung disease, silicosis. Some animal studies have shown that high silica exposures are carcinogenic; in these studies, silica was injected into the lungs or abdomen of mice or rats at concentrations which were several hundred times the normal worker exposure level. The conclusion reached at the symposium was that current government silica exposure standards minimize respiratory disease or lung cancer that might be caused from exposures to silica.

Silicosis was a recent news item in the *Job Safety and Health Report* (7-24-84, p. 120). The article notes that the Cook County medical examiner ruled the death of a worker, who suffered silicosis after working at the Illinois Brick Company, to be a homicide. The Cook County state's attorney, Richard J. Daley, Jr., will decide whether or not to prosecute the case. According to the county deputy medical examiner, Robert H. Kirschner, the company, which went out of business in 1981, violated EPA regulations for safe handling of silica and *did not provide workers with protection* from silica dust. Another death and 11 cases of silicosis have occurred among former workers.

Another lawsuit involves a former Amoco refinery worker who has lung

cancer and has filed a \$6 million suit against nine companies that manufactured or distributed asbestos. The worker had been employed for 37 years as an insulator, and he claims the asbestos products were defective and unreasonably dangerous.

Health Study of Petroleum Workers

Chevron recently reported that ~~worker~~ epidemiology studies at two facilities involving 14,179 employees ~~showed~~ no work-related health effects. However, for employees hired ~~prior to~~ 1948, there was a slight increase in incidence of lymphatic cancers, and ~~the~~ will be further evaluated in a follow-up study.

TOXIC TIDBITS

Toxicologists Receive Prison Sentences

In April, three former toxicologists of IBT Laboratories near Chicago were given 6- to 12-month prison sentences by a Chicago federal court for falsifying laboratory test data. IBT was a highly regarded toxicology contract laboratory in earlier years, and this incident caused federal regulations to be promulgated which describe how toxicology studies should be conducted and managed.

Potential Toxicity of Antifreeze

Union Carbide recently reported that in studies with pregnant mice and rats, high oral doses of ethylene glycol caused maternal toxicity (except the low-dose group of mice) and malformed newborn. Further studies will investigate whether the reproductive toxicity can occur at nonmaternal toxic doses.

Corporate Toxicology Inquiry

It is important that industrial health hazards be addressed through a program that adequately identifies, evaluates, controls, and thereby minimizes the hazards. In this regard, please notify W. D. Broddle, Corporate Toxicologist, Medical Division, of any toxicity issues that should be addressed. A timely response will be prepared after the matter is thoroughly researched.

The opinions, findings, and conclusions expressed herein are not necessarily those of Conoco but of the authors for each article.

Contributing authors include:

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ZDDP and Testicular Toxicity

In 1980, rabbit dermal studies showed that the much-used lubricant additive, zinc dithio-diphosphate (ZDDP), caused testicular toxicity. Follow-up studies have shown this effect only occurs at concentrations of ZDDP that cause skin irritation; the skin irritation apparently reduces appetite and the subsequent weight loss could cause stress and hormonal changes that adversely affect the testis.

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INDUSTRIAL HYGIENE & TOXICOLOGY NEWS



April 1985

Volume 3, Number 1

Unleaded Gasoline Vapors

Recent animal studies funded by the American Petroleum Institute showed that two years of 8-hour a day exposure to unleaded gasoline vapors caused tissue damage and/or tumors of the kidney and mammary gland. The kidney effects were only seen in male rats and may reflect unusual sensitivity to hydrocarbons since these effects are not seen in several other species of animals or even humans. Later studies indicate that the male rat kidney has a greater tendency to accumulate hydrocarbons compared to other animal species.

In spite of this data, the Environmental Protection Agency and its Scientific Advisory Board have concluded that vaporized unleaded gasoline should be classified as "PROBABLY CARCINOGENIC." This reflects the conservative nature of a regulatory agency.

The American Petroleum Institute is conducting a thorough research program to fully assess the potential health effects of gasoline. Results so far indicate that the more volatile fraction of gasoline does not cause kidney damage in the male rat (the above 2-year study involved totally vaporized gasoline).

This issue on gasoline is a good example of how the petroleum industry strives to assess and control toxic properties of its products. The American Petroleum Institute is supporting the following activities related to motor fuel distillates:

- A contractor is performing a health risk analysis for gasoline.
- Public exposure to gasoline vapors is being evaluated. Prevention of this exposure by vapor recovery systems for automobiles and/or gasoline pumps is also being studied.
- An epidemiology study of petroleum workers is also planned.
- A workshop will be held on October 14-16 to discuss neurobehavioral effects of hydrocarbons.

Collection Of Data For Occupational Illnesses

The American Petroleum Institute (API) is reviewing federal and state developments for reporting occupational illness. For example, OSHA maintains a program dealing with occupational injury and illness, while EPA enforces a law that requires industry to record and inform EPA of worker allegations involving adverse health effects. The state of New York is attempting to establish a carcinogen registry that would be used to review potential workplace hazards. Congress recently allocated \$500,000 so that OSHA could audit industry practices in recording occupational illnesses.

API plans to assess and improve its efforts in tracking employee health. For example, how closely should industry monitor a worker's health after he terminates employment, retires, or is disabled. For sure, government and industry will continue their efforts to monitor and improve worker health surveillance programs.

Petroleum Coke: Animal Studies

The American Petroleum Institute issued a final report on petroleum coke inhalation studies in animals. Three groups of female and male rats and monkeys were exposed for two years (1981-1983) to micronized, delayed-process petroleum coke dust at concentrations of 0, 10.2, or 30.7 mg/m³ (6 hrs/day, 5 days/week).

Petroleum coke dust caused no significant toxic responses in monkeys but a low level inflammatory response was seen in the rats' lungs at 10.2 mg/m³ and benign nodules were observed in the lungs of some female rats at 30.7 mg/m³. Overall, these studies show petroleum coke dust to be a fairly inert material.

Avoiding Overexposure To Hydrogen Sulfide

A petroleum company recently observed that its workers were complaining of headaches, dizziness, and other nervous system effects which were caused by a purchased additive used to manufacture lube oils and greases. The additive's container was found to have the toxic gas, hydrogen sulfide, in the "head space," and workers were exposed when opening the container. By understanding the source of the problem, workers easily avoided overexposure to hydrogen sulfide.

It is important to note that many lube oils and greases contain zinc dialkyl dithiophosphate (ZDDP) and this additive is capable of releasing small amounts of hydrogen sulfide. Routine handling and use of these products should not cause overexposure to hydrogen sulfide.

Coal Pile Runoff

A recent research article reported on simulated runoffs from "model" coal piles that were extracted with acid, methylene chloride, hexane, petroleum ether, and sodium hydroxide. The extracts were then tested using cell culture techniques and shown to cause genetic and other types of cell damage.

Several investigators have conducted similar studies with either simulated or real-life coal pile runoff and reported negative or slightly positive toxic effects for extracts of the runoff. However, one should be cautious in using these results to predict potential health hazards since: (a) solvent extraction is not "real-world" and (b) the human body has protective repair mechanisms that prevent toxic materials from causing adverse health effects.

Benzene/Workplace Regulation

A draft document concerning occupational exposure to benzene has been prepared by OSHA and sent for review

to the Office of Management and Budget. The document is 398 pages long and is OSHA's reply to the 1980 Supreme Court decision to overturn OSHA's Emergency Temporary Standard of 1 ppm as a time-weighted average. The draft proposal suggests lowering the current exposure limit of 10 ppm to an 8-hour time-weighted average of 1 ppm and a maximum short term exposure limit (STEL) of 5 ppm for no more than 15 minutes. It also proposes an action level of 0.5 ppm.

Health Effects Of Attapulgitite

Attapulgitite is a fibrous clay material and is sometimes used as a drilling fluid additive. Recent studies in rats show that inhalation or injection of attapulgitite, as with asbestos, causes lung or abdominal cancer. Mining operations involving attapulgitite indicate that some mine workers have attapulgitite fibers in their lungs and lung damage is evident. Even though potential inhalation hazards are lessened when a fibrous material is in a wet media, as with a drilling mud, workers should avoid overexposure to attapulgitite dust.

—UPDATE—

Hazard Communication/ Material Safety Data Sheets

Conoco is working to meet the Nov 25, 1985 deadline for compliance with the Federal Hazard Communication Rule in regard to Material Safety Data Sheets (MSDSs), container labeling, and other aspects of the rule. Conoco has approximately 500 products for which MSDSs will be developed. Approximately one-third of these products have completed a corporate review process that includes a new MSDS format. Approximately 80 percent of the remaining products are currently being reviewed; all products will have been reviewed by the November 1985 deadline. After this date, Conoco and other manufacturing companies must provide MSDSs to customers upon their initial purchase and with the first purchase after the MSDS is updated. It is not required that MSDSs be provided to retail customers. MSDSs will be developed for all Conoco process streams by May 25, 1985. Conoco Medical is developing an automated procedure to generate MSDSs and to maintain records of the distribution.

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TOXICOLOGY & HAZARD COMMUNICATION NEWS



January 1986

Volume 4, Number 1

Unleaded Gasoline Vapors: New Research Information

Several articles have appeared in this newsletter concerning recent animal studies funded by the American Petroleum Institute. These studies showed that male rats developed kidney damage and kidney tumors after being exposed for two years (6 hours a day) to vaporized unleaded gasoline.

API has committed over four million dollars to conduct further studies aimed at determining whether unleaded gasoline is a significant health hazard. **Preliminary results from these new studies indicate that unleaded gasoline vapors are not a significant health hazard;** these results are as follows:

- Kidney toxicity is only seen in male but not female rats. Test results show that male rats have a blood protein, not found in humans, which binds paraffinic hydrocarbons; this complex seems to become concentrated in the kidney and eventually causes damage and kidney tumors. Future research will determine if humans have blood proteins that bind paraffinic hydrocarbons.
- The kidney toxicity in male rats is not caused by the more volatile gasoline hydrocarbons that account for most human exposure.
- Studies of health records for petrochemical workers have not shown a significant increased incidence for kidney disease or kidney cancer.

Rat studies which showed kidney toxicity involved exaggerated exposures to unleaded gasoline vapors; i.e., 70-2100 parts per million (ppm)

concentration for six hours a day. The most common exposure for the general public is at a service station and the exposure is for only five to ten minutes at concentrations below 10 ppm. Refinery worker exposures average less than 30 ppm. This concentration can be compared to the OSHA regulatory standard of 500 ppm for petroleum distillates or the 300 ppm workplace guideline for gasoline as set by the American Conference of Governmental Industrial Hygienists, ACGIH.

Mineral Oils: Composition and Skin Cancer

For many years, oil companies have tried to determine if there is a correlation between the composition of mineral oils (i.e., lubricating oil) and the potential to cause skin cancer in animal skin painting studies. A European research association, CONCAWE, evaluated data from skin painting studies involving 76 oils; degree of skin painting carcinogenicity was compared to several compositional and physical characteristics (percent of aromatic carbon, refractive index of a dimethylsulfoxide extract, individual concentration of six polynuclear aromatics, specific gravity, sulfur content, and viscosity).

The main finding of the study was that **no single analytical parameter was found to be a reliable predictor of skin carcinogenic activity in animals.** Thus, while several polynuclear aromatics, PNAs, are highly carcinogenic in animal skin painting studies, prediction of human cancer risk cannot be made from simple knowledge of PNA content. Several types of hydrocarbons, including PNAs, are known to be initiators, accelerators, or

inhibitors of the carcinogenic process based on animal skin painting studies. Similar conclusions were reached by the International Agency for Research on Cancer in 1973. Therefore, predicting skin carcinogenic potential of an organic material is not easy since materials containing PNAs may or may not represent a potential health hazard.

Benzene Litigation

Observers called it a landmark decision when a Minnesota administrative law judge ruled on April 22 that Minnesota must pay \$113,000 to families of two highway workers exposed to benzene while working. Workplace exposures to benzene were alleged to be from products like asphalts, kerosene, and gasoline; gasoline was used to clean the worker's clothes while at work. Both workers died of chronic myelogenous leukemia. Chronic benzene overexposure is reported to cause leukemia but the prevalent type of leukemia is acute, not chronic myelogenous leukemia.

Punitive damages were not awarded since the evidence did not uphold the plaintiffs' claim that the Minnesota transportation department had concealed information. It is not known whether the case will be appealed to a higher court. Regardless, the ruling in favor of the plaintiffs could have significance for industries that have benzene in the workplace.

Ceramic Fibers

A recent publication by Babcock & Wilcox Corporation states that ceramic fibers may pose a health hazard. Ceramic fibers are amorphous, aluminum silicate products made from synthetic or naturally occurring clay

(Continued)

Ceramic Fibers (Continued From First Page)

These types of fibers have been manufactured for 25-30 years and are used in many household and industrial products (gaskets, insulators, etc.).

Animal inhalation studies have shown that repeated exposure to high concentrations (95-200 fibers/cc) of ceramic fibers can cause lung damage and tumors. The use of products containing ceramic fibers may form cristobalite, a form of silica, which can cause lung disease if repeated overexposure occurs. In the future, industry will fund studies to evaluate employees who have worked in an industry using ceramic fibers to produce a product. Health-effects related to workplace exposures will be examined; the results from these studies will be available in 3-5 years.

Until more is known about the possible health effects of ceramic fibers, one should be cautious when using products made of this material. Ceramic fibers are not presently regulated by any regulatory agency. However, proper ventilation and protective devices should be used to prevent overexposure to the eyes, skin, or lungs.

Further questions on this matter should be directed to Medical or Safety and Industrial Hygiene personnel; a booklet prepared by Babcock & Wilcox is available upon request.

MSDSs and Labeling Issues

As the deadline of May 1986 draws nearer for manufacturers to maintain Material Safety Data Sheets (MSDSs) in their workplaces for employees, requests for sheets pertaining to Conoco products are increasing. The OSHA Hazard Communication Standard which was passed in November of 1983, specified that by November 25, 1985, the manufacturing industry must have developed an MSDS on each hazardous product manufactured. The MSDS must include data on health and physical hazards, emergency and first aid, transportation, storage, safety, and environmental information. Conoco developed approximately 400 MSDSs covering over 600 manufactured products. This effort involved a corporate MSDS Review Committee consisting of personnel from Medical, Transportation, Safety & Industrial Hygiene, Marketing

Technical Services, Refining Technical Services, Environmental Conservation, Legal, and each department which manufactured the product.

As of mid-October, Conoco started distributing these MSDSs through an automated procedure to all customers upon their first purchase of the product. After an MSDS is revised, a new MSDS will then be provided to each customer upon their next purchase. Procedures have been developed to review and update all sheets every two years. As of December 31, over 33,000 sheets had been distributed to approximately 10,000 customers. That number increases as daily sales are processed. Another effect of the Standard is that labels for all Conoco products which are considered potentially hazardous by OSHA have been revised and placed on product containers. Labeling requirements are also specified by OSHA for bulk shipments made in rail and tank cars. Labels have been developed for all affected Conoco products.

Requests for more information on Conoco MSDSs should be made to Mary Ann Chance in Ponca City on ETN 442-6000 or 405-767-6000.

TOXICOLOGY & HAZARD COMMUNICATION NEWS

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TOXICOLOGY & HAZARD COMMUNICATION NEWS



July 1986

Volume 4, Number 2

Hazard Communication Issues

In May, Conoco received its first Occupational Safety and Health Administration (OSHA) inspection for compliance with the Hazard Communication Standard, which was effective November 25, 1985. The inspector reviewed Conoco's system involving Material Safety Data Sheets, labels, and the Hazard Determination procedure used to decide whether manufactured products are considered hazardous according to OSHA's criteria. An on-site inspection of the Compounding and Packaging facility was also conducted. The inspection resulted in no violations or citations.

Other elements of the Standard were effective May 25, 1986. These included employee information and training, labeling of in-plant containers, maintenance of MSDSs, and development of written compliance programs.

Currently, the Standard only applies to Standard Industrial Classification Codes (SIC) 20-39. For Conoco, this includes Refining and Conoco Specialty Products Inc., but OSHA is planning to broaden the scope of the Standard. This could then affect other Conoco operating departments.

Conoco has developed over 500 MSDSs on manufactured products, additives, and intermediates. MSDSs are distributed to Conoco customers through an automated system following the first purchase of a Conoco product and, thereafter, when an MSDS is revised. Approximately 53,000 MSDSs were distributed to 20,000 customers between November 1985 and June 1986.

For further information concerning the Hazard Communication Program or Material Safety Data Sheets, contact Mary Ann Chance, Medical Division, Ponca City.

Clarified Oil/New Toxicity Findings

Results from a 90-day skin painting study on rats were recently reported by Mobil Oil. Clarified oil from FCC units caused liver damage and mortality at doses as low as 8 mg/kg (approximately 0.1 drop per rat). Carbazole derivatives, c1ccc2c(c1)nc3ccccc3n2, were found to be the major dermal penetrants and may constitute up to 20 percent of the clarified oil. Carbazoles are potent carcinogens and liver toxins in animals. Clarified oil has a boiling range of 500°-1000°F and contains high concentrations of polynuclear aromatic hydrocarbons, some of which are potent animal carcinogens.

This new information should not necessitate a change in workplace practices or engineering designs since Conoco operations minimize potential exposure. However, the new information should be included in future employee training courses. The Conoco Material Safety Data Sheet for Conoco Clarified Oil, and for any Conoco product containing significant amounts of clarified oil, will be modified to contain this new toxicity information dealing with carbazoles.

Proposed Toxicity Testing By EPA

The EPA, using Section 4 of the Toxic Substances Control Act, is proposing animal testing for two petroleum hydrocarbons, methyleyclopentane

(MCP) and hexane. MCP is a major component of commercial hexane products, but there is inadequate information to characterize the toxicity of MCP. The proposal states that MCP should be tested for neurotoxicity, subchronic (90-day) toxicity, and inhalation/dermal pharmacokinetics (absorption, distribution, metabolism, and excretion). Hexane is a known neurotoxin. Hexane would be studied for mutagenicity, subchronic toxicity, carcinogenicity, reproductive toxicity, and pharmacokinetics. The potential costs are \$0.4 MM and \$3 MM for the MCP and hexane studies, respectively. Presently, the testing costs would be shared by commercial hexane (>50 percent n-hexane and >5 percent MCP) producers, but the American Petroleum Institute is interacting with EPA to determine which tests are justified and who must pay for the studies.

Carcinogens in Food Products

The Food and Drug Administration has proposed procedures that would allow food-producing animals to be given low concentrations of compounds which are carcinogenic in laboratory studies (Federal Register, October 31, 1985).

The procedures would implement an exemption to the Delaney clause by permitting the use of carcinogenic compounds (feed additives, veterinary products, etc.) in food-producing animals if "no residue" can be found in edible tissues (milk, meat, eggs, etc.).

Under the proposal, "no residue" would be operationally defined as no residue that would yield a probable lifetime cancer risk of less than one in a million.

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Black Lung Disease

Coal companies have been successful in making mines a safer place to work. However, black lung disease continues to be a problem for industry. A researcher at West Virginia University reports a study showing that highly reactive free radicals may be one cause of black lung. Free radicals can cause tissue damage. Breaking and crushing coal produces free radicals, but their concentration drops swiftly within 5 minutes after the coal is mined. This may partially explain why black lung is difficult to produce in laboratory animal studies. Lung tissue from deceased coal miners shows a direct correlation between the severity of black lung and concentration of free radicals in the tissue. The study may also explain why anthracite miners have a greater risk of black lung since mining of anthracite coal produces more free radicals than bituminous coal.

More research is needed to determine the relationship between black lung and free radicals. But regardless, the coal industry continues to improve

working conditions in the mines. The fact that free radicals, produced during coal mining operations, are short-lived offers additional hope that black lung disease can be minimized.

Aquatic Toxicity of Petrochemical Industry Effluents

Wastewater effluent from the largest Scandinavian petrochemical complex was recently tested for aquatic toxicity using rainbow trout, water fleas, and bacteria. These tests indicate that the petrochemical effluent did not represent an ecological hazard. The effluent was not toxic to the trout nor mutagenic to the bacteria. The water flea was not adversely affected by 2 percent effluent concentration, but 3 percent effluent decreased reproduction rate of the fleas. This latter concentration was much higher than effluent released from the plant site, so the effluent would not be expected to affect reproduction of water fleas under normal operating conditions.

Asbestos/EPA Phaseout

Asbestos is a known animal and human carcinogen. An EPA proposal was published January 29, 1980 which would eventually phase out the mining, manufacturing, and importation of all asbestos products. Three alternatives would make the phaseout either immediate or gradual over a 5- to 10-year period. Public hearings were to begin this summer.

TOXICOLOGY & HAZARD COMMUNICATION NEWS

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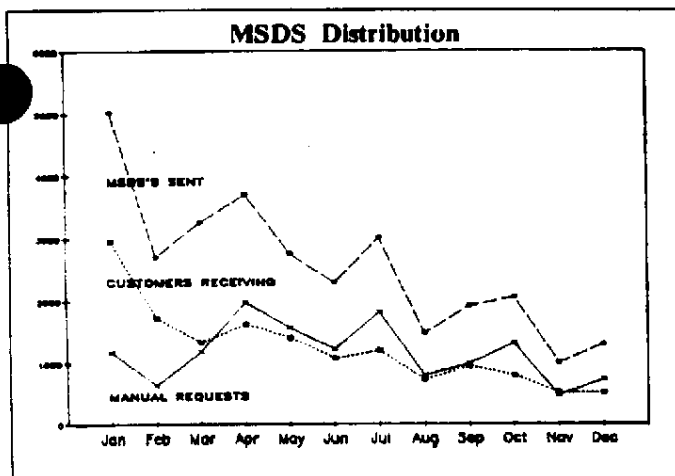


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Hazard Communication A Busy World

The acronym MSDS stands for Material Safety Data Sheet and is becoming a busy buzz word. The preparation of the MSDS is required by the OSHA Hazard Communication Standard, which also requires MSDSs to be sent to all customers upon the first purchase of a product and whenever the MSDS is updated. The chart below shows the distribution of MSDSs usually decreased as a company's customers receive the initial MSDS, even though monthly sales averaged approximately 38,000.



Conoco is complying with this federal requirement by the daily distribution of MSDSs on an automated basis, which distributes MSDSs for product sales and telephone/letter requests. The year 1986 has been busy; a total of 30,346 MSDSs were distributed to 14,712 customers. This number resulted from processing 452,411 product sales and providing 13,854 MSDSs for telephone and letter requests. A total of 180,516 customer records were verified by computer to determine whether the customer required an MSDS.

How to Develop an MSDS

A corporate procedure has been established for development of MSDSs for all products, intermediates, and additives manufactured by Conoco. This procedure involved the development of a Corporate MSDS Review Committee which was established to review and provide input to pertinent sections of the MSDS. The committee has been essential to the development of 538 MSDSs currently being distributed to customers. These MSDSs are also used by various operating departments in training programs. In 1987, a three-year company process will begin for reviewing all current MSDSs.

The cooperation of the Corporate MSDS Review Committee has been outstanding and is greatly appreciated. Their input and support was essential in making Conoco MSDSs a quality product. Our appreciation goes out to the following Conoco groups who assist with the MSDS Review Process:

Conoco Specialty Products, Inc.
Continental Pipe Line
Corporate Safety and Industrial Hygiene
Environmental Conservation
Legal
Manufacturing Technology and Engineering
Marketing and Marketing Technical Services
Medical Division, Houston
Medical Division, Ponca City
Natural Gas Products
North American Refining
Research and Development
Surface Transportation Safety & Environmental Affairs
Toxicology

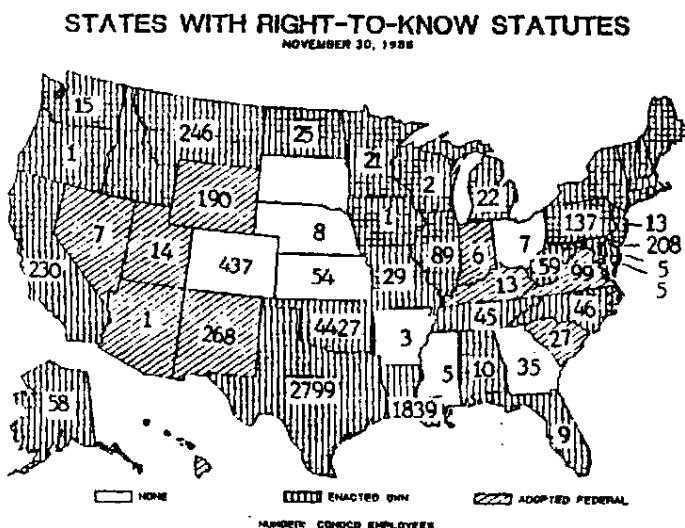
The development of an MSDS can be initiated by contacting Mary Ann Chance, Coordinator, Hazard Communication Program, Ponca City. Medical Division maintains a corporate record of all customers/persons receiving MSDSs; therefore, all requests for distribution of MSDSs should be routed through Ms. Chance's office (405 761-6000; ETN 442-6000).

Ever-Changing/Ever-Challenging Issue: "Right-to-Know"

All manufacturers should be complying with the Federal Hazard Communication Standard which requires, among other things, development and distribution of Material Safety Data Sheets (MSDSs), hazard warning labels, and training programs. While the standard was passed in November 1983 and became effective in November 1985, industry continues to struggle with compliance, partly because of inconsistent interpretations coming from enforcement of the standard.

To further complicate this issue, in September, the U.S. Court of Appeals concluded that the Federal Hazard Communication Standard did not preempt Pennsylvania's Right-to-Know law for the manufacturing industry. This ruling may encourage other states to enact laws with provisions different from the federal rule. One of the main differences between the federal and Pennsylvania laws concerns product labeling. Pennsylvania requires the listing of nonhazardous ingredients on MSDSs if the concentration is 3 percent or more and special hazardous ingredients at concentrations of 0.01 percent or more. The labels must list the five major nonhazardous ingredients or any ingredient present in the mixture at 5 percent or greater. Labels must be placed on products shipped into or through the state. Industry appealed this case to the U.S. Supreme Court, so manufacturers do not have to comply until a decision is issued.

Forty-two states have Right-to-Know laws. An abundance of communities also have Right-to-Know laws which are not preempted by the federal program. The map below designates states with Right-to-Know laws and the number of Conoco employees per state.



Presently, industry is faced with a new challenge because the Superfund Amendments and Reauthorization Act of 1986 (SARA) was passed on October 17, 1986. Emergency Planning and Community Right-to-Know provisions—known as Title III—present a variety of issues to industry. Provisions include reporting requirements covering production and emission of certain substances. A list of over 400 "extremely hazardous substances," along with reportable quantities, are included. The Title III Amendment does not have preemption over state and community Right-to-Know laws. Thus, compliance with Title III does not necessarily mean you are in compliance with OSHA (Occupational Safety and Health Administration), state, or local regulations.

SARA also requires OSHA to issue a standard for hazardous waste workers by October 1987. An interim final rule was issued and became effective December 19, 1986; requirements include training, medical surveillance, protective equipment, monitoring, waste handling, and emergency response procedures.

Compliance issues continue to grow for Conoco and the rest of the petroleum industry. The issues are really 'ever-changing' and 'ever-challenging.'

Hazard Communication — Who Is Complying?

Did you ever wonder if all companies were complying with government regulations? The Occupational Safety and Health Administration's Hazard Communication Standard requires significant compliance by manufacturers. A recent survey of nearly 100 manufacturers in the area around Albany, New York, found that 56 percent of the companies were unfamiliar with the Standard. The survey also showed that 80 percent of the same manufacturers were confused about the differences between the federal standard and New York's Right-to-Know law.

When all the manufacturers were asked about major requirements of the federal standard, 44 percent said they were not using Material Safety Data Sheets, 56 percent had not established labeling programs, 61 percent were not training their employees about toxic substances, and 75 percent did not have a hazard communication program. It should be noted that 91 of the 94 manufacturing companies responding to the survey had fewer than 50 employees.

Uniformity: A Problem in Enforcing the Hazard Communication Standard

The enforcement of the Hazard Communication Standard is troublesome to both OSHA and industry. One reason is that the standard is performance-oriented; OSHA sets goals for industry but does not specify exactly how to reach them. In other words, OSHA has not outlined the steps a manufacturer must take to comply and distinctions between compliance and noncompliance can be "very subtle."

OSHA's enforcement also can vary with each inspector. OSHA has 1,150 compliance officers who have issued 6,123 citations and \$58,000 penalties for violations of the Hazard Communication Standard between November 25, 1985, and December 1986. Of these, 74 percent fell into ten categories (in order of most to least prevalent):

- No written hazard communication program
- No information on training
- No MSDSs
- Missing information on MSDSs
- No labeling identification (in-plant)
- Incorrect label warning (in-plant)
- No written procedures for hazard determination
- No label for shipped containers
- MSDSs not maintained nor accessible to employees
- Incorrect label warnings for shipping containers
- MSDSs lacked required information.

OSHA reported that 1,379 citations have been issued for no written hazard communication programs, 1,039 for no information and training, and 641 for no MSDSs. There were 310 citations for "serious violations," and only 1 willful citation. According to OSHA, 38 days is the average time to correct the problems. Only 132 of the penalties were contested.

Conoco had two OSHA Hazard Communication Standard compliance inspections. The inspections involved the Ponca City Medical Division and the Billings, Montana, Refinery. During the inspection at Ponca City, 58 Conoco MSDSs were taken for a complete review by OSHA; no citations were issued. Following the Billings Refinery inspection, 22 citations were issued regarding 5 MSDSs and corresponding labels. Conoco will contest 12 of these citations and modify the MSDSs and labels for the remaining 10.

Phenol—A Toxic Chemical

Phenol is a corrosive liquid, and its rapid absorption can cause serious internal organ damage and death. Recently, a summer student employee of a petrochemical company in Texas was accidentally sprayed with phenol. Although rescue workers washed most of the chemical from his body within minutes after the accident, he suffered convulsions and died a few hours later.

The victim's parents sued the petrochemical company with failure to take reasonable precautions to prevent the accidental release of phenol, failure to post proper warnings about the chemical's dangers, and failure to instruct employees of proper emergency procedures. The parents won a \$2 million settlement.

Occupational Disorders

The National Institute for Occupational Safety and Health (NIOSH) has begun to develop strategy to minimize what they consider to be the ten leading occupational disorders. These disorders are lung disease, musculoskeletal injuries, cancer, severe trauma, cardiovascular disease, reproductive disorders, neurotoxicity, hearing loss, and skin and psychological disorders. NIOSH believes more emphasis should be put on premarket product testing, worker health, and safety programs.

American Petroleum Institute Update

- The API Toxicology Committee will evaluate the relative health hazards of petroleum pollutants most commonly found in a refinery or at waste disposal sites. Air emissions from land farming sites will also be evaluated.
- API plans to prepare a white paper explaining quantitative risk assessment. Industry pollutants and their health effects (organ damage, cancer, etc.) will be compared to "real-world" health risks, such as lightning, car and home accidents, etc.
- EPA, as dictated by the Safe Drinking Water Act, is setting recommended maximum concentration levels (RCMLs) for water pollutants. EPA proposes to set a RCML of zero for known human carcinogens (i.e., benzene); API will try to convince EPA to set a quantifiable concentration that does not present a significant health risk.

- High exposure to benzene represents a potential health hazard, and API has responded to several state regulations aimed at minimizing exposure to benzene, as follows:

Florida recently adopted a 1-ppb groundwater limit for benzene. API argued that a 10- to 100-ppb limit would adequately protect human health. Costs would be prohibitive for cleaning groundwater to a level of ≤ 1 ppb. Interestingly, nonwater sources account for >99 percent of benzene exposure (workplace, 1000 ppb; urban air, food, and cigarettes, 1000 to 3000 ppb).

California proposes to reduce airborne benzene concentrations 50 percent by the year 2000 (3 ppb down to 1.5 ppb). This may require the reduction of benzene in gasoline from the present 2 to 5 percent to less than 1.4 percent. Hydrocarbon emissions at service stations also may have to be further reduced.

New York is proposing a 1-ppb limit for benzene in surface water.

API has given \$250,000 to the Chemical Industry Institute of Toxicology (CIIT) to better define mechanisms of toxicity for benzene.

- Health Hazard Review of Refinery Products:

Two international organizations, IARC (International Agency for Research on Cancer) and CONCAW (Europe's counterpart to API), have intensified their activities involving refinery streams. IARC plans to publish a document in 1988 which discusses the relative carcinogenic properties of crude oil and motor or heating fuels. CONCAWE will initiate, in January, mouse skin painting studies to evaluate refinery middle distillates (gasoline, diesel fuels, etc.) for their ability to cause organ damage or skin tumors.

- Miscellaneous Issues:

API continues to prepare for EPA Test Rules concerning C_9 aromatics (i.e., ethyl toluene, etc.) and hexane/methylcyclopentane. Each toxicity testing program will cost \$1-\$3 million.

Neurotoxicity and reproductive effects are starting to rival cancer as the dominant health concern for Congress, regulators, and industry. The National Institute for Occupational Safety and Health (NIOSH) and Scandinavian health agencies are proponents of this issue. Workplace exposures, waste disposal, and product labeling may be impacted.

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