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INDUSTRIAL HYGIENE DIGEST

Literature Abstracts

- Industrial Hygiene
- Occupational Health and Safety
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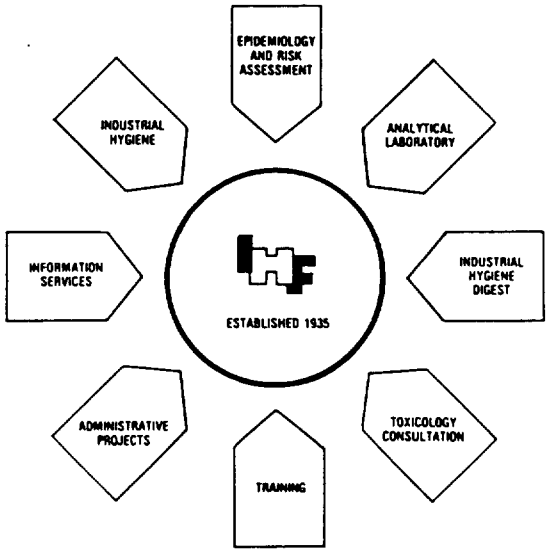

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NEWS ITEMS

1427/93X CHEMICAL EXPOSURE SUBJECT OF CANADIAN PROJECT
IOHA Newsletter 1(3):2, November, 1993.

Accidental inhalation of irritants such as gases and acids in the workplace is the subject of a new research project being conducted by the Institut de Recherche en Sante et en Securite du Travail du Quebec. This type of common occupational accident, which may cause a bronchial obstruction syndrome accompanied by asthma-like symptoms, is frequently overlooked. Currently, there are no statistics on the subject, and few relevant studies have been conducted. The Canadian project will characterize bronchial injuries in workers exhibiting symptoms of the syndrome who haven't received anti-inflammatory medication and establish the extent of function impairment. The evolution of symptoms and the extent and reversibility of residual bronchial obstruction will be described, and subjects' bronchial reactivity will be compared to workers suffering from occupational asthma. Researchers hope the project will increase awareness of this type of occupational injury and provide a basis for the development of a clinical trial of the effectiveness of anti-inflammatory medication administered immediately after an accident.
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1428/93X OSHA LISTS 30 RULES ON TAP FOR '94-95; ERGONOMIC PROPOSAL DUE OUT NEXT SUMMER
Occup. Safety & Health Reporter 23(24):741-742, November 10, 1993.

Employers and workers can expect the Occupational Safety and Health Administration to propose or issue 30 regulations by September 1995, according to an internal OSHA document. Among them, regulations to curb workplace cumulative trauma disorders are set to be proposed by late summer 1994, and a final rule on motor vehicle safety should be issued the following summer, according to the one-page regulatory schedule OSHA has drafted and circulated among some business groups and labor unions. The document lays out the regulations tentatively scheduled to be proposed or issued in the four quarters of fiscal 1994 and 1995. The draft document, dated Oct. 14, is more detailed than OSHA's semiannual regulatory agenda published last month in the Federal Register, which spells out all the proposals and final rules the agency plans to complete and when. For fiscal 1994, OSHA expects to act on 19 rulemakings, including the following: Final rules on reporting fatalities or multiple hospitalizations, electric power, asbestos, and hazard communication, and an advance notice of proposed rulemaking for abatement verification (by Dec. 31, 1993); Final rules on grain handling, confined spaces in shipyards, placards on hazardous materials packages, and personal protective equipment for the face, head, eyes, and feet, and proposals on coke ovens and longshoring (January 1994 through March 1994); Final rules on logging and fall protection for construction (Subpart M), a proposal for recordkeeping, and a notice of a meeting for the steel erection negotiated rulemaking committee (April 1994 through June 1994); and Proposed rules on ergonomics, industrial trucks, and accreditation of training programs for hazardous waste operations, and a final rule on methylene chloride (July 1994 through September 1994). Final rules addressing glycol ethers and personal protective equipment for shipyards are slated for completion by the end of 1994, according to the document. During the first three months of 1995, the agency expects to finalize its hazard abatement proposal and to issue a final rule on walking and working surfaces for general industry (subparts D and I). Final rules on recordkeeping, 1,3-butadiene, and scaffolds for construction and shipyards are all on tap for the third quarter of fiscal 1995, which runs from April 1995 through June 1995. Finally, the agency plans to round out fiscal 1995 by issuing final regulations on motor vehicle safety, coke ovens, and access and egress for shipyards during July, August, and September of 1995. The document lists "additional projects" but does not indicate when the agency thinks it will act on them. These projects include three workplace hazards the agency was petitioned to issue through new regulations: indoor air, chromium, and tuberculosis.
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1429/93X WIDESPREAD LASER USE IN OPERATING ROOMS PROMPTS LEGISLATION REQUIRING SAFETY TRAINING
Occup. Safety & Health Reporter 23(10):749-750, November 10, 1993.

The widespread use of lasers in operating rooms has prompted legislators in New York, Ohio, and Oregon to introduce measures requiring additional fire safety training for nurses, surgeons, and other workers in operating rooms. The move follows the lead of California, which enacted a law in 1992 requiring that all general acute care hospitals develop written policies and procedures for fire safety training. Kimberly-Clark, a manufacturer and marketer of health care products, including non-flammable gowns for

workers and surgical drapes that cover patients, supports the legislation. Lasers and other advanced electrical equipment now are used in 60 percent to 80 percent of all surgical procedures and have been linked with fires in operating rooms and other oxygen-rich environments. The hazards come from a host of sources. For example, Jack Norris, a certified registered nurses' anesthetist and director of anesthesiology for Northern Maine Medical Center in Fort Kent, Maine, said he documented cases of fires in operating rooms and intensive care units that started after: Workers accidentally activated lasers, igniting the surgical drapes that cover patients; A scrub nurse received a burn on her leg from the end of a high intensity fiber optic light cord that melted the drape and burned a hole through her scrub suit; and A spark from an improperly held defibrillator paddle ignited a bed sheet during a cardiac arrest incident. Two proposed bills in New York resemble the California law that went into effect Jan. 1 in that they mandate that training be based on fire safety guidelines and standards from the National Fire Protection Association as they apply to surgical rooms. In Oregon, a bill introduced by state Sen. Robert Shoemaker (D) would require the state fire marshal to adopt rules regarding fire safety for surgical suites. And in Ohio, each hospital would have to develop and provide fire safety training programs for its workers and prepare an emergency fire safety plan for all rooms in which surgery is performed, under a measure introduced by state Rep. Vermel Whalen (D). While legislators examine the issue, health care groups such as the Denver-based Association of Operating Room Nurses (AORN) are embarking on their own voluntary programs.
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1430/93X BILBAO, SPAIN DESIGNATED AS SEAT OF EUROPEAN AGENCY FOR JOB SAFETY, HEALTH
Occup. Safety & Health Reporter 23(26):794-795, November 24, 1993.

The special European Summit of heads of government and state in Brussels on Oct. 29 decided that the European Agency for Health and Safety at Work should have its seat in Spain. The granting to Spain of the new agency came as part of a deal in which 11 new European agencies were given seats across the EC. Spanish authorities subsequently decided that the agency, first created on paper by a 1991 Council regulation (91/C 271/03), will be sited in Bilbao, northern Spain. Work that has been held up in many areas, including safety and health at the workplace, can now go ahead, leaders at the Summit emphasized. According to the terms of the regulation, the new agency will improve the exchange of information and experience in the field of health, hygiene, and safety at work. In particular, the agency will have as its task the gathering and dissemination of data. It also will help the European Commission with the implementation of various programs relating to the work environment, including providing technical and scientific coordination, and advising on training. It will, furthermore, monitor the implementation of EC legislation at the national level and advise the EC on the necessity of setting up machinery to monitor repercussions of that legislation. It will also collect and coordinate information on member states' programs. The agency's administrative board will have a representative from each member state, six industry and six union representatives and three Commission representatives. A director for the agency has not yet been named. It is expected that the agency will be up and running early in 1994.
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1431/93X COURT: TARGET YOUR WARNING LABELS
Occup. Hazards 55(11):18-19, 1993.

Labels on hazardous material containers must include target organ information, a federal court has ruled. The U.S. Court of Appeals for the Sixth Circuit vacated an Occupational Safety and Health Review Commission ruling in Secretary of Labor v. American Cyanamid Co. and said the company was in violation of the hazard communication standard (CFR 1910.1200) for not providing "appropriate hazard warnings." In December 1985, OSHA cited American Cyanamid, which produces resins and molding compounds, for alleged violations of the hazcom standard. The compliance officer said warning labels were not adequate. For instance, a label for silica and talc said: "CAUTION: MAY BE HARMFUL IF INHALED." The compliance officer said the label should have warned against lung damage. OSHA said labels should provide explicit information on which organ a chemical will attack. Cyanamid contested the citation. An administrative law judge affirmed the violation. The review commission overturned it. The commission held that hazcom does not require target organ data on labels. Rather, the standard requires a case-by-case determination if the labels are appropriate for each circumstance, the commission ruled. The secretary of labor, however, interpreted "appropriate hazard warning" to mean disclosure of the effects a chemical exposure would have on specific body organs. The court of appeals agreed with the secretary. In its ruling, the appeals court

cited Appendix A to 1910.1200, which says employees exposed to chemicals should be "apprised of both the change in body function and the signs and symptoms that may occur to signal that change." In a 1985 compliance directive, OSHA stated that phrases such as "caution," "danger," or "harmful if inhaled" generally do not meet the intent of the standard in and of themselves. The court agreed. "A worker who knows that dizziness or nausea results from exposure to a chemical with which he is working is better able to recognize his peril and take protective action than one who experiences symptoms but knows only from the chemical's label that it is 'harmful if inhaled,'" the court ruled.
---Text reprinted

1432/93X BETTER PROTECTION NEEDED FOR DENTAL STAFF, RESEARCHER SAYS IN DETAILING ACCIDENT STUDY
Occup. Safety & Health Reporter 23(23):729, November 3, 1993.

A California researcher Oct. 26 called for stronger measures to protect dental health care workers from potential bloodborne infections, citing the high risk of injury and exposure to blood and body fluids during dental procedures. Francisco Ramos-Gomez, an assistant professor in the Department of Growth and Development at the University of California at San Francisco, said dental health care workers are among the highest-risk groups for hepatitis B infection among all health care workers. Speaking at the American Public Health Association's 121st annual meeting, Ramos presented findings from a study of accidental injuries among dental students and other dental care personnel at various teaching sites at UCSF and the Dental University of the Pacific. Ramos also is director of pediatric dental services at San Francisco General Hospital. Ramos and his colleagues found that dental students, assistants, and residents were at high risk for injuries despite the use of infection control precautions. Some 92 percent of the dental health care workers studied were gloved during their exposures and followed universal precautions at all times. The researchers examined 293 accidental injuries reported at the institutions between October 1989 and December 1992. The incidents included 179 punctures and cuts, 104 needlesticks, 9 mucous splashes, and one bite. They found that dental assistants suffered the highest rate of injury at 25 per 100 person-years, followed by residents with 13 per 100 person- years, and dental students with a rate of 10 per 100 person-years. Restorative procedures were the most risky, with 4.8 injuries per 10,000 procedures, followed by oral surgery (3.5 per 10,000 procedures), and peridontal work (2.1 per 10,000 procedures), according to Ramos. The source of injury was most frequently a dental instrument, accounting for 35 percent of the injuries, while injections accounted for 19 percent of the injuries. According to Ramos, health care provider organizations need to address unique hazards inside and outside health care laboratories, assure adequate supplies of sterile equipment, and reduce unnecessary injections. Furthermore, implementing ergonomic intervention to prevent accidents and ensuring hepatitis B vaccines should be given high priorities, he said. He also called for more education and awareness about reporting injuries or exposures. Future prospective studies are needed to accurately define specific practices that may increase or decrease the risk of occupational exposure, he added.
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1433/93X PSYCHIATRIC HOSPITAL IN CHICAGO CITED BY OSHA FOR WORKPLACE VIOLENCE
Occup. Safety & Health Reporter 23(22):646, October 27, 1993.

A Chicago psychiatric hospital was cited by the Occupational Safety and Health Administration in September for failing to protect its workers from patients' violent behavior, in what observers say could be the first citation OSHA has issued that deals with workplace violence. The hospital did not contest the citations and has worked out an abatement program with OSHA to address the hazards, Ronald J. McCann, director for OSHA's Chicago area office said. Laurette Green, an industrial hygienist involved with the inspection, said she thought the citation was federal OSHA's first directed at workplace violence. A spokesman for OSHA's national office, however, could neither confirm nor deny that claim. Since the agency does not have any regulations that specifically address violence, OSHA used Section 5(a)(1) of the Occupational Safety and Health Act, commonly known as the general duty clause, to address the hazard. OSHA proposed a $5,000 fine against Charter Barclay Hospital for a serious violation of the general duty clause for exposing workers to serious physical injury during "seclusion/restraint incidents with violent psychiatric patients," according to the Sept. 22 citation. The hospital also was cited for five violations of OSHA's bloodborne pathogens standard, with penalties totaling $10,350, and violations of the agency's hazard communication and recordkeeping standards totaling $6,750 in proposed penalties. Workers have suffered fractures, torn

cartilage, bites, knee damage, head injury, and contusions from patients' punching and kicking. Green said the agency nearly halved the penalty levied against Barclay, citing the hospital's cooperativeness and pro-active approach in resolving the hazards. She said the hospital did not ask for a penalty reduction. OSHA laid out its policy on workplace violence in a May 1992 memo that concluded employers could be cited under the general duty clause for failing to adequately protect its workers from acts of violence in the workplace.
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1434/93X PANEL UPHOLDS CMA MSDS FORMS
Occup. Safety & Health 62(11):20, 1993.

An American National Standards Institute panel on Oct. 11 denied an appeal by six industry groups to reverse a voluntary ANSI guideline for material safety data sheet preparation. The organizations asked ANSI's Board of Standards Review on Oct. 7 in New York City for the reversal, but the board opted instead to approve the standard as recommended by the Chemical Manufacturers Association. CMA crafted the guideline to offer more consistent, understandable MSDSs, and ANSI approved the revised forms on June 3. The CMA guideline suggests 16 sections with uniform data requirements and order of presentation for every chemical that requires an MSDS. OSHA's Hazard Communication Standard mandates MSDSs to notify chemical handlers of possible dangers and proper use, but a uniform MSDS outline is not required. The groups said they were denied due process in the rule's formative stages, and CMA did not get a consensus for authorization of the guideline. Only 43 of the 70 groups that CMA questioned favored the consensus standard, they said, and that "constitutes barely more than a majority." In addition, the groups' recommendations for revising the CMA guideline were not included in the completed standard, they said. CMA officials countered that they followed ANSI procedures, and it was not possible to include all of the organizations' recommendations without hampering the overall industry-wide consensus.
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1435/93X JOB SAFETY, HEALTH RULES SLATED FROM ENERGY DEPARTMENT BY YEAR'S END
Occup. Safety & Health Reporter 23(22):657, October 27, 1993.

Contractors working at the nation's nuclear weapons plants can expect by year's end new regulations from the Department of Energy designed to protect workers and the environment from nuclear and radiological hazards, DOE said in its semiannual regulatory agenda published Oct. 25 (58 FR 56268). However, DOE does not know when it will issue a rule setting out how the department will penalize contractors who fail to certify that they use properly trained emergency response workers, according to the agenda published in the Oct. 25 Federal Register. DOE expects to issue both a proposal and a final rule dealing with nuclear safety management. These regulations will form the basic requirements for DOE contractors and subcontractors for ensuring nuclear safety at DOE facilities. A final rule focusing on training, technical safety requirements, safety analysis reports, and unreviewed safety questions is slated for completion by December 1993, according to DOE's agenda. The department's occupational radiation protection final rule is due any day, according to the agenda, which lists October 1993 as the final action date. That rule provides radiation protection requirements for DOE workers and DOE contractor operations, with a greater emphasis on exposure levels "as low as reasonably achievable," commonly known as ALARA, to better protect workers. The regulation also will require that employers have written radiation protection programs. DOE also plans to subject Energy Department contractors and subcontractors to the Price Anderson Amendments Act, which covers safety requirements, training, and radiation protection. The department is unsure when it will publish a proposal laying out procedures for penalizing contractors who do not train workers how to respond in emergencies involving hazardous substances. Contractors who do not certify that they use workers who have been trained also will face penalties under the regulation. The action date for this rule is listed as undetermined. The department also plans to amend its workplace substance abuse programs to include alcohol abuse.
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1436/93X NIOSH MEETING TO FOCUS ON DUST CONTROL DURING DYE HANDLING, WEIGHING OPERATIONS
Occup. Safety & Health Reporter 23(22):659, October 27, 1993.

The National Institute for Occupational Safety and Health will meet Nov. 2 to discuss efforts to control dust during manual dye operations, according to a Federal Register notice (58 FR 54595). The open meeting, scheduled from 1 p.m. to 4 p.m., will focus on the review of a NIOSH project designed to evaluate worker exposure to dye dust during

the handling and weighing of dyes in the drum room of a small dyehouse. The project is being conducted jointly with the Ecological and Toxicological Association of the Dyestuffs and Manufacturing Industry and will include various recommendations for controlling dye dust. One specific recommendation is the design of a ventilated booth, which would be installed at the site and evaluated for its effectiveness.
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1437/93X INDUSTRY REPORT CALLS INTO QUESTION NEED FOR OSHA STANDARD REDUCING LIMITS
Occup. Safety & Health Rep. 23(22):662, October 27, 1993.

A study examining the effects of chronic exposure to methylene chloride in the chemical industry showed no differences in certain symptoms or adverse health effects between exposed and non-exposed groups, according to a report presented to an international conference on workplace health Sept. 27. The results call into question the need for a U.S. Occupational Safety and Health Administration proposal to reduce permissible occupational exposure levels to methylene chloride from the present 500 parts per million for an eight-hour period to 25 ppm. Kevin Soden, medical director of the Fibers and Film Group at Hoechst Celanese Corp., told delegates at the 24th International Congress on Occupational Health that a study undertaken at the company's plant in Belgium revealed that carboxyhemoglobin observed in workers exposed to methylene chloride at levels of 55 ppm or below were 3.57 percent or less for non-smokers and 6.14 percent or less for smokers. These values, Soden said, "are well below the levels of concern indicated by OSHA in the proposed standard." Soden explained that part of the rationale for lowering the current OSHA standard was apprehension over potential adverse cardiac health effects due to elevated levels of carboxyhemoglobin resulting from the metabolism of methylene chloride. However, "epidemiologic studies have not demonstrated excess ischemic heart disease mortality among workers exposed to methylene chloride even at levels up to several hundred parts per million," he added. The study was carried out at Hoechst Celanese's triacetate production plant in Lanaken, Belgium, and involved workers exposed to high levels of methylene chloride for more than 10 years. The solvents used to produce the triacetate included methylene chloride as well as acetone and methanol.
---Text reprinted

1438/93X TRAINING WOULD BE EXPANDED UNDER BILL; OSHA HAZCOM, HAZWOPER JURISDICTION PRESERVED
Occup. Safety & Health Reporter 23(25):768, November 17, 1993.

Transportation workers who unload or in some cases take inventory of hazardous waste materials would be covered under federal job safety and health regulations governing hazardous waste training and hazard communication, under a Senate bill introduced Nov. 8. The language is included in the Hazardous Materials Transportation Authorization Act of 1993 (S 1640), introduced by Sen. J. James Exon (D-Neb) to reauthorize the Hazardous Materials Transportation Act. Exon's proposal was marked up by the Senate Commerce, Science, and Transportation Committee Nov. 9. House efforts to reauthorize the act have resulted in two bills, HR 3460 and HR 2178, both of which are under review by House committees on energy and commerce and public works. A Senate Commerce, Science, and Transportation Committee staffer said that Section 5 of Exon's proposal is designed to expand coverage of federal job safety training requirements to those workers who have less frequent but potentially dangerous contact with hazardous materials, including some drivers and workers who inventory arriving shipments. Requirements for hazardous materials training were most recently revised in 1990 under the Hazardous Materials Transportation Uniform Safety Act. None of the training requirements developed by the Department of Transportation may conflict with or duplicate OSHA's hazard communication standard or its hazardous waste operations and emergency response training rule--the HAZWOPER rule--under Exon's proposal. House and Senate committee staffers said Nov. 15 that the reauthorization of the act is unlikely to be approved before Congress adjourns, given several key upcoming votes, including legislation implementing the controversial North American Free Trade Agreement.
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1439/93X STRICTER LEAD STANDARDS SOUGHT
Occup. Safety & Health 62(11):19-20, 1993.

The International Brotherhood of Painters and Allied Trades is seeking stricter lead exposure limits and medical surveillance guidelines for workers abating lead from bridges, businesses, hospitals, schools and other buildings. The union outlined its recommendations in its document "Getting the Lead Out -- Protecting All Americans From Lead-Paint Poisoning" and submitted copies to OSHA, EPA

and Congress. The union is planning a coordinated effort--working with Congress and the regulatory agencies to protect workers, officials said. Title X of the Housing and Community Development Act of 1992 launched lead-paint exposure reduction safeguards for the construction industry and allocated money for lead-paint abatement for public housing. That act ordered OSHA to set an interim standard lowering the permissible exposure limit (PEL) for construction at 50 µg/cubic meter--the general industry guideline. However, the union is urging OSHA to further reduce that limit to 40 µg/cubic meter--the standard suggested by the National Institute for Occupational Safety and Health. In addition, it recommends OSHA mandate employee blood monitoring every two weeks as lead abatement is conducted. The interim standard mandates testing every two months for the initial six months and then every six months. The union is also recommending that EPA create national testing guidelines including performance-based and written tests for employees and employers, training on medical surveillance and record-keeping, instruction on sound lead paint abatement methods, data on possible, unfavorable health outcomes and safety information documents for new coatings or paints that include lead. Title X required EPA to establish standards for training, licensing and certification of lead abatement contractors and their workers.
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1440/93X DISCRIMINATION COMPLAINT FROM TWO MINERS RESULTS IN REHIRING UNDER SETTLEMENT WITH MSHA
Occup. Safety & Health Reporter 23(26):790, November 24, 1993.

Two Kentucky coal miners, fired for refusing to operate mining equipment in oppressive heat and hazardous conditions, were rehired and awarded back wages, under an agreement the company reached with the Mine Safety and Health Administration, MSHA announced Nov. 5. Edward Phillips Jr. and Benjamin Holder, front-end loader operators at Locust Grove Coal Co.'s No. 4 surface mine in Wolfe County, Ky., filed a discrimination complaint with MSHA under Section 105(c) of the Federal Mine Safety and Health Act. That section protects miners from discrimination when, in good faith, they refuse to work in conditions that they reasonably believe are not safe or healthful. Because of the very hot weather and lack of air conditioning, each miner faced two choices, neither of them safe, MSHA said. The miners could operate the loader with the cab door closed and subject themselves to 115 degree to 130 degree temperatures. Or, they could operate the loader with the door open, exposing themselves to heat, exhaust fumes from other machinery, and roadway dust, MSHA said. Moreover, a heavy concentration of dust obscured the miners' views to the point that they could not see. The miners refused to operate their loaders under such conditions, and were fired the next day. Locust Grove Coal Co. did not admit any wrongdoing but did agree to make good-faith efforts to maintain the air conditioning units in all front-end loaders, MSHA said. The agreement also gave both men their jobs back at the same pay, benefits, and seniority. In addition, the company paid back wages and attorneys' fees.
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1441/93X WOMEN'S HEALTH, SAFETY CONCERNS IGNORED, LABOR DEPARTMENT OFFICIAL TELLS CONFERENCE
Occup. Safety & Health Reporter 23(25):769-770, November 17, 1993.

While the health and safety concerns of women in the workforce are substantial and complex, Karen Nussbaum, director of the U.S. Department of Labor's Women's Bureau, said Nov. 13 that employers have generally denied or ignored such problems. Nussbaum said female workers are suffering broadly from repetitive strain injuries and are more likely than men to be murdered on the job. She said women also experience greater levels of job-related stress and job burnout than men. At the same time, however, women have had little success convincing employers to address their workplace health and safety concerns. Nussbaum said that occupational safety and health policies have generally focused on the prevention of problems in male-oriented occupations such as construction and mining. While women encounter less dramatic workplace hazards, the hazards they do encounter are more pervasive and can be just as dangerous. She noted that large numbers of women have been pushed into clerical and service jobs under the assumption they were safe. At the same time, repetitive strain injuries, which occur primarily in these types of jobs, represent the number one job-related illness, accounting for 52 percent of all workplace illnesses, according to Nussbaum. Job stress and burnout, which are generally associated with high-paying jobs held by men are actually much more pervasive in low-paying jobs held by women, Nussbaum contended. She said research shows that debilitating levels of stress and burnout are primarily found in jobs in which demands are high and the

capacity for control is minimal. Nussbaum specifically pointed to a survey that evaluated depression disorders in 104 occupations. The research found that data entry operators and computer operators--jobs generally held by women--rated as the top two professions for depression disorders. Nussbaum also noted that women are more likely to be murdered on the job than men. A bureau survey recently found that homicide ranked as the number one cause of workplace-related deaths among women. Forty percent of all workplace deaths among women are homicides. She attributed this problem to the fact that women are often placed in very visible positions with little or no protection. Linda Ray Murray, director of the Winfield Moody Medical Center in Chicago, suggested that women begin thinking of occupational health and safety issues in a much broader context than the illnesses and hazards people experience on the job. "The health and safety issues we face in the workplace have more to do with the discrimination and sexism we face as women," according to Murray, who is also a consultant on workplace issues. "The hazards we face on the job are influenced by our status as women." In this regard, Murray said the number one "occupational disease" suffered by women is unemployment and underemployment.
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1442/93X HOSPITALS SHOULD LOOK AT JOB CATEGORIES ASSOCIATED WITH TB TESTS, CDC OFFICIAL SAYS
Occup. Safety & Health Reporter 23(25):772, November 17, 1993.

Hospitals need to look more closely at tuberculin skin test results in specific wards and jobs rather than an institution's overall conversion rate, William R. Jarvis, chief of the Investigation and Prevention Branch of the Centers for Disease Control and Prevention's National Center for Infectious Diseases, said Nov. 8. Follow-up investigations at five hospitals that had outbreaks of multidrug-resistant tuberculosis--and subsequently implemented CDC's 1990 guidelines for preventing TB transmission in health care settings--found that the overall health care worker skin test conversion rates in the pre-epidemic and pre- and post-intervention periods were similar. At hospitals that experienced outbreaks despite the implementation of CDC's guidelines, Jarvis added, there have been "dramatic decreases" in transmission of TB from patient to health care worker. But unless there is one person in a hospital who has the job of testing health care workers for TB, "it won't get done right," he said. Another concern Jarvis has, he told the advisory council, is that physicians, such as those in the pulmonary and infectious disease departments, are not in the skin testing programs because they are not hospital employees. Jarvis also said that many health care workers continue to use surgical masks for protection from TB when the 1990 guidelines recommend the use of dust-mist-fume respirators for minimum protection. CDC has published draft revisions of its guidelines for preventing TB transmission in a health care setting, and comments are due by Dec. 13. The draft revision recommends that health care workers who may be exposed to infectious TB wear high-efficiency particulate air filters. A survey of hospitals by CDC revealed that no respondents had health care employees who wore the device, Jarvis said.
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1443/93X DEAR OUTLINES 1994 AGENDA TO OSHA STAFF; REICH REAFFIRMS ADMINISTRATION COMMITMENT
Occup. Safety & Health Reporter 23(26):779-780, November 24, 1993.

The Clinton administration is committed to "strict and responsible" enforcement of job safety laws and fully supports Joseph A. Dear's efforts to accomplish that goal as the new head of the Occupational Safety and Health Administration, Labor Secretary Robert B. Reich said Nov. 19 as he introduced Dear to OSHA staff. Some 250 OSHA staff members were on hand during a "town hall" meeting at the Labor Department's headquarters in Washington, D.C., to meet Dear and to hear the secretary's remarks. In his remarks, Dear's recurring theme was of "saving lives, preventing injuries, and protecting the health of American workers." Dear noted the three-point program he outlined shortly after his confirmation that focuses on a more effective targeting of enforcement efforts; a streamlined standard-setting process; and education and training. Dear said he was "committed" to OSHA reform, but would not tip the administration's hand on measures to reform the Occupational Safety and Health Act. A memo will be sent to the president on the matter and Secretary Reich will announce the administration's position "very soon", he said. The administration's goals for fiscal 1994 were mapped out in a five-page document Dear provided to the staff at the close of the hour-long session. The final version puts enforcement ahead of standard-setting as the first goal, whereas an earlier draft put standard-setting first. Dear took a series

of questions from OSHA staff on matters ranging from indoor air quality at the Labor Department to the need to alert industry to the cost-saving benefits of workplace safety measures.
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1444/93X REPORTS CRITICIZE NAFTA IMPACT
Occup. Health & Safety 62(11):17, 1993.

Recent reports by the General Accounting Office and the United Auto Workers are critical of Mexican-border area training and working conditions and underscore concerns about the North American Free Trade Zone Agreement. The GAO report, The Work Environment at Eight U.S.-Owned Maquiladora Auto Parts Plants, said Mexican production facilities usually do not prevent or track workplace dangers, a researcher on the GAO project said. John Froines of the University of California School of Public Health, addressing a gathering organized by the Society for Occupational and Environmental Health, said the GAO report outlines deficiencies in worker illness and injury reporting and safety training. He said the study casts doubt on employer dedication to health and safety and medical surveillance. NAFTA would enhance trade between the United States, Canada and Mexico through gradual tariff reduction. U.S. congressional approval is still needed. A United Auto Workers report also criticized the strength of Mexico's health and safety guidelines and enforcement. For example, Mexico's stiffest penalty is $1,500 for a repeat offense, and there are no initial sanctions, according to the UAW's Comparison of Mexican and United States Occupational Safety and Health Legislation, Regulation and Enforcement. The weaker safety commitment could prompt massive job displacement to Mexico, the report stated. In contrast, OSHA has more targeted and comprehensive lockout/tagout standards and more stringent caps on substances such as benzene, lead and asbestos, the report stated. OSHA can assess maximum fines of $70,000 for willful infractions and can penalize companies for a first-time offense. "These weaknesses, when added to limited personnel and other resources, would leave U.S. employers operating in Mexico virtually unregulated for worker health and safety," the report said.
---Condensed from text

1445/93X LAUTENBERG PROPOSES SENATE COMPANION BILL TO BAN SMOKING IN PUBLIC, PRIVATE WORKPLACE
Occup. Safety & Health Reporter 23(26):784, November 24, 1993.

A Senate proposal that would ban smoking in most of the nation's public and private workplaces was introduced Nov. 18 by Sen. Frank R. Lautenberg (D-NJ). Lautenberg's proposal, the Smoke-Free Environment Act of 1993, mirrors house legislation introduced Nov. 3 by Rep. Henry Waxman (D-Calif). Both bills would require building owners to implement the smoking ban in all offices regularly entered by 10 or more people. Smoking could be allowed in designated smoking areas as long as they were separately ventilated, according to both proposals. No hearings have been scheduled on either proposal as of Nov. 22. Lautenberg's proposal, S 1680, would provide the Environmental Protection Agency authority to grant waivers from the smoking ban if the employer or building owner "can prove that unusual and extenuating circumstances prevent total compliance," according to a Nov. 18 statement from Lautenberg. As in the Waxman proposal, the Lautenberg bill proposes no direct EPA enforcement of the smoking ban. Instead, the Senate and House bills would allow building occupants and visitors to file civil suits for violations, with a maximum $5,000 penalty per day, according to the legislation. However, an "alleged violator" of the ban would have 60 days to comply with the law after being notified of a potential violation, according to the legislation.
---Condensed from text

1446/93X KEYBOARD LAYOUT BEING STUDIED TO COMBAT REPETITIVE STRESS INJURIES
Occup. Safety & Health Reporter 23(26):787-788, November 24, 1993.

A California State University professor is taking a new look at an old keyboard design to combat the rising injury toll on workers being caused by repetitive stress injuries. Rick Robertson, a biochemist and professor of health and education at CSU Sacramento, is currently conducting a study to evaluate the effectiveness of a different keyboard layout to reduce such injuries. Putting workers in an ergonomically sound position is already an accepted practice, but it only addresses part of the problem, Robertson said. Because workers' injuries are being caused by repetition and stress, Robertson is studying the use of the Dvorak keyboard layout to reduce the range of motions--and the inherent stresses on the human body--needed in most typing situations. Instead of the normal

keyboard layout that has been used for 120 years, the Dvorak system--developed in the 1930s--places the most commonly used letters in the keyboard's home row, the keys on which the operator's fingers normally rest. In standard keyboard layouts the home row has A, S, D, and F for the left hand, and J, K, and L for the right hand. The Dvorak system places the most commonly used vowels under the fingers of the left hand--A, O, E, and U--and the most commonly used consonants for the right hand--H, T, N, and S. This layout allows the user to strike the most commonly used keys without having to reach or stretch. Workers are easily retrained to use the Dvorak system, Robertson maintained, adding that he is currently working on a training protocol for the system. In addition, Robertson is seeking persons suffering from carpal tunnel syndrome to take part in his study.
---Text reprinted

1447/93X CARPET INDUSTRY UNVEILS NEW LABEL PROGRAM TO PROTECT INSTALLERS, OTHERS FROM EMISSIONS
Occup. Safety & Health Reporter 23(26):788, November 24, 1993.

The Carpet and Rug Institute Nov. 15 unveiled a new information labeling program to instruct installers and consumers on how to reduce exposure to carpet emissions to prevent headaches, eye irritation, and some respiratory problems associated with new carpets. Ron VanGelderen, president of the industry group, said the institute's program will include labeling on each piece of carpet to provide installation procedures and precautions. The industry action was hailed by Reps. Mike Synar (D-Okla) and Bernard Sanders (I-Vt) at the unveiling, though both criticized actions by the federal regulatory agencies--the Consumer Product Safety Commission and the Environmental Protection Agency--that have authority to address the issue. He noted that industry also is beginning an extensive research effort to identify emission sources and is working to build a consensus among policy-makers on scientific research. The industry effort includes a 3-inch by 5-inch consumer information label that advises consumers and installers to contact their physician if they experience cold or flu-like symptoms while installing carpet. Those who are allergy-prone or sensitive to odors or chemicals will be advised to avoid the area or leave the premises when the materials are being installed or removed. The label also advises that consumers and installers vacuum old carpet before replacing it and vacuum the floor after both the old carpet and pad have been removed. If adhesives or pads are used, consumers should request "low emission" products, according to the label. Adequate ventilation--at least 72 hours--should be provided following the installation of all new carpet, the label states. Synar said that Congress will continue to monitor research under development by carpet manufacturers, following a nearly year-long controversy surrounding research conducted by the Massachusetts-based Anderson Laboratories Inc. in 1992. The laboratory reported that mice subjected to air blown over certain carpet samples showed symptoms of respiratory and pulmonary trauma and, in some cases, died. EPA announced in September that its attempts to replicate those findings resulted in only one death following 52 studies using test mice, one that could not be conclusively tied to inhalation of carpet emissions.
---Condensed from text

MEETINGS & COURSES

February 1-3, 1994, Madison, WI
ESTABLISHING AND IMPLEMENTING THE PRODUCT SAFETY PROGRAM
Contact: Engineering Registration, Department of Engineering and Professional Development, University of Wisconsin, 702 Langdon St., Madison, WI 53706

February 7-9, 1994, Chapel Hill, NC
BUILDING INSEPCTION FOR LEAD ABATEMENT
Contact: Occupational Safety and Health Educational Resource Center, University of North Carolina, 109 Conner Dr., Suite 1101, Chapel Hill, NC 27514

February 7-11, 1994, Orlando, FL
LASER SAFETY: HAZARDS, INSPECTION & CONTROL
Contact: Laser Institute of America, 12424 Research Parkway, Suite 125, Orlando, FL 32826

February 10-11, 1994, St. Paul, MN
HEALTH CARE INDUSTRY: EMPLOYEE HEALTH AND SAFETY
Contact: Midwest Center for Occupational Health and Safety Program in Continuing Education, University of Minnesota, 640 Jackson St., St. Paul, MN 55101

February 14-18, 1994, Salt Lake City, UT
INTRODUCTION TO INDUSTRIAL TOXICOLOGY
Contact: Rocky Mountain Center for Occupational and Environmental Health, Dept. of Family and Preventive Medicine, Bldg. 512, Salt Lake City, UT 84112

February 14-18, 1994, Cincinnati, OH
NONIONIZING RADIATION
Contact: NIOSH/Training Registrar, Division of Training and Manpower Development, Robert A. Taft Laboratories M.S. C-11, 4676 Columbia Parkway, Cincinnati, OH 45226-1998

February 15-17, 1994, St. Paul, MN
CONDUCTING INDOOR AIR QUALITY INVESTIGATIONS
Contact: Midwest Center for Occupational Health and Safety, Program in Continuing Education, University of Minnesota, 640 Jackson St., St. Paul, MN 55101

February 23-25, 1994, Cincinnati, OH
RECOGNITION & CONTROL OF UPPER EXTREMITY CUMULATIVE TRAUMA DISORDERS: AN ERGONOMIC APPROACH
Contact: NIOSH/Training Registrar, Division of Training and Manpower Development, Robert A. Taft Laboratories M.S. C-11, 4676 Columbia Parkway, Cincinnati, OH 45226-1998

February 27-28, 1994, Santa Clara, CA
WORKSHOP ON TECHNICAL, LEGISLATIVE, REGULATORY AND PROGRAM ISSUES IN THE LEAD-BASED PAINT FIELD
Contact: Registrar, National Lead Abatement Council Workshops, P.O. Box 535, Olney, MD 20832

February 27-March 4, 1994, Kiawah Island, SC
PATHWAY ANALYSIS AND RISK ASSESSMENT FOR ENVIRONMENTAL COMPLIANCE AND DOSE RECONSTRUCTION
Contact: RAC Course Coordination Office, Conference & Publication Services, Ltd., 1715 North Wells #34, Chicago, IL 60614

February 17,-March 2, 1994, Atlanta, GA
THIRD NATIONAL SYMPOSIUM ON BIOSAFETY: APPLICATION OF BIOSAFETY PRINCIPLES TO VARIOUS WORKSITES
Contact: Third National Symposium on Biosafety Professional and Scientific Associates, Inc., 2635 Century Parkway, Suite 990, Atlanta, GA 30345-3112

February 28-March 4, 1994, Orlando, FL
14TH ANNUAL OCCUPATIONAL SAFETY AND HEALTH WINTER INSTITUTE
Contact: North Carolina Occupational Safety and Health Educational Resource Center, University of North Carolina, 109 Conner Dr., Suite 1101, Chapel Hill, NC 27514

LEGAL DEVELOPMENTS

1448/93X VIRGINIA SUPREME COURT REFUSES TO INCLUDE CUMULATIVE TRAUMA INJURY IN 'DISEASE' DEFINITION
Occup. Safety & Health Reporter 23(26):783, November 24, 1993.

The Virginia Supreme Court refused Nov. 5 to broaden the scope of the state's worker's compensation statute to include as a compensable "occupational disease" a worker's torn rotator cuff (Merillat Industries Inc. v. Parks, Va SupCt, No. 921532, 11/5/93). Under state law, an employee must demonstrate that an "occupational disease" is not "an ordinary disease of life," the court said. Carter McKinnon Parks worked for Merillat Industries Inc. removing paint booth hangers from a rotating overhead conveyor, a task that required repetitive shoulder movement. After suffering a tear to the rotator cuff muscle of his left shoulder, he filed for workers' compensation benefits, contending the tear was an "occupational disease." The company refused benefits, arguing that it was a cumulative trauma injury and not compensable under Virginia law. The state industrial commission ruled in Park's favor, as did the state court of appeals, but Merillat appealed both decisions. The Supreme Court held that under state law, an employee must show that a disease arose "out of and in the course of employment" and is not a "disease of life." To do this, a worker must establish six factors: (1) that there was a direct causal relationship between the disease and work conditions and that the disease is an "expected" result of occupational exposure; (2) that it can be "fairly traced" to employment as the "proximate" cause; (3) that it would not have resulted from exposure off the job; (4) that it is "incidental" to the character of the business; (5) that it originated from a risk associated with the job; and (6) that it "flowed as a natural consequence" of the work. The court said that in drafting the statute, lawmakers repeatedly used the word "disease" and applied the six causality factors in its definition. The same factors, it noted, are not applied in defining a condition, an ailment, or an impairment.
---Text reprinted

1449/93 THE ETERNAL TRIANGLE REVISITED: THE INSURANCE DEFENSE LAWYER AND CONFLICTS OF INTEREST
B. Wunnicke, For the Defense 35(11):20-27, 1993.

The cliche "bright line" has no application to the matters duscussed in this article.

Instead, the tripartite relationship of insured, insurer, and insurance defense counsel is in a state of flux--both judicially and legislatively. The notion that the potential conflict of interest problems inherent in the tripartite relationship is "just an ethics question" is obsolete. The issues presented in this article are part of the "fabric" of insurance defense counsel representation. The answers to those issues are to be found in ad hoc analyses, with courts, legislation, and ethical rules providing guidelines.
---Author's conclusion reprinted by permission

1450/93 DO WORKERS' COMPENSATION LAWS PROTECT INDUSTRIAL HYGIENISTS FROM LAWSUITS BY INJURED WORKERS?
N. C. Stout, Am. Ind. Hyg. Assoc. J. 54(11): 701-704, 1993. 29 refs.

Workers' compensation laws provide injured employees with a swifter, more certain, and less litigious system of compensation than existed under the common law. Although workers' compensation is almost always an injured employee's exclusive remedy against the employer, the employee may bring a common-law tort action against a "third party" who may be liable in whole or in part for the employee's injury. This article investigates whether industrial hygienists are "third parties" and therefore subject to suit by injured employees who claim that industrial hygienists negligently caused their injuries. The author concludes that in most states, where the industrial hygienist and the injured worker are fellow employees, the industrial hygienist shares the employer's immunity from suit. As to the consultant who performs the industrial hygiene services as an independent contractor, the author concludes that the employer's nondelegable duty to provide a safe workplace offers industrial hygiene consultants an argument that they share the employer's immunity from suit. Countervailing arguments, however, leave the industrial hygiene consultant vulnerable to negligence claims in many jurisdictions. There is a trend among the states to extend the employer's immunity to those who provide safety and health services to the employer.
---Author's abstract reprinted by permission

BOOKS & PAMPHLETS

1451/93X FIREFIGHTER'S HAZARDOUS MATERIAL REFERENCE BOOK AND INDEX, 2ND EDITION
D. J. Davis, et al., Van Nostrand Reinhold, 115 Fifth Avenue, New York, NY 10003; 1993, 1333 pp. Price: $129.95. ISBN: 0-442-01346-9.

When minutes count, emergency response personnel can take the correct action by referring to this one-stop reference. It features some 1,500 pages of critical fire suppression information on more than 800 hazardous chemicals, in a format specifically designed for ease of use in emergency situations. By providing all the hazard data needed in one source, this vital field manual saves users from referring to many different books when time is pressing. Completely up to date, all entries in the Second Edition have been re-evaluated, revised, and enhanced to reflect new findings on hazardous chemicals. The authors have included 38 new chemicals, additional synonyms, an updated glossary, a new section on label data, new information on shipping container hazards, and CAS numbers for all chemicals. Also new to this edition is a massive yet easy-to-access 8,000-entry index that quickly pinpoints where to find additional information on a particular chemical in one or more of 12 widely used reference books. This 400-page guide saves readers hours of precious research time. Data is provided in the same convenient Materials Safety Data Sheet style that made the First Edition so popular. These sheets offer vital facts such as: Chemical name, DOT guide hazard class and guide number, STCC number, and a manufacturer's name and telephone number; Normal physical form, color, odor, and other physical properties; Chemical properties such as melting point, vapor pressure, and degree of solubility; Health hazard information on inhalation, ingestion, absorption, hazards to wildlife, and decontamination; and Fire, reactivity, corrosivity, and radioactivity hazards. If research has shown varying limits for different chemical characteristics, the guide lists the most conservative figures to assure staying within safety boundaries--an invaluable feature considering that published sources have indicated lower explosive limits that vary by as much as 50 degrees for the same chemical. This massive databank is ideal for all professionals who need speedy access to hazard information during demanding conditions. It meets the reference needs of professional and volunteer firefighters, emergency response personnel, and plant managers.
---Reprinted from book jacket

1452/93X THE ERGONOMICS OF MANUAL WORK
W. S. Marras, et al., eds., Taylor & Francis Inc., 1900 Frost Road, Suite 101, Bristol, PA 19007; 1993, 725 pp. Price: $150.00. ISBN: 0-7484-0060-5.

Prevention of musculoskeletal disorders, especially low back injuries and cumulative trauma disorders due to repetitive work both in the office environment and on the factory floor, can have an enormous impact on the quality of working life, industrial competitiveness, and health care costs worldwide. For example, the cost of treating persons with low back disorders (LBD) has become a real burden on modern society. In the United States alone, the estimates of occupational LBD range from one to 15 per cent annually depending upon occupation and, over a career, can seriously affect about 60 per cent of all workers. This is why the area of repetitive handling of loads, and the related strain of information processing when working with computer terminals, have been in the past and continue to be one of the most important issues in contemporary ergonomics. This book is a collection of selected papers presented at the International Ergonomics Association World Conference on Ergonomics of Materials Handling & Information Processing at Work, held in Warsaw, Poland, 14-17 June 1993. It focuses on the impact of repetitive manual and automated load handling, tool manipulation, and information processing at work on human health, comfort, productivity and safety, and also addresses the consequences of the above issues for prevention of work-related injuries and improvement of quality of working life. The current volume describes much of the leading-edge research in ergonomics of manual handling and information processing at work throughout the world. Since musculoskeletal complaints and disorders constitute a complex and interdisciplinary problem, the reader will find a comprehensive treatment of the subject matter ranging from evaluation of physical stressors like repetitive motion, low back biomechanics, and posture at manual or computerized work, to organizational and management issues, including worker participation, training, education and work standardization, and industrial automation efforts. The present volume offers a springboard from which many new ideas and research directions in occupational ergonomics will arise in the near future.
---Reprinted from book jacket

1453/93X HAZARDOUS CHEMICALS DESK REFERENCE, THIRD EDITION
R. J. Lewis, Sr., Van Nostrand Reinhold, 115 Fifth Avenue, New York, NY 10003; 1993, 1742 pp. Price: $99.95. ISBN: 0-442-01408-2.

Derived from the Sax's Dangerous Properties of Industrial Materials database, this new edition provides detailed hazard information on approximately 6,000 chemical substances commonly encountered in the workplace, industry, laboratories, and the environment. Featured in the Third Edition are 900 new entries--their inclusion based on toxicity, fire and explosion hazard, or importance in industry. All other entries have been revised and updated, and many contain new information on the physical properties of those entries. The author has given careful consideration to the EPA's TSCA inventory. Summaries rather than exhaustive reviews of hazardous properties make this source ideal for on-site usage. All data are presented in an easy-to-find format for those who must work with and evaluate the hazards of drugs, food additives, preservatives, ores, pesticides, dyes, detergents, lubricants, soaps, plastics, and other substances. Also covered are industrial intermediates, industrial waste products, and extracts from plant and animal sources. Like its predecessor editions, this Third Edition will be the standard quick-reference guide on hazardous properties of chemical substances. It will be an indispensable, on-the-job working tool for industrial hygienists, chemists, toxicologists, safety professionals, and responders to emergencies.
---Condensed from book jacket

1454/93X CUMULATIVE TRAUMA DISORDERS. CURRENT ISSUES AND ERGONOMIC SOLUTIONS: A SYSTEMS APPROACH
K. G. Parker and H. R. Imbus, Lewis Publishers, CRC Press Inc., 2000 Corporate Blvd., N.W., Boca Raton, FL 33431; 1992, 144 pp. Price: $59.95. ISBN: 0-87371-322-2.

OSHA frequently requires companies to implement the type of program promoted in this first and only book to address both the medical and ergonomic aspects of cumulative trauma. This combination of conservative medical intervention and attention to ergonomic design of jobs creates the long-term cost control that companies are actively seeking. The book presents a down-to-earth discussion of issues facing companies as they try to implement an ergonomic program to control cumulative trauma. It examines cumulative trauma from all angles, paying particular attention to cumulative trauma disorders

of the upper extremities. Specific topics addressed include CTD etiology, in-plant control programs, return-to-work concepts, ergonomic stressors and their root causes, and basic guidelines for ergonomic workstation design. It also explains many of the programmatic features included in the OSHA Ergonomic Guidelines for the Red Meat Industry, which OSHA uses as a means to structure their regulatory activities. This book discusses the rationale and value of implementing program components in the OSHA guidelines as they pertain to the production environment, presenting technical information in a clear, easy-to-read format. This is an essential book for managers of workers' compensation costs, plant nurses, safety and health technicians and managers, and ergonomics consultants.
---Reprinted from book jacket

1455/93X HANDBOOK OF ENVIRONMENTAL HEALTH AND SAFETY PRINCIPLES AND PRACTICES, SECOND EDITION, VOLUME II
H. Koren, CRC Press, Inc., 2000 Corporate Blvd., N.W., Boca Raton, FL 33431; 1991, 672 pp. Price: $69.95. ISBN: 0-87381-414-8 (v. 2).

This book is a must for the reference library of anyone with environmental concerns. Written by an expert in the field and co-published by the National Environmental Health Association, this volume will prove to be a valuable, major information resource on environmental issues in the 1990s. The much needed update on current issues and regulations is presented in a thorough, concise and systematic manner. The broad spectrum of topics are presented in logical progression starting with an introductory chapter outlining the relationship of the environment to humans (and its dilemmas), and carries us through environmental health emergencies and how to deal with them. Most current environmental health laws can be found in each chapter. The extensive bibliography and comprehensive index provide invaluable guidance to all who utilize its contents. This volume is truly a necessary reference book or text for instructors, students, and others involved in environmental health.
---Reprinted from book jacket

INDUSTRIAL MEDICINE

1456/93 PRE-EMPLOYMENT SCREENING OF NHS EMPLOYEES WITH EPILEPSY
M. Floyd, et al., Occup. Med. 43(4):193-196, 1993. 6 refs.

A survey was carried out on whether district health authorities have adopted clear policies with regard to the pre-employment screening of people with epilepsy. The survey revealed that only a small number have done so and that a few others claimed to be following recommended guidelines. It is evident that there is a need for an organization, such as the Association of National Health Service Occupational Physicians, to develop a more authoritative and comprehensive set of guidelines in this area. The paper concludes by suggesting some of the key elements to be included in such a set of guidelines.
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1457/93 THE VALUE OF QUESTIONNAIRES AND SPIROMETRY IN ASTHMA SURVEILLANCE PROGRAMMES IN THE WORKPLACE
S. C. Stenton, et al., Occup. Med. 43(4):203-206, 1993. 16 refs.

Shipyard workers and job applicants (n = 1126) completed an asthma questionnaire, and underwent measurements of ventilatory lung function (FEV_1, FEV_1/FVC and PEFR) and airway responsiveness. Airway responsiveness (to inhaled methacholine) was expressed as the dose calculated to provoke a 20 per cent fall in FEV_1, ie the PD_{20}. Results were categorized into four levels: high (PD_{20} < 200 µg), medium (200-1000 µg), low (1001-6400 µg) and unquantifiable (> 6400 µg), which correspond with definite, possible, doubtful and no asthmatic activity. These categories agreed closely with diagnoses of asthma by general practitioners and the use of bronchodilator medication. The sensitivity and specificity of the questionnaire and the measurements of ventilatory function for detecting asthmatic activity were then determined. The questionnaire symptoms (wheeze, chest tightness, undue coughing or abnormal breathlessness) had a low (28 per cent) sensitivity for detecting definite or possible asthmatic activity and a specificity of only 73 per cent. The sensitivity of the ventilatory function tests (any one abnormal) was also low at 21 per cent with a specificity of 92 per cent. When the FEV_1 < 80 per cent predicted criterion was considered separately, its sensitivity was 11 per cent and its specificity was 98 per cent. These results illustrate that caution is

needed when interpreting the results of questionnaires and measurements of ventilatory lung function in the diagnosis of asthma among working populations.
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1458/93X A SURVEY OF PRIMARY LUNG CANCER AMONG NTT WORKERS IN THE TOKYO AREA: THE INCIDENCE AND MORTALITY DURING THE PAST 30 YEARS AND SIGNIFICANCE OF RADIOLOGIC SCREENING
H. Miyagawa, et al., Jap. J. Ind. Health 35 (5):395-402, 1993. 30 refs.

An epidemiological study of primary lung cancer was conducted on NTT workers in the Tokyo area (about 40,000 persons). During the past 30 years (1960-1989), 77 cases (71 males and 6 females) of primary lung cancer were detected by routine medical examination (radiologic screening by radiophotography at their workplaces) or by clinical symptoms, of whom 59 (54 males and 5 females) were dead as of the end of December 1991. Standardized incidence rate and standardized death rate of the males by the direct method (5-yr age groups from 20 to 59 yr of age, per 100,000 population) were 4.5 in the 1960's, 9.9 in the 1970's and 9.8 in the 1980's, and 3.3 in the 1960's, 7.9 in the 1970's and 8.2 in the 1980's respectively, with increase being observed from the 1970's. Standardized incidence ratio and standardized death ratio of the males by the indirect method (5-yr age groups from 20 to 59 yr of age) were 107 in the 1970's, 86.8 in the 1980's, and 53.8 in the 1960's, 99.4 in the 1970's and 98.5 in the 1980's, respectively. No significant difference could be observed when compared to the national average. By histological type, 44 cases of adenocarcinoma, 12 cases of squamous cell carcinoma, 8 cases of small cell carcinoma, 7 cases of large cell carcinoma and 6 cases of other or unclear types were detected. Excluding the 3 unclear cases, of the 77 cases, 54 cases were peripheral type and the remaining 20 cases were hilar type of radiophotography. Peripheral adenocarcinoma was the most common type. Clinical stage by TNM classification was confirmed in 50 cases, of whom 12 cases were stage I, 5 cases were stage II, 9 cases were stage IIIA, 8 cases were stage IIIB and 16 cases were stage IV. As for the means of detection, 41 cases were detected by routine medical examination (radiologic screening by radiophotography) and 36 cases were detected by clinical symptoms. The lung cancers of the hilar type could be detected by clinical symptoms at a higher rate than by radiologic screening, but those of the peripheral type were detected at a significantly higher rate by radiologic screening than by clinical symptoms. The 41 screened cases were detected at an earlier stage and showed a better prognosis than the 36 clinical cases. The rate of operable cases (75.6% in screened cases vs. 30.6% in clinical cases) and 1,2,3 and 4-yr survival rates (1 yr 88.6% vs 41.4%, 2 yr 48.6% vs. 17.2%, 3 yr 37.2% vs. 13.8%, and 4 yr 34.3% vs. 10.3%) were significantly higher in the screened cases than in the clinical cases. Though the 5-yr survival rate was not significantly different between the two groups, the survival curve calculated by Kaplan-Meier method and test by generalized Wilcoxon method showed that the prognosis of the screened cases were better than that of the clinical cases. Routine medical examination by radiological screening at workplaces is not sufficient to detect lung cancers of the hilar type, but is considered to be effective in detecting lung cancers of the peripheral type. Positive and careful effort should be continued for the detection of early lung cancers in workers.
---Authors' abstract in English

1459/93 SCREENING FOR SKIN CANCER: EXPERIENCE OF AN OCCUPATIONAL HEALTH SCREENING PROGRAMME
R. K. Curley, et al., Occup. Med. 43(4):207-210, 1993. 26 refs.

A skin cancer screening programme involving 2150 employees based at the head office of a large UK retailer resulted in the detection of four melanomas at an early curable stage. In addition, three other malignant and three potentially malignant tumours were discovered, and individuals at greater risk of developing melanoma were identified and counselled accordingly.
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1460/93 EMPLOYEES' AND OCCUPATIONAL PHYSICIANS' DIFFERENT PERCEPTIONS OF THE WORK-RELATEDNESS OF HEALTH PROBLEMS: A CRITICAL POINT IN AN EFFECTIVE CONSULTATION PROCESS
H. N. Plomp, Occup. Med. 43(Suppl. 1):S18-S22, 1993. 16 refs.

In a survey on workers' attitude and behaviour towards the occupational health service (OHS) in their company, it appears that there is hardly any relationship between physicians' and employees' judgement on the work-relatedness of health problems presented during a consultation hour. This is considered an alarming outcome with severe implication for the doctor-client communication. In this article an explanation for this large discrepancy between the physicians' and employees'

judgement is derived from the clarification given by employees and from theories on the lay-definition of health and illness and on doctor-patient interaction. Apart from factors already mentioned in the general literature on the doctor-patient relation, the socio-economic implications of the label of 'work-relatedness of health problems' in the field of the occupational health services, turns out to be an important factor in the explanation.
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1461/93 OCCUPATIONAL EXPOSURE TO BLOODBORNE DISEASES AND UNIVERSAL PRECAUTIONS: MEASUREMENTS OF HEALTH CARE WORKERS' SELF REPORTED ATTITUDES
M. M. Grady, et al., AAOHN J. 41(11):533-540, 1993. 24 refs.

As the numbers of persons infected with bloodborne diseases continues to increase, it is paramount that all health care workers exhibit behaviors reflecting unerring compliance with universal precautions. Physicians and RNs who are highly trained in bloodborne diseases and universal precautions, who have the tools available for universal precautions, and who are exposed to people with bloodborne diseases, are overwhelmingly not complying with universal precautions. To better understand how attitudes impact behaviors, a valid and reliable tool was developed which measured health care workers' attitudes toward bloodborne diseases and universal precautions. Training programs addressing attitudes and knowledge may help change health care workers' non-compliant behaviors into behaviors reflecting compliance with universal precautions.
---Authors' abstract reprinted by permission of the American Association of Occupational Health Nurses

1462/93 QUALITY ASSESSMENT OF OCCUPATIONAL HEALTH SERVICES INSTRUMENTS
F. J. H. van Dijk, et al., Occup. Med. 43 (Suppl. 1):S28-S33, 1993. 23 refs.

Interest in the quality of instruments for occupational health services is growing as a result of European legislation on preventive services stressing, for example, risk identification and assessment. The quality of the services can be enhanced when the quality of the applied instruments can be judged and improved. To judge quality aspects of instruments, a basic draft scheme and criteria are presented. A first category of criteria covers measurement objective and study design and comprises for example sample strategy and data aggregation level. Technical quality aspects are validity, reliability, standardization and precision. Acceptability of an instrument by employees, employers and professionals belongs to the process quality. At last, strategic quality or presumed utility has to be assessed. As an illustration four instruments have been judged: periodic occupational health surveys, pre-employment medicals, the company audit on work and health, and specific working conditions assessment instruments. Finally the presented basic scheme and criteria are brought into discussion.
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SKIN DISEASES & BURNS

1463/93X THE EFFECTS OF ALCOHOL AND DETERGENT ON THE SKIN: BARRIER FUNCTION
R. Dao-feng, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(3):193, 1993.

The effects of alcohol and detergent on the skin were studied. (1) The skin separated from new born rat was submerged in 70% alcohol or sprayed with 70% alcohol and reserved for ten minutes. It was found that the skin barrier function altered. (2) The skin separated from new born rat was submerged in 0.01%-1% detergent solutions in water for ten minutes, or detergent of the same concentration was applied to the skin for four hours. There were no effects on the skin barrier function. It is suggested that using 0.1% - 0.3% detergent in daily life is safe and that it should be careful to protect skin from corrosion when 70% alcohol is used as disinfectant.
---Authors' abstract in English

CHEMICAL HAZARDS

1464/93 A SURVEY OF AIRBORNE HDI, HDI-BASED POLYISOCYANATE AND SOLVENT CONCENTRATIONS IN THE MANUFACTURE AND APPLICATION OF POLYURETHANE COATINGS
H. E. Myer, et al., Am. Ind. Hyg. Assoc. J. 54(11):663-670, 1993. 23 refs.

This study summarizes the results of industrial hygiene surveys performed between 1979 and 1987 in paint manufacturing and application operations using polyurethane coatings containing hexamethylene diisocyanate (HDI) and HDI-based polyisocyanates (trade name Desmodur N). A total of 466 Desmodur N and 457 HDI samples were collected from 47 operations most of which were in application. The

application surveys covered manufacture and refinishing of transportation vehicles, painting of large military and civilian equipment, industrial finishing operations, and maintenance and construction operations. The primary objective of the surveys was to assess the potential exposure to HDI and HDI-based polyisocyanate. In more than 60% of the surveys, concentrations of airborne organic solvents also were monitored. Isocyanates were sampled using toluene/nitroreagent in midget impingers, and solvents were collected using charcoal tubes. They were analyzed using high pressure liquid chromatography and gas chromatography, respectively. The data from these workplace situations show there is some potential for isocyanate overexposure of unprotected workers and that it is greater in spray than in nonspray operations.
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1465/93 A TWO-GENERATION REPRODUCTION STUDY WITH HYDROQUINONE IN RATS
A. M. Blacker, et al., Fund. & Appl. Toxicol. 21(4):420-424, 1993. 11 refs.

The effects of hydroquinone (HQ) on reproductive performance and fertility were assessed in a two-generation study with CD Sprague-Dawley rats (one litter per generation). HQ was administered in an aqueous solution by gavage at doses of 0, 15, 50, and 150 mg/kg/day. F0 and F1 parental animals were dosed daily for at least 10 weeks prior to cohabitation, during cohabitation, and until scheduled termination. At all dose levels tested, no adverse effects were observed on feed consumption, survival, or reproductive parameters for the F0 or F1 parental animals. Mild, transient tremors were observed shortly after dosing at 150 mg/kg/day in several F0 and F1 parental animals and in a single F0 male at 50 mg/kg/day. These tremors occurred infrequently and were considered to be due to an acute stimulatory effect of HQ on the nervous system. Body weights for F0 and F1 parental females were similar between all dose groups throughout the study. Body weights for F0 parental males were also comparable to those of control throughout the study. Statistically significant differences in body weights were noted for the F1 parental males in the 50 and 150 mg/kg/day dose groups at several intervals during the premating, mating, and postmating periods. No treatment-related effects on pup weight, sex distribution, or survival were noted for pups of either generation. Upon postmortem examination, no treatment-related gross lesions were observed in either the F0 or F1 parental animals or their weanlings. Histopathologic examination of reproductive tissues and pituitary glands from high-dose F0 and F1 parental animals did not reveal any changes related to treatment with HQ. Thus, no adverse effects on reproduction or fertility were observed in either generation at any dose level, and the results of the present study indicate that HQ is not a selective reproductive toxicant. The no observed effect levels for general and reproductive toxicity are 15 and 150 mg/kg/day, respectively.
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1466/93X STUDIES ON THE TOXICITIES AND OCCUPATIONAL EXPOSURE LIMIT OF CHLOROFORM
L. Ling-hong, et al., Chinese J. Ind. Hyg. Occup. Dise. 11(4):254, 1993.

In order to get necessary data to recommend the maximum acceptable concentration (MAC) of chloroform, a series of studies were carried out. The results showed that the occupationally exposed population of chloroform were mainly distributed in the industries of the organic glass processing, extraction of organic materials and synthesis of refrigerant. The chloroform concentration in the work sites ranged from 4.27 to 147.9 mg/m^3. The workers exposed to chloroform at a geometric average concentration of 29.51 mg/m^3 had some uncomfortable signs such as tiredness, somnolence and palpitation etc. The lower levels of serum transferrin and pre-albumin as compared with those of controls indicated that the liver protein synthesis function was impaired. The neurobehavioral functions of the exposed workers were also affected. Male SD rats after subacute inhalation of chloroform revealed reversible impairment of liver function. The authors recommend 20 mg/m^3 as the recommended MAC of chloroform at present in China.
---Authors' abstract in English

1467/93 PHASE-SPECIFIC DEVELOPMENTAL TOXICITY IN MICE FOLLOWING MATERNAL METHANOL INHALATION
B. Bolan, et al., Fund. & Appl. Toxicol. 21(4):508-516, 1993. 29 refs.

Methanol is toxic to embryos of mice and rats when inhaled by dams at high concentrations. The present studies examined methanol-induced developmental toxicity following inhalation exposure (6 hr/day) of pregnant CD-1 mice to 5000, 10,000, or 15,000 ppm either throughout organogenesis (GD 6-15), during the period of neural tube development and closure (GD 7-9), or during a time of potential neural tube reopening (GD 9-11). Transient neurologic

signs and reduced body weights were observed in up to 20% of dams exposed to 15,000 ppm. Examination of near-term fetuses revealed embryotoxicity (increased resorptions, reduced fetal weights, and/or fetal malformations) at 10,000 and 15,000 ppm, while 3-day exposures at 5000 ppm yielded no observable adverse effects. Terata included neural and ocular defects, cleft palate, hydronephrosis, deformed tails, and limb (paw and digit) anomalies. Neural tube defects and ocular lesions occurred after methanol inhalation between GD 7-9, while limb anomalies were induced only during GD 9-11; cleft palate and hydronephrosis were observed after exposure during either period. These findings were consistent with prior reports that maternal methanol inhalation at high levels induces developmental toxicity in a concentration-dependent manner. Furthermore, our data indicate that the spectrum of teratogenic effects depended upon both the timing (i.e., stage of embryonic development) and the number of methanol exposures.
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1468/93 BIOMARKERS OF HUMAN EXPOSURE TO BENZENE

W. E. Bechtold and R. F. Henderson, J. Toxicol. Environ. Health 40(2-3):377-386, 1993. 25 refs.

Three biomarkers for benzene exposure were developed. The first biomarker, muconic acid in urine, results from the ring opening of a benzene metabolite. A gas chromatography/mass spectroscopy (GC/MS) assay was developed to measure urinary muconic acid, and the analyte in urine samples from workers occupationally exposed to benzene was determined. Workers exposed to benzene concentrations as low as 4.4 ppm over an 8-h day showed higher urinary muconic acid concentrations than did any control individual ($p < .005$). The second biomarker, S-phenylcysteine (SPC) in hemoglobin (Hb), results from the addition of benzene oxide to a cysteine sulfhydryl group. A GC/MS assay was developed to measure SPC in the blood of F344/N rats and B6C3F$_1$ mice exposed to benzene by inhalation. The cysteine moiety on rat Hb is at a more accessible site than on Hb of mice or humans, and rats showed considerably higher levels of SPC than did mice. As yet, the authors have been unable to detect SPC in the globin of humans occupationally exposed to benzene. The third biomarker is SPC in albumin. In humans occupationally exposed to average concentrations of 0, 4.4, 8.4, and 23.1 ppm benzene, 8 h/d, 5 d/wk, SPC increased in the exposed groups linearly, giving a statistically significant slope ($p < .001$) of 0.044 ± 0.008 pmol/mg albumin/ppm. The assay for SPC is arduous and often imprecise; assuming these difficulties can be overcome, muconic acid in urine and SPC in albumin may be useful for accurately determining benzene exposure.
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1469/93 1-NITRONAPHTHALENE TOXICITY IN RAT LUNG AND LIVER: EFFECTS OF INHIBITING AND INDUCING CYTOCHROME P450 ACTIVITY

R. D. Verschoyle, et al., Toxicol. & Appl. Pharmacol. 122(2):208-213, 1993. 22 refs.

In rats, 1-nitronaphthalene (1-NN) causes both pulmonary and hepatic toxicity. Pulmonary toxicity is evident as bronchiolar damage, with necrosis of Clara cells and ciliated cells, whereas hepatic injury involves vacuolation of centrilobular hepatocytes. Pretreatment with O,O,S-trimethylphosphorodithioate [OOS-MeP(S)] or p-xylene gave three- to fourfold protection against 1-NN toxicity. These pretreatments also prevented both the increase in lung weight and the rise in γ-glutamyltranspeptidase and alkaline phosphatase activity in bronchoalveolar lavage fluid normally associated with 1-NN toxicity. Pretreatment with Arochlor 1254 or β-naphthoflavone (β-NF) did not alter the LD50 of 1-NN. Arochlor or β-NF pretreatment did, however, prevent morphological signs of lung injury and any increase in either lung weight or enzyme activity in bronchoalveolar lavage fluid. Liver damage was not prevented by these treatments; indeed, injury was exacerbated and was transferred from centrilobular to periportal areas. In control rats the covalent binding of [1-^{14}C]NN to liver microsomes was eight times greater than to lung microsomes. Pretreatment with OOS-MeP(S) decreased covalent binding to lung microsomes, without affecting binding to liver microsomes. Conversely, both Arochlor and -NF slightly increased covalent binding in lung, but increased liver binding by 250-300%. Phenobarbitone also increased binding to liver microsomes by 250-300%, but failed to increase, or alter, the distribution of liver damage. The reported effects of these pretreatments indicate that the toxicity of 1-NN is probably activated by isoenzyme CYP2B1 in lung, but by isoenzymes CYP1A1 or CYP1A2 in the liver.
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1470/93 COMPARATIVE EFFECTS OF TWO POLYCHLORINATED BIPHENYL CONGENERS ON CADMIUM HOMEOSTASIS IN RAT CEREBELLAR GRANULE CELLS
P. R. S. Kodavanti, et al., Toxicol. & Appl. Pharmacol. 123(1):97-106, 1993. 57 refs.

Some polychlorinated biphenyls (PCBs) have been reported to alter locomotor activity and decrease brain dopamine function in laboratory animals. PCBs with ortho- and/or parachlorine substitutions and varying number of chlorinations are known to decrease cell dopamine content in vitro and have been detected in brains of animals exposed to PCBs, suggesting that the neurotoxicity could be mediated by ortho-substituted congeners. Dopamine or other neurotransmitter uptake and release phenomena are dependent on the maintenance of intracellular Ca^{2+} homeostasis, and perturbations in Ca^{2+} homeostasis could lead to altered cell function and/or death. The authors compared the effects of two PCB congeners on Ca^{2+} homeostasis in cerebellar granule cells: 2,2'-dichlorobiphenyl (DCBP), a putative neurotoxic congener, and 3,3',4,4',5-pentachlorobiphenyl (PCBP), a presumed nonneurotoxic congener. In cerebellar granule cells (6-8 days in vitro), DCBP was cytotoxic as indicated by a significant increase in LDH leakage at 200 µM after 2 hr of exposure and at 100 µM after 4 hr exposure. PCBP, on the other hand, did not affect LDH leakage even at 200 µM for up to 4 hr. Although both congeners increased cerebellar granule cell $[Ca^{2+}]_i$, DCPB was more effective in increasing $[Ca^{2+}]_i$ produced by both congeners was not transient, but a steady rise was observed with time. To understand cellular Ca^{2+}-buffering capacity, Ca^{2+} sequestration and Ca^{2+} extrusion were studied in mitochondria, microsomes, and synaptosomes, isolated from adult rat cerebellum. DCBP was a potent inhibitor of $^{45}Ca^{2+}$ uptake by mitochondria (IC50 = 6.17 ± 0.53 µM) and microsomes (IC50 = 7.61 ± 0.35 µM). PCBP inhibited Ca^{2+} sequestration by mitochondria (68% of control) and microsomes (72% of control), but the effects were much less than those produced by equivalent concentrations of DCBP. Synaptosomal Ca^{2+}-ATPase was inhibited by DCBP, but not by PCBP. These results indicate that at concentrations where cytotoxicity in cerebellar granule cells was not observed, DCBP increased intracellular $[Ca^{2+}]_i$, and at the same concentrations, Ca^{2+} sequestration by intracellular organelles and Ca^{2+}-ATPase in synaptic plasma membrane were inhibited. Although PCBP increased $[Ca^{2+}]_i$ in cerebellar granule cells to some extent, it was not potent in affecting Ca^{2+} sequestration or Ca^{2+} extrusion in adult cerebellar components. Hence, PCBP-induced slight increase of $[Ca^{2+}]_i$ levels in the cells might have been associated with effective Ca^{2+} sequestration by intracellular organelles, as seen in cerebellar preparations. The results of this study support the hypothesis that the position of chlorine substitution in the biphenyl ring and/or number of chlorine substitutions may have significant implications for predicting potential effects of PCB congeners in the nervous system, and perturbations in Ca^{2+} homeostasis might play a significant role in the neuroactivity of PCBs.
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1471/93 COMPARATIVE CARCINOGENICITY OF POLYBROMINATED BIPHENYLS WITH OR WITHOUT PERINATAL EXPOSURE IN RATS AND MICE
R. S. Chhabra, et al., Fund. & Appl. Toxicol. 21(4):451-460, 1993. 39 refs.

Chronic toxicity and carcinogenicity studies of a polybrominated biphenyl mixture (PBB) were conducted in F344/N rats and B6C3F1 mice of each sex. The major objective of the study was to determine if exposure to PBB during the perinatal period, in addition to conventional exposure of animals for 2 years, enhances the sensitivity of the bioassay to identify the carcinogenic potential of this chemical. The studies were designed to determine the toxic and carcinogenic effects of dietary PBB in rats and mice receiving (i) perinatal exposure up to 8 weeks of age followed by control diet for 2 years, (ii) exposure for 2 years beginning at the age of 8 weeks, and (iii) combined perinatal/adult exposure to PBB (perinatal exposure to 8 weeks of age followed by adult exposure for 2 years). During the perinatal period, rats were exposed to PBB at dose levels ranging from 1 to 10 ppm and adult exposure concentrations ranged from 3 to 30 ppm in the diet. In the mice, the dose levels ranged from 3 to 30 ppm in both perinatal and adult exposure portions of the chronic studies. A total of eight dose groups (including controls) were used with 60 animals in each group. Liver was the major target organ of PBB toxicity. Perinatal exposure alone (through dietary administration of 10 ppm PBB to the dams) had no effect on the incidences of neoplasms in female F344/N rats, but in male rats, perinatal exposure was associated with a marginally increased incidence of hepatocellular adenomas that may have been related to chemical administration. In male and female $B6C3F_1$ mice, perinatal exposure to 30 ppm PBB resulted in significantly increased incidences of hepatocellular neoplasms. In adult-only dietary exposure studies, PBB was carcinogenic in male and female F344/N rats

and male and female B6C3F$_1$ mice based on increased incidences of hepatocellular neoplasms. Combined perinatal and adult dietary exposure to PBB confirmed the findings of the adult-only exposures for the increased incidences of hepatocellular neoplasms in rats and mice. In male rats, there were no enhancing effects of combined perinatal and adult exposure. However, perinatal exposure enhanced the susceptibility of female rats receiving adult exposure of 10 or 30 ppm to the induction of liver neoplasms. For male and female rats, a combined analysis of the incidences of leukemia in the adult-only, perinatal-only, and combined perinatal and adult exposure groups revealed an apparent association between increasing incidences of mononuclear cell leukemia and exposure to PBB. In male and female mice, it was not possible to adequately assess the enhancing effects of combined perinatal and adult exposure on hepatocellular tumors, because adult-only exposure to 10 or 30 ppm PBB resulted in high incidences (84-98%) of liver neoplasms. However, with increased perinatal exposure, there were increases in the numbers of mice with hepatocellular carcinomas and in the numbers of mice with multiple hepatocellular adenomas, suggesting that combined perinatal and adult exposure increases PBB-related hepatocellular carcinogenicity relative to adult-only exposure.
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1472/93 BINDING OF POLYCHLORINATED BIPHENYLS TO THE ARYL HYDROCARBON RECEPTOR
S. A. Kafafi, et al., Environ. Health Perspectives 101(5):422-428, 1993. 33 refs.

A new thermodynamic model for calculating the dissociation constants of complexes formed between the aryl hydrocarbon receptor (AhR) and polychlorinated biphenyls (PCBs) is reported. The free energies of binding of PCBs to AhR are controlled by their lipophilicities, electron affinities, and entropies. The corresponding physicochemical properties of polychlorinated dibenzo-p-dioxins and dibenzofurans also control their interactions with AhR. The authors present evidence supporting the hypothesis that the majority of PCBs are likely to interact with AhR in their nonplanar conformations. In addition, we demonstrate that the affinities of PCBs for AhR relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin correlate with corresponding toxic equivalency factors in animals. The reported methodology is likely to be applicable to other polyhalogenated and mixed polyhalogenated bi- and terphenyls and related xenobiotics; thus, it could minimize the number of in vivo studies in laboratory animals and facilitate the identification of potentially hazardous aromatic xenobiotics.
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1473/93 AN ANALYSIS OF THE RELIABILITY OF SELF REPORTED WORK HISTORIES FROM A COHORT OF WORKERS EXPOSED TO POLYCHLORINATED BIPHENYLS
C. R. Rosenberg, Brit. J. Ind. Med. 50(9): 822-826, 1993. 25 refs.

An investigation was conducted to examine the reliability (reproducibility) of self reported occupational histories obtained from a cohort of 326 capacitor manufacturing workers who had participated in an epidemiological study relating health abnormalities to exposure to polychlorinated biphenyls (PCBs). For a subsample of the cohort (n = 164) in which occupational histories were obtained twice (in 1976 and 1979), reliability of cumulative exposure to PCBs ranged from 93.6% for the early PCB period (1947-70) to 95.7% for the late PCB period (1971-6). These respective reliabilities were lower, however, for workers who changed jobs often. Workers above the median value of a weighted job change index had early and late reliabilities of 89.9% and 83.6% respectively. Reliability is a relevant factor when calculating power or sample size during the planning stage of epidemiological studies, for interpretation or adjustment of estimates in the analysis stage, or for determination of study feasibility.
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1474/93 STYRENE INHALATION TOXICITY STUDIES IN MICE. II. SEX DIFFERENCES IN SUSCEPTIBILITY OF B6C3F1 MICE
D. L. Morgan, et al., Fund. & Appl. Toxicol. 21(3):317-325, 1993. 30 refs.

Styrene is a commercially important chemical used in the production of plastics and resins. In initial short-term styrene inhalation studies, toxicity was significantly greater in male B6C3F1 mice than in females, suggesting that males may metabolize styrene more extensively and/or may be less able to detoxify reactive metabolites. In addition, a nonlinear dose-response was observed where toxicity and mortality were greater in mice exposed to 250 ppm than in those exposed to 500 ppm. These studies were conducted to investigate potential mechanism(s) for sex differences and the nonlinear dose-response in styrene toxicity by evaluating the effects of repeated styrene exposure on styrene oxide production, hepatic GSH availability, and hepatotoxicity in male and female B6C3F1 mice. Mice (36/sex/dose) were exposed to 0, 125, 250, or 500 ppm styrene 6 hr/day for up

to 3 days. Styrene exposure caused increased mortality and hepatotoxicity (centrilobular necrosis, increased serum liver enzymes) in males and females after one or two exposures to 250 and 500 ppm. Hepatic GSH levels were decreased in a dose-dependent manner in males and females. After one exposure, GSH levels in males rebounded above controls in all dose groups. After three exposures to 125 or 250 ppm males appeared to maintain GSH levels; GSH was still decreased in the 500 ppm group. GSH levels in females were decreased after each exposure in all dose groups to lower levels than in males, and did not rebound above controls. Male mice had significantly greater blood styrene levels than females after one exposure to 500 ppm; however, there were no significant sex differences in blood styrene after subsequent exposures. Levels of SO in blood were not significantly greater in male mice than females within a dose group, and did not change significantly with repeated styrene exposures for 3 days. Blood styrene and SO levels were significantly higher at 500 ppm than at 250 ppm indicating that styrene uptake and metabolism are greater at 500 ppm than at 250 ppm. The higher incidence of mortality in male mice and the nonlinear dose-response to styrene cannot be explained by gender- or dose-related differences in hepatotoxicity, GSH depletion, or blood styrene or SO levels.
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1475/93 STYRENE INHALATION TOXICITY STUDIES IN MICE. III. STRAIN DIFFERENCES IN SUSCEPTIBILITY
D. L. Morgan, et al., Fund. & Appl. Toxicol. 21(3):326-333, 1993. 19 refs.

Inhalation toxicity studies were conducted to evaluate mouse strain differences in the susceptibility to styrene vapors. Male and female B6C3F1, C57BL/6, Swiss, and DBA/2 mice (8 weeks old) were exposed to 0, 125, 250, or 500 ppm styrene 6 hr/day, for 4 days (20/sex/dose). Histopathological changes and changes in liver weights were evaluated as a measure of hepatotoxicity. Styrene uptake and styrene-7,8-oxide (SO) formation were estimated by measuring levels of styrene and SO in blood. An estimate of SO detoxification by conjugation with GSH was obtained by measuring hepatic GSH depletion. In general, mortality, increased liver weights, and hepatocellular necrosis were observed in the 250 and 500 ppm dose groups for all strains and both sexes. Considerable sex and strain differences were observed. Mortality, increased liver weights, and hepatocellular necrosis were greatest in B6C3F1 and C57BL/6 mice in the 250 ppm dose group and in males; hepatotoxicity was similar in both strains. Swiss mice exhibited dose-dependent increases in mortality, liver weights, and in hepatocellular necrosis, with only slight sex differences at early time points. Hepatotoxicity in DBA/2, B6C3F1, and C57BL/6 strains was greater at 250 than 500 ppm; however, toxicity was less severe in DBA/2 than in other strains based on absence of mortality in either sex and less extensive liver necrosis at both 250 and 500 ppm. Blood styrene and SO levels did not correlate well with strain differences in toxicity. The relative toxicity (mortality and hepatotoxicity) was B6C3F1 > Swiss > DBA/2; however, relative blood styrene and SO levels were B6C3F1 $\geq$ DBA/2 > Swiss. Hepatic GSH depletion, (B6C3F1 $\geq$ DBA/2 > Swiss) correlated with blood SO levels as expected. These results demonstrate significant biologic variability in the susceptibility of mouse strains to styrene toxicity. These differences are presumably due to strain and sex differences in metabolism; however, toxicity did not correlate well with blood SO levels, suggesting that other reactive metabolites may contribute to styrene toxicity in mice.
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1476/93 EVALUATION OF THE RELATIONSHIP BETWEEN PAH CONTENT AND MUTAGENIC ACTIVITY OF FUMES FROM ROOFING AND PAVING ASPHALTS AND COAL TAR PITCH
M. L. Machado, et al., Fund. & Appl. Toxicol. 21(4):492-499, 1993. 24 refs.

Fume condensates from asphalt and coal tar pitch were evaluated to determine if polycyclic aromatic hydrocarbon (PAH) composition, crude oil source, or temperature at which the fume was generated correlated with mutagenic activity. The fume condensates were tested for mutagenic activity using a modified Ames Test. Benzo[a]pyrene (BP) and other PAHs were detected in all samples. The concentration of BP in coal tar pitch was 18,100 ppm while the concentration in asphalt was less than 6 ppm. Coal tar fume condensates were also approximately 100 times more mutagenic than those of asphalt. Generation temperature, crude oil source, and/or process conditions affected the PAH concentrations but not the mutagenicity in roofing asphalt fume condensates. With paving asphalt fumes, PAH content and mutagenicity varied with crude oil source but not with processing conditions; due to limited data, it was not possible to determine the effect of generation temperature. Coal tar pitch fumes generated at 316°C contained significantly higher

concentrations of PAHs than those generated at 232°C and the mutagenic activity generally paralleled the PAH content. A subset of the paving asphalts demonstrated good correlation between mutagenicity and three- to seven-ring PAH content. These results indicate that asphalt fumes are far less mutagenic than coal tar fumes. Asphalt fumes differ in their ability to induce mutagenic activity, and, most likely, in their potential carcinogenicity.
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1477/93 INCREASE IN NEUROPSYCHIATRIC SYMPTOMS AFTER OCCUPATIONAL EXPOSURE TO LOW LEVELS OF STYRENE
C. Edling, et al., Brit. J. Ind. Med. 50(9): 843-850, 1993. 14 refs.

The results of this study suggest that exposure to styrene below the current Swedish permissible exposure limit of 20 ppm induces neurotoxic effects expressed as an increased number of neuropsychiatric symptoms. Twenty men exposed to styrene at a plastics factory participated. The reference group included 20 non-exposed men matched for age, working schedule, and physical work load. Exposure to styrene during one workday was assessed by personal air monitoring and biological monitoring. To evaluate the physical work load the pulse (heart) rate was measured. One week before the study each man completed a neuropsychiatric symptom questionnaire containing 16 items. Also 17 questions regarding acute symptoms of local irritation and symptoms of the central nervous system were presented after the psychometric tests were performed. The tests were simple reaction time, colour word vigilance, and symbol digit. A follow up with regard to the symptoms among the exposed men was done after their summer vacation, about two to five weeks after their last exposure. The mean eight hour time weighted average (TWA) concentration of styrene in air, measured by passive dosimetry was 8.6 ppm (range 0.04-50.4 ppm). The exposed men had significantly more symptoms than the referents although there were no significant differences for the psychometric tests. At the follow up the exposed men reported fewer symptoms. This study indicates that symptoms are earlier indicators of adverse effects than complex tests and underlines the importance of regular follow up of people exposed to styrene (and probably organic solvents in general).
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1478/93 BENZENE METABOLISM BY RECONSTITUTED CYTOCHROMES P450 2B1 AND 2E1 AND ITS MODULATION BY CYTOCHROME b_5, MICROSOMAL EPOXIDE HYDROLASE, AND GLUTATHIONE TRANSFERASES: EVIDENCE FOR AN IMPORTANT ROLE OF MICROSOMAL EPOXIDE HYDROLASE IN THE FORMATION OF HYDROQUINONE
R. Snyder, et al., Toxicol. & Appl. Pharmacol. 122(2):172-181, 1993. 47 refs.

Benzene metabolism was investigated using two purified rat hepatic MFO systems containing either cytochrome P450 2B1 or cytochrome P450 2E1. Studies performed over a wide substrate concentration range indicate that cytochrome P450 2B1 represents a relatively low-affinity form of cytochrome P450 with respect to benzene metabolism while cytochrome P450 2E1 is substantially more efficient at low benzene concentrations (apparent K_m value 0.17 mM). Cytochrome b_5 stimulated benzene metabolism by both cytochromes P450 2B1 and P450 2E1. With cytochrome P450 2E1 the stimulation of benzene metabolism by cytochrome b_5 was very pronounced (up to 6-fold) at low concentrations of benzene and was most effective (up to 15-fold) with respect to formation of hydroquinone. The metabolites observed in these studies were phenol and hydroquinone. Cytochrome P450 2E1 metabolized phenol with an affinity and capacity comparable to those of benzene. Hydroquinone was the major product formed at all substrate concentrations, while some catechol was formed at higher concentrations of phenol. Phenol metabolism was also stimulated by cytochrome b_5. The metabolism of benzene by cytochrome P450 2E1 in the presence of the major microsomal epoxide hydrolase, mEH_b, yielded phenol, hydroquinone, and benzene dihydrodiol. Interestingly, the addition of mEH_b did not lead to a decrease of the toxicologically important metabolite hydroquinone as might be expected from sequestration of the intermediate benzene oxide to the vicinal dihydrodiol pathway but rather led to a marked (more than 4-fold) increase in the formation of hydroquinone, suggesting catalysis by mEH_b of a predominant attack at the homoallylic position rather than at a carbon atom which forms the epoxide ring of benzene oxide. The addition of glutathione transferases plus glutathione did not yield GSH conjugates during benzene metabolism. However, metabolism of phenol by cytochrome P450 2E1 in the presence of glutathione yielded a nonenzymatically formed glutathione conjugate derived from hydroquinone or from an oxidative product of hydroquinone.
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1479/93 EFFECT OF DOSE ON THE DISPOSITION OF 2-ETHOXYETHANOL AFTER INHALATION BY F344/N RATS

C. H. Kennedy, et al., Fund. & Appl. Toxicol. 21(4):486-491, 1993. 25 refs.

Glycol ethers such as 2-ethoxyethanol (EE) are widely used as solvents because they are miscible in aqueous and organic solutions. Toxic effects of EE in rodents include teratogenicity, fetotoxicity, hematotoxicity, and testicular atrophy. The purpose of this study was to determine the effect of dose on the absorption, metabolism, and excretion of 2-ethoxy[U-^{14}C]ethanol by F344/N rats after inhalation exposure. Rats were exposed to either 5 ppm EE for 5 hr 40 min or 46 ppm EE for 6 hr. The uptake and metabolism of EE were linear in the concentration range studied. Significant percentages of the retained doses were exhaled during (22%) and after exposure (16%) as $^{14}CO_2$. Forty-six percent of the retained dose was excreted in the urine. Approximately 10% of the retained dose was detected in the carcass 66 hr after exposure. The major urinary metabolite was ethoxyacetic acid (EAA), the toxic metabolite of EE. The amount of EAA excreted was linearly related to exposure concentration. Ethylene glycol and N-ethoxyacetyl glycinate were identified as minor metabolites excreted in the urine. The results of this study suggest that the toxicity of inhaled EE should be directly proportional to the exposure concentration up to 46 ppm if the toxicity of EE is due to EAA.

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1480/93 MIXED SOLVENT EXPOSURE AND HEARING IMPAIRMENT: AN EPIDEMIOLOGICAL STUDY OF 3284 MEN. THE COPENHAGEN MALE STUDY

P. Jacobsen, et al., Occup. Med. 43(4):180-184, 1993. 21 refs.

Animal experiments and human studies have indicated an effect on auditory functions from exposure to organic solvents. In this study the relationship between self-assessed hearing problems and occupational exposure to solvents was investigated in a cross-sectional design with 3284 participating men aged 53-74 years. Exposure to solvents for five years or more resulted in an adjusted relative risk (RR) for hearing impairment of 1.4 (95 per cent CI: 1.1-1.9) in men without occupational exposure to noise. Factors adjusted for were age, noise traumas, chronic middle ear infection and family history of hearing impairment. The prevalence of hearing impairment in men not exposed to organic solvents was 24 per cent and the attributable risk from solvent exposure was 9.6 per cent. Exposure for less than five years had no effect on hearing capacity. Occupational exposure to noise for five years or more had an effect twice that of solvents, RR: 1.9 (95 per cent CI: 1.7-2.1). In men exposed to both solvents and noise the effect of the latter dominated and no additional effect from solvents was found. A subsample of 51 men was examined with pure tone audiometry and 20 of 21 men who reported abnormal hearing also fulfilled an audiometric criterion for hearing impairment. In conclusion a damaging effect on hearing ability from long-term solvent exposure was found in the present study. The relative effect was moderate, but with a high background frequency of hearing problems in the unexposed sample, the absolute effect, ie attributable risk, was considerable and of both clinical and preventive importance.

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1481/93 NEUROPHIL FUNCTION AFTER EXPOSURE TO POLYCHLORINATED BIPHENYLS IN VITRO

P. E. Ganey, et al., Environ. Health Perspectives 101(5):430-434, 1993. 28 refs.

Polychlorinated biphenyls (PCBs) are known to be immunotoxic, yet the effects on neutrophil (PMN) function are not well characterized. The authors incubated PMNs isolated from rat peritoneum with a mixture of PCB congeners, Arochlor 1242, in the absence or presence of either phorbol myristate acetate (PMA) to stimulate generation of superoxide anion (O_2^-) or N-formyl-methionyl-leucyl-phenylalanine (fMLP) to induce degranulation (measured as release of β-glucuronidase). Arochlor 1242 alone stimulated O_2^- production at a concentration of 10 µg/ml. Significant cytotoxicity was not observed under these conditions. This concentration of Arochlor 1242 also increased O_2^- generation in PMNs activated with 20 ng PMA/ml. In the presence of a concentration of PMA (2 ng/ml) that by itself did not stimulate production of O_2^-, 1 µg Arochlor 1242/ml caused significant generation of O_2^-, indicating synergy between Arochlor 1242 and PMA. Arochlor 1242 caused release of β-glucuronidase from quiescent PMNs; however, in PMNs stimulated with fMLP to undergo degranulation, Arochlor 1242 inhibited release of β-glucuronidase. The effects of two PCB congeners, one that binds to the Ah receptor (3,3',4,4'-tetrachlorobiphenyl) and one that has little affinity for this receptor (2,2',4,4'-tetrachlorobiphenyl) were examined. 3,3',4,4'-tetrachlorobiphenyl had no effect on PMN function in vitro, whereas 2,2',4,4'-tetrachlorobiphenyl had effects similar to those observed with Arochlor

1242. These results indicate that PCBs affect PMN function in vitro in a complex manner, stimulating or inhibiting function under different conditions. These effects are apparently not mediated through the Ah receptor.
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1482/93 RELATIVE FORMATION OF DICHLOROACETATE AND TRICHLOROACETATE FROM TRICHLOROETHYLENE IN MALE B6C3F1 MICE
M. V. Templin, et al., Toxicol. & Appl. Pharmacol. 123(1):1-8, 1993. 23 refs.

The hepatocarcinogenicity of trichloroethylene (TRI) has been attributed to the metabolite trichloroacetate (TCA). However, mice also form dichloroacetate (DCA) and trichloroethanol (TCE) as metabolites of TRI. TCA and DCA have both been shown to induce hepatic tumors in mice. This study was undertaken to measure the kinetics of TCA and DCA formation in the B6C3F1 mouse using doses of TRI ranging from 0.38 to 15 mmol/kg and TCA at doses of 0.03 to 0.61 mmol/kg. The formation and elimination of TCA and DCA have been found to be nonlinear with the dose of TRI. Quantifiable levels of DCA were found in blood with doses above 0.76 mmol/kg TRI. The peak concentration of DCA did not show an appreciable change with an increased dose; however, the area under the curve (AUC) increased linearly with respect to the dose of TRI. Both peak concentration and AUC of TCA and TCE increased in a linear manner to a dose of 3.8 mmol/kg. The kinetics of TCA elimination following doses of TCA were similar to those found for TCA following doses of TRI. A significant dose-dependent partitioning of TCA into blood over liver was found at the higher doses of TRI and TCA investigated. Binding of TCA to plasma constituents accounted for this distributional pattern. Prior work has documented that DCA can be formed from TCA. However, the AUC for DCA following TRI exceeds that predicted from the formation of TCA from TRI. Additional pathways would, therefore, appear to account for the formation of DCA. Results from this investigation suggest that sufficient concentrations of DCA appear to be formed and may contribute to the hepatocarcinogenicity of TRI.
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1483/93 URINARY THIODIGLYCOLIC ACID AND THIOETHER EXCRETION IN MALE RATS DOSED WITH 1,2-DICHLOROETHANE
J. P. Payan, et al., J. Appl. Toxicol. 13(6): 417-422, 1993. 26 refs.

1,2-dichloroethane (DCE) is extensively metabolized and partially excreted in urine as thioether compounds, which include thiodiglycolic acid (TDGA). In this study, we have compared the urinary excretion of TDGA and thioethers in the rat after administration of increasing doses of DCE. Male Sprague Dawley rats were given a single oral dose of labelled [^{14}C]DCE (0.125 to 8.08 mmol kg^{-1} body wt.) and 24-hr urine samples were collected. The TDGA and thioethers were determined in urine by a gas chromatography method and by the thioether assay after alkaline hydrolysis, respectively. The percentage of the administered radioactivity that was excreted in urine decreased with increasing dose of DCE and ranged between 63 and 7.4%. The amount of TDGA increased proportionally to the DCE dose up to 1.01 mmol DCE kg^{-1} body wt. and corresponded to 0.22 mmol TDGA mmol^{-1} DCE. Up to 0.25 mmol DCE kg^{-1} body wt., the amount of thioethers recovered in urine was not significantly different as compared to the vehicle control group (11.8 ± 0.6 µmol SH equiv. kg^{-1} body wt., n = 10). From the 0.25-4.04 mmol DCE kg^{-1} body wt. dose, the amount of thioethers increased linearly with the dose of DCE and corresponded to 0.028 mmol SH equiv. mmol^{-1} DCE. The ratio between urinary thioethers and TDGA increased with the DCE dose and reached 0.17 ± 0.01 (n = 5) at a dose of 8.08 mmol DCE kg^{-1} body wt. Moreover, TDGA contents determined in urine by gas chromatography before and after alkaline hydrolysis were not significantly different. These results have shown that urinary TDGA was a much better monitor of DCE exposure than total thioethers, not only in specificity but also in sensitivity. Moreover, they point out that TDGA was not hydrolysed under alkaline conditions, making the thioether assay inappropriate for determining TDGA content.
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1484/93 INFLUENCE OF SIZE OF LIPOSOMES IN POTENTIATING THE EFFICACY OF ENCAPSULATED TRIETHYLENETETRAMINE-HEXAACETIC ACID (TTHA) AGAINST CADMIUM INTOXICATION
J. R. Behari, et al., Ind. Health 31(1):29-33, 1993. 12 refs.

Polyaminocarboxylic acids have widely been used as antidotes in heavy metal intoxication, however, their hydrophilic nature renders them to be mostly distributed extracellularly. To facilitate the intracellular delivery of such chelating agents, triethylenetetraamine-hexaacetic acid (TTHA) was encapsulated in small unilamellar vesicles (SUV) or dehydration rehydration vesicles (DRV) and its effect was examined in the amelioration of cadmium toxicity. Mice were administered cadmium (0.2 mg/kg Bwt.) as $CdCl_2$ intraperi-

toneally daily for five days. After a period of four weeks rest, they were given two intravenous injections of TTHA as free material or encapsulated in liposomes (0.16 m mole/kg) at a gap of 48 hours. Urinary and fecal elimination of cadmium and its distribution in the liver, kidney and spleen was monitored after TTHA treatment. The results indicate the efficacy of TTHA in removing cadmium from the body organs of preexposed animals and its excretion through urine and feces was maximum when it was encapsulated in SUV liposomes.
---Authors' abstract in English

1485/93X EPIDEMIOLOGICAL INVESTIGATION ON MALIGNANT TUMORS IN WORKERS EXPOSED TO VINYL CHLORIDE
H. Mei-yuan, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(3):192, 1993.

Thirteen polyvinyl chloride manufacturing plants of 12 cities in China were investigated. This survey covered 5459 workers exposed to vinyl chloride and 6461 workers unexposed to it. The investigation was carried out in retrospective and prospective cohort study, recorded from year of starting production to December 31, 1989. The results showed that the incidence and mortality of liver cancer in male workers exposed to vinyl chloride were significantly higher than those of the control group. The mortality of liver cancer in male workers exposed to vinyl chloride also was significantly higher than that of the male population in the middle cities in China. Among malignant tumors, liver cancer ranked first in male workers exposed to vinyl chloride. The average age for persons who were diagnosed as liver cancer in male workers was significantly younger than that of the control group.
---Authors' abstract in English

1486/93 APLASTIC ANEMIA AND PESTICIDES: AN ETIOLOGIC ASSOCIATION?
L. E. Fleming and W. Timmeny, J. Occup. Med. 35(11):1106-1116, 1993. 38 refs.

The majority of cases of aplastic anemia, a rare previously lethal disease, are of unknown etiology. Nevertheless, for the past 3 decades, case reports and case series of aplastic anemia have suggested an etiologic association between aplastic anemia and pesticide exposure. A review of the medical literature, including basic science literature, confirms a possible etiologic association between pesticide exposure and aplastic anemia. Two hundred and eighty cases of aplastic anemia associated with pesticide exposure were reported in the literature. The majority of these cases were young (mean age, 34 years; median, 28), with a short latency (mean, 5 months) and with a history of occupational exposure to pesticides. The pesticide exposures reported were the organochlorines and organophosphates, both commonly used pesticides throughout the world. Therapeutic and methodologic issues as well as future directions for research into this etiologic association are discussed.
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1487/93 ASSESSING THE NEUROTOXIC POTENTIAL OF METHYL ETHYL KETOXIME IN RATS
G. E. Schulze and M. J. Derelanko, Fund. & Appl. Toxicol. 21(4):476-485, 1993. 36 refs.

The potential of methyl ethyl ketoxime (MEKO) to produce neurotoxicity following acute and subchronic exposure was studied in rats. A Functional Observational Battery, assessment of motor activity, and neuropathology evaluations were conducted in the context of acute and subchronic toxicity studies. Three independent studies are reported: a pilot time-effect study designed to determine the time course and time to peak effect following a single high dose of MEKO, a single-dose neurotoxicity study, and a subchronic (13-week) repeated-dose neurotoxicity study in rats. An acrylamide-positive control group was included in the acute and subchronic studies for comparison with MEKO. Following an acute oral exposure of MEKO at a dose level of 900 mg/kg, locomotor activity was decreased compared to control with maximum decreases occurring between 30 and 60 min following oral administration. In the acute study, transient treatment-related changes in ease of cage removal, ease of handling, and in posture and gait were observed 1 hr after dosing with 900 mg/kg MEKO, as were significant depressions in motor activity. Following a single 300 mg/kg dose, transient MEKO-related changes in gait and aerial righting reflex were noted 1 hr after dosing. All effects were reversible within 24 hr of dosing. The single 100 mg/kg dose of MEKO was without observable effects. No acrylamide-related behavioral effects were noted following a single 50 mg/kg dose. In the subchronic study, transient treatment-related changes in ease of cage removal, ease of handling, and in posture, gait, and aerial righting were observed at the 400 mg/kg/day dose level when assessments were conducted immediately after dose administration. No consistent behavioral effects were observed prior to daily dose administration even after 13 weeks of exposure, indicating a lack of cumulative behavioral effect. No consistent behavioral changes were noted at doses of 125 mg/kg/day

and below. Significant dose-related decreases in red cell mass, and increases in methemoglobin levels, reticulocyte, leukocyte, Heinz body counts, and spleen weights occurred at subchronic MEKO doses of 40 mg/kg/day and higher. No MEKO-related neuropathological changes occurred. Animals receiving acrylamide at 20 mg/kg/day showed expected behavioral and neuropathological changes consistent with peripheral neuropathy. In conclusion, high doses of MEKO can produce transient and reversible changes in neurobehavioral function consistent with central nervous system (CNS) depression. No evidence of cumulative neurotoxicity was detected. The hematopoietic system was effected at doses which did not produce detectable changes in CNS function.
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1488/93 QUANTITATION OF AN EPITHELIAL S-PHASE RESPONSE IN THE RAT FORESTOMACH AND GLANDULAR STOMACH FOLLOWING GAVAGE DOSING WITH ETHYL ACRYLATE

D. M. Gillette and C. B. Frederick, Toxicol. & Appl. Pharmacol. 122(2):244-257, 1993. 45 refs.

Gavage dosing of the irritant, ethyl acrylate (EA), has been found to induce hyperplasia in the rat forestomach, but no signs of toxicity in the glandular stomach or in organs remote from the site of dosing. To quantitatively describe this effect as a background for subsequent modeling studies, pulse measurements of the number of S-phase cells were made following a single gavage dose of EA. The time-course of the S-phase response in the forestomach epithelium following a high dose (200 mg/kg or a 4% solution in corn oil) indicated that the number of S-phase nuclei was decreased relative to control animals immediately following gavage dosing with a minimum at 6 hr, but that the number of S-phase nuclei increased significantly above control values by 20 hr and remained significantly elevated until at least 48 hr following the gavage dose. A single-dose dose-response study with gavage doses of 0, 2, 10, 20, 50, 100, or 200 mg/kg EA and S-phase analysis at 24 hr following gavage dosing indicated that a significant increase in S-phase nuclei was evident at doses of 20 mg/kg or higher. Dosing with EA for 2 weeks at dose levels of 0, 10, 50, or 200 mg/kg caused a prolonged elevation of S-phase nuclei only at the 200 mg/kg dose level during the 24 hr following the last gavage dose. Lower doses did not induce a significant increase in the S-phase nuclei. In contrast to the forestomach, the S-phase response of the glandular stomach was transient following a single 200 mg/kg gavage dose, and only a marginal response was observed following multiple 200 mg/kg doses. No effects were observed at lower doses. Comparison of these results to prior determinations of the effect of EA on the concentration of nonprotein sulfhydryls (primarily glutathione) in the forestomach and glandular stomach indicate a correlation of the stimulation in S-phase activity in the forestomach with the repletion and overshoot of tissue nonprotein sulfhydryl levels.
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1489/93 HEPATIC FAILURE LEADS TO LETHALITY OF CHLORDECONE-AMPLIFIED HEPATOTOXICITY OF CARBON TETRACHLORIDE

M. G. Soni and H. M. Mehendale, Fund. & Appl. Toxicol. 21(4):442-450, 1993. 50 refs.

Chlordecone (Kepone) amplification of CCl_4 toxicity occurs at small, nontoxic levels of chlordecone and CCl_4 and results in highly increased irreversible hepatotoxicity culminating in lethality. Although it is generally assumed that CCl_4 lethality is due to hepatic failure, no definitive studies are available in the literature bridging massive liver failure and death. The present studies were designed to evaluate whether hepatic failure is the cause of the lethality during chlordecone-amplified CCl_4 toxicity. Male Sprague-Dawley rats were maintained on control or a chlordecone (10 ppm) diet for 15 days and injected with CCl_4 (100 µl/kg, ip) on Day 16. Rats were killed at 0, 6, 12, 24, 36, and 48 hr after CCl_4 challenge. Hepatic failure was evaluated by measuring plasma glucose, ammonia, bilirubin, aspartate transaminase (AST), alanine transaminase (ALT), sorbitol dehydrogenase (SDH), hepatic ATP, glycogen, and by histological and histomorphometric analyses. Plasma creatinine, urea, and kidney histopathology were also assessed for possible renal injury. As expected CCl_4 administration to chlordecone-pretreated rats resulted in 20% lethality by 36 hr, which progressed with time, and all rats died within 72 hr. A significant and progressive hypoglycemia was observed with a 60% reduction in plasma glucose at 48 hr. Hepatic glycogen content dropped precipitously. Similarly, hepatic ATP levels remained suppressed (80% of control) at all the time points studied. Plasma ammonia levels were significantly elevated, and by 48 hr, a threefold increase was observed. Plasma ALT, AST, SDH, and bilirubin increased progressively until the death of rats receiving the chlordecone + CCl_4 combination. Histopathologically, the liver sections revealed a progressive and irreversible damage evidenced by vacuolation,

accumulation of fat, and increase in hepatocellular necrosis resulting in disrupted hepatolobular structure. Administration of the same dose of CCl_4 to rats maintained on a normal diet resulted in only marginal changes in plasma enzymes, no increase in serum bilirubin, and no significant injury in liver sections at 24 hr. CCl_4 administration to chlordecone-pretreated rats resulted in a marginal increase in plasma creatinine and urea only at later time points. Histopathological examination of sections of kidneys from rats receiving either chlordecone + CCl_4 combination or the same dose of CCl_4 alone did not reveal any evidence of significant renal injury. The clinical end points of hepatic function measured in the present study are consistent with the sequel of hepatic failure and hepatic encephalopathy leading to animal death in chlordecone-amplified CCl_4 toxicity.
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1490/93X THE EFFECTS OF CARBON TETRACHLORIDE ON Ca, CaM MESSENGER SYSTEM IN HEPATOCYTES
T. Wei-feng, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(4):253, 1993.

The effects of carbon tetrachloride (CCl_4) on intracellular calcium ions and the activities of calmodulin and Ca^{++}, Mg^{++}--ATPase in hepatocytes were observed. The results showed that the intracellular Ca^{++} ions were markedly increased, the activity of Ca^{++}, Mg^{++}--ATPase decreased and LDH obviously elevated in culture medium as the concentration of CCl_4 in medium was increased and the exposure time prolonged. The low dose of CCl_4 did not affect the activity of CaM in hepatocytes. While CCl_4 concentration in medium was 0.96 mg/ml, the activity of CaM and Ca^{++}, Mg^{++}--ATPase were significantly decreased. The decrease of CaM activity was not related with the contents of CCl_4 in hepatocytes indicating that the decrease of CaM activity is not inhibited by CCl_4 itself.
---Authors' abstract in English

1491/93 DISPOSITION OF INHALED ISOBUTENE IN F344/N RATS
R. F. Henderson, et al., Toxicol. & Appl. Pharmacol. 123(1):50-61, 1993. 29 refs.

Isobutene (2-methylpropene) (CAS No. 115-11-7) is a gas widely used in the chemical manufacturing industry. As an aid to planning long-term toxicity studies, research was conducted to determine the effect of exposure concentrations on the absorption and metabolism of isobutene in F344/N rats. Male F344/N rats (11-15 weeks of age) were exposed for 2 hr to 0, 40, 400, or 4000 ppm isobutene, and a time-course evaluation of blood levels of isobutene was performed using headspace analysis methods. Blood levels of isobutene were linearly related to exposure concentrations between 40 and 400 ppm but increased in a supralinear fashion at the highest concentration, suggesting that the capacity of the rats to metabolize isobutene has been exceeded. Total uptake, excretion patterns, and metabolic conversions were studied in rats exposed for up to 6 hr to 0, 2, 40, 400, or 4000 ppm [^{14}C]isobutene. Absorption of the inhaled isobutene was approximately 8% up to 40 ppm isobutene, but decreased at the higher concentrations. The amount of isobutene metabolized per ppm · hr of exposure was also linear up to 40 ppm but decreased at higher concentrations. Over 90% of the absorbed isobutene was metabolized at exposure concentrations up to 400 ppm, but the exposure to ~4000 ppm isobutene resulted in approximately 20% of the absorbed dose exhaled as the unmetabolized isobutene. Two urinary metabolites were identified as isobutenediol and 2-hydroxyisobutyric acid. Two other urinary metabolites were tentatively identified as sulfate conjugates of isobutenediol. Based on these studies, linear dose-response relationships would be expected in chronic toxicity studies for exposures up to 40 ppm isobutene. Additional studies would be required to determine if repeated exposures would induce higher metabolic capacities in the exposed rats.
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1492/93 A HAZARD AND OPERABILITY STUDY OF ANHYDROUS AMMONIA APPLICATION IN AGRICULTURE
A. B. Spencer and M. G. Gressel, Am. Ind. Hyg. Assoc. J. 54(11):671-677, 1993. 8 refs.

Researchers from the National Institute for Occupational Safety and Health (NIOSH) applied Hazard and Operability (HAZOP) analysis to examine hazards during the use of anhydrous ammonia by farmers. This analysis evaluated the storage, transfer, and application of anhydrous ammonia, identifying credible hazard scenarios, practical solutions, and research needs. Ninety-five findings were developed that are of use to farmers, distributors of ammonia and application equipment, and manufacturers of application equipment. The findings generally involve training, equipment design changes, preventive maintenance, and material compatibilities. The HAZOP team found that additional safety features need to be developed or implemented. The study also pointed out where correct operator procedure and preventive

maintenance can prevent inadvertent releases. Other inadvertent releases are caused by incompatible materials, or by using equipment in ways other than intended. Several examples of the findings are given to emphasize the HAZOP technique and the high-risk scenarios. Strategies for dissemination to the agricultural community are presented.
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1493/93 RAILROAD DIESEL EXHAUST: CONCENTRATION AND MUTAGENICITY
S. K. Hammond, et al., Appl. Occup. Environ. Hyg. 8(11):955-963, 1993. 24 refs.

High volume fixed location samples of particles and vapor phase components were collected on filters and XAD-2 resin, respectively, to study the concentration and mutagenicity of diesel exhaust in locomotive repair shops at four railroads. The geometric mean concentrations were 96 $\mu g/m^3$ [geometric standard deviation (GSD) = 2.14] for 23 samples of respirable particles, 164 $\mu g/m^3$ (GSD = 1.86) for 26 samples of total particles, and 432 $\mu g/m^3$ for 9 samples of vapor phase components. Approximately 30 to 40 percent of the particle mass was extractable in dichloromethane. Chemical class separation of these extracts by normal phase liquid chromatography yielded nearly half the mass in the aliphatic fraction, less than one third in the aromatic fraction, and about one quarter in the polar fraction. Extracts of particle samples were found to be mutagenic in the Salmonella typhimurium forward mutation assay system. Most of this activity was in the polar fraction. None of the vapor phase samples tested contained significant mutagenic activity either with or without metabolic activation. The locomotive repair shop air was approximately 1 order of magnitude more mutagenic than urban air. These elevated levels of mutagens found in diesel locomotive repair shops are consistent with the increased mortality from lung cancer that has been found among railroad workers.
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1494/93X THE EFFECT OF ACETIC ACID UPON WORKERS' HEALTH AND EXPOSURE LIMIT
W. Hong-bo, et al., Chinese J. Ind. Hyg. Occup. Dise. 11(3):192-193, 1993.

This paper reports the results of medical examination on 588 workers exposed to acetic acid vapour and determination of acetic acid in 1062 air samples collected in factories which produce acetic acid or use it. The results indicated that there were dose--response relationships between the concentration of acetic acid in exposure and eye conjunctiva or upper respiratory tract mucosa irritation, immunoglobulin (IgA, IgG) level. There were highly significant differences in detectable rate of all the above responses compared with the control group while the acetic acid concentration (TWA) was 16.31 mg/m^3; there was significant difference in detectable rate of individual symptom and sign while TWA was 6.79 mg/m^3 and 7.76 mg/m^3; there was no difference between the exposed group and control group while TWA was 2.18 mg/m^3. On the basis of the spot investigation and the data of toxicology, along with reference to the health standard of acetic acid in different countries, the authors recommend the maximum allowable concentration of acetic acid in air at workplace is 10 mg/m^3.
---Authors' abstract in English

1495/93 DECREASE IN MERCURY CONCENTRATION IN BLOOD AFTER LONG TERM EXPOSURE: A KINETIC STUDY OF CHLORALKALI WORKERS
G. Sallsten, et al., Brit. J. Ind. Med. 50 (9):814-821, 1993. 28 refs.

The elimination of mercury (Hg) in blood was investigated in 14 chloralkali workers exposed to metallic Hg vapour for 1-24 (median 10) years. Blood and urine samples were collected on several (median eight) occasions during a period of 17-26 days. The initial Hg concentrations were about 80 nmol/l in whole blood (B-Hg) and 17 nmol/mmol creatinine in urine (U-Hg). The decrease in Hg in whole blood, plasma (P) and erythrocytes (Ery) was best characterised by a two compartment model. In a model with a common half life for all subjects, the best fit for B-Hg was obtained with half lives of 3.8 days for a fast phase and 45 days for a slow phase. The half life of the fast phase was shorter for P-Hg than for Ery-Hg, whereas the opposite was the case for the slow phase. The half lives of the slow phases in whole blood and plasma were longer, and the relative fractions of the slow phases were higher (about 50%) after long term exposure than those (about 20%) reported after brief exposure. Slower elimination indicates higher accumulation of Hg in organs with long half lives, and possibly the presence of at least one additional, even slower compartment. The U-Hg fluctuated substantially during the sampling period, and average concentrations decreased only slightly.
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1496/93 A COHORT STUDY OF WORKERS EXPOSED TO FORMALDEHYDE IN THE BRITISH CHEMICAL INDUSTRY: AN UPDATE

M. J. Gardner, et al., Brit. J. Ind. Med. 50 (9):827-834, 1993. 16 refs.

A cohort study of workers exposed to formaldehyde in the British chemical industry in any one of six factories has been extended after the earlier published report in 1984. A further eight years of follow up to the end of 1989 have been included for the originally reported 7660 workers first employed before 1965, and a first follow up to the same date has been carried out for 6357 workers first employed since 1964. Extensive checking of the database has taken place including records at the factories, the MRC Environmental Epidemiology Unit, and the National Health Service Central Register. The updated findings include one death from nasal cancer compared with 1.7 expected in this number of men during the follow up period--which gives no support to the original hypothesis based on animal experimental data that formaldehyde may be a nasal carcinogen in humans. There have been no cases of nasopharyngeal cancer in the cohort compared with an estimated 1.3 expected--which gives no support to the findings in a similarly designed study in the United States of an excess of cancers of the nasopharynx associated with exposure to formaldehyde. There has been a slight excess of about 12% for lung cancer with 402 deaths compared with about 359 expected. This is similar to that found in the United States study, but higher than we reported earlier before the checking procedures and extended follow up. Further analysis gives no definitive indication of this excess of lung cancer being clearly related to formaldehyde exposure, and the increase is within that generally thought consistent with possible confounding effects of cigarette smoking (although no data are available on this point).
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1497/93 NEPHROTOXICITY IN RATS FOLLOWING LIVER TRANSPLANTATION FROM CADMIUM-EXPOSED RATS

H. M. Chan, et al., Toxicol. Appl. Pharmacol. 123(1):89-96, 1993. 25 refs.

Although kidney is considered as the critical organ for cadmium (Cd) toxicity, little is known about the transport of Cd to kidney after chronic exposure. In order to study this transfer, male Lewis rats (150-200 g) were given eight injections (sc) of $CdCl_2$ (3 mg Cd/kg) over 2 weeks which resulted in increases of tissue Cd and metallothionein (MT) concentrations (223 and 1850 µg/g, respectively, in the liver and 118 and 873 µg/g, respectively, in the kidney). Livers from Cd-injected rats were transplanted to age-matched control healthy Lewis rats and the recipient rats were killed at 2 to 47 days after transplantation. The levels of Cd and MT in the liver of recipient rats were decreased (106 and 1503 µg/g, respectively) with time after surgery. On the other hand, renal Cd and MT levels were markedly increased (195 and 1468 µg/g, respectively) and most of the Cd in the kidney was bound to MT. About 100 ng/ml of Cd and MT were detected in the plasma of recipient rats by ELISA. There was some periportal fibrosis in the liver due to transplant procedure which did not anastomose hepatic arteries. There was an increase in blood urea nitrogen levels in rats transplanted with Cd-containing liver. In addition, both necrosis and inflammation were observed in the epithelial cells in the proximal tubules in the kidney which typically occurs in chronic Cd toxicity. These results suggest that the major source of renal Cd in chronic Cd exposure may be derived from hepatic Cd which is transported in the form of Cd-MT in blood plasma.
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1498/93X A STUDY ON γ-GT ACTIVITY IN URINE OF WORKERS EXPOSED TO LEAD

H. Xing-xuan, et al., Chinese J. Ind. Hyg. Occup. Dise. 11(4):255, 1993.

The renal function and porphyrin metabolism of 218 workers exposed to lead were investigated. It was found that there was no correlation between γ-GT activity in urine and lead concentration in urine or degree of lead toxicity. Declining of γ-GT activity in urine was an early change to show lead-induced renal damage. γ-GT activity in urine could be a monitoring parameter for lead-induced renal damage.
---Authors' abstract in English

1499/93X A STUDY OF URINARY N-ACETYL-B-D-GLUCOSAMINIDASE ACTIVITY IN LEAD-EXPOSED WORKERS

H. jian-an, et al., Chinese J. Ind. Hyg. Occup. Dise. 11(4):255-256, 1993.

The adverse effects of long-term exposure to lead on renal function were studied in 262 male and 87 female workers in a lead refinery. Laboratory examinations showed that the urinary protein and urinary lysozyme increased markedly in lead workers. The urinary N-acetyl-β-D-glucosaminidase (NAG) activity in urine increased markedly in lead workers and showed significant correlation

with lead exposure indices and renal function indices. These results demonstrate that long-term exposure to lead may cause damage on renal function. The workers whose NAG increased most significantly belonged to the group that was poisoned and exposed to lead lighter, which indicates that NAG does not rise continuously with the increase of lead-induced impairment and suggests that NAG may be more suitable as one of the most sensitive index for estimating renal dysfunction due to lead in earlier periods.
---Authors' abstract in English

1500/93 SUBCHRONIC TOXICITY OF CUPRIC SULFATE ADMINISTERED IN DRINKING WATER AND FEED TO RATS AND MICE
C. D. Herbert, et al., Fund. & Appl. Toxicol. 21(4):461-475, 1993. 34 refs.

The effects of acute poisoning by cupric sulfate in a number of species are well known; however, the effects of chronic low-level ingestion of cupric sulfate are less well characterized. Because exposure of humans to cupric sulfate may occur through drinking water, food, soil, or ambient air, subchronic toxicity studies were conducted in male and female F344/N rats and B6C3F$_1$ mice by the drinking water (2-week exposure) and dosed feed (2- and 13-week exposure) routes. Animals were evaluated for histopathology, clinical pathology, reproductive toxicity, and tissue metal accumulation, and target organs were examined by a variety of special stains and by electron microscopy to characterize the observed lesions. In drinking water, cupric sulfate concentrations of 300 to 100 ppm produced no ill effects, whereas concentrations of 3000 to 30,000 ppm were lethal to rats and mice within 2 weeks. In feed, cupric sulfate concentrations of 4000 to 16,000 ppm caused significant reductions in body weight gain in both species in the 2- and 13-week studies. Hyperplasia and hyperkeratosis of the limiting ridge of the forestomach were present in both species in the 2- and 13-week studies. Rats in the dosed feed studies had a dose-related increase in inflammation in the liver and changes in clinical chemistry parameters which were indicative of hepatocellular damage and cholestasis. Histologic changes in the kidneys of rats consisted of a dose-related increase in the number and size of eosinophilic protein droplets in the epithelial cytoplasm and the lumina of the proximal convoluted tubules. Droplets were larger and more numerous in males than in females. Urinalysis results were suggestive of renal tubular epithelial damage. Iron staining of spleens from treated animals indicated a marked depletion of iron stores in both male and female rats, but not in mice, while hematologic and clinical chemistry alterations in rats in the 13-week study, along with histologic changes in bone in the 2-week dosed feed study, were indicative of a microcytic anemia. Cupric sulfate produced no adverse effects on any of the reproductive parameters measured in rats or mice of either sex. These results indicate that cupric sulfate at high exposure levels is a hepatic and renal toxicant, as well as an inducer of anemia in rodents, with rats more sensitive than mice following subchronic exposure.
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1501/93 URINARY PORPHYRIN PROFILES AS A BIOMARKER OF MERCURY EXPOSURE: STUDIES ON DENTISTS WITH OCCUPATIONAL EXPOSURE TO MERCURY VAPOR
J. S. Woods, et al., J. Toxicol. Environ. Health 40(2-3):235-246, 1993. 23 refs.

Porphyrins are formed as intermediates in the biosynthesis of heme. In humans and other mammals, porphyrins with eight, seven, six, five, and four carboxyl groups are excreted in the urine in a well-established pattern. Mercury selectively alters porphyrin metabolism in kidney proximal tubule cells, leading to an altered urinary porphyrin excretion pattern. Previous studies in rats have shown that changes in the urinary porphyrin profile during exposure to mercury as methylmercury hydroxide are uniquely characterized by highly elevated (20- to 30-fold) levels of four- and five-carboxyl porphyrins and by the excretion of an atypical porphyrin ("precoproporphyrin"), which elutes on high performance liquid chromatography (HPLC) approximately midway between penta- and coproporphyrins. Changes in the urinary porphyrin profile are highly correlated with the dose and duration of mercury exposure and persist for up to 20 wk following cessation of mercury treatment. In the present studies, the utility of urinary porphyrin profile changes as a biomarker of mercury exposure in human subjects was evaluated. Urinary porphyrin concentrations were measured in dentists participating in the Health Screening Programs conducted during the 1991 and 1992 annual meetings of the American Dental Association and compared with urinary mercury levels measured in the same subjects. Among dentists with no detectable urinary mercury, mean concentrations of urinary porphyrins were within the established normal ranges for male human subjects. In contrast, among dentists with urinary mercury in excess of 20 µg/L, mean urinary concentrations of four- and five-carboxyl porphyrins as well as of precoproporphyrin were elevated three to four times those of unexposed subjects. Significant differences in urinary

porphyrin concentrations remained when porphyrin concentrations in spot urine samples were adjusted for creatinine levels. These findings suggest that urinary porphyrin profiles may serve as a useful biomarker of mercury exposure in clinical or epidemiologic studies of mercury-related human health risks.
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1502/93 EFFECTS OF IN UTERO METHYLMERCURY EXPOSURE ON A SPATIAL DELAYED ALTERNATION TASK IN MONKEYS
S. G. Gilbert, et al., Toxicol. & Appl. Pharmacol. 123(1):130-136, 1993. 36 refs.

Adult female monkeys (Macaca fascicularis) were exposed to 0, 50, 70, or 90 µg/kg/day of methylmercury prior to and throughout pregnancy and produced 11, 9, 2, and 2 infants, respectively. At birth, blood mercury levels of treated infants ranged from 1.04 to 2.46 ppm. At approximately 7 to 9 years of age, the monkeys were trained by successive approximation to respond on a lit button for a small amount of apple juice. The monkeys were then trained on a 0.1-sec spatial delayed alternation task to a specified criterion of performance. This was followed by 10 sessions each of fixed delay times of 0.5, 1, 3, 5, and 10 sec, followed by 20 sessions containing variable delay times of 0.1 to 15 sec. Data from all treated monkeys were combined. There were no differences between treated and control monkeys in initial button training or number of sessions to reach criterion on 0.1-sec delay procedure. On the fixed delay sessions, the treated monkeys had significantly more correct trials, and fewer incorrect responses, preservative responses, and delay responses than controls. There were no differences between the treated and control monkeys on performance on the variable delay schedule. Results from this study indicate that in utero methylmercury exposure did not adversely affect the spatial memory of adult monkeys when tested on a delayed alternation task and may have facilitated performance on this task.
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1503/93 RATIONALE FOR SELECTING EXFOLIATED BLADDER CELL MICRONUCLEI AS POTENTIAL BIOMARKERS FOR ARSENIC GENOTOXICITY
A. H. Smith, et al., J. Toxicol. Environ. Health 40(2-3):223-234, 1993. 50 refs.

Biomarkers of effect have important potential in epidemiology, since they may enable ascertainment of exposure-effect associations in relatively inexpensive cross-sectional studies, with confirmation by short follow-up after cessation of exposure. Arsenic is known to cause human skin and lung cancer, and may also cause various internal cancers including bladder, kidney, and liver cancer. The strongest epidemiological association between arsenic ingestion and an internal cancer is that with bladder cancer. Epidemiological studies of a Taiwanese population exposed to high levels of arsenic from drinking water reported relative risks for bladder cancer well above any other known environmental carcinogen. Populations at increased risk for bladder cancer from other exposures, such as smoking and schistosomiasis infection, have elevated frequencies of micronuclei in exfoliated bladder cells. We have therefore proposed that the bladder cell micronucleus assay could be an appropriate biological marker of genotoxic effect of arsenic exposure. In this paper, we present the rationale for choosing the bladder cell micronucleus assay as a potential biomarker of effect for arsenic. The authors also briefly describe the studies they are conducting using this biomarker in currently exposed populations.
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1504/93 PRELIMINARY REPORT ON A SIMPLE NEW ASSAY FOR DNA-PROTEIN CROSS-LINKS AS A BIOMARKER OF EXPOSURES EXPERIENCED BY WELDERS
M. Costa, et al., J. Toxicol. Environ. Health 40(2-3):217-222, 1993. 13 refs.

A method originally developed to detect topoisomerase DNA complexes has been adapted to determine DNA-protein cross-links formed in cells following their exposure in vitro and in vivo to cross-linking agents. A preliminary study on welders and controls has been carried out to assess the feasibility of this assay to detect human exposure to chromium (Cr) and nickel (Ni) that are associated with increased DNA-protein cross-links. The percentage of cross-link was significantly higher among welders (1.85% ± 1.14) than among controls (1.17% ± 0.46; $p = .01$). Cross-links were not affected by age, weight, or smoking status. The assay developed has substantial advantages over previous methods, being considerably more simple, inexpensive, and sensitive.
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1505/93 REVERSIBILITY OF LEAD-INDUCED DEPRESSION OF GROWTH
P. B. Hammond, et al., Toxicol. & Appl. Pharmacol. 123(1):9-15, 1993. 20 refs.

The overall objective of this investigation was to determine whether the growth-depressive effects of lead (Pb) are reversible. The animal model used was the female weanling rat. In Study 1, one group of animals was exposed to Pb for 10 days, a second group was exposed for an additional 21 days, and a third group of animals served as controls. Animals whose Pb was terminated after 10 days caught up completely with controls in terms of linear growth but only partially in terms of ponderal growth. There was no growth catch-up vis-a-vis controls among animals whose Pb exposure was continued for an additional 21 days, to the end of the study. In Study 2, Pb was terminated after only 3 days of exposure. Depression of body weight gain was completely reversed within 1 day after termination of exposure. In Study 3, the role of undernutrition alone (food restriction) was investigated. Depression of body weight gain was immediately apparent and, as with Pb, decrease in linear growth (tail length) was not apparent until later. Catch-up to controls in terms of weight was achieved within 1 day of free access to food when food restriction was for 3 days. Catch-up was also complete after 10 days of food restriction, but was slower (7 days). Evidence for catch-up in terms of linear growth was equivocal. It is concluded that the reversibility of the effects of Pb on growth is dependent on the duration of Pb-induced reduction of food consumption and that linear growth depression is more readily reversible than ponderal growth depression. A final study (Study 4) was undertaken to assess the role of reduced water consumption in limiting food intake and growth. Comparison groups were (1) control, (2) Pb via drinking water, and (3) Pb via sc osmotic pumps. Water consumption was significantly decreased only with Pb by drinking water. Thus, the reduced water consumption with Pb delivered orally seems not to be causally related to the associated depression of food consumption and growth.
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1506/93X EVALUATING OCCUPATIONAL LEAD POISONING AND SPECIFIC PERMANENT WORK DISABILITY
L. Kurajica and S. Curin, Arh. Hig. Rada Toksikol. 44(2):163-172, 1993. 11 refs.

Evaluation of occupational lead poisoning and resultant permanent work disability calls for a procedure which is not easy to conduct. This is because vague, non-manifest lead poisonings and transient prepoisoning states have lately prevailed over clearly manifested, obvious lead poisonings as were found earlier due to unfavourable working conditions. A reason for this further lies in non-specific clinical symptoms of lead poisoning as well as in lack of a strict set of rules - especially when it comes to assessing biological indicators of abnormal lead absorption in the body - for experts in the disability assessment boards to go by. In view of that, the conduct of those taking part in the evaluation procedure (general practitioner of patient's own choice and team of experts in pension and disability assessment boards) is analysed. Many assessments have been found deficient. An amendment to the rules for expert evaluation is proposed.
---Authors' abstract in English

1507/93 EFFECT OF IN VIVO EXPOSURE TO IODINE-131 ON THE FREQUENCY AND PERSISTENCE OF MICRONUCLEI IN HUMAN LYMPHOCYTES
G. K. Livingston, et al., J. Toxicol. Environ. Health 40(2-3):367-375, 1993. 21 refs.

The validity of the micronucleus test as a biomarker of chromosome damage in dividing mammalian cells is well established. This assay was used to study the response of peripheral lymphocytes of a 34-yr-old male patient following treatment with ^{131}I ablative radiation therapy following a total thyroidectomy. Coincidentally, 8 mo before diagnosis, the patient had provided a blood sample for an in vitro study of micronucleus induction following exposure to graded doses of x-rays. The background frequency in the unexposed culture showed a mean count of 6.0 micronuclei per 1000 binucleated (first division) lymphocytes, while mean values of 18.5, 29.0, 41.0, 61.0 and 75.5 micronuclei/1000 cells were observed following x-ray doses of 5, 10, 15, 20, and 25 cGy, respectively. These data fit a nonthreshold, linear dose-response function ($y = 2.78x + 3.71$; $r = .99$). Eight months after the in vitro x-ray study, the subject was diagnosed with thyroid cancer. Surgery was performed, and 5 wk later the patient received 1.78 GBq (48 mCi) of ^{131}I as adjuvant radiation therapy. Blood was drawn 11 d after the radiation treatment and at monthly intervals thereafter to analyze the frequency and persistence of micronuclei. The first posttreatment sample showed 35.5 micronuclei per 1000 binucleate cells. Based on the linear dose-response equation from the earlier study, the sixfold increase in micronucleus frequency suggests a dose to the peripheral blood of approximately

11 cGy. The cytogenetic dose estimate compares to ~30 cGy using a new model based on external whole-body counting data. Nine consecutive monthly samples have been analyzed to date. Although the micronucleus count has fluctuated (four- to sixfold above background), the frequency after 8 mo is equivalent to the first posttreatment sample. Data show that radiation-induced cellular lesions persist for months following relatively brief radiation exposure to a medical isotope. Results of this study support the conclusion that the lymphocyte micronucleus test is a rapid, sensitive, and perhaps quantitative biomarker of low-dose (< 25 cGy) radiation exposure.
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1508/93 INTERRELATION BETWEEN URINARY σ-AMINOLEVULINIC ACID (ALA), SERUM ALA, AND BLOOD LEAD IN WORKERS EXPOSED TO LEAD
K. Tomokuni, et al., Ind. Health 31(2):51-57, 1993. 11 refs.

Using a fluorometric HPLC method, the authors determined σ-aminolevulinic acid (ALA) in sera and urine samples from 16 lead workers with blood lead levels ranging from 19 to 107 μG/100 ml. The concentration of ALA in serum correlated highly with the urinary ALA concentration (μ= 0.957 for ALA mg/l; γ = 0.967 for ALA mg/g creatinine). The ALA concentrations in the serum of lead workers ranged from 11 to 151 μg/l with a mean of 51 μg/l. In addition, the concentrations of urinary ALA (mg/g creatinine) and serum ALA μg/l) had a strong correlation with blood lead concentrations (γ = 0.838 and 0.892, respectively). These data indicate that the measurement of serum ALA, as well as urinary ALA, is very useful for the biological monitoring of occupational lead exposure.
---Authors' abstract in English

1509/93X MANGANESE TRANSFER VIA BLOOD TO TESTES AND BRAINS IN MALE MICE AND ITS EXCRETION IMPELLED BY SODIUM PARA - AMINOSALICYLIC ACID
W. Wei-Ping, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(3):192, 1993.

Transfer of manganese from blood to testes and brains and other organs was demonstrated by giving a single ip injection of $MnCl_2$ (0.25 μCi/g) to male mice. The results showed that the blood--testes barrier and blood--brain barrier were more permeable to manganese and that manganese was more readily accumulated in the testes and brain. The toxic effects of Mn on hypothalamic--pituitary --testicular axis in male mice may result from the direct action of manganese on hypothalmus and testes tissues. No Mn deposit in pituitary was found. The data also indicated that the blood--testes barrier blood--brain barrier were more permeable to PAS--Na, and that manganese was effectively combined and excreted in the testes and brain.
---Authors' abstract in English

1510/93 INCREASED RISK OF PROTEINURIA AMONG A COHORT OF LEAD-EXPOSED PREGNANT WOMEN
P. Factor-Litvak, et al., Environ. Health Perspectives 101(5):418-421, 1993. 41 refs.

Long-term exposure to high concentrations of lead results in renal dysfunction. During a prospective study of environmental lead and pregnancy outcomes in 1502 women residing in two towns in Yugoslavia, we explored whether moderate exposure to lead results in increased rates of proteinuria. The geometric mean blood lead concentrations (BPb) were 17.1 5.1 μg/dl in the smelter and nonexposed towns, respectively. Increases in BPb were associated with increased odds ratios for both trace and ≥ 1+ proteinuria, measured using a urinary dipstick. Comparing the women in the upper 10th percentile of exposure to those in the lowest 10th percentile, the adjusted odds ratio for ≥ 1+ proteinuria was 4.5 (95% CI 1.5, 13.6). Similarly, the adjusted odds ratio for trace proteinuria was 2.3 (95% CI 1.3, 4.1). Similar to other studies showing associations between chronic exposure to lead and renal dysfunction, the data suggest that long-term exposure to environmental lead may be associated with proteinuria.
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1511/93 EPIDEMIOLOGICAL SURVEY OF WORKERS EXPOSED TO COBALT OXIDES, COBALT SALTS, AND COBALT METAL
B. Swennen, et al., Brit. J. Ind. Med. 50(9): 835-842, 1993. 35 refs.

Several organs (lung, skin, thyroid, heart, bone marrow) are potential targets of cobalt (Co). Whereas there is no doubt that inhalation of Co alone may cause bronchial asthma, its role in the occurrence of hard metal disease is still controversial because most cases were reported in workers exposed not only to Co but also to other substances such as tungsten carbide, titanium carbide, iron, silica and diamond. To assess whether exposure to pure Co dust (metal, oxides, or salts) may lead to adverse health effects a cross sectional study was carried out among 82 workers in a Co refinery. The results were compared with those in a sex and age matched control group. The Co group had been

exposed for 8.0 years on average (range 0.3-39.4). The geometric mean time weighted average exposure assessed with personal samplers (n = 82) was about 125 µg/m^3 and 25% of the values were higher than 500 µg/m^3. The concentrations of Co in blood and in urine after the shift were significantly correlated with those in air. Concentration of Co in urine increased during the workweek. A slight interference with thyroid metabolism (decreased T3, T4, and increased TSH), a slight reduction of some erythropoietic variables (red blood cells, haemoglobin, packed cell volume) and increased white cell count were found in the exposed workers. The exposed workers complained more often of dyspnoea and wheezing and had significantly more skin lesions (eczema, erythema) than control workers. Within the exposed group a dose-effect relation was found between the reduction of the forced expiratory volume in one second/ vital capacity and the intensity of current exposure to Co assessed by the measurement of Co in air or in urine. The prevalence of dyspnoea was related to the dustiness of the workplace as reflected by a statistically significant logistic regression between this symptom and the current levels of Co in air and in urine. No difference between lung volumes, ventilatory performances, carbon monoxide diffusing capacity, and serum myocardial creatin kinase and procollagen III peptide was found between the Co and control groups and no lung abnormalities were detected on the chest radiographs in both groups. The results suggest that exposure to high airborne concentrations of Co alone is not sufficient to cause pulmonary fibrosis. This finding is compatible with experimental studies indicating that interaction of other airborne pollutants with Co particles play a part in the pathogenesis of parenchymal lung lesions.
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INDUSTRIAL DUSTS & INHALANTS

1512/93 EVALUATION OF CARCINOGENIC RISK IN FRICTION PRODUCT WORKERS
P. M. Kogan, et al., Med. Lav. 84(4):290-296, 1993. 13 refs.

Mortality rates of two cohorts of asbestos friction product (FP) workers were studied in comparison with the population of the adjoining towns over periods of 20 and 40 years respectively. The second cohort was subdivided into 3 subcohorts exposed to chrysotile asbestos (CA), vulcanization and/or polymerization vapours and gases (VPGV) and asbestos bakelite (AB) or asbestos rubber (AR) dusts. In the first cohort no deaths from lung cancer were recorded, even though the total tumour mortality was higher than in the general population. In the second cohort an excess tumour mortality was observed in the first subcohort for stomach cancer only. In the other two subcohorts the expected rates were higher for all the tumour sites. Following intraperitoneal injection of CA, AB and AR dusts, malignant tumours developed in 31.5% of the rats which received CA, and in about 10% of the rats which were injected with AB and AR dusts. Also, the mean longevity of CA-treated animals was significantly lower than in the other two groups. Thus, the carcinogenic risk was real in the group of FP production workers with significant CA exposure only.
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1513/93 DEPOSITION, CLEARANCE, AND SHORTENING OF KEVLAR PARA-ARAMID FIBRILS IN ACUTE, SUBCHRONIC, AND CHRONIC INHALATION STUDIES IN RATS
D. P. Kelly, et al., Fund. & Appl. Toxicol. 21(3):345-354, 1993. 21 refs.

The deposition and clearance of lung-deposited Kevlar para-aramid fibrils (subfibers) have been investigated as part of a subchronic and chronic inhalation toxicity testing program. Fibrils recovered from lung tissue in para-aramid-exposed Sprague-Dawley rats were microscopically counted and measured after exposures to airborne fibrils which were about 12 µm median length (ML) and < 0.3 µm median diameter. In each of three studies lung-recovered fibrils were progressively shorter with increasing residence time in the lungs. Twenty-eight days after a single 6-hr exposure at 400 respirable fibrils per cubic centimeter (f/cm^3) the ML of recovered fibrils decreased to about 5 µm. Twenty-four months after a 3-week exposure to 25 or 400 f/cm^3, fibrils reached about 2 µm ML. After 2 years of continuous exposure at 2.5, 25, or 100 f/cm^3 or 1 year exposure plus 1 year recovery at 400 f/cm^3, fibril ML approached 4 µm. In the 2-year study, the lung-fiber accumulation rate/exposure concentration was similar for the three highest concentrations and was about 3X greater than that seen at 2.5 f/cm^3, indicating that concentrations of about 25 f/cm^3 or more may overwhelm clearance mechanisms. Time required for fibrils to be reduced to < 5 µm in the lung was markedly less at lower exposure concentration and shorter exposure time. The primary shortening mechanism is proposed to be long fibril cutting by enzymatic attack at fibril defects. However, length-selective fibril deposition and clearance may contribute to

shortening in the first few days after exposure. The enzymatic cutting hypothesis is supported by measured increases in numbers of short fibers following cessation of exposures, continued shortening of the fibril length distribution up to 2 years following exposure, and in vitro fibril shortening after 3 months in a proteolytic enzyme preparation. The conclusion is that para-aramid fibrils are less durable in the lungs of rats than expected from the known chemical resistance of commercial yarn. These data suggest that at the low para-aramid fibril exposures found in the workplace, this fibril-shortening mechanism may limit the residence time of long fibers in the lungs of exposed workers. In addition, associated cascade impactor aerodynamic measurements indicate that due to their ribbon shape and curly nature, para-aramid fibrils behave aerodynamically larger than straight fibers.
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1514/93 A COHORT STUDY ON MORTALITY AMONG WIVES OF WORKERS IN THE ASBESTOS CEMENT INDUSTRY IN CASALE MONFERRATO, ITALY
C. Magnani, et al., Brit. J. Ind. Med. 50 (9):779-784, 1993. 14 refs.

The study investigates mortality from cancer and other diseases in a cohort of wives of asbestos cement workers in Casale Monferrato (northwest Italy). After the exclusion of women with an occupational record in the asbestos cement industry, the cohort comprised 1964 women. Their domestic exposure was estimated according to their husbands' periods of employment in the plant: 1740 had a period of domestic exposure whereas the remaining 224 married an asbestos cement worker only after he definitely stopped his activity in the asbestos cement plant; these have, therefore, been considered as unexposed. The cohort of wives was constructed entirely through official records in the town offices and is both exhaustive and unaffected by recall bias. At the end of follow up (1988) 1669 women were alive, 270 were dead and 25 (1.2%) were untraced. Main mortality analyses were only up to age 79 to reduce the misclassification of causes of death. Expected mortality was based on local rates. Mortality analyses were limited to the period 1965-88 due to the availability of local rates: in that period 210 deaths occurred among women with domestic exposure v 229.1 expected. There were four deaths from pleural tumours (one diagnosed as mesothelioma at necropsis) and six from lung cancer v. 0.5 and 4.0 expected respectively. Two further cases of mesothelioma were diagnosed by histological examination after the end of follow up. None of the three wives with histologically diagnosed mesothelioma had been engaged in industrial activities. Corresponding information for the other three cases could not be traced.
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1515/93 MESOTHELIOMA OF PLEURA AND PERITONEUM FOLLOWING EXPOSURE TO ASBESTOS IN THE LONDON AREA
M. L. Newhouse and H. Thompson, Brit. J. Ind. Med. 22:261-266, 1965. 7 refs.

A series of 83 patients from the London Hospital with a diagnosis of mesothelioma confirmed by necropsy or biopsy has been studied for possible exposure to asbestos. The series consisted of 41 men and 42 women; 27 of the patients had peritoneal and 56 pleural tumours. The earliest death recorded was in 1917, but only 10 of the series died before 1950 and 40 (48%) between 1960 and 1964. In 76 of the series full occupational and residential histories were obtained. Forty (52.6%) gave a history of occupational or domestic (living in the same house as an asbestos worker) exposure to asbestos compared with nine (11.8%) out of 76 patients from the same hospital suffering from other diseases ($P < 0.001$). None of the 17 suspected cases of mesothelioma, rejected on pathological grounds, was found to have had any exposure to asbestos. There was also evidence that neighbourhood exposures may be important. Among those with no evidence of occupational or domestic exposures, 30.6% of the mesothelioma patients and 7.6% of the in-patients with other diseases lived within half a mile of an asbestos factory ($P < 0.01$). Out of the 31 patients with occupational exposures only 10 were in jobs scheduled under the Asbestos Regulations of 1931. The interval between first exposure and the development of the terminal illness of mesothelioma ranged between 16 and 55 years. In 47 patients in the mesothelioma series, lung tissue or sputum was available for examination. In 30 (62.5%), either asbestosis or asbestos bodies were present.
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1516/93X STUDY ON THE RELATIONSHIP BETWEEN APPEARANCE OF AUTOANTIBODIES AND CHEST X-RAY FINDINGS OF ASBESTOS PLANT EMPLOYEES
M. Tamura, et al., Jap. J. Ind. Health 35(5): 406-412, 1993. 20 refs.

Antinuclear factor (ANA) and rheumatoid factor (RF) were determined in 220 employees of an asbestos plant. The relationship of the appearance of the two factors to sex, age, smoking habit, duration of asbestos exposure

and asbestos exposure level was studied. In 207 employees who had chest roentgenograms, the relationship of these two factors to pulmonary lesions and pleural lesions was examined. Of the 220 employees, 33 (15%) had ANA and 7 employees (3.2%) had RF. ANA positive rate in the asbestos plant employees was significantly higher than in the control. Factors significantly correlated to their appearance could not be demonstrated. With the progress of pulmonary lesions the ANA positive rate significantly elevated, but ANA positive rate was not significantly correlated with pleural lesions. RF did not show any significant correlation with any of the factors.
---Authors' abstract in English

1517/93 THE IMPORTANCE OF LUNG FUNCTION, NON-MALIGNANT DISEASES ASSOCIATED WITH ASBESTOS, AND SYMPTOMS AS PREDICTORS OF ISCHAEMIC HEART DISEASE IN SHIPYARD WORKERS EXPOSED TO ASBESTOS
A. Sanden, et al., Brit. J. Ind. Med. 50(9): 785-790, 1993. 29 refs.

The mortality from ischaemic heart disease was studied in a prospective cohort of 1725 shipyard workers exposed to asbestos. The analyses were stratified for age and smoking habits and restricted to men. In agreement with other findings, men with impaired lung function had a significantly higher risk (relative risk (RR) = 3.5) of dying from ischaemic heart disease than men with normal lung function. Men with asbestosis or suspected asbestosis had a significantly higher risk (RR = 3.1) of dying from ischaemic heart disease than men without asbestosis. Thus asbestosis or suspected asbestosis also seemed to be a risk factor for ischaemic heart disease. This finding was independent of respiratory function. There was no increased risk for ischaemic heart disease in men when compared with men without pleural plaques. Men with production of phlegm or sputum and wheezing or whistling had no increased risk for ischaemic heart diesase compared with men without these symptoms. In the group with normal lung function men with dyspnoea had a significantly higher risk of dying from ischaemic heart disease than men without dyspnoea. The findings for men with asbestosis or suspected asbestosis indicated a further risk factor besides impaired lung function, in persons exposed to asbestos. Perhaps this risk factor is due to lesions of the pericardium with consequences for heart function.
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1518/93 EFFECT OF MINERAL PARTICLES CONTAINING IRON ON PRIMARY CULTURES OF RABBIT TRACHEAL EPITHELIAL CELLS: POSSIBLE IMPLICATION OF OXIDATIVE STRESS
C. Guilianelli, et al., Environ. Health Perspectives 101(5):436-442, 1993. 28 refs.

Environmental mineral particles such as asbestos are responsible for numerous respiratory diseases. In addition to effects related to their geometry, particles are now assumed to act by triggering an oxidative stress process. Iron-containing particles, in particular, can produce oxygen-activated species by oxidizing their iron. To evaluate the involvement of iron-containing particles in respiratory diseases, three mineral particles (chrysotile, nemalite, and hematite) were tested in primary cultures of tracheal epithelium. Because of the ciliary beat, the three mineral particles were quickly concentrated at the periphery of the mucociliary epithelium, reconstituted in vitro where they induced cellular lesions. Endocytosis of the three types of particles was observed. Cytotoxicity studies have indicated that among the tested particles, the most cytostatic after 24 hr of treatment was the one that contained more Fe^{2+} available on the surface, nemalite. Moreover, the effect of nemalite was reduced by pretreatment with desferioxamine. As mineral particles, especially asbestos, are suspected to induce squamous metaplasia, we chose to study two specific transformations of the epithelium: the expression of cytokeratin-13 and the formation of cross-linked envelopes. Under these culture conditions, nemalite and chrysotile increased the expression of the cytokeratin-13, a specific marker of squamous metaplasia, whereas nemalite was the only particle able to strongly induce the formation of cross-linked envelopes. Nemalite was the most cytostatic particle and the most efficient at inducing squamous metaplasia. Measures of oxidizing power by electron-spin resonance revealed that nemalite produced the most oxygen-activated species. This observation and its reduced toxicity by the desferrioxamine treatment suggest that nemalite could act on rabbit tracheal epithelial cells by an oxidative stress process.
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1519/93 EVALUATION OF GLOVE BAG CONTAINMENT AND ASBESTOS ABATEMENT CLEARANCE: METHODOLOGIES FOR ASBESTOS REMOVAL
P. A. Froehlich and B. A. Hollett, Appl. Occup. Environ. Hyg. 8(11):937-944, 1993. 15 refs.

In a study of the effectiveness of glove bags to control asbestos exposures to workers and contamination of the environment, a four-man crew removed asbestos in eight rooms in four schools. The workers had little prior experience using glove bags and received on-the-job training in proper techniques during the early stages of the study. Daily personal breathing zone (PBZ) samples on all workers and short-term (STBZ) and work-area samples for airborne asbestos were collected and analyzed by phase contrast microscopy (PCM). The asbestos fiber concentrations of 67 PBZ samples ranged from 0.002 to 1.41 fibers/cc when asbestos lagging was being removed; 67 percent were greater than 0.2 f/cc. During an accidental release, a short-term (15 minute) concentration of 9.3 f/cc was measured. Asbestos concentrations indicated by 77 area samples were slightly lower, ranging from 0.001 to 0.96 f/cc. For the part of the study that evaluated environmental contamination, various methodologies were used to determine the airborne asbestos concentration for clearance after abatement. Preremoval and postremoval sampling results using aggressive and nonaggressive techniques were analyzed by PCM and transmission electron microscopy (TEM). It was found that aggressive sampling and TEM analysis provided the most sensitive method to evaluate the cleanliness of the work sites that were studied. However, the TEM method has a high interlaboratory variability, and the polycarbonate filter media used in this study had a highly variable contamination problem. A standard TEM method and a laboratory certification program should be developed to help ensure the reliability of reported TEM results. Exposure concentrations at these four schools indicate that glove bags, as used during this study, did not completely contain the asbestos being removed. Workers were exposed to airborne asbestos above the National Institute for Occupational Safety and Health recommended exposure limit and the Occupational Safety and Health Administration permissible exposure limit. Asbestos concentrations determined by aggressive sampling and TEM analysis indicated a higher level of contamination after removal than before in five of the eight rooms evaluated. Although worker training and experience are important components in performing proper abatement, this study of glove bags did not provide a basis to specify conditions under which adequate containment can be ensured. Because of the uncertainty in controlling exposures during the use of glove bags, it is essential to provide a back-up containment system (e.g., isolation, barriers, negative air), personal protective equipment (e.g., disposable coveralls), and respiratory protection.
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1520/93X ANALYSIS OF THE COMPONENTS OF FERRUGINOUS BODY CORE FROM COAL MINE PNEUMOCONIOSIS PATIENTS IN BEIJING COAL AREA
L. Hong-zhen, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(4):253, 1993.

Ferruginous bodies and dust from the pulmonary tissue of 24 pneumoconiosis patients in Beijing Coal Bureau were extracted by Smith's digestive method. Analysis of the core of ferruginous bodies by EDXA showed that there were two kinds of bodies: one kind contained Al, Si, S, Ca, Fe as the main elements, with black core, is called "coal body"; the other kind contained Na, Mg, Al, Si, Ca, Fe, with transparent core similar to the amphibole, is called "asbestos body". It is suggested that the dust in coal miners' lung(s) of Beijing Coal Bureau consisted of both coal dust and asbestos dust, which are the causal factors in coal mine pneumoconiosis.
---Authors' abstract in English

1521/93 ASBESTOSIS MORTALITY IN ITALY
E. Merler and R. Capocaccia, Med. Lav. 84(4): 286-289, 1993. 17 refs.

A total of 204 deaths due to asbestosis occurred in Italy in the period 1970-1989, including 24 females; asbestosis death rates (per million) were 0.31 $\pm$ 0.05 among males and 0.4 $\pm$ 0.02 among females. The rates increased a little when comparing 1980-1989 with 1970-79. Deaths were concentrated in a limited number of geographical areas where an extensive industrial use of asbestos is known to have occurred and where there were also high rates of mortality due to primary pleural tumours.
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1522/93 USE OF PERSONAL MEASUREMENTS FOR OZONE EXPOSURE ASSESSMENT: A PILOT STUDY
L.-J. S. Liu, et al., Environ. Health Perspectives 101(4):318-324, 1993.

During summer 1991, the authors collected indoor, outdoor, and personal ozone concentration data as well as time-activity data in State College, Pennsylvania. These concentrations were measured for 23 children and their homes using passive ozone samplers.

Outdoor concentrations were also measured at a stationary ambient monitoring site. Results from this pilot study demonstrate that fixed-site ambient measurements may not adequately represent individual exposures. Outdoor ozone concentrations showed substantial spatial variation between rural and residential regions. Ignoring this spatial variation by using fixed-site measurements to estimate personal exposures can result in an error as high as 127%. In addition, evidence from our pilot study indicates that ozone concentrations of a single indoor microenvironment may not represent those of other indoor microenvironments. Personal exposures were significantly correlated with both indoor (r = 0.55) and outdoor (r = 0.41) concentrations measured at home sites. Multiple regression analyses identified indoor ozone concentrations as the most important predictors of personal exposures. However, models based on time-weighted indoor and outdoor concentrations explained only 40% of the variability in personal exposures. When the model included observations for only those participants who spent the majority of their day in or near their homes, an R^2 of 0.76 resulted when estimates were regressed on measured personal exposures. It is evident that contributions from diverse indoor and outdoor microenvironments must be considered to estimate personal ozone exposures accurately.
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1523/93X MEASUREMENT OF ETHYLENE OXIDE AT A MEDICAL STERILIZATION SITE
F. Asakawa, et al., Jap. J. Ind. Health 35 (5):413-418, 1993. 20 refs.

Although ethylene oxide gas is widely used as a sterilizing agent for medical instruments because of its disinfection property, the effects of its use in medical settings have not been clarified. In the present study, we measured the ethylene oxide gas concentration (EOGC) within a hospital sterilization unit and in the ambient air near the unit. Before the sterilizer was turned on (about 9:00), the ambient air EOGC was below the detection limit (0.1 ppm). When the door was opened to place the instruments in the sterilizer, the maximum EOGC near the door of the sterilizer was 1.71 ppm. Before the sterilizer door was opened, the residual EOGC within the sterilizer was 0.10-24.56 ppm. During the operation of the sterilizer (9:00-17:00), ethylene oxide gas could not be detected in the air near the unit. When the sterilizer door was opened at the end of the routine operation of the sterilizer (about 17:00), EOGC near the door was 2.10-2.73 ppm. After the door was closed, the ambient air EOGC level was 0.5-0.57 ppm. These findings indicate that the personnel near the unit were exposed to ethylene oxide gas for about 15 min during the transfer. However, no ethylene gas could be detected by the ethylene oxide gas monitor (3M Co., #3551). The finding that EOGC in sterilized medical instruments after 24 h of aeration was about 2 ppm also suggests that the personnel using these instruments were exposed to ethylene oxide gas. None of the EOGC values obtained in this study exceed the recommended threshold limit value of Japan which was revised from 50 ppm to 1 ppm in 1990. Further environmental management as well as continuous monitoring of EOGC in medical workplace settings are required, since the effect of long-term ethylene oxide gas exposure at low concentration has not yet been determined.
---Authors' abstract in English

1524/93X A STUDY ON THE CHARACTERISTICS OF LUNG FUNCTION IMPAIRMENT IN COAL WORKERS' PNEUMOCONIOSIS
C. Cai-di, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(4):253, 1993.

This paper analysed and evaluated the characteristics of lung function impairment in coal workers' pneumoconiosis (CWP) by measuring ventilation and exchange function in 140 cases of CWP. There were pulmonary emphysema and hypoxemia in the early stage of CWP. Increase of small air way resistance and the presence of focal emphysema were chiefly pathological base for CWP. Hypoxemia was closely related with emphysema. DLCO was decreased obviously in stage II and was related to multiplication of interstitial fibrosis.
---Authors' abstract in English

1525/93 RAT PLEURAL MESOTHELIAL CELLS SHOW DAMAGE AFTER EXPOSURE TO EXTERNAL BUT NOT INTERNAL CIGARETTE SMOKE
H. S. Sekhon, et al., Environ. Health Perspectives 101(4):326-330, 1993. 18 refs.

The combination of cigarette smoke and high-level occupational asbestos exposure produces a synergistic increase in the incidence of lung cancer; however, smoking does not affect the incidence of mesothelioma. Here we present the results of tests of two theories that have been proposed to explain this phenomenon; namely, that pleural mesothelial cells are resistant to cigarette smoke-induced damage and that the pleural connective tissue acts as a barrier that prevents smoke from reaching the mesothelial cells. To test these hypotheses, excised whole rat lung preparations were exposed to either internal (intratracheal) or external (pleural surface) smoke. For comparison, additional excised

lung preparations were exposed to solutions of hydrogen peroxide either externally or intratracheally. Mesothelial cells exposed to external smoke showed widespread, dose-dependent uptake of Trypan blue. Mesothelial cells did not take up Trypan blue after exposure to internal smoke. Bronchial epithelial cells exposed to internal smoke did show uptake, but to a lesser degree than externally exposed mesothelial cells. Examination by scanning and transmission electron microscopy showed that internal smoke did not affect mesothelial cell ultrastructure, whereas external smoke produced obvious mesothelial cell damage and mesothelial cell detachment. Catalase and deferoxamine, scavengers of active oxygen species, provided protection against smoke-induced mesothelial cell injury, but inactivated catalase did not. External hydrogen peroxide produced a very similar, dose-dependent pattern of Trypan blue uptake and ultrastructural changes. Intratracheal hydrogen peroxide also damaged mesothelial cells, but the extent of damage was always less than with comparable concentrations of external hydrogen peroxide. The authors conclude that : 1) pleural mesothelial cells are sensitive to damage by smoke-derived active oxygen species; 2) the pattern of injury is similar to that produced by hydrogen peroxide; 3) bronchial epithelial cells appear to be less sensitive to smoke-induced oxidant damage than mesothelial cells; and 4) at least acutely, the pleura appears to act as a barrier to smoke and penetration of active oxygen species.
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1526/93X PATHOLOGICAL SMEAR EXAMINATION OF NASAL MUCOSA DAMAGE CAUSED BY WOOD, COAL AND METAL DUST AND ITS MULTIPLE LINEAR REGRESSION
Y. Yi-biao, et al., Chin. J. Ind. Hyg. Occup. Dise. 11(4):256, 1993.

The nasal mucosa cytology from 114 workers exposed to wood, coal and metal dust was examined. The results showed that three kinds of dust caused pathological damage in different degree and the degree of damage correlated closely with working ages, dust concentration and dust types by multiple linear regression. The regression equation may contribute to determining the environmental hazardous degree and provide scientific basis for evaluating dustproof measure.
---Authors' abstract in English

1527/93 PASSIVE CIGARETTE SMOKE, COAL HEATING, AND RESPIRATORY SYMPTOMS OF NONSMOKING WOMEN IN CHINA
C. A. Pope and X. Xu, Environ. Health Perspectives 101(4):314-316, 1993. 21 refs.

In this study, the authors evaluated data from a sample of 973 never-smoking women, ages 20-40, who worked in three similar textile mills in Anhui Province, China. They compared prevalence rates of respiratory symptoms across homes with and without coal heating and homes with different numbers of smokers. Multiple logistic regression models that controlled for age, job title, and mill of employment were also estimated. Respiratory symptoms were associated with combined exposure to passive cigarette smoke and coal heating. Effects of passive cigarette smoke and coal heating on respiratory symptoms appeared to be nearly additive, suggesting a dose-response relationship between respiratory symptoms and home indoor air pollution from these two sources. The prevalence of chest illness, cough, phlegm, and shortness of breath (but not wheeze) was significantly elevated for women living in homes with both smokers and coal heating.
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1528/93 TOXICOLOGICAL INVESTIGATIONS ON SILICON CARBIDE. 1. INHALATION STUDIES
J. Bruch, et al., Brit. J. Ind. Med. 50(9): 797-806, 1993. 36 refs.

The question of lung damage as a result of exposure to silicon carbide (SiC) was investigated by inhalation experiments to obtain information on the qualitative response of lung tissue to the test substance (SiC). For comparison, quartz, kaolinite, and tempered clay dusts were used. The indices for the effects of the dusts studied were organ weights, numbers of bronchoalveolar cells, lung surfactant phospholipid concentrations including subfractions, and lung clearance. Exposure to the test samples was carried out according to the Essen inhalation model in two independent series. The results of the two series were similar: Compared with sham controls, exposure to SiC did not affect the indices studied. Even at a low dose (a quarter of the SiC dose) quartz gave pronounced deviations in all indices. In particular, an increase in granulocytes indicated toxic properties of the dust. The long term elimination of quartz from the lung was worse than that of SiC. The kaolinite and tempered clay dusts were intermediate between SiC and quartz based on several of the indices studied. It is concluded that SiC is deposited practically inert in the lung.
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1529/93 TOXICOLOGICAL INVESTIGATIONS ON SILICON CARBIDE. 2. IN VITRO CELL TESTS AND LONG TERM INJECTION TESTS
J. Bruch, et al., Brit. J. Ind. Med. 50(9): 807-813, 1993. 35 refs.

Silicon carbide (SiC) dust and other dusts for comparison were injected intratracheally at a high dose (50 mg) into rats and the response of the lungs and the lymph nodes was studied after an appropriate experimental period. The indices studied were: histological changes in the lung and lymph nodes, organ weights, the formation of collagenous fibres, and the appearance of quartz typical areas. According to several epidemiological investigations and previous experimental animal studies, SiC produces silicogenic (fibrogenic) effects. No changes in the tissues studied in terms of damaging fibrogenic effects could be found after eight months (first series) and three and 12 months (second series). In particular, the histological findings and the absence of quartz typical areas as well as the quantitative determination of collagen fibres show that SiC had no harmful effects on tissues. Based on these results, the extent to which other exposures during the production of SiC can be responsible for the established radiological alterations is discussed. Without doubt the following may be confounders: SiC fibres, crystalline SiO_2 (quartz, cristobalite, tridymite), and possibly gaslike emissions (SO_2). From the hygienic medical point of view the workplaces during SiC manufacture should be examined carefully. The substance SiC dust as such can be considered as inert from the experimental results based on qualitative and extremely sensitive procedures. A revision of the present threshold value for SiC in the German MAK list is called for.
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PHYSICAL HAZARDS

1530/93 VISUAL COMFORT IN VDT OPERATION: PHYSIOLOGICAL RESTING STATES OF THE EYE
S. Taptagaporn and S. Saito, Ind. Health 31 (1):13-28, 1993. 28 refs.

To recommend a comfortable visual display terminal (VDT) workstation design in an aspect of visual ergonomics, physiological resting states of the eye in 3 visual systems, pupil, vergence, and accommodation, were objectively investigated in 3 experiments. Experiment 1 ascertained a positive display polarity (dark characters on a bright background) and an illumination level of 500 lx to be the most appropriate working conditions, by using pupil analysis and subjective visual comfort in 10 subjects. Dark vergence, in experiment 2 was evaluated to be at a distance of about 50 cm from the eye, as an average in 14 subjects. Dark vergence was found to shift farther with an upward gaze while a nearer shift occurred with a downward gaze. In experiment 3, the average dark focus for 11 subjects was found to be 1.4 diopters (D) or a distance of about 74 cm from the eye. The positive correlation between refractive status of the eye and dark focus was statistically significant ($r = 0.602$). The ergonomic recommendations for a VDT workstation obtained in this study are a positive display polarity with an appropriate lighting condition, a downward gaze, and a viewing distance between 50 and 70 cm. These recommendations are considered to reduce visual fatigue due to prolonged VDT work and to facilitate visual comfort at work.
---Authors' abstract in English

1531/93 EVOLUTION OF OSTEOARTICULAR DISORDERS AS A FUNCTION OF PAST HEAVY PHYSICAL WORK FACTORS: LONGITUDINAL ANALYSIS OF 627 RETIRED SUBJECTS LIVING IN THE PARIS AREA
F. Derriennic, et al., Brit. J. Ind. Med. 50(9):851-860, 1993. 25 refs.

The relations between osteoarticular disorders and occupational exposure to heavy physical work factors were studied in a random sample of retired subjects living in the Paris area, all of whom had contributed to the same retirement pension fund. 627 subjects were originally seen in 1982-3 and 464 of them were seen again five years later. On both occasions, the same questionnaire was completed during a home interview. Osteoarticular disorders were evaluated by the presence of pain, with or without restricted joint movement, for at least six months before interview. The heavy physical work factors were those reported by the subject at the first interview, and only subjects who stated that they had been exposed to these factors for more than 10 years were considered as exposed persons. For those who were seen twice, the frequency of osteoarticular pain increased during the five years between the two interviews, from 52% to 65% in the men and 72% to 82% in the women. Among both sexes, these frequencies were significantly higher in those who stated that in the past they had to carry heavy weights and work in tiring positions. The increases in frequency of pain during the five year study period were also related to these occupational factors. In general, the frequencies for subjects not exposed to occupational factors caught up with those found for the exposed

group. This interaction of age with the relation between exposure to heavy physical work factors and osteoarticular disorders does not seem to be explained by confounding factors, including age at the first interview, the fact of living alone, of being a former manual worker, of having a cardiorespiratory disorder, and smoking habits. The results of the survey suggest that working conditions are an important cause of osteoarticular disorders that last well beyond the end of working life.
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1532/93 DEVELOPMENT AND EVALUATION OF AN OCCUPATIONAL HEALTH SERVICES PROGRAMME ON THE PREVENTION AND CONTROL OF EFFECTS OF VIBRATION
C. T. J. Hulshof, et al., Occup. Med. 43 (Suppl. 1):S38-S42, 1993. 27 refs.

The outline of a study in occupational health services (OHS) on the prevention and control of effects of whole-body vibration is described and preliminary results are presented here. The study comprises an inventory of current activities of occupational health services in vibration-related issues, the development of a specific OHS-programme and evaluation of this programme, mainly on process level. Results of the inventory, a questionnaire survey in occupational health services (n = 112, response 67%), show that the impact of OHS in prevention and control of adverse health effects is small. The development and evaluation of a specific OHS-programme may be useful in setting up a preventive approach. Some methodologic problems are discussed also.
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1533/93 A NEW METHOD FOR DETERMINING EXTRA TIME BY CONSIDERING ERGONOMIC LOADS IN THE GARMENT AND METAL-WORKING INDUSTRIES
V. Verhovnik and A. Polajnar, Arh. Hig. Rada Toksikol. 44(2):139-149, 1993. 3 refs.

The changing labour conditions in the garment and metal-working industries have led to the necessity of determining new extra times to establish the time standard. In this paper, a method of measuring stress and strain imposed upon the operator in new working conditions by determining the additional production coefficient is presented. The method gives criteria and grades to assess stress at the workplace. Physical stress (dynamic and static), thermal and visual stress, discomfort caused by noise, aerosols, gases and vapours, and the stress due to monotony are assessed. The stresses are expressed by ecological, physiological and psychological indexes. The indexes are pondered. Ponderation includes the factor of the magnitude and the time of exposure to stress. Ponderation is expressed by the number of points, the total being an adequate presentation of the stresses. Stress and strain decrease the working performance of the operator. Therefore they must be included in the standard to compensate for the operator's lower working efficiency due to physical and psychological strain at the workplace. Short breaks and stops allowed during work enable the operator to perform work tasks without getting excessively tired. The necessary correction of the production time is made by applying the ergonomic coefficient K_{er}.
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1534/93 IMPACT OF REGULAR RELAXATION TRAINING AND PSYCHOSOCIAL WORKING FACTORS ON NECK-SHOULDER TENSION AND ABSENTEEISM IN HOSPITAL CLEANERS
H. Toivanen, et al., J. Occup. Med. 35(11): 1123-1130, 1993. 50 refs.

Occupational stress in hospital cleaners (n = 50), and the effect of relaxation training (n = 25, age matched, randomized), were studied by recording the electrical activity of the upper trapezius muscle at rest and during working conditions at the beginning, middle, and end of a 6-month follow-up period. A short (15-minute) relaxation program was practiced daily at the workplace to provide stress management. The amount of sick leave was counted, and the extent of depression and some psychosocial working factors were screened. Intercorrelations were found between the neck-shoulder tension, psychosocial factors, depression, and the absentee rate. The relaxation training diminished tension in the neck-shoulder region efficiently; nevertheless, the decrease in absenteeism may have been related mainly to the social support offered by the research maneuver itself.
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1535/93X HAND-ARM VIBRATION RISK AND CUMULATIVE TRAUMA DISORDERS IN THE SHOE MANUFACTURING INDUSTRY
M. Delbiancho, et al., Med. Lav. 84(4):306-310, 1993. 18 refs.

The article reports the case of a women working in a shoe factory who had been using vibrating tools for 5 years. Because of paresthesia in her left hand, in 1989 she underwent various diagnostic trials that revealed an initial carpal tunnel syndrome of the left wrist and a homolateral epicondylitis. Measurement of the vibrations transmitted to the

hand from the vibrating tool confirmed the probability of a high risk of exposure for the hand-arm system. Such adverse effects have been described by British authors as "cumulative trauma disorders" and were confirmed in this study. The importance of further studies aimed at estimating the type and degree of exposure to vibrations in shoe manufacturing workers is stressed.
---Authors' abstract in English

1536/93 DIAGNOSTIC VALUE OF FINGER THERMOMETRY IN ASSESSMENT OF HAND-ARM VIBRATION SYNDROME
A. Bogadi-Sare and M. Zavalic, Arh. Hig. Rada Toksikol. 44(2):133-138, 1993. 27 refs.

Finger thermometry and cold provocation test were performed in 90 chainsaw workers and 58 healthy controls. The workers were grouped according to the Taylor-Pelmear scale of hand-arm vibration syndrome into subgroups 0, 1, 2, 3. The recovery rate reflected passive vasodilative ability. According to the results of the study, the test could differentiate the subjects with clinically manifest vibration-induced white fingers (stages 1, 2 and 3) from the controls. The discriminating threshold of recovery rate with regard to Raynaud's phenomenon was 90%. With that diagnostic limit the above method was sensitive and specific enough to verify vibration-induced vasospastic disorders and therefore could be recommended for their surveillance.
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1537/93 EFFECTS ON HEALTH AND SOCIAL WELL-BEING OF ON-CALL SHIFTS: AN EPIDEMIOLOGIC STUDY IN THE FRENCH NATIONAL ELECTRICITY AND GAS SUPPLY COMPANY
E. Imbernon, et al., J. Occup. Med. 35(11): 1131-1137, 1993. 17 refs.

An investigation of the effects on health and social well-being of on-call shift work to cover emergencies outside working hours has been carried out by Electricite de France-Gaz de France, the French national company that supplies gas and electricity. This transversal survey compared a group of workers exposed to on-call shift work (n = 145) with a group that was not (n = 195). Each subject completed a questionnaire about the demands of his work, state of health, psychologic equilibrium using the Langner scale, and the impact of his job on social and family life. A "weekly report form," completed for 3 consecutive weeks randomly selected using a sampling plan covering the entire year to take into account seasonal variations, was subsequently filled in by 115 of the group exposed to on-call shift work and 167 of those who were not, to investigate events occurring outside working hours and sleep. The findings show that the main demands of being on-call were telephone calls, which were five times more numerous during the weeks on-call; this was accompanied by a shorter sleeping time (a mean of 6.8 hours versus 7.4 hours during a normal week) and more frequent tiredness on waking up (25.7% vs 13.2%). No particular disorder was found more frequently in the exposed group, but the psychologic equilibrium and family and social life of the workers in the on-call shift group were disturbed: some variables in the questionnaire and indices calculated from some items revealed adverse effects. Analysis of the frequency of on-call shifts showed that these effects were greater the more frequently the subject was on-call (linear tendency test significant or nearly significant). These findings lead us to suggest an improved organization of the on-call shifts outside working hours and an extension of the intervals between on-call shifts.
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1538/93X WORK/VISION RELATIONSHIP IN A PREVENTIVE MEDICINE CONTEXT: INITIAL GUIDELINES FOR A CORRECT ERGOPHTHALMOLOGIC APPROACH PROPOSED BY THE ITALIAN GROUP FOR THE STUDY OF WORK/VISION RELATIONSHIPS. PART 2: METHODS
Italian Group for the Study of Work/Vision Relationships, Med. Lav. 84(4):324-331, 1993.

In view of the numerous problems concerning the relationship between work and vision, the Italian Group for the Study of Work/Vision Relationships has developed a document that sets out initial guidelines for environmental monitoring and health surveillance in ergophthalmology. Particular emphasis is given to fact-finding inspections and collection of subjective assessments that will enable the occupational health physician to identify any adverse factors in the working environment and assess the visual effort of the operators. The importance of cooperation between occupational health physician and ophthalmologists in the various phases of ergophthalmological assessment is stressed. An analytical list is provided of the parameters that the ophthalmologist should measure during eye examination as well as the appropriate assessments that the occupational health physician should perform if an ophthalmological specialist is not available. Suggestions for periodic controls on the basis of visual effort and ophthalmological status are made. It is the task of the occupational health physician to establish the fitness or other-

wise of the patients for the job, and for this the Group is preparing further documents.
---Authors' abstract in English

1539/93 DEVELOPMENT OF A SYSTEM FOR ANALYZING WORKING POSTURES
A. Seo, et al., Ind. Health 31(2):69-77, 1993. 19 refs.

In order to assist in the analysis of working postures which might cause lumbago in the field of industrial health, a system was developed for the synchronous recording and analyzing of postures, work content and physiological data. The system is composed of a portable unit for recording 3 channels of goniometers, 1 channel of inclinometer and 1 channel of surface electromyogram, a video camera for recording work content, a host computer and some peripheral devices for analyzing the data from the portable unit and video camera. In this system, postures are automatically classified from data on joint angles and upper body inclination angle by using a discriminant function. The joint angles are measured by the goniometers using rubber optical fibers. The angle of upper body inclination is obtained by the inclinometer using a magnetic resistance sensor. In addition to the work content and video images, the postures and the electromyogram can be analyzed and confirmed by simultaneous display of the data on the host computer screen. Based on the trial use of this system in a work model of manual baggage handling, it was proved useful for evaluating in detail the workload caused by working postures.
---Authors' abstract in English

1540/93 ERGONOMIC EVALUATION OF CHECKSTAND DESIGNS IN THE RETAIL FOOD INDUSTRY: A REPORT BASED ON EXPERT ASSESSMENT
K. A. Grant, et al., Appl. Occup. Environ. Hyg. 8(11):929-936, 1993. 16 refs.

Increasing evidence suggests that musculoskeletal disorders are common in the U.S. retail food industry. Cashiers who use electronic scanners appear to be at especially high risk for upper extremity cumulative trauma disorders (CTDs). One potential source of biomechanical stress is the checkstand design. Checkstand design can greatly influence the cashier's posture and movement patterns during grocery checking tasks. It is hypothesized that designs which expose cashiers to stressful postures and unnatural movements may be associated with increased musculoskeletal complaints. The National Institute for Occupational Safety and Health (NIOSH) is conducting an industrywide study to evaluate the prevalence and possible causes of musculoskeletal disorders among retail food workers. An objective of this research is to evaluate the relationship between CTDs and different checkstand designs. This article describes initial activities to identify ergonomic stressors associated with five common checkstand types found in the United States. A panel of ergonomic experts was convened to rate the degree of biomechanical stress placed on specific body areas (neck, shoulders, elbows, hand/wrist, and back) by 13 different checkstand configurations. The panel reviewed cashier work activities recorded on videotape, and design specifications collected during site visits to different grocery stores. The experts agreed that certain checkstand features are more likely to impose substantial biomechanical stresses on cashiers than others. NIOSH investigators will use the expert's assessments as a basis for future studies in this industry.
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1541/93 CRITERIA FOR THE ERGONOMIC EVALUATION OF WORK CHAIRS
E. Occhipinti, et al., Med. Lav. 84(4):274-285, 1993. 12 refs.

On the basis of a critical overview of specialised ergonomics literature and of national and international standards on the subjects, this paper outlines the main ergonomic requirements and characteristics for work chairs. The main ergonomic requirements for work chairs are the following: Safety: the chair should not be the source or cause of accidents. Adaptability: the chair's dimensions and control features should be such that they meet the anthropometric characteristics of at least 90% of the potential users. Comfort: the chair should be physiologically comfortable for the user. To this end, the following are all important features: seat-plane and backrest contours, backrest height and inclination adjustability, padding and covering materials that allow the body to breathe. Practicality: the chair, and in particular the control features, should be practical and easy to control use. Durability: the chair should offer good wear and durability of its components and controls. Suitability for the job: the chair should be appropriately designed for the intended type of job and working environment. For each of these requirements single parameters are considered and for each parameter specific qualitative and/or quantitative data are given in order to class each single item as: "not acceptable", "acceptable" or "good", as regards standards and

regulations, anthropometric parameters and intended uses. Criteria are given for a concise assessment of each of the six main requirements and for a comprehensive assessment of the "ergonomic quality" of the work chair.
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1542/93 SLEEP INDUCTION EFFECTS OF STEADY 60 dB (A) PINK NOISE
T. Kawada and S. Suzuki, Ind. Health 31(1): 35-38, 1993. 7 refs.

The effects of 60 dB (A) steady pink noise on sleep induction were studied. Two experiments were conducted. First, 10 night-sleep polygrams of a young male subject were recorded consecutively as controls. Five night polygrams of the same subject were then recorded with exposure to steady 60 dB (A) pink noise. Second, polygrams of four students were recorded using the same noise exposure as in the first experiment. Polygrams for the control night were also recorded. Noise exposure tended to shorten sleep latency, i.e., the values were 4.2 and 9.5 min in the first and second experiment, respectively. The steady 60 dB (A) noise made sleep induction easier.
---Authors' abstract in English

1543/93 A WOOD CHIP MILL NOISE ABATEMENT PROGRAM
D. C. Bruck and R. L. Richards, Sound & Vibration 27(10):24-26, 1993.

This article describes a program for reducing noise produced by a wood chip mill located in Hoquiam, WA. The mill, located 165 ft from single-family residences, was generating noise 15 dBA above limits established by state noise regulations. Compliance with the ordinance was achieved by treating each contributing sub-source, identified through an intensive noise measurement program.
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1544/93 A SURVEY ON NOISE EXPOSURE LEVEL IN AN ALUMINUM CAN PRODUCTION PLANT
S. M. Mirbod, et al., Ind. Health 31(1):1-12, 1993. 19 refs.

The present investigation was designed to quantify noise exposure of laborers at various sections of an aluminum can production plant. The acoustic environment in each area was described by sound pressure level (SPL). Decibel (dB) readings were taken for a range of individual frequencies and weighting scales (A and C). Speech interference level (SIL) values for laborers in different production sections were also determined. Moreover, by means of a personal noise dosimetry technique, the equivalent continuous noise exposure level (dB(A)) during an 8-h shift (Leq, 8) was computed. The results obtained were as follows. Spectral analysis of the noise indicated that high SPL associated with high frequency noise exceeded the permissible limit against hearing damage, and it generally amounted to levels higher than 90 dB(A), whereas those inside the control rooms were in the range of 54-60.5 dB(A). Assessment of the results obtained from personal noise dosimeters also revealed that the $L_{eq,8}$ values were higher than the prescribed limit (85 dB(A)). By preliminary audiometric examinations on the right ears of workers, hearing threshold shifts (HTS) were noticed in the range of 7-11 dB at 1 kHz and 12-16 dB at 4 kHz. With regards to the SIL values (93.2-96.5 dB(A)) which were more than the maximum vocal effort, communication between workers and/or with supervisor were appraised to be very difficult (shouting) or impossible. It was concluded that (a) the dB readings observed in this survey indicate a potentially serious possibility of hearing disability, even though high level of HTS could not be noticed in the preliminary audiometric test, and (b) the risk of accidents should also be taken into account regarding the non-auditory effects of such a high level of noise. The authors suggest that (1) minimizing the transmission of noise through acoustical countermeasures need to be considered, and (2) introducing a schedule comprising on-time and off-time could be beneficial in a workers' health conservation program.
---Authors' abstract in English

1545/93 HEARING CONSERVATION IN THE MINING INDUSTRY. EVALUATION OF A RISK FACTOR QUESTIONNAIRE
D. McBride, Occup. Med. 43(4):185-192, 1993. 14 refs.

The objectives of this study were to assess the validity of a self-administered hearing questionnaire in the assessment of risk to hearing, to amend the questionnaire design as necessary, and to give general guidance on the use of audiometric questionnaires in hearing conservation programmes. The study was carried out at a colliery in Staffordshire. The odds of deafness, according to the Health and Safety Executive definition, were analysed by exposure to the hearing risk variables in the questionnaire. The results of the hearing questionnaire were linked to a cross-sectional audiometric survey. There were 189 questionnaires eligible for inclusion. Noise exposure at work was reasonably well predicted by having to shout at work (OR 1.42, 95 per cent CI 0.58-3.54) and being exposed to noisy tools and machinery (OR 2.12, 95 per cent CI 0.72-6.72). Risk to hearing

from disease was predicted by having 'abnormal' hearing or discharging ears, but not by any of the other exposure variables. Risk to hearing from acoustic trauma was demonstrated for fire-arms (OR 1.23, 95 per cent CI 0.5-2.98). None of the hobbies included in the questionnaire usefully predicted hearing loss. The conclusions are that, contrary to Health and Safety Executive advice, audiometric questionnaires may reasonably be administered to all employees, as they are useful in the documentation of hearing loss risk factors. They should not, however, be used to detect ear disease. A revised questionnaire was drafted as the result of these findings, and will be piloted in a larger population.
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ENVIRONMENTAL PROBLEMS

1546/93 RISK ASSESSMENT AND MANAGEMENT OF CHEMICAL CONTAMINANTS IN FISHERY PRODUCTS CONSUMED IN THE USA
F. E. Ahmed, et al., J. Appl. Toxicol. 13(6): 395-410, 1993. 93 refs.

In the USA a small proportion of fishery products are contaminated with appreciable amounts of potentially hazardous contaminants. However, risks to consumers are not generally high. Inorganic contaminants with the greatest potential for toxicity are antimony, arsenic, cadmium, lead, mercury, selenium and sulfites. Among organic compounds, polychlorinated biphenyls, dioxins, several chlorinated hydrocarbon insecticides, certain processing-related and aquaculture-related contaminants pose potential risks for consumers. Log-normal distributions appear to provide good descriptions of the pattern of variation of contaminant concentrations among different geographic areas, and some contaminants (mostly organic) appear to be much more variable than others. This variability offers a solution for reduction of exposure through restricting the harvest of aquatic organisms from specific sites, and by excluding certain species. It is recommended that: (i) existing State and Federal regulations and environmental monitoring be strengthened and enforced to minimize contamination of the aquatic environment; (ii) a program of shared responsibility be instituted, where Federal agencies develop a set of monitoring and inspection practices and state agencies assume responsibility for primary control, site closures and advisories issue; (iii) research and public education by government agencies and health professionals be expanded to determine actual risks and approaches to manage them; (iv) mandatory labeling be considered for specific contaminants; (v) a better system requiring international agreements be developed in order to minimize the differences among various national regulatory approaches.
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1547/93 SOURCES OF TOXIC TRACE ELEMENTS IN URBAN AIR IN ILLINOIS
C. W. Sweet, et al., Environ. Sci. Technol. 27(11):2502-2510, 1993. 25 refs.

Samples of airborne inhalable particulate matter (PM-10) were collected in southeast Chicago and East St. Louis and analyzed for 29 trace elements using X-ray fluorescence spectrometry and neutron activation analysis. Wind trajectory analysis, factor analysis, and chemical mass balance modeling were used to determine the most important sources of the toxic trace elements. Industrial complexes were the most significant sources of copper and cadmium in East St. Louis (smelters) and of manganese and chromium in southeast Chicago (steel mills). It is concluded that some sources have a large effect on the concentrations of specific toxic metals in the atmosphere without significantly affecting overall PM-10 levels.
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INDUSTRIAL HYGIENE & PREVENTIVE ENGINEERING

1548/93 CONFINED SPACE VENTILATION: TRACER GAS ANALYSIS OF MIXING CHARACTERISTICS
S. M. Bowes, et al., Am. Ind. Hyg. Assoc. J. 54(11):639-646, 1993. 10 refs.

Dilution ventilation is often used to control potential airborne health hazards, fire, or explosive conditions by mixing contaminated air with uncontaminated (e.g., outdoor) air. Dilution ventilation of confined spaces is used to displace oxygen-deficient, explosive, or toxic atmospheres prior to worker entry. Application of dilution ventilation requires the selection of an empirical mixing factor. This study sought an objective means of measuring mixing effectiveness for application to selected petrochemical industry vessels. The tracer gas sulfur hexafluoride (SF_6) was metered into the air entering the vessel of interest, and the SF_6 concentration was monitored at the vessel exhaust with an infrared analyzer modified to sample at 90 L/min for rapid response. The rate of SF_6 concentration rise and decay was recorded using a datalogger. The mixing factor was calculated on the basis of measured ventilation rates, vessel dimensions, and SF_6 rise and decay

curves. Air in the vessels analyzed did not exhibit rapid mixing; mixing factors calculated from experimental observations were less consistent than hypothesized--an indication of the heterogeneous nature of actual ventilation patterns. Qualitative ventilation analysis (smoke tubes, anemometry) was employed to assess air circulation within the vessels and confirmed shunting, large eddy formation, and an apparent effect of ambient (outside) wind on internal airflow patterns. It is concluded that tracer gas studies provide useful information on air mixing within vessels, which can assist the industrial hygienist in optimizing dilution ventilation for specific confined spaces.
---Authors' abstract reprinted by permission

1549/93 AN ANESTHESIA MASK GAS-SCAVENGING SYSTEM
A. Schapera, J. Occup. Med. 35(11):1138-1141, 1993. 6 refs.

The level of N_2O contamination in the breathing zone of anesthesiologists was measured while they administered inhalation anesthesia by mask to five patients. A mask gas-scavenging attachment was used for 30 minutes and then removed while anesthesia continued for a further 30 minutes. The levels of N_2O with and without the scavenging attachment were compared. Using the scavenging attachment, N_2O contamination was reduced from greater than 150 ppm to less than 5 ppm, a level well below the 25 ppm limit recommended by the National Institute for Occupational Safety and Health. The scavenging device is a simple and effective way to reduce operating room contamination with N_2O during delivery of anesthesia by mask.
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1550/93 ASSESSMENT OF TASK AND PEAK EXPOSURES TO SOLVENTS IN THE MICROELECTRONICS FABRICATION INDUSTRY
M. F. Hallock, et al., Appl. Occup. Environ. Hyg. 8(11):945-954, 1993. 10 refs.

Short-term exposures to six solvents used in microelectronic fabrication clean rooms were assessed. The solvents measured were: 2-ethoxyethyl acetate, n-butyl acetate, xylene, isopropanol, acetone, and propylene glycol monomethylether acetate. Short-term exposures during production and maintenance tasks were measured using both charcoal tubes to obtain average task exposures and direct reading instrumentation to obtain real-time peak levels. All measured samples were considerably below current government or consensus standards for short-term exposures. Pharmacokinetic modeling was used to evaluate the toxicological significance of the highest real-time peaks measured, which in these clean rooms were to the solvent acetone. The model suggested that the peaks measured were below acetone levels associated with reproductive health risks in animals.
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OCCUPATIONAL HEALTH MANAGEMENT

1551/93 WORKING MOTHERS AND INFANT CARE: A REVIEW OF THE LITERATURE
C. R. Roberts and P. McGovern, AAOHN J. 41(11):541-546, 1993. 26 refs.

The number of women who returned to work after childbirth increased steadily through the 1980s, with many mothers returning to work earlier than ever before. This trend has caused new mothers, their employers, and legislators to examine the issue of infant day care. Infant day care availability, arrangements, and cost influence maternal work force participation. These concerns may also impact on the physical and mental health of the working mother. Further research is needed to determine if and how infant day care concerns affect worker productivity, and to determine how to obtain quality day care at a reasonable cost.
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1552/93X AGEING AND ABILITIES FOR WORK
B. Petz, Arh. Hig. Rada Toksikol. 44(2):191-204, 1993. 20 refs.

With the average life duration becoming longer there is an increasing number of old people in the population. In the literature the problem of old people is still neglected. The most visible changes in old people occur in physical characteristics and functions; at first a change in psychological functions was also reported to take place. However, it was shown that results depended to a great extent on the method used; the longitudinal method (following up one and the same generation) frequently gave rather different and much better results than the cross-sectional method. The question of old age and working abilities is an important one. Certain positive personality traits seem to compensate for a drop in certain abilities. In the modern automated industry time pressure and adaptation to new working conditions are a handicap for the elderly, but the application of different ergonomic principles can greatly improve the situation.
---Author's summary in English

1553/93 JOB STRESS AND OCCUPATIONAL HEALTH NURSING: MODELING HEALTH AFFIRMING CHOICES
S. L. Crawford, AAOHN J. 41(11):522-528, 1993. 21 refs.

Job stress is a condition or event in the workplace that induces strain (a physical, psychological, or behavioral response to a stressor). The outcome of unrelieved job stress can be burnout. Occupational health nurses can experience job stress in the areas of intrinsic job factors, organizational structures, reward systems, human resource systems, and leadership. Stress reduction techniques can be grouped into physical, social, spiritual, intellectual, emotional, and environmental strategies. Application of stress reduction strategies to reduce experienced job stress in occupational health nurses is one way occupational health nurses can model health affirming choices.
---Author's abstract reprinted by permission of the American Association of Occupational Health Nurses

1554/93 EFFECTS OF WORK-SITE HEALTH PROMOTION ON ILLNESS-RELATED ABSENTEEISM
R. W. Jeffery, et al., J. Occup. Med. 35(11): 1142-1146, 1993. 15 refs.

This study examined the effects of work-site health promotion on employee absenteeism. Thirty-two work sites were randomized to programs for weight control and smoking cessation or to no treatment for 2 years. The prevalence of self-reported absences from work was assessed at baseline and follow-up. Results using work site as the unit of analysis showed a net reduction in the percent of workers reporting a sick day in the last month in treatment versus control work sites of 3.7% (P = .04) and 3.4% (P = .06) in cross-sectional and cohort analysis, respectively. Further analyses found that the rate of participation in smoking (P = .09) but not weight programs (P = .72) was positively associated with change in sick day prevalence and that this effect was strongest in baseline smokers (P = .002). It is concluded that work-site smoking cessation programs may yield important short-term economic benefits by reducing employee absenteeism.
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1555/93 SYSTEM FOR QUALITY MANAGEMENT
C. M. Yarborough, J. Occup. Med. 35(11):1096-1102, 1993. 141 refs.

Total quality management will provide important benefits for organizations that are involved with the delivery of occupational and environmental health care. These organizations should shift from traditional medical management to the new paradigm. Identification of a set of relevant parameters for this new management system is necessary to implement the quality culture within our professional settings. An exhaustive literature search was undertaken on the topic of total quality management to delineate a framework for consideration by occupational and environmental health managers. Proposed are essential components of a management system for quality excellence which are derived from review of reported approaches among health care organizations and industry, various lists of quality principles and criteria, and classical systems theory.
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1556/93 ON THE JOB CONFLICT: HOW TO SURVIVE
C. A. Bacon, AAOHN J. 41(11):529-532, 1993. 1 ref.

Conflicts arise when deep seated but diametrically opposed views clash. Handling on the job conflict well requires a process of emotional and intellectual fine tuning that can, eventually, lead to a workable solution. A series of identifiable steps are experienced in working through value conflicts. Conflict can be a growth experience, expanding professional confidence and adding to personal stature by keeping ideals intact.
---Author's abstract reprinted by permission of the American Association of Occupational Health Nurses

1557/93 COORDINATING REGULATORY COMPLIANCE PROGRAMS
R. Eckhardt, Prof. Safety 38(11):16-20, 1993. 5 refs.

An integrated program differs from traditional programs in that it addresses concerns of environmental protection, health, safety, workers' compensation, wellness, etc., as a whole rather than as separate entities. It includes a commitment to compliance and demonstrates a moral responsibility to employees and the environment. Such a program informs employees of these areas, related laws, their effects and interactions with the community, and requests employee assistance in resolving problems. In other words, this approach assumes that people are motivated through incentive, responsibility and inclusion--not by regulation--to meet company goals. The program also takes a non-adversarial approach to government agencies by documenting all actions and consistently punishing willful violators. Integrating separate

regulatory programs can help companies increase profits through reduced staff overhead, more efficient administrative efforts and lower associated and/or hidden costs. The program is based on an ethical system that promotes respect for employees and the community. An integrated system diminishes the self-centered emphasis on profit (often at the expense of employees or the community) and redirects the focus to creating quality products via an educated, responsible workforce.
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1558/93 FREQUENCY OF EXERCISE AND DROPOUTS IN A WORK-SITE PROGRAM: CORRELATES OF 6-MONTH ACTIVITY PATTERNS
W. D. Lynch and D. S. Main, J. Occup. Med. 35(11):1147-1151, 1993. 8 refs.

Exercise professionals have little information concerning expected levels of exercise for new participants. This study examined the frequency of exercise of 949 employees during their first 6 months of membership in a work-site health promotion facility, using automated check-in data. Overall, the frequency of exercise declined, the proportion of frequent exercisers declined, and the proportion of employees who dropped out increased. Men exercised more frequently and were less likely to drop out than were women ($P < .01$). Younger employees exercised more frequently than did older employees. Employees in the middle salary level exercised more frequently than did employees in the lower or upper levels ($P < .01$). The employee groups that started out with a lower frequency of exercise remained at a lower frequency throughout the 6 months. By their 6th month, women were 50% more likely to drop out and 50% less likely to exercise regularly than were men. These figures provide a basis for comparison with other programs to document expected exercise behavior.
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SAFETY, ACCIDENT PREVENTION

1559/93 TRAUMATIC FATALITIES AT WORK: AMERICAN INDIANS AND ALASKA NATIVES, 1980 THROUGH 1988
J. R. Sugarman, et al., J. Occup. Med. 35 (11):1117-1122, 1993. 24 refs.

To define the rates and characteristics of fatal occupational injuries among American Indians and Alaska Natives (AI/AN) in the United States, the authors examined death certificates included in the National Traumatic Occupational Fatalities data base for deaths occurring from 1980 to 1988. Two hundred and seventy-four work-related deaths among AI/AN civilians (259 men, 15 women) were identified. In 1980, the fatality rate among employed AI/AN was 5.5/100,000 workers compared with 7.7/100,000 workers for the United States. Ninety percent of the AI/AN deaths were from unintentional injury, 6% from homicide, and 3% from suicide. The pattern of fatal occupational injuries among AI/AN differs from that for all races combined, especially with regard to the larger percent of AI/AN fatalities in the agriculture, forestry, and fishing industry and the high proportion of water transportation incidents.
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ANALYTICAL METHODS

1560/93 QUANTITATIVE MEASUREMENT OF PORPHYRINS IN BIOLOGICAL TISSUES AND EVALUATION OF TISSUE PORPHYRINS DURING TOXICANT EXPOSURES
J. S. Woods and H. D. Miller, Fund. & Appl. Toxicol. 21(3):291-297, 1993. 30 refs.

Porphyrins are formed in most eukaryotic tissues as intermediates in the biosynthesis of heme. Assessment of changes in tissue porphyrin levels occurring in response to the actions of various drugs or toxicants is potentially useful in the evaluation of chemical exposures and effects. The present paper describes a rapid and sensitive method for the extraction and quantitation of porphyrins in biological tissues which overcomes difficulties encountered in previously described methods, particularly the loss of porphyrins during extraction and interference of porphyrin quantitation by coeluting fluorescent tissue constituents. In this procedure 8- through 2-carboxyl porphyrins are quantitatively extracted from tissue homogenates using HCl and methanol and are subsequently separated from potentially interfering contaminants by sequential methanol/phosphate elution on a C-18 preparatory column. Porphyrins are then separated and measured by reversed-phase high-performance liquid chromatography and spectrofluormetric techniques. Recovery of tissue porphyrins using this method is close to 100% with an intra-assay variability of less than 10%. The authors have employed this procedure to measure liver and kidney porphyrin concentrations in male Fischer rats and to define the distinctive changes in tissue porphyrin patterns associated with treatment with the hepatic and

renal porphyrinogenic chemicals, allylisopropylacetamide, and methyl mercury hydroxide, respectively. This method is applicable to the measurement of tissue porphyrin changes resulting from drug or toxicant exposures in clinical, experimental, or environmental assessments.
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1561/93 SOURCE IDENTIFICATION FOR MULTIPLE CHEMICAL EXPOSURE USING PATTERN RECOGNITION AND CLASSIFICATION TECHNIQUES
B. P. Simmons and R. C. Spear, Environ. Sci. Technol. 27(11):2430-2434, 1993. 9 refs.

To characterize sources of exposure to organic solvent mixtures, breathing zone air samples were collected from workers in a printing/bookbinding plant. The analysis of air samples revealed complex patterns of exposure to organic solvents. Principal component analysis (PCA) plus classification and regression tree (CART) analysis identified sources of exposure and verified that exposure classification of workers by job type corresponded closely to exposures measured using personal air monitoring. The variable loadings for most principal components of air exposure matched identifiable combinations of solvent mixtures used in the workplace. PCA and CART models both accurately described the sources of multiple chemical exposures.
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1562/93 A FIELD-TEST FOR DETECTING ORGANOPHOSPHORUS COMPOUNDS IN WATER
E. Reiner, et al., Arh. Hig. Rada. Toksikol. 44(2):159-162, 1993. 8 refs.

An enzyme test has been worked out for detecting organophosphorus compounds in water. The test is based on the inhibition of cholinesterase. The detection limits for the "nerve gases" are (µg/L): Soman 0.12, VX 5.9, Sarin 9.9 and Tabun 26. The detection limit for the organophosphorus pesticide dichlorvos is 50 µg/L.
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1563/93 A METHOD TO OBTAIN A WELL-DEFINED FRACTION OF RESPIRABLE PARA-ARAMID FIBERS
R. P. F. Schins, et al., Environ. Health Perspectives 101(5):414-416, 1993. 5 refs.

The authors developed a preparation method to obtain respirable-sized fractions of para-aramid fibers. The procedure, based on floatability, consists of stirring and subsequent settling of p-aramid pulp in distilled water. Two distinct phases are obtained, with small fibers in the upper part of the suspension, which represents about 33% of the total volume. Optimal results were obtained when 2.0 g pulp was stirred for 15 hr in 800 ml distilled water containing 0.125% ethanol and settled for 5 hr. The mass yield ranged between 0.4 and 0.6%, more than 90% of the particles had an aspect ratio $\geq$ 3:1. The mean fiber length was about 6 µm, and the mean fiber diameter was about 0.4 µm as determined by transmission and scanning electron microscopy. The number of fibers obtained was 4 X 10^6 fibers/µg under their standard conditions.
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1564/93 A METHOD FOR DETERMINATION OF METHYL TERT-BUTYL ETHER IN GASOLINE VAPORS AND LIQUID GASOLINE SAMPLES
J. Palassis, et al., Appl. Occup. Environ. Hyg. 8(11):964-969, 1993. 9 refs.

This article describes the development of a method for determining the presence of methyl tert-butyl ether (MTBE), in a matrix of gasoline vapors and in liquid gasoline samples, with the simultaneous analysis of benzene, toluene, xylenes, and total hydrocarbons. An assessment of the method's performance based on field use is also included. The method recommends collection of air samples for MTBE on 400- and 200-mg coconut-shell charcoal tubes in series, desorption in carbon disulfide, split-vent injection, analysis by gas chromatography (GC) using a capillary column, and detection by flame ionization detector. The analysis of liquid gasoline samples is accomplished by direct GC injection. The estimated limit of detection for air samples is 20 µg MTBE per sample, and 0.002 percent MTBE for liquid gasoline samples. The estimated analytical precision of MTBE standards in the range of 9 to 426 µg/mL is 4.5 percent. Samples stored at ambient temperature are stable for at least 5 days. MTBE-spiked samples stored at -7°C for 27 days indicated 90 percent recovery. Air sample volumes of 8 L are recommended when MTBE concentrations are near 10 ppm. Larger volumes should be collected if lower MTBE concentrations are expected. The method was field tested at different service stations in Los Angeles, California, Phoenix, Arizona, and Cincinnati, Ohio, where 121 personal (breathing zone) air samples were collected on charcoal tubes, and 75 liquid gasoline samples were collected and analyzed for MTBE and other gasoline hydrocarbons. The method worked well for all of these samples. The majority of personal exposures to MTBE were near the detection limit. MTBE concentrations in gasoline bulk samples varied from nondetectable to 12.4 percent.
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1565/93X THE PROBLEM OF ASBESTOS CONTENT DETERMINATION IN BULK SAMPLES: STUDY OF THE EFFECT OF COMMINUTION ON THE DIFFRACTOMETRIC RESPONSE OF CHRYSOTILE CONTAINED IN AN ASBESTOS-CEMENT SAMPLE

S. Puledda and L. Paoletti, Med. Lav. 84(4): 297-305, 1993. 14 refs.

To determine the asbestos content in a bulk sample by X-ray diffractometry, the sample must be previously comminuted until an adequate granulometry is reached. However, this treatment can produce a decrease in fibre crystallinity which, in turn, causes an attenuation of the diffractometric response of asbestos. The authors studied a "wet" comminution method that was tested on an asbestos-cement sample containing chrysotile. This procedure made it possible to limit the attenuation of the diffractometric response of chrysotile to reasonable values (about 20%). Moreover, the study of the comminution kinetics revealed a time interval during which both fibre granulometry and diffractometric response tend to reach a plateau value. In this interval, the comminution time is not a critical factor with respect to the diffractometric behaviour of chrysotile. Therefore, this interval offers favourable conditions for preparing bulk samples to be submitted to X-ray diffraction.
---Authors' abstract in English

1566/93 DETERMINATION METHOD FOR METHYL IODIDE USING DIFFUSIVE SAMPLER AND CAPILLARY GC WITH THERMAL DESORPTION INJECTOR AND FID

S. Kanno, Ind. Health 31(2):39-50, 1993. 7 refs.

A determination method for methyl iodide in the work place has been developed, using a diffusive sampler and a capillary gas chromatograph with a thermal desorption cold trap injector and an FID. The sampler consists of a glass tube (6 mm o.d., 4 mm i.d., 16 cm length) packed with porous polymer beads. The diffusion path of the sampler is made of a 3 mm i.d., 52 mm length poly (terafluoroethylene) tube inserted in the glass tube. The sampling rate of the sampler for methyl iodide was 4.6 ml/h, and variations caused by temperature, relative humidity, and wind speed were found to be small and negligible. The sample could be stored for at least two weeks without significant loss. A time-weighted average concentration of methyl iodide in the range of sub ppm to ppm for two to six hours can be measured by this method. The average concentration of methyl iodide for a period of a few seconds can also be measured by grab sampling, i.e., injecting 20 ml of air directly into the sampler.
---Author's abstract in English

1567/93 HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY DETECTION OF SULFIDE IN TISSUES FROM SULFIDE-TREATED MICE

T. W. Mitchell, et al., J. Appl. Toxicol. 13 (6):389-394, 1993. 61 refs.

The biological and forensic use of ion-interaction reversed-phase high-performance liquid chromatography for the determination of hydrogen sulfide-derived methylene blue is evaluated by measuring the sulfide content in tissues from sulfide-treated mice. Various preparative conditions were examined. The determinations of background levels of sulfide from brain, liver and kidney were compared to sulfide levels from mice exposed to 60 $\mu g\ g^{-1}$ sodium hydrosulfide. At the time of death, significant increases above background sulfide levels were measured for all three biological tissues. To evaluate its forensic potential, the authors used this sulfide detection methodology to evaluate comparatively the sulfide levels from fresh and frozen samples of brain, liver and kidney. The stability of sulfide levels obtained from frozen brain makes this tissue the most reliable tissue for forensic evaluation. Samples of brain, liver and kidney obtained within 24 h of death by sulfide intoxication had demonstrable elevations in sulfide concentration.
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1568/93 BINDING OF THE CATIONIC DYE, JANUS GREEN B, AS A MEASURE OF THE SPECIFIC SURFACE AREA OF CRYSTALLINE SILICA IN AQUEOUS SUSPENSION

L. N. Daniel, et al., Toxicol. & Appl. Pharmacol. 123(1):62-67, 1993. 33 refs.

Twelve preparations of crystalline silica, with a wide range of particle sizes, were assayed by a new method, which measures surface adsorption of the cationic dye Janus green B to crystalline silica samples in a buffered aqueous suspension. The same samples were also assayed for total surface area by the Brunauer-Emmett-Teller (BET) method of surface adsorption of nitrogen gas. A strong linear correlation was found between the two methods of measurement ($r = 0.977$). Reproducible specific surface area measurements by the Janus green B adsorption method were made on 2-mg samples using ordinary visible wavelength spectrophotometric equipment, whereas the BET method necessitated sample sizes in excess of 100 mg and more specialized instrumentation. Five size-fractionated preparations from the same Min-U-Sil α-quartz sample

showed an increase in BET surface area and Janus green B binding per unit weight with decreasing particle size. Among four standard α-quartz samples tested, Min-U-Sil 5 and F600 had the lowest specific surface areas, whereas DQ-12 and Chinese standard α-quartz had much higher surface areas. The synthetic silica preparations cristobalite and tridymite had intermediate surface areas. Binding by the cationic dye Janus green B is consistent with a surface charge mechanism and provides a useful new technique for the assessment of surface characteristics of crystalline silica samples. Its linear relationship to surface area suggests that the ratio of aqueous surface charge to surface area is constant for different crystalline silica preparations. Comparison of surface areas for different preparations of crystalline silica is important in understanding the relative activities of these preparations in studies on mechanisms of silicosis and silica-induced lung cancer.
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1569/93 ELECTROSPRAY IONIZATION MASS SPECTROMETRIC CHARACTERIZATION OF ACRYLAMIDE ADDUCTS TO HEMOGLOBIN
D. L. Springer, et al., J. Toxicol. Environ. Health 40(2-3):161-176, 1993. 30 refs.

The most common procedure to identify hemoglobin adducts has been to cleave the adducts from the protein and characterize the adducting species by, for example, derivitization and gas chromatography/mass spectrometry. To extend these approaches the authors used electrospray ionization mass spectrometry (ESI-MS) to characterize adducted hemoglobin. For this the authors incubated [^{14}C]acrylamide with the purified human hemoglobin (type A_0) under conditions that yielded high adduct levels. When the hemoglobin was separated by reversed-phase high-performance liquid chromatography (HPLC), 65% of the radioactivity copurified with the β-subunit. Three adducted species were prominent in the ESI mass spectrum of the intact β-subunit, indicating acrylamide adduction (i.e., mass increase of 71 Da) and two additional unidentified moieties with mass increments of 102 and 135 Da. Endoproteinase Glu-C digestion of the adducted β-subunit resulted in a peptide mixture that, upon reversed-phase HPLC separation, provided several radiolabeled peptides. Using ESI-MS the authors identified these as the V_{91-101} and $V_{102-122}$ peptides that represent the cysteine-containing peptides of the β-subunit. These results provide definitive information on acrylamide-modified human hemoglobin and demonstrate that ESI-MS provides valuable structural information on chemically adducted proteins.
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1570/93 INHIBITION AND ENHANCEMENT IN THE ANALYSIS OF AIRBORNE ENDOTOXIN LEVELS IN VARIOUS OCCUPATIONAL ENVIRONMENTS
A. Hollander, et al., Am. Ind. Hyg. Assoc. J. 54(11):647-653, 1993. 25 refs.

Inhibition and enhancement effects on the Limulus Amebocyte Lysate (LAL) assay were studied in a series of endotoxin exposure samples from various occupational environments. Two types of analyses were performed, with various dilutions and with spiked samples. Results showed that inhibition and enhancement occurred in some samples, leading to respective underestimation and overestimation of the endotoxin concentration. When inhibition or enhancement is present, the result of this study shows that large differences in endotoxin concentration may be found, depending on the dilution at which the sample is analyzed. False conclusions about exposure levels and their potential health effects might be introduced. Results show that quality control procedures need to become standard practice when endotoxins are analyzed in occupational environments and development of a validated, generally accepted protocol should be encouraged.
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HAZARDOUS WASTE

1571/93 INVESTIGATION OF THE EFFECT OF MOISTURE ON THE SORPTION AND DESORPTION OF CHLOROBENZENE AND TOLUENE FROM SOIL
C. Thibaud, et al., Environ. Sci. Technol. 27(11):2373-2380, 1993. 23 refs.

The sorption isotherms of chlorobenzene and toluene on a standard EPA soil at different relative humidities were measured using a dynamic technique based on frontal analysis chromatography. At 0% relative humidity, the isotherms were BET (Brunauer-Emmett-Teller) type II isotherms, indicating monolayer coverage of the surface followed by multilayer coverage. As the relative humidity increased, the shape of the isotherm became progressively a type III isotherm, indicating weaker adsorbent/adsorbate interactions. The presence of water greatly reduced the organic uptake by soil, especially at low organic concentrations. The effect of humidity was attributed to adsorptive displacement of the organic by water. A mechanistic approach was was considered to evaluate the contribution

of the possible sorption mechanisms to the total sorption. It was found that adsorption at the gas-liquid interface was important and that dissolution in liquid water and partitioning into organic matter from the adsorbed water phase were negligible. The BET theory for adsorption of binary gas mixtures on solid surfaces successfully represented the data in the relative humidity range 0-50% and relative organic pressure range 0-30%. The effect of humidity on the desorption profile was investigated, and it was found that the efficiency of extraction was increased when using a water-saturated gas stream for desorption instead of a dry gas stream.
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1572/93 MODELING AND SIMULATION STUDIES OF ELECTROPLATING SHOPS FOR HAZARDOUS WASTE MINIMIZATION
C. Celardin and A. Palazoglu, Haz. Waste & Haz. Materials 10(3):279-295, 1993. 18 refs.

The objective of this paper is to demonstrate the utility of modeling and simulation studies in systematically minimizing the hazardous wastes generated by the metal finishing industries. The mathematical models of electroplating processes are used to understand and evaluate the consequences of design modifications, process variations and changes in shop demand. Such models provide guidelines to implement various waste reduction strategies and based on economic objectives can help optimize the shop operation.
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1573/93 SELECTIVE RECOVERY OF NICKEL AND COBALT FROM ELECTROMACHINING SLUDGE MATERIALS
L. G. Twidwell, et al., Haz. Waste & Haz. Materials 10(3):297-311, 1993. 22 refs.

The recovery of nickel and cobalt from electromachining sludge in the form of relatively high-purity marketable products has been investigated. The investigation has shown that a series of hydrometallurgical unit operations can be performed to recover nickel and cobalt from electromachining sludge in the form of nickelic hydroxide and cobalt sulfate/cobalt metal, respectively. The recovery unit operations for nickel include high pH cyanide complexation, followed by oxidation and precipitation of nickelic hydroxide. The resultant filtrate can be treated for cobalt concentration and recovery by precipitation of a cobaltous/cobaltic double cyanide salt and cobaltous hydroxide. This concentrated form of cobalt can then be converted to cobalt sulfate by acid baking; then redissolved and electrowon as high purity cobalt metal. Product purity rivals that of conventional multistage solvent extraction processes. First order cost estimation indicates the possibility of excellent return on investment.
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1574/93 DESCRIPTION OF TIME-VARYING DESORPTION KINETICS: RELEASE OF NAPHTHALENE FROM CONTAMINATED SOILS
D. F. Connaughton, et al., Environ. Sci. Technol. 27(11):2397-2403, 1993. 31 refs.

Release rates of naphthalene from suspensions of freshly contaminated (days to weeks) and aged (approximately 30 years) soil samples were obtained using a gas purge method. A continuously increasing resistance to desorption was observed with increasing purge time. Initial desorption rates were similar to those estimated using available empirical relationships, but subsequent desorption rates were lower by more than 1 order of magnitude. A model incorporating a continuum of compartments with a gamma (Γ) distribution of rate coefficients was postulated to describe the experimental data. An analytical equation with two adjustable parameters was obtained for the mass fraction desorbed. Release profiles with this "Γ model" were able to describe the experimental release profiles for long term desorption experiments. An implication of the gamma model is that increased incubation time will allow organic compounds to be sorbed to compartments or regions in the sorbent that exhibit slow adsorption/desorption kinetics. This has important implications for the fate and remediation of sites that have been contaminated with hydrophobic organic compounds for extended time periods.
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1575/93 DESORPTION OF TRICHLOROETHYLENE IN AQUIFER MATERIAL: RATE LIMITATION AT THE GRAIN SCALE
P. Grathwohl and M. Reinhard, Environ. Sci. Technol. 27(11):2360-2366, 1993. 33 refs.

Soil-gas venting for the removal of sorbed trichloroethylene (TCE) was studied in columns packed with either wet or oven-dry Santa Clara aquifer material. After the wet columns were vented up to 1 h, the removal rate was independent of the flow rate and limited by slow intraparticle mass transfer. In contrast, removal of TCE from columns filled with oven-dry material was proportional to the flow rate after 20 days of venting. This suggests that intraparticle pore water limits mass transfer from the internal sorption sites. Desorption was

modeled using an intraparticle diffusion model assuming homogeneous porous spheres. The model was calibrated in batch sorption studies using the apparent diffusion rate constant as a fitting parameter.
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1576/93 TWO-STAGE EVALUATION OF EXPOSURE TO MERCURY AND BIOMARKERS OF NEUROTOXICITY AT A HAZARDOUS WASTE SITE
J. S. Reif, et al., J. Toxicol. Environ. Health 40(2-3):413-422, 1993. 37 refs.

Communities surrounding the Rocky Mountain Arsenal (RMA), a Superfund site in Colorado, were studied in order to determine whether exposures to mercury were greater among persons who resided there than among residents of a comparison area 12-15 miles distant. From a census-based stratified random sample, 469 persons were interviewed and urine samples were obtained for biomonitoring. Mercury was detected in urine from 32 (6.8%) of the 469 persons sampled at a detection limit of 5 ppb. Trace levels of mercury (detectable, but nonquantifiable) were found in 80 (17.1%) of the persons sampled. Neither the frequency of detection, the arithmetic mean, nor the geometric mean value for urine mercury was found to be statistically different when persons living near the site were compared to persons from the more distant comparison area. The risk of mercury exposure associated with demographic variables, residence, occupation, hobbies, dietary habits, water supply, housing, and activity patterns was evaluated. In the second stage of the evaluation, the Neurobehavioral Core Test Battery (NCTB) is being used to assess individual functional deficits and nervous system disorders associated with exposure to mercury and other neurotoxic chemicals.
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1577/93 TRICHLOROETHYLENE CONCENTRATION EFFECTS ON PILOT FIELD-SCALE IN-SITU GROUNDWATER BIOREMEDIATION BY PHENOL-OXIDIZING MICROORGANISMS
G. D. Hopkins, et al., Environ. Sci. Technol. 27(11):2542-2547, 1993. 30 refs.

A pilot study of in-situ aerobic cometabolic degradation of trichloroethylene (TCE) through the injection of phenol and oxygen into a confined aquifer was conducted at the Moffett Field test site together with a related laboratory study. With injected phenol and dissolved oxygen concentrations of 12.5 and 35 mg/L, respectively, first-order TCE removal of 88% was obtained over a concentration range of 62-500 µg/L. With 1000 µg/L TCE, removal was lower (77%), but increased to 90% when the phenol concentration was raised to 25 mg/L. The maximum field transformation yield of 0.062 g of TCE/g of phenol compared favorably with the highest measured resting-cell laboratory yield of 0.11 g of TCE/g of phenol. These results demonstrate high promise for in-situ aerobic cometabolic biodegradation of TCE with phenol-induced enzymes.
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1578/93 FIELD EVALUATION OF THE LIGNIN-DEGRADING FUNGUS PHANEROCHAETE SORDIDA TO TREAT CREOSOTE-CONTAMINATED SOIL
M. W. Davis, et al., Environ. Sci. Technol. 27(11):2572-2576, 1993. 27 refs.

A field study to determine the ability of selected lignin-degrading fungi to remediate soil contaminated with creosote was performed at a wood-treating facility in south central Mississippi in the autumn of 1991. The effects of solid-phase bioremediation with Phanerochaete sordida and of two control treatments on soil concentrations of 14 priority pollutant polycyclic aromatic hydrocarbon (PAH) components of creosote were followed for 56 days. PAH analytes containing ≥ 5 rings persisted at their original concentrations in all treatments. However, depletion of 3-ring (85-95%) and 4-ring (24-72%) analytes after 56 days was greater in the fungal treatment than in control treatments in all cases. This finding demonstrates the potential of lignin-degrading fungi in the solid-phase bioremediation of creosote-contaminated soils. However, the persistence of the larger analytes represents a significant challenge to this developing technology.
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REGULATORY ACTIONS, PROPOSED/FINAL RULES

1579/93X NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS; AMENDMENTS TO COMPLIANCE EXTENSIONS FOR EARLY REDUCTIONS; 40 CFR PART 63
Environmental Protection Agency, 58 FR 62539-62543, November 29, 1993

Action: Final rule.

1580/93X DETERMINING CONFORMITY OF GENERAL FEDERAL ACTIONS TO STATE OR FEDERAL IMPLEMENTATION PLANS; 40 CFR PARTS 6, 51, AND 93
Environmental Protection Agency, 58 FR 63214-63259, November 30, 1993

Action: Final rule.

1581/93X BURNING OF HAZARDOUS WASTE IN BOILERS AND INDUSTRIAL FURNACES; 40 CFR PARTS 266 AND 271
Environmental Protection Agency, 58 FR 59598-59603, November 9, 1993

Action: Interim final rule.

1582/93X OFFICE OF WATER CHEMICALS; FINAL TEST RULE; 40 CFR PART 799
Environmental Protection Agency, 58 FR 59667-59682, November 10, 1993

Action: Final rule.

1583/93X HEALTH AND ENVIRONMENTAL STANDARDS FOR URANIUM AND THORIUM MILL TAILINGS; 40 CFR PART 192
Environmental Protection Agency, 58 FR 60340-60356, November 15, 1993

Action: Final rule.

1584/93X NOTICE OF LISTING OF CATEGORIES AND REGULATORY SCHEDULE FOR AIR EMISSIONS FROM OTHER SOLID WASTE INCINERATORS; 40 CFR PART 51
Environmental Protection Agency, 58 FR 58948-58501, November 2, 1993

Action: Notice of listing of categories of sources of other solid waste incineration units under section 129 of the Clean Air Act (Act) and a schedule for promulgation of regulations.

1585/93X ASBESTOS, MANUFACTURE, IMPORTATION, PROCESSING AND DISTRIBUTION PROHIBITIONS; 40 CFR PART 763
Environmental Protection Agency, 58 FR 58964-58968, November 5, 1993

Action: Continuing restrictions on certain asbestos-containing products.

1586/93X TESTING CONSENT AGREEMENT FOR N-METHYLPYRROLIDONE; 40 CFR PART 799
Environmental Protection Agency, 58 FR 61814-61816, November 23, 1993

Action: Final Consent Agreement.

1587/93X PROTECTION AGAINST MALEVOLENT USE OF VEHICLES AT NUCLEAR POWER PLANTS; 10 CFR PART 73
Nuclear Regulatory Commission, 58 FR 58804-58807, November 4, 1993

Action: Proposed rule.

1588/93X RULEMAKINGS TO GRANT STANDARD DESIGN CERTIFICATION FOR EVOLUTIONARY LIGHT WATER REACTOR DESIGNS; 10 CFR PART 52
Nuclear Regulatory Commission, 58 FR 58664-58667, November 3, 1993

Action: Advanced notice of proposed rulemaking (ANPR).

1589/93X URANIUM MILL TAILINGS REGULATIONS; CONFORMING NRC REQUIREMENTS TO EPA STANDARDS; 10 CFR PART 40
Nuclear Regulatory Commission, 58 FR 58657-58664, November 3, 1993

Action: Proposed rule.

1590/93X POLYCHLORINATED BIPHENYLS (PCBs); RECLASSIFICATION OF PCB AND PCB-CONTAMINATED TRANSFORMERS; 40 CFR PART 761
Environmental Protection Agency, 58 FR 60970-60976, November 18, 1993

Action: Proposed rule.

1591/93X GLYCOL ETHERS CATEGORY; TOXIC CHEMICAL RELEASE REPORTING; COMMUNITY RIGHT-TO-KNOW; NOTICE OF AVAILABILITY, TECHNICAL AMENDMENT, EXTENSION OF COMMENT PERIOD; 40 CFR PART 372
Environmental Protection Agency, 58 FR 60574-60575, November 17, 1993

Action: Proposed rule; notice of availability, technical amendment, and extension of public comment period.

1592/93X ACETOPHENONE, PHENOL, N,N-DIMETHYLANILINE, ETHYL ACETATE, AND 2,6-DIMETHYLPHENOL; PROPOSED TEST RULE, NOTICE OF OPPORTUNITY TO INITIATE NEGOTIATIONS FOR TSCA SECTION 4 TESTING CONSENT AGREEMENTS; 40 CFR PART 799
Environmental Protection Agency, 58 FR 61654-61671, November 22, 1993

Action: Proposed rule.

1593/93X SIGNIFICANT NEW USES OF CERTAIN ACRYLATE ESTERS; 40 CFR PART 721
Environmental Protection Agency, 58 FR 61649-61654, November 22, 1993

Action: Proposed rule.

1594/93X PREPARATION, ADOPTION, AND SUBMITTAL OF STATE IMPLEMENTATION PLANS: METHODS FOR MEASUREMENT OF VISIBLE EMISSIONS; 40 CFR PART 51
Environmental Protection Agency, 58 FR 61640-61649, November 22, 1993

Action: Proposed rule and notice of public hearing.

1595/93X PRIVACY ACT OF 1974; EXEMPTIONS; 40 CFR PART 16
Environmental Protection Agency, 58 FR 61638-61640, November 22, 1993

Action: Proposed rule.

1596/93X RISK MANAGEMENT PROGRAMS FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION; 40 CFR PART 68
Environmental Protection Agency, 58 FR 60419, November 16, 1993

Action: Proposed rule; notice of public hearing.

1597/93X PROHIBITION OF HEXAVALENT CHROMIUM-BASED WATER TREATMENT CHEMICALS IN COMFORT COOLING TOWERS; PROPOSED AMENDMENT TO LIMIT THE SCOPE OF THE EXPORT NOTIFICATION REQUIREMENTS; 40 CFR PART 749
Environmental Protection Agency, 58 FR 63148-63152, November 30, 1993

Action: Proposed rule.

1598/93X OPTING INTO THE ACID RAIN PROGRAM: CHANGE IN PUBLIC COMMENT PERIOD FOR THE PROPOSED RULE; 40 CFR PARTS 72, 73, 74, 75 AND 78
Environmental Protection Agency, 58 FR 63134, November 30, 1993

Action: Proposed rules; change in public comment period.

1599/93X NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS; HALOGENATED SOLVENT CLEANING; 40 CFR PART 63
Environmental Protection Agency, 58 FR 62566-62598, November 29, 1993

Action: Proposed rule and test method; notice of public hearing.

1600/93X FACT SHEET FOR THE MULTI-SECTOR STORMWATER GENERAL PERMIT
Environmental Protection Agency, 58 FR 61146-61596, November 19, 1993

Action: Notice.

1601/93X AMBIENT WATER QUALITY CRITERIA ANILINE AND 2,4-DIMETHYLPHENOL
Environmental Protection Agency, 58 FR 61910-61911, November 23, 1993

Action: Notice of availability and request for comments on Proposed Ambient Water Quality Criteria Documents for the Protection of Aquatic Life.

1602/93X AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS; EQUIVALENT METHOD DESIGN
Environmental Protection Agency, 58 FR 61902-61903, November 23, 1993

Action: Notice.

MISCELLANEOUS

1603/93X THE INTERNATIONAL CHEMICAL SAFETY CARDS
E. Menichini, Med. Lav. 84(4):267-273, 1993. 12 refs.

Information is given on a new form of safety data sheets for chemical substances: the "International Chemical Safety Cards", that were developed by the "International Programme on Chemical Safety" of the WHO, in cooperation with the Commission of the European Communities. The Cards are prepared by various scientific institutions and then peer-reviewed by a committee of internationally-recognized experts. At the moment, 349 Cards are available in English. The Commission has also translated 78 Cards into the other eight official languages of the European Community. Among the aims of this undertaking, the most significant are: (a) the possibility of comparing risks associated with different substances, through the use of "standard phrases", whose meaning is given in a specific Guide; (b) circulation of information on chemical risks on a global level, particularly in those countries that are not able to make their own evaluations.
---Author's abstract in English

1604/93 USE OF BIOLOGICAL MARKERS IN OCCUPATIONAL HEALTH RESEARCH AND PRACTICE
P. A. Schulte, J. Toxicol. Environ. Health 40 (2-3):359-366, 1993. 29 refs.

The promise of biological markers in occupational health research and practice has been described in the scientific literature. The current generation of biological markers has the potential to allow for the earlier detection of disease, for the reduction of misclassification of exposure and outcome, for

heightened understanding of mechanisms and etiologic pathways, and for the designation of groups at risk. What is necessary now is a strategy for realizing this potential. The elements of such as a strategy may include the following: (1) a program to validate biomarkers, (2) increased utilization of valid biomarkers in etiologic and prevention research, and (3) developmental programs to encourage interdisciplinary collaboration and train molecular epidemiologists. A framework for linking biomarkers and epidemiologic study designs has evolved during the past 5 yr. For this progress to continue, it is important that discussion about biomarkers reflect a specificity with regard to both the type of marker and the use for which it is intended.
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1605/93 BIOMARKERS AND MOLECULAR EPIDEMIOLOGY OF OCCUPATIONALLY RELATED CANCER
F. Perera, J. Toxicol. Environ. Health 40 (2-3):203-215, 1993. 67 refs.

Effective prevention of cancer requires sensitive early warning systems to identify groups, and ultimately individuals, who are at high risk of developing cancer and to accurately estimate the magnitude of their risk. Incorporated with molecular epidemiologic studies, biologic markers have the potential to provide quantitative human data on the biologically effective dose of carcinogens, resultant molecular effects, and genetic/acquired factors that modulate these effects. Clearly, this information is directly relevant to risk identification and to risk quantification.
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601 Wythe St.,
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