

COPIED

13053 - 13064



his

Bibliography



vinyl
chloride

ASI 000013053

CIS 75-1979 Vinyl-chloride-induced liver disease - From idiopathic portal hypertension (Banti's syndrome) to angiosarcomas. Thomas L.B., Popper H., Berk P.D., Selikoff I., Falk H. *New England Journal of Medicine* Boston, USA. 2 Jan. 1975. Vol.292. No.1, p.17-22. illus. 32 ref. (In English)

This paper presents a case for the concept that splenomegaly with portal hypertension associated with hepatic fibrosis (Banti's syndrome) may be the result of exposure to known or unknown chemical agents. Autopsy and biopsy of 20 liver specimens from 20 workers exposed to vinyl chloride for 2-18 years, 15 of whom had angiosarcoma and 5 hepatic fibrosis, were studied. Spleens of whom were examined in 5 cases. The histological characteristics of angiosarcoma were classified into 3 basic patterns (sinusoidal, papillary, cavernous), are described. A peculiar pattern of progressive portal-tract, inconspicuous intrahepatic and conspicuous capsular fibrosis was seen in the 5 workers without angiosarcoma, and in tumour-free portions of the liver in angiosarcoma cases. The relations between the hepatic fibrosis found and angiosarcoma are discussed. The histological similarity to inorganic arsenic poisoning and idiopathic portal tension suggests that the latter may be caused by chemical agents. (03912)

CIS 75-1943 The industrial toxicology of vinyl chloride - A review. Holmberg B., Molina G. *Work - Environment - Health*. Helsinki, Finland. 1974 Vol.11, No.3, p.138-144. 49 ref. (In English)

A comprehensive review of the pertinent literature on vinyl chloride (VC). Its properties are described and its uses listed as a gas and as a monomer (VCM). The instances when occupational exposure may occur are pointed out: during synthesis of VCM, polymerisation of VCM to polyvinyl chloride (PVC), compounding of PVC, and manufacture of products made from PVC. The acute effects of exposure to high concentrations of VC and its flammability are indicated and the effects of long-term exposure described at length. Results of animal studies are reviewed and threshold limit values discussed in the light of all the toxicological data available. (04054)

CIS 75-1932 Carcinogenicity of vinyl chloride - Literature survey. Action cancérogène du chlorure de vinyle - Revue bibliographique. Cavigneaux A., Morel C. *Cahiers de notes documentaires - Sécurité et hygiène du travail* Paris, France. 2nd quarter 1975. No.79, Note No.956-79-75, p.201-206. 93 ref. (In French)

Brief survey of the historical background to present-day knowledge and awareness of the toxicity of vinyl chloride monomer (VCM): the carcinogenicity of which has been demonstrated by animal experiments and observed cases of workers engaged in cleaning out polymerisation autoclaves, the first of which date from Jan. 1974. From comparison of VCM with more highly carcinogenic substances a safe TLV would fall between 25 and 10ppm. (03907)

CIS 75-1929 Order of 20 November 1974 to supplement the list of processes requiring special medical supervision. Arrêté du 20 novembre 1974 complétant la liste des travaux nécessitant une surveillance médicale spéciale. *Journal officiel de la République française*, Paris, France. 30 Nov. 1974. Vol.106, No.280 p.11979. (In French)

The item "processes for the polymerisation of vinyl chloride" is added to the list of processes requiring special medical supervision in the schedule appended to the Order of 22 June 1970. (03967)

CIS 75-1927 Determination of vinyl chloride monomer at the sub-ppm level using a personal monitor. Myers S.A., Quinn H.J., Zook W.C. *American Industrial Hygiene Association Journal*, Akron, USA. May 1975. Vol.36 No.5 p.332-337 illus. 13 ref. (In English)

A method is described for personal-breathing-zone sampling of vinyl chloride (VC) in ambient air. The procedure utilises adsorption of the gas on activated charcoal followed by thermal elution onto a gas chromatograph. The method had a standard deviation of 0.04 at the 1-ppm level and a limit of detection of 20 parts per billion (ppb) or lower, and meets the current U.S. Federal requirements for monitoring VC. The limit of detection might be reduced to 1ppb by increasing the operating sensitivity of the instrument. (03942)

CIS 75-1922 Suggested technical concentration for vinyl chloride. (Technische Richtkonzentration (TRK) für Vinylchlorid). Bekanntmachung. Federal Ministry of Labour and Social Affairs (Bundesministerium für Arbeit und Sozialordnung). Bonn, 19 Mar. 1975. *Arbeitsschutz*. Stuttgart, Germany (Fed.Rep.). Apr. 1975. No.4, p.127. (In German)

The Committee for Dangerous Substances (Ausschuss für gefährliche Arbeitsstoffe) has determined a suggested technical concentration value of 5ppm for vinyl chloride, with effect as of 1 July 1975. Scope, exemptions, explanatory memorandum of objectives and grounds for this measure. Factors taken into consideration in fixing the suggested value: technological achievements and feasibility, chemical analysis facilities; medical and toxicological data. (03922)

CIS 75-1751 The problem of the occupational environment. Pittom L.A. *Chemistry and Industry* London, United Kingdom. 20 Sep. 1975. No.18, p.768-770 (In English)

This paper, presented at a symposium on the Industrial Economy of the East Midlands, discusses the long-term risks to health from chemical substances and potential catastrophe from large-scale release of flammable or toxic substances. Lessons learned from the discovery of vinyl chloride monomer toxicity are enumerated. Attention was drawn to the recommendations to avoid disasters such as the explosion of the Nypro Ltd. chemical works in 1974. (03854)

CIS 75-1681 Preventive medicine and technical protective measures in PVC-manufacturing plants. (Werksärztliche Vorsorge und technische Schutzmassnahmen in PVC-herstellungsbetrieben). Thies A.M. *Arbeitsmedizin - Sozialmedizin - Präventivmedizin*. Stuttgart, Germany (Fed.Rep.). Dec. 1974. Vol.9, No.12, p.276-280. illus. 23 ref. (In German)

Organisational measures (special works committees, information of personnel, frequent medical examinations, exchange of experience at the national and international levels) and technical protection measures are presented: methods of determining vinyl chloride in air; improved ventilation and exhaust for autoclaves; methods of cleaning polymerisation autoclaves. The threshold limit value for vinyl chloride, which has been reduced in the German Fed.Rep. from its original level of 500ppm to 50ppm, is briefly discussed. (03879)

CIS 75-1678 Health hazard evaluation/toxicity determination. Seattle, Washington. Polakoff P.L., Vandervort R. PB-229 709/1WJ. National Technical Information Service, Springfield, Virginia 22151. USA. Sep. 1973. 23p. illus. 2 ref. Price: Photocopy US-\$4.25/Microfiche US-\$1.45. (In English)

A health hazard survey evaluated thermal decomposition products of a polyvinyl chloride meat packaging film at six retail grocery companies. The medical evidence in this limited study showed that the air contaminants generated by the thermal cutting and sealing of the film in conjunction with the meat wrapping are potentially toxic to meat wrapping employees. Symptoms range from mild eye, nose and throat irritation to more serious disorders for meat wrappers who were predisposed to respiratory difficulties. Recommendations were: pre-employment medical examinations to screen out those disposed to pulmonary disorders, maintenance of meat wrapping machinery, and proper ventilation of the surroundings. (03870)

CIS 75-1665 Toxic and carcinogenic effects of vinyl chloride. (Patologia tossica e neoplastica da cloruro di vinile). Mazzella D., Bosco M. *Rivista degli infortuni e delle malattie professionali*. Roma, Italy. May-June 1975. Vol.62, No.3, p.313-328. 48 ref. (In Italian)

Literature survey of the hazards of exposure to vinyl chloride in polymerisation plants: acute toxicity, chronic toxicity (central nervous system disorders, asthenia, anorexia), scleroderma, eczema, acroosteolysis, Raynaud's syndrome, hepatotoxic effects, carcinogenicity (angiosarcoma of the liver). Animal experiments have confirmed these toxic and carcinogenic effects. The author supports the view of the authorities of several countries who have proposed to fix the TLV in air of this substance at 1ppm. He recommends that all investigations of this question should be coordinated at a central source. (03847)

CIS 75-1662 Reduction of exposure to vinyl chloride. (Nedbringande av expositionen för vinylklorid). Meddelanden 1974:30. National Board of Occupational Safety and Health (Kungliga Arbetskyddsstyrelsen). Postfach, Stockholm 34, Sweden. 14 Oct. 1974. 2p. Gratis. (In Swedish)

With effect from 1 Jan. 1975, the Swedish threshold limit value for vinyl chloride has been lowered from 20 to 1ppm, and the ceiling value from 50 to 5ppm (average exposure up to 15 min.). Employers should as soon as possible take the necessary measures to reduce vinyl chloride concentrations below the new levels. Where concentrations cannot be reduced below 20ppm, respiratory protection should be provided. (03840)

CIS 75-1654 Angiosarcoma of the liver in workers exposed to vinyl chloride - Report on the first two cases observed in Italy. (Angiosarcoma epatico in operai esposti a cloruro di vinile. Resoconto dei primi due casi riscontrati in Italia). Maltoni C. *Medicina del lavoro*. Milano, Italy. Nov.-Dec. 1974. Vol.65, No.11-12, p.445-450. illus. 4 ref. (In Italian)

Description of 2 cases of liver angiosarcoma observed in workers in the polyvinyl chloride (PVC) industry. The first case concerned a worker employed in the extrusion-blowing unit of a plant producing PVC bags; the angiosarcoma involved the pericardium, lungs and liver. In the case of the second worker, who was employed in the vinyl chloride polymerisation unit of the plant, only the liver was involved. (03805)

CIS 75-1653 Vinyl chloride carcinogenesis: Current results and perspectives. Maltoni C., Lefemine G., Chicco P., Carretti D. *Medicina del lavoro*. Milano, Italy. Nov.-Dec. 1974. Vol.65, No.11-12, p.421-444. 6 ref. (In English)

Results of research carried out in 3 species of animals (rats, mice, hamsters).

to determine the carcinogenicity of vinyl chloride. Inhalation of the gas induced in rats: nephroblastoma, angiosarcoma and angioma of the liver, skin cancer, hepatoma, brain neuroblastoma and mammary carcinomas; in mice: lung adenoma, mammary carcinoma, angiosarcoma and angioma of the liver, and skin epithelioma; in hamsters: angiosarcoma of the liver, skin trichoepithelioma, lymphoma, and papilloma and scanthoma of the forestomach.

(03804)

CIS 75-1652 Vinyl chloride pathology: Present state of the problem (Patologia da cloruro di vinile: Stato attuale del problema). Foà V., Bertazzi P.A. *Medicina del lavoro*, Milano, Italy, Nov.-Dec. 1974, Vol.65, No.11-12, p.401-420, 31 ref. (In Italian)

This article briefly reviews methods used for the production of vinyl chloride monomer (VCM) and its polymerisation to obtain polyvinyl chloride, and goes on to describe the operations involving exposure to VCM (cleaning, loading, unloading and degassing autoclaves, drying, sacking, etc.). Literature survey of pathological effects of VCM (toxicity, acroosteolysis, angiosarcoma of the liver, etc.). As regards the carcinogenicity of the monomer, the existence of a dose-response relationship has been demonstrated by experimental methods. The authors point out the necessity for epidemiological surveys in Italy, and recall the decisions taken to reduce the TLV for VCM in many countries. The last chapter is devoted to non-occupational exposure to VCM.

(03803)

CIS 75-1639 Cancers due to vinyl chloride (Les cancers par chlorure de vinyle). Laroche D.P.R. Université de Paris V, Faculté de médecine de Cochin - Port-Royal, Paris, France, 1975, 70p. 78 ref. (In French)

This MD thesis reviews the chemical and physical properties of vinyl chloride monomer (VCM), briefly describes research up to the present on the toxic effects of this substance, and describes its action on bone and skin tissue and the overall symptoms of VCM poisoning. The author then proceeds to the central subject of his study, namely liver toxicity and above all carcinogenicity, referring to Viola's and Maltoni's experimental work and 30 cases observed in man. Clinical picture of liver angiosarcoma. Analysis of the cause/effect relation between VCM and cancer shows that exposure to this substance increases the incidence of this form of cancer 300 to 600-fold, the most exposed workers being those engaged in cleaning out polymerisation autoclaves. Practical measures are recommended for industry as regards prevention, supervision of exposed individuals and screening the most heavily exposed population. Total avoidance of any occupational exposure to VCM is recommended.

(03779)

CIS 75-1634 Annual report 1974. International Agency for Research on Cancer, 150 Cours Albert-Thomas, 69008 Lyon, France, 1974. World Health Organisation, 1211 Genève, Switzerland, 1974, p.68-82. Illus. Price: SF.10.00 for the whole report. (In English, French)

Chapter 4 of the report is devoted to the activity of the Unit of Chemical Carcinogenesis of the IARC. The programme of this Unit is centered on 3 aspects of carcinogenesis: (a) comparative study of the metabolism of carcinogens in human and animal tissues; (b) chemical carcinogenicity in vitro; (c) mutagenicity tests. The Unit is also responsible for the co-ordination of carcinogenicity data (publication of "Monographs on the evaluation of carcinogenic risk of chemicals to man", most of which have been abstracted by the CIS), evaluation of the significance for man of experimental chemical carcinogenesis data, etc.

(03761)

CIS 75-1631 A case of angiosarcoma of the liver in a worker exposed to vinyl chloride monomer (Un cas d'angiosarcome hépatique chez un ouvrier exposé au chlorure de vinyle monomère). Ravier E., Diter J.M., Piat J. *Archives des maladies professionnelles*, Paris, France, Mar. 1975, Vol.36, No.3, p.171-177, Illus. 52 ref. (In French)

This article enumerates the "black spots" where the risk of exposure to vinyl chloride monomer is especially severe in the plastics industry (polymerisation plants, especially in cleaning out autoclaves) and describes a case of angiosarcoma of the liver in a worker occupationally exposed to the monomer for 19 years. Description of clinical symptoms and results of histological examination.

(03740)

CIS 75-1619 General methods for prevention of occupational cancers due to chemical substances (Méthodes générales de prévention des cancers professionnels d'origine chimique). Favier C. Université de Paris VII, Faculté de médecine Xavier-Bichat, Paris, France, 1975, 69p. 36 ref. (In French)

The author of this MD thesis comments on the difficulty of proving the occupational origin of cancer, and examines the various carcinogenic or potentially carcinogenic chemical agents (inorganic and organic), following the classification adopted by R. Truhaut in his attempt to list the potentially carcinogenic chemical agents used in industry. A chapter is devoted to chemical carcinogenesis: carcinogenic effect of chemical substances, mode of action, promoting agent, possible role of cell membrane, mechanism of tumour onset. The author discusses technical measures of prevention (substitution of other products, prohibition, protection, maximum allowable concentrations, cleanliness, supervision and inspection, information and education) and medical prevention in general (examinations and check-ups), and legislation in va-

CIS 75-1406 Contribution of infrared thermography to diagnosis and supervision of disorders due to exposure during vinyl chloride polymerisation processes - Table No.52 (acroosteolysis) of the Schedule of occupational diseases (Apport de la thermographie infrarouge au diagnostic et à la surveillance des affections consécutives aux opérations de polymérisation du chlorure de vinyle - Tableau n°52 (acro-ostéolyse) des maladies professionnelles). Réty J., Lazard P., Berrod J., Schmitt M. *Archives des maladies professionnelles*, Paris, France, July-Aug. 1974, Vol.35, No.7-8, p.733-738. Illus. (In French)

The use of thermography in examining 3 persons with radiologically visible acroosteolysis, one person with completely recalcified bone lesion and 2 healthy controls brought to light certain vascular disorders among the 4 first-mentioned subjects; it was impossible to ascertain whether these vascular disorders preceded and had a causative effect on the bone damage or not. Infrared thermography would appear to be of considerable use in studying the pathogenesis of this disease, and from the forensic point of view, as well as assisting diagnosis if the syndrome precedes the bone lesion.

(03590)

CIS 75-1404 Chemical products and carcinogenesis (Chemicaliën en het ontstaan van kanker). Henderson P.T., Seutter-Berlage F. *Natuur en techniek*, Maastricht, Netherlands, Apr. 1975, Vol.43, No.4, p.210-227. Illus. 2 ref. (In Dutch)

After an introduction on xenobiotics (substances which are foreign to the human body) and the uninhibited proliferation of the cancerous cell, the authors study the question of carcinogenesis due to chemical products: carcinogenic constituents of tar (polycyclic aromatic hydrocarbons), aromatic amines (aniline dyes and dyes containing azo compounds), vinyl chloride (angiosarcoma of the liver), nitrites and nitroso-amines. In a chapter devoted to natural substances which are carcinogenic, the aflatoxins and cycasin are given as examples. Other subjects dealt with include the activation and inhibition of carcinogenic substances (role of enzymes), mutagenesis (insertion of carcinogenic molecules in the DNA helix) and prevention of cancer.

(03585)

CIS 75-1403 Haemostatic phenomena in vinyl chloride disease (Hämostaseologische Aspekte bei der Vinylchlorid-Krankheit). Bachner U., Etzel F., Lange C.E., Marsteller H.J., Veltman G. *Deutsche medizinische Wochenschrift*, Stuttgart, Germany (Fed.Rep.), 22 Nov. 1974, Vol.99, No.47, p.2409-2410, 8 ref. (In German)

The authors examined 70 workers employed in the polyvinyl chloride industry and noted that in 80% of the cases observed thrombocytopenia constituted the earliest and most frequent sign of exposure to vinyl chloride monomer. The incidence of splenomegaly increased in proportion to the degree of thrombocytopenia (minimum values 17,000/mm³). Results of laparoscopy, cytological analyses and haemostatic function tests. A check-up made one year after termination of exposure revealed a tendency to persistent thrombocytopenia, especially pronounced among a group showing varicosity of the oesophagus and reduced plasminogen levels.

(03581)

CIS 75-1357 Outbreaks of occupational disease rock industry. Occupational Hazards, Cleveland, USA, May 1974, Vol.3, No.5, p.43-48. Illus. (In English)

An epidemic of peripheral neuritis affected 128 of 950 workers in a USA coated fabrics plant engaged in printing and dyeing textiles and fabrics and coating fabric wall coverings with plastic. The solvent 2-hexanone (methyl butyl ketone) was suspected. In 1972 the company had substituted this solvent for methyl isobutyl ketone. Work practices at the plant added to workers' exposure (eating lunch at workposts making ingestion a second avenue of exposure, overtime, etc.). A NIOSH team investigated the outbreak. There is a possibility of synergism between 2-hexanone and another chemical. The outbreak seriously deteriorated worker-management relations, with threatened closure of the plant until health conditions improved. The article also refers to 3 cases of liver angiosarcoma in a vinyl chloride polymerisation plant, discussing TLVs, and reviewing the respective roles of NIOSH and the Occupational Safety and Health Administration (OSHA).

(03386)

CIS 75-1349 NIOSH manual of analytical methods. HEW Publication No.(NIOSH)75-121, National Institute for Occupational Safety and Health, Rockville, Maryland 20852, Government Printing Office, Washington, D.C. 20402, USA, 1974, 320p. Illus. 139 ref. (In English)

Fundamental reference book describing 39 procedures for analysis used by the NIOSH Physical and Chemical Analysis Branch for industrial hygiene analyses, covering some 135 chemical substances. Methods are indexed and classified as recommended, accepted, operational, tentative or proposed. Principle of each method, range and sensitivity, interferences, reliability, apparatus and reagents, etc. Procedures described include those for: lead (in urine); mercury (blood, urine); free silica by colorimetry; antimony (urine); carbon dioxide (air); free silica - quartz, cristobalite, tridymite - (air, dust); quartz (coal dust) by infrared spectroscopy; carbon monoxide (air, blood, urine); cyanide (air); fluoride and hydrogen fluoride (air); acrolein (air); beryllium (air); formaldehyde (air); hydrogen sulfide (air); organic solvents (air); arsenic (urine, air); toluene diisocyanate (air); diphenylmethanediisocyanate (air); sulfur dioxide (air); cadmium (air); total particulate chromium (air); ozone (air); lead (air); parathion (air); oil mist (air); aromatic amines (air); chromic acid (air); general procedure for metals; mercury (air); and vinyl chloride (air).

A description of a 2-stage thermal desorption unit for mercury determination is appended. (03362)

CIS 75-1345 Some anti-thyroid and related substances, nitrofurans and industrial chemicals. IARC monographs on the evaluation of carcinogenic risk of chemicals to man. Vol 7. International Agency for Research on Cancer, 150 Cours Albert-Thomas 69008 Lyon, France, 1974. 326p. 809 ref. Price: SF.32 00 (In English)

A series of 23 monographs consisting of data reviewed and evaluated by an international group of experts (Lyon, 4-11 Feb. and 18-24 June 1974). Individual monographs are devoted to: Anti-thyroid and related substances: amiloride; ethylenethiourea; methylthiourea; propylthiourea; thioacetamide; thiouracil; thiourea; urethane Nitrofurans 2-amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole; trans-2-[di(methylamino)methyl]imino-5-(2-(5-nitro-2-furyl)-vinyl)-1,3,4-oxadiazole 2-(2-formylhydrazino)-4-(5-nitro-2-furyl)thiazole; 5-(morpholinomethyl)-3-[15-nitrofurfurylidene]amino-2-oxazolidinone; 5-nitro-2-furaldehyde semicarbazone; 1[(5-nitrofurfurylidene)amino]-2-imidazolidinone; N-[4-(5-nitro-2-furyl)-2-thiazolyl]acetamide. Industrial chemicals: acetamide; benzene; diazomethane; ortho- and para-dichlorobenzene; ethyl methanesulfonate; methyl methanesulfonate; polychlorinated biphenyls; and vinyl chloride. (03353)

CIS 75-1296 The mechanisms of Raynaud's phenomenon. McGrath M.A., Penny R. *Medical Journal of Australia*, Sydney, Australia 31 Aug. 1974, Vol.61(12), No.9, p.328-333, and 7 Sep. 1974, No.10, p.367-375. Illus. 106 ref. (In English)

Raynaud's phenomenon is the direct result of altered haemodynamics in the vessels of the hand and a complication of many diseases. After some historical remarks and definitions of Raynaud's phenomenon and Raynaud's disease, this review summarises current concepts of the various haemodynamic factors involved in the normal control of the circulation through the hand and fingers. The physiology of the peripheral circulation and the flow characteristics of blood are discussed in detail. The pathogenesis of Raynaud's phenomenon is considered in relation to connective tissue diseases, neurovascular compression, arterial disease, blood abnormalities, occupational factors such as vibration, hand trauma, vinyl chloride polymerisation, drugs and toxins and other pathological conditions. A systematic approach to the investigation of these disorders is outlined in an appendix. (03356)

CIS 75-1190 Retrospective investigation of mortality and morbidity following exposure to vinyl chloride in the Federal Republic of Germany. Retrospektive Erhebungen zur Mortalität und Morbidität nach VC-Exposition in der Bundesrepublik Deutschland. Thies A.M., Frentzel-Beyme R. *Arbeitsmedizin - Sozialmedizin - Präventivmedizin* Stuttgart, Germany (Fed.Rep.) Apr. 1975, Vol.10, No.4, p.73-75. 5 ref. (In German)

Statistical data on polyvinyl chloride and on the number of workers exposed to hazard in this industry in the Fed. Rep. of Germany. Incidence of 'vinyl chloride disease' (180 notified cases, 57 recognised as statutory occupational disease). Morbidity from cancer (5 cases of haemangio-endothelial sarcoma). Principles of epidemiological surveys in the chemical industry. (03354)

CIS 75-1090 Polyvinyl chloride. Barr R.J., Bonin M. *Journal of the American Medical Association*, Chicago, USA 3 Mar. 1975, Vol.231, No.9, p.914. 7 ref. (In English)

In this letter to the editor, the authors report a finding at autopsy in a case of proved primary haemangiosarcoma of the liver, a stain for sulfated acid mucopolysaccharides (Alcian blue, pH 2.5) gave a strongly positive result in sections from the liver. The authors suggest that the level of acid mucopolysaccharides in the serum and urine of persons exposed to PVC might be useful as a gross screening test for primary haemangiosarcoma, since no other specific biochemical indicator has yet been found. (03359)

CIS 75-1065 Potential hazards of vinyl chloride and the situation in the Netherlands. 'Vinylchloride: potentiële gevaren en Nederlandse situatie'. Bailemans A.W.M. *De veiligheid*, Amsterdam, Netherlands Oct. 1974, No.10, p.417-419. (In Dutch)

Information on the production and uses of vinyl chloride is followed by an account of recent research into the carcinogenic properties of this compound. Exposure is likely in vinyl chloride and polyvinyl chloride production plants, in the production of certain elastomers containing vinyl chloride as a copolymer, and in polyvinyl chloride converting shops. The author estimates the working population exposed in the Netherlands and gives an account of the measures taken by the Dutch labour inspection authorities since alarming data on the carcinogenicity of vinyl chloride was received in Jan. 1974. Comparison of threshold limit values in the USA and 7 European countries (Belgium, France, Germany (Fed.Rep.), Italy, Sweden, Switzerland, and United Kingdom). (03358)

CIS 75-1064 Notification No.26/1974 concerning the threshold limit value for vinyl chloride. Meddelelse nr.26/1974 om hygiejnisk grænseværdi for vinylchlorid. M.26/1974. Directorate of Labour Inspection (Direktoratet for Arbejdstilsynet), Uspalagade 20, 2100 København O, Denmark 26 Nov. 1974, 1p. Gratis. (In Danish)

The threshold limit value for vinyl chloride has been reduced from 100ppm to

20ppm with effect from 1 Jan. 1975 and to 1ppm with effect from 1 Apr. 1975. (03357)

CIS 75-1041 Transitory myocardial damage by halogenated hydrocarbons. 'Passagere Myokardschädigung durch Halogen-Kohlenwasserstoffe'. Ravens K.G., Steer H., Wronski R., Pape C. *Deutsche medizinische Wochenschrift*, Stuttgart, Germany (Fed.Rep.), 21 June 1974, Vol.99, No.25, p.1364-1367. Illus. 18 ref. (In German)

A 28-year-old man developed electrocardiographic evidence of acute posterior-wall myocardial infarction after cleaning work with a chlorinated hydrocarbon solvent (essentially a mixture of tetrachloroethylene and chloroethylene) in a confined space. A transitory rise in serum enzyme activities supported the diagnosis of myocardial infarction. Case report and discussion of findings. The presence of severe extrasystole volleys and the rapid regression of the electrocardiographic changes without full development of the infarct stage or any sign of permanent myocardial scarring, suggest that the changes were due to a transitory disturbance of cell-membrane functions. (03352)

CIS 75-1029 Principles applicable to preventive medical examinations - Hazards of vinyl chloride. 'Berufsgenossenschaftliche Grundsätze für arbeitsmedizinische Vorsorgeuntersuchungen - Gefährdung durch Vinylchlorid'. Federation of Industrial Mutual Accident Insurance Associations (Hauptverband der gewerblichen Berufsgenossenschaften), 53 Bonn, July 1974. *Arbeitsmedizin - Sozialmedizin - Präventivmedizin* Stuttgart, Germany (Fed.Rep.) Oct. 1974, Vol.9, No.10, p.226-229. 6 ref. (In German)

Principles for prevention or early detection of diseases that may be caused by vinyl chloride. They relate to all aspects of pre-employment and periodical examinations as well as to the following points: physical and chemical characteristics and threshold limit value, sources of hazard, absorption, clinical picture of acute and chronic poisoning, interpretation of the blood platelet count obtained. Instructions for platelet counting intended for laboratory personnel are appended. (03351)

CIS 75-771 Vinyl chloride - Hearing before the Subcommittee on Environment of the Committee on Commerce. United States Senate 93rd Congress, Committee on Commerce, Subcommittee on Environment 2nd session on dangers of vinyl chloride, 21 Aug. 1974, Washington, D.C. Serial No.93-110, U.S. Government Printing Office, Washington, D.C. USA, 1974, 156p. 96 ref. (In English)

Detailed record of testimonies received by this Subcommittee with a wealth of factual and statistical evidence of health damage to workers: acroosteolysis, Raynaud's syndrome, angiosarcoma and other liver damage, gastrointestinal and lung disease, etc. Attention is drawn by witnesses to increasing evidence of mutagenic and teratogenic effects, and hence of the need for both male and female workers not to be exposed to vinyl chloride monomer (VCM) during the fertile age. Authoritative statements were made by witnesses representing the scientific and medical professions, the National Institute for Occupational Safety and Health (NIOSH), the National Cancer Institute, the Food and Drug Administration, the plastics industry and trade unions, etc. Urgent need for cohort studies among retired workers with prolonged occupational exposure was stressed as well as for research on other monomers and polymers produced or used in industry, and on the interactive effects of VCM with other carcinogens. Future and present action by ACGIH, NIOSH, WHO and other bodies is mentioned. (03350)

CIS 75-770 Profiles of benzo(a)pyrene and coal tar pitch volatiles at and in the immediate vicinity of a coke oven battery. Jackson J.O., Warner P.O., Mooney T.F. *American Industrial Hygiene Association Journal*, Akron, USA, May 1974, Vol.35, No.5, p.276-281. Illus. 18 ref. (In English)

Concentrations of these substances were determined at 3 on-battery and 3 off-battery sites of a 70-oven coke manufacturing plant. 72% of the on-battery samples and 30% of all samples exceeded the 0.2mg/m³ TLV for benzene-soluble coal tar pitch volatiles while benzo(a)pyrene concentrations were much higher than average ambient air levels. The influence of adjacent batteries and wind conditions is briefly discussed. (03349)

CIS 75-764 Health hazards of vinyl chloride. (Gesundheitsgefährdung durch Vinylchlorid). Weinmann W. *Sicher ist sicher*, Berlin (Westsektoren), Sep. 1974, Vol.25, No.9, p.373-376. (In German)

The following aspects are briefly dealt with: uses of vinyl chloride (including its use as an aerosol propellant); occupational diseases; underlying causes of these diseases; statutory recognition of a disease as being occupation-induced; TLV or indicative concentration value; research projects in the Federal Republic of Germany (literature surveys, scanning and evaluation, analysis of autoclave atmospheres, animal experiments, X-ray and immunological examinations, in-depth study of fatal cases in the industry). The article refers to Recommendation No.147 of the International Labour Organisation concerning prevention and control of occupational hazards caused by carcinogenic substances and agents. (03348)

CIS 75-742 Vinyl chloride - An occupational health problem. 'Vinylchloride - Een bedrijfsgeneeskundig probleem'. Kolk J.J. *Tijdschrift voor sociale geneeskunde*, Bussum, Netherlands 5 Mar. 1975, Vol.53, No.5, p.142-149. 39 ref. (In Dutch)

General review of this problem and literature survey concerning the hazards of exposure to vinyl chloride: "vinyl chloride disease" symptoms (thrombocytopenia, splenomegaly, pulmonary function disorders, increased serum transaminase activity, cutaneous histological changes, etc.); angiosarcomas and their diagnosis; results of epidemiological investigations and animal experiments; aetiology and pathogenesis; TLVs (trends in the USA, the Netherlands, and Sweden); protection of users. (02523)

CIS 75-499 An evaluation of organic vapor respirator cartridges and canisters against vinyl chloride Smith D.L., Giesler W.S. HEW Publication No.(NIOSH)75-111, National Institute for Occupational Safety and Health, Office of Technical Publications, Post Office Building, Cincinnati, Ohio 45202, USA, Oct. 1974, 23p. Illus. 5 ref. Gratis. (In English)

Report on the procedure, setup and results of laboratory tests on the life service of 4 types of approved organic vapour respirator cartridges and of 4 types of approved front- or back-mounted organic vapour gas-mask canisters relative to several concentrations of vinyl chloride. Various mixtures of vinyl chloride gas and air were passed through the cartridges and canisters. The downstream concentration was monitored until breakthrough occurred. The effect of concentration on breakthrough time conformed to absorption theory. Service life increased at low humidities and decreased at high humidities. Organic vapour respirator cartridges have a service life of 20min at vinyl chloride concentration below 50ppm. The service life of the canisters is 100min at concentrations below 100ppm. Facepiece leakage is expected to be 10% for a half-mask respirator and 1% for a full-facepiece respirator. (02542)

CIS 75-493 Sclerodermal aspects of occupational acroosteolysis (polymerisation of vinyl chloride) (Aspects sclérodermiques de l'acroostéolyse professionnelle (polymérisation du chlorure de vinyle)). Moulin G., Rety J., Palard P., Vouillon G., Guttin G. *Annales de dermatologie et de syphiligraphie* Paris, France, 1974, Vol.101, No.1, p.33-44. Illus. 19 ref. (In French)

The authors report on 4 very stereotyped cases of occupational acroosteolysis in workers employed over periods of 1-6 years, in descaling vinyl chloride polymerisation autoclaves, and consider the various aspects of this disease: functional symptoms, clinical examinations and other tests, course of the disease, diagnosis and physiopathology. They emphasise the resemblance between this type of occupational acroosteolysis and scleroderma of the so-called acrosclerosis variety. (02592)

CIS 75-473 Vinyl chloride - Code of practice for health precautions. Health and Safety Executive, Baynards House, 1 Chepstow Place, London W2 4TY, United Kingdom, Feb. 1975, 41p (In English)

This document was prepared by a working party with representatives of labour and management, the Factory Inspectorate and the Employment Medical Advisory Service. It sets out an interim hygiene standard for vinyl chloride: a ceiling value of 50ppm and a time-weighted average of 25ppm, allowing that wherever practicable exposure should be brought as near as possible to zero concentrations. The Code deals with: hazards (liver damage, acroosteolysis, Raynaud's phenomenon, sclerodermal), control of vinyl chloride levels in the atmosphere, entry into confined spaces, housekeeping, preventive maintenance of plant and equipment, monitoring, respiratory protective equipment, medical examinations, clothing accommodation, washing and bathing facilities, registers and records, joint consultation, education and training, emergency plan. In addition to stating the standard itself, appendices list the physical properties of vinyl chloride and give details of the requirements relating to the aspects listed above and some relevant legal requirements. It is stressed that this first edition of the Code is temporary, and suggestions for improving it are invited. (02671)

CIS 75-467 Vinyl chloride: doubtful safety (Vinylchloride: onzekere veiligheid). Zielhuis R.L. *Nederlandsche tijdschrift voor geneeskunde*, Amsterdam, Netherlands, 16 Jan. 1975, Vol.119 No.2, p.63-66, 15 ref. (In Dutch)

Literature review of recent cases (including fatalities) of liver angiosarcoma due to vinyl chloride and other carcinogenic and toxic effects of this substance reported from polymerisation plants in the USA, United Kingdom, Sweden and Germany (Fed.Rep.). The author extends this review to surveys made to assess the working population exposed to vinyl chloride and to study their morbidity. He also draws attention to the potential hazards of a similar compound, i.e. vinylidene chloride. (02636)

CIS 75-457 More facts on vinyl chloride and cancer. *British Medical Journal*, London, United Kingdom, 30 Nov. 1974, No.5943, p.486-487, 13 ref. (In English)

A brief review of the relationship between vinyl chloride and angiosarcoma of the liver, pointing to instances of the tumour in the USA and other countries, mostly in workers concerned with the polymerisation process. Polyvinyl chloride as manufactured may contain 200-400ppm vinyl chloride and may therefore present a hazard to secondary users in the PVC processing industries. Considerations on the possibility that vinyl chloride may cause other tumours in addition to angiosarcoma of the liver. (02596)

CIS 75-437 Angiosarcoma of the liver in vinyl chloride/polyvinyl chloride workers. *Journal of Occupational Medicine*, Downers Grove, USA, Dec. 1974, Vol.16, No.12, p.809 (In English)

The National Institute for Occupational Safety and Health (NIOSH) has requested members of the medical community in the USA and other countries to report information on suspected cases of liver angiosarcoma in workers exposed to vinyl chloride. A brief review is given of the 26 cases reported to date in 6 countries (Czechoslovakia, Germany (Fed.Rep.), Norway, Sweden, United Kingdom and USA). (02540)

CIS 75-431 Carcinogenicity bioassays of vinyl chloride - I. Research plan and early results. Maltoni C., Lefemine G. *Environmental Research*, New York, USA, 1974, Vol.7, No.3, p.387-405. Illus. 25 ref. (In English)

An investigation into the carcinogenic potentialities of vinyl chloride in experimental animals. The effects of this compound are being studied in relation to various experimental factors (route of administration, dose level, length of treatment, species, strain, age of the animals, etc.). Preliminary results are presented. A direct relationship has been found between dose and length of treatment, and neoplastic response. (02523)

CIS 75-424 The plant physician's view of so-called "vinyl chloride disease" (Arbeitsmedizinische Gedanken zur sogenannten "Vinylchloriderkrankung"). Thiess A.M., Versen P. *Arbeitsmedizin - Sozialmedizin - Präventivmedizin*, Stuttgart, Germany (Fed.Rep.), July 1974, Vol.9, No.7, p.146-148. (In German)

Approximate data on the number of persons occupationally exposed in the Western countries. Epidemiological study of the situation in Germany (Fed.Rep.). Principal forms of health impairment observed in 23 cases of vinyl chloride disease, recognised as being of occupational origin: Raynaud's phenomenon, liver damage with fibrosis and thrombocytopenia. Causes of death among PVC-exposed workers include hepatic haemangio-endothelioma and other types of malignancy. Study of the possible causes of vinyl chloride disease. Preventive measures (lowering of TLV in air to 50ppm). (02483)

CIS 75-423 Angiosarcoma of the liver in a vinyl-chloride worker Lee F.L., Harry D.S. *The Lancet*, London, United Kingdom, June 1974, Vol.1, No.7870, p.1316-1318. Illus. 16 ref. (In English)

An account of angiosarcoma of the liver, an extremely rare tumour, in a man of 71 years who had been a process worker for 20 years in the manufacture of polyvinyl chloride from vinyl chloride monomer. The evidence is strong that angiosarcoma of the liver is an occupational tumour and that vinyl chloride is the cause. The possibility of contributory factors is discussed together with the other hazards of exposure to vinyl chloride. (02481)

CIS 75-422 Liver tumour in vinyl chloride workers - Drastic reduction of threshold limit value in 1974 (Levercancer hos vinylchloridarbetare - Kraftig sänkning av gränsvärdet i år). Viklund B., Lundberg B. *Arbetsmiljö*, Stockholm, Sweden, 1974, No.8, p.24-25. Illus. (In Swedish)

An account of the latest findings concerning the carcinogenic action of vinyl chloride and the standard for occupational exposure to vinyl chloride recommended by the U.S. National Institute for Occupational Safety and Health (NIOSH) is followed by considerations on exposure other than in the plastics industry (insecticide sprays, cosmetics). While the American TLV was lowered from 200 to 50ppm on 5 Apr. 1974, the Swedish TLV was lowered from 500 to 20ppm (allowing for a 15min ceiling value of 50ppm) a few weeks later. The question is raised as to whether polyvinyl chloride sets free dangerous amounts of vinyl chloride during conversion or use. (02477)

CIS 75-178 Directives concerning health protection measures in work with vinyl chloride (Richtlinien über Schutzmassnahmen zur Verhütung von Gesundheitsschäden beim Umgang mit Vinylchlorid). Richtlinien Nr.2, Industrial Mutual Accident Insurance Association for the Chemical Industry (Berufsgenossenschaft der chemischen Industrie), Heidelberg, Apr. 1974, Verlag Chemie GmbH, 694 Weinheim/Bergstr., Germany (Fed.Rep.) 1974, 8p. (In German)

These directives apply to vinyl chloride production and polymerisation plants, and those using this substance. The pertinent clauses of the Association's safety regulations concerning work premises and workposts are reproduced, followed by general provisions and safety rules concerning TLVs, ventilation, protection of the respiratory tract and in particular the cleaning of autoclaves. Advice on first aid procedures. (02388)

CIS 75-162 Toxic substances list - 1974 edition. Christensen H.E., Luginbyhl T.T., Carroll B.S. HEW Publication No.(NIOSH)74-134, National Institute for Occupational Safety and Health, Rockville, Maryland 20852, USA, June 1974, 904p. Price: US-\$10.00. (In English)

42 000 listings of chemical substances (13 000 different chemicals, 29 000 synonyms and cross-references) with detailed toxicity data - toxic dose, route, species exposed, type of exposure reported (e.g. lethal), dose causing the toxic response (usually mg/kg or ppm), body system affected - with reference to bibliographical sources from which the toxicity data were extracted. 5 000 new substances have been included since the 1973 list. Occupational safety and health standards in force in the USA (air contaminants, asbestos, carcinogens, vinyl chloride, pesticides, requests for health hazard evaluation) are appended. The new edition also incorporates the Wiswesser Line Notation.

tion (WLN) of chemical names with a full explanation of the system.

CIS 75-145 Report of a working group on vinyl chloride. IARC International Technical Report No. 74/005 International Agency for Research on Cancer, 150 Cours Albert-Thomas, 69008 Lyon, France, 1974. 55p. 66 ref. (In English)

A report of the discussions, conclusions and recommendations of an IARC working group (Lyon, France, 24-25 June 1974) convened to attempt a co-ordination on an international scale of studies on the effects on man of vinyl chloride. An IARC monograph on vinyl chloride, in which all available relevant published information on vinyl chloride and its polymers and copolymers is reviewed, had been approved by a previous meeting of the working group (Lyon, 18-24 June 1974) and is appended to this report. (02272)

CIS 74-1929 Mortality study of workers in the manufacture of vinyl chloride and its polymers. Tabershaw I.R., Gaffey W.R. *Journal of Occupational Medicine*, Downers Grove USA Aug 1974 Vol 16 No.8 p.509-518. 11 ref. (In English)

An epidemiological study of 8384 men who had at least one year's occupational exposure to vinyl chloride before 31 Dec. 1972 suggests that in humans vinyl chloride as well as being incriminated in the causation of haemangiosarcoma may also be associated with cancer of multiple sites. The other major findings of the study are: (1) the overall mortality of the population studied was approximately 75% of what would be expected in a comparable population of U.S. males; (2) no cause of death showed a statistically significant excess over what would be expected in a comparable U.S. male population; and (3) no deaths from angiosarcoma of the liver were found other than those previously identified. (01962)

CIS 74-1928 Mutagenic and antifertility sensitivities of mice to di-2-ethylhexyl phthalate (DEHP) and dimethoxyethyl phthalate (DMEP). Singh A.R., Lawrence W.H., Autian J. *Toxicology and Applied Pharmacology*, New York USA July 1974 Vol 29 No 1 p.35-46. 28 ref. (In English)

Numerous plastic materials used for medical and paramedical applications as well as for food processing and packaging are made of polyvinyl chloride. To provide the desirable physical characteristics, significant quantities of plasticisers are added. One commonly used group of plasticisers is the phthalic acid esters, probably the most widely used. It is known that small quantities of plasticisers can be leached from such materials by blood, milk and other solutions. This communication presents the results of dominant lethal, mutation and antifertility studies on bis(2-ethylhexyl) phthalate and dimethoxyethyl phthalate in mice. These 2 phthalate esters produced some degree of dose-dependent and time-dependent antifertility and mutagenic effects. (01961)

CIS 74-1908 Angiosarcoma of the liver following vinyl chloride exposure. Block J.B. *Journal of the American Medical Association*, Chicago USA July 1974 Vol 229 No 1 p.53-54. 6 ref. (In English)

6 cases of angiosarcoma of the liver are reported among workers exposed to vinyl chloride. From the standpoint of preventive medicine, 2 hypotheses should be explored: (1) the development of the disease is the result of low-level exposure to vinyl chloride over a long period; (2) the tumour is the result of a high-level exposure many years previously. The fact that all these employees had at least 12 years' potential exposure would appear to favour the first hypothesis. In each case, however, there was also the possibility of a high-level exposure during the early work history. (01880)

CIS 74-1816 Early detection of polyvinylchloride fires (Frühmeldung bei PVC-Bränden). *Sicherheitsingenieur*, Heidelberg, Germany (Fed. Rep.) Dec. 1973 Vol 4 No 12 p.594-597. 1111. (In German)

Describes a system consisting of a network of 20mm-diameter tubing connected to an exhaust fan which makes it possible to take air samples at different points in a plant. The exhaust air is analysed with the aid of an ionisation apparatus. The HCl arising from the breakdown of PVC is detected by using NH₃. The construction and operation of the analyser and the measuring and alarm devices are described. (01941)

CIS 74-1746 Evaluation of working conditions and health status of workers engaged in the production of polyvinyl chloride by block polymerisation (Gigieničeskaja ocenka uslovij truda i sostojanija zdorov'ja rabočih v proizvodstve bločnogo polivinilchlorida). Filatova V.S., Gronsberg E.Š., Radzukevič T.M., Reznik N.D., Tomičev A.I. *Gigiena truda i professionalnye zabollevaniya*, Moskva, USSR Jan. 1974 No 1, p.3-6. 7 ref. (In Russian)

On the whole, automated production of polyvinyl chloride by block polymerisation is considered in a favourable light. However, excessive vinyl chloride and polyvinyl chloride atmospheric concentrations in polymerisation and bagging shops and excessive noise levels in compressor and vacuum pump rooms were noted. The workers most exposed are particularly affected by vascular disorders. Measures proposed include airtight enclosure of remote-controlled valves, mechanised cleaning inside reactor chambers, installation of soundproof observation cabins in the pump and compressor rooms, etc. (01520)

CIS 74-1676 Proportional mortality among vinyl-chloride workers. Monson R.R., Peters J.M., Johnston M.N. *The Lancet*, 17 Aug. 1974 Vol. II (1974), No. 7877, p.397-398. 4 ref. (In English)

Results of a proportional-mortality analysis of 161 deceased workers in 2 U.S. plants, one producing vinyl chloride monomer (26 workers) and the other polymerising the monomer into polyvinyl chloride (135). A 50% excess of deaths due to all types of cancer was found. Specific sites of cancer with the greatest excess included the liver and biliary tract, the lung and the brain. The excess in fatal cancer cases was seen mainly in men who died before age 60. (01697)

CIS 74-1630 Recommended standard for occupational exposure to vinyl chloride. National Institute for Occupational Safety and Health, Rockville, Maryland, Office of Technical Publications, National Institute for Occupational Safety and Health, Post Office Building, Cincinnati, Ohio 45202, USA, 1974. 8p. (In English)

Background (events and toxicological findings) of the standard; scope and application; definitions of terms; requirements for regulated areas; routine operations: reactor and vessel entry; maintenance and decontamination; hygiene measures; signs; information and training; environmental monitoring and record keeping; reports; medical surveillance. Despite the fact that animal experiments have shown no liver tumours at atmospheric concentrations of 50ppm, the concept of an allowable working level is rejected, since there is probably no threshold for carcinogenesis. Any person exposed to measurable concentrations of vinyl chloride should wear an air-supplied respirator since chemical cartridge respirators do not afford adequate protection against vinyl chloride vapours. (01543)

CIS 74-1622 Vinyl chloride monomer - Advisory notes for PVC processors. British Chemical Industry Safety Council of the Chemical Industries Association, Almbic House, 93 Albert Embankment, London SE1 7TU, United Kingdom, May 1974. 4p. (In English)

Data collected in a number of PVC processing plants to identify operations (warehousing, PVC compounding operations, PVC fabrication process) during which residual vinyl chloride monomer (a suspected carcinogen) is released into the work atmosphere are summarised. Advice is given concerning the optimal siting of ventilation. (01522)

CIS 74-1073 A case of occupational acroosteolysis, presumably due to vinyl chloride. Takeuchi Y., Mabuchi C. *Japanese Journal of Industrial Health*, Tokyo, Japan, July 1973, Vol. 15, No. 4, p.385-394. 1111. 20 ref. (In Japanese - Summary in English)

A brief review of the literature is followed by the detailed description of the case of an autoclave cleaner who had worked for 4 years in a plant manufacturing polyvinyl chloride. He suffered from diarrhoea, Raynaud's phenomenon, scleroderma, indurations of both hands and spontaneous pain in the fingers of the right hand. An X-ray examination revealed acroosteolysis of these fingers. Although he gave up his cleaning job 9 years ago, shortening of the fingers of the right hand, paraesthesia of the right half of the body, abnormal EEG, hypertension, hyperbilirubinemia and slight angiosclerotic changes in the optic fundi still exist. These disorders are presumed to be due to vinyl chloride poisoning. The prevailing TLV of 500 ppm for vinyl chloride in Japan is considered too high. (01182)

CIS 74-1039 The so-called vinyl chloride disease - an occupational systemic sclerosis? (Die sogenannte Vinylchlorid-Krankheit - eine berufsbedingte Systemisklerose?). Lange C.E., Jühe S., Stein G., Veitman G. *Internationales Archiv für Arbeitsmedizin - International Archives of Occupational Health*, Berlin (Westsektoren), 3 Dec. 1973, Vol. 32, No. 1-2, p.1-32. 1111. 36 ref. (In German)

Results of examinations of 13 workers employed for periods varying between 2 and 18 years as autoclave operators in polyvinyl chloride production including examinations of the skin, vascular system, bone structure, hematopoietic system, liver, spleen and lungs. The authors found a variety of symptoms greatly exceeding the known syndrome of acroosteolysis (particularly fibrosis of the liver and the lungs); they presume that long-term vinyl chloride exposure is responsible for the complex pathological picture. They propose 'vinyl chloride disease' as designation for this systemic disease. (01006)

CIS 74-1035 A bibliography on vinyl chloride. National Institute for Occupational Safety and Health, Post Office and Court House Bldg., Cincinnati, Ohio 43201, USA, 28 Feb. 1974. 12p. (In English)

Bibliography containing 147 references to works published between 1941 and 1973 (but especially during the last decade) on the following subjects: toxicology, technology, dermatology, occupational health, Raynaud's syndrome, acroosteolysis, clinical examinations, experimental research and observations on carcinogenesis. (00975)

CIS 74-765 Chronic toxic liver damage among workers employed in polyvinyl chloride production (Chronisch-toxische Leberschaden bei Arbeitern in der PVC-Produktion). Marsteller H.J., Leibach W.K., Müller R., Jühe S., Lange C.E., Rohner H.G., Veitman G. *Deutsche medizinische Wochenschrift*, Stuttgart, Germany (Fed. Rep.), 30 Nov. 1973, Vol. 98, No. 48, p.2211-2214. 22 ref. (In German - English translation available)

The introduction referring to reports from various sources points out that cases of liver damage among workers engaged in PVC production have been neglected on account of the emphasis placed on acroosteolysis symptoms. Results of laparoscopic examinations and liver biopsy of 20 autoclave operators showing symptoms of liver damage are given and compared with the findings of clinical examinations and chemical analysis. Chronic thrombocytopenia and toxic liver damage with splenomegaly occurred considerably more frequently than acroosteolysis.

00764

CIS 74-744 Angiosarcoma of liver in the manufacture of polyvinyl chloride. Creech J.L. Johnson M.N. *Journal of Occupational Medicine* Downers Grove, USA, Mar. 1974 Vol.16 No.3, p 150-151, 1 ref. (In English)

In this special communication 2 industrial physicians refer to 3 fatal cases of liver angiosarcoma among workers of a plant manufacturing polyvinyl chloride. One case concerning a chemical worker employed from 1955 to 1970 is reported more fully (occupational history, pathological findings, clinical course). The communication is followed by an editor's note referring to the ex-

perimental work carried out by Dr. Maltoni at the Istituto di Oncologia of the University of Bologna (Italy). Dr. Maltoni is said to have demonstrated angiosarcoma of the liver and other tumours in mammals at concentrations of vinyl chloride (the monomer of polyvinyl chloride) which are found in workroom atmospheres.

00674

CIS 74-0012 The hazards of PVC. *IAEI News*, Chicago, USA, Sep.-Oct. 1973, Vol. 45, No. 5, p. 4-5, 2 ref. (In English)

Warnings should be issued, indicating the generation of HCl when polyvinyl chloride insulation in electrical installations is heated externally or internally by electric overload. HCl vapours may be present in the atmosphere at hazardous levels prior to the generation of black smoke, so that fire-fighting personnel may not be readily cognizant of the danger. Accidents are cited, the principles of decomposition are explained, and the symptoms of poisoning are described.

See following pages for abstracts
dated prior to 1974

CIS 73-533 Occupational acroosteolysis. Markowitz S.S., et al. "Archives of Dermatology", Chicago, Illinois, USA, Aug. 1972, Vol.106, No.8, p.219-223. Illus. 10 ref.

Occupational acroosteolysis appears to be related to the polymerisation of polyvinyl chloride from vinyl chloride. Detailed reports of 2 cases among reactor cleaners are presented, followed by a review of current knowledge regarding the incidence (3% or less), aetiology, clinical picture and prognosis of this disease which can be described as a Raynaud's-like syndrome involving the hands, sclerodermoid-like changes of the skin of the hands and forearms, and osteolytic and sclerotic lesions of the bones, particularly the extremities and sacro-iliac joints.

CIS 73-372 Encyclopaedia of occupational health and safety. International Labour Office, 1211 Geneva 22, Switzerland, 1972. 2 vols. 1834p. Illus. 3500 ref. Price: US\$48. 18.

A comprehensive and practical review in encyclopaedic form of the vast range of accident and disease hazards that may confront man in his work, and advice on specific safety and health measures. Nearly 900 articles by around 600 authors from over 60 countries, ranging in length from 250 to 4000 words are devoted to: individual industries, workplaces or professions (abattoirs, biscuit making, iron and steel industry, teaching, etc.); harmful agents (individual chemicals or groups of chemicals, compressed air, dust, noise, radiations, etc.); specific diseases (bladder cancer, coal-workers' pneumoconiosis, mycoses, zoonoses, etc.) or body organs or systems (digestive system, eyes, mouth and teeth, respiratory system); safety and health techniques or equipment (detection and analysis of atmospheric contaminants, dust control, fire prevention and protection, ventilation, etc.); the application of various sciences to worker protection (epidemiology, human engineering, statistics, etc.); and a wide range of social problems (the aged in employment, alcoholism, the employment of young persons, workmen's compensation, etc.). There is a comprehensive index.

CIS 73-40 Arterial hypertension and Raynaud's phenomenon in polyvinyl-chloride production workers (Hypertension artérielle et syndrome Raynaud chez les ouvriers occupés à la fabrication du polychlorure de vinyle). Sucko, I., et al. 1. Internationales Symposium der Werkstoffe der chemischen Industrie. Medichem, BASF, Ärztliche Abteilung, 67 Ludwigshafen, Germany (Fed.Rep.), 1972, p.820-828. 10 ref.

Paper read at the 1st International Symposium of Plant Physicians of the Chemical Industry (Ludwigshafen, 27-29 April 1972). Report on a 9-year (1961-1969) study of 112 young polyvinylchloride workers. During this period systolic and diastolic pressures and the incidence of arterial hypertension increased, and this is attributed to the prolonged action of vinylchloride monomer on vasomotor centres and a generalised vasoconstriction.

[For the complete proceedings of this symposium, see CIS 32-1973, Xiz : ms : sv (610.1).]

CIS 73-32 First International Symposium of Plant Physicians of the Chemical Industry (Ludwigshafen, 27-29 Apr. 1972) (1. Internationales Symposium der Werkstoffe der chemischen Industrie (Ludwigshafen, 27-29 Apr. 1972)). Medichem, BASF, Ärztliche Abteilung, 67 Ludwigshafen, Germany (Fed.Rep.), 1972. 532p. Illus. Ref.

The 64 papers presented at this symposium cover diagnosis and periodic-examination problems, results of large-scale studies on heart and kidney disease and vision and hearing, occupational cancer and asbestos: skin diseases, vinylchloride disease, etc. A large number of papers are devoted to poisoning and industrial toxicology (phenol, chloroform, manganese, organophosphates, paraquat, dicyanates, ethyleneimine, acetylene mono- and dichloride, dimethylformamide, diphenyl, nitrile, etc.). A number of these papers are abstracted on separate CIS cards.

CIS 72-2533 The correlation of clinical and environmental measurements for workers exposed to vinyl chloride. Kramer, C.G., and Mutchler, J.E. "American Industrial Hygiene Association Journal", Westmont, New Jersey, USA, Jan. 1972, Vol.33, No.1, p.19-30. Illus. 20 refs.

A group of 98 healthy workers exposed to vinyl chloride and smaller amounts of vinylidene chloride for periods of up to 25 years was studied systematically from the point of view of environmental exposure and medical records, and a correlation was established between environmental measurements and clinical findings. Statistically significant results were obtained. The methodology is presented and discussed, and conclusions are drawn as regards the practical application of toxicological feedback from worker exposures.

CIS 72-2530 Properties and essential information for safe handling and use of vinyl chloride. Chemical Safety Data Sheet SD-66 (revised). Manufacturing Chemists' Association, 1825 Connecticut Avenue, N.W., Washington, D.C. 20009, 1972. 18p.

Vinyl chloride monomer (CH_2CHCl), also known as chloroethylene or chloroethene, is a flammable compound which is easily ignited, producing dangerous combustion gases composed largely of hydrogen chloride and carbon monoxide. Its main hazard to health is associated with excessive respiratory exposure which can result in disorders of the central nervous system. Properties and engineering control measures, precautions concerning personnel engaged in the handling of vinyl chloride, safety measures in shipping, handling and storage, cleaning and repair of tanks and equipment, and advice on toxicity, first aid and the medical management of poisoning.

CIS 72-333 Investigations into the toxicity of extracts of plasticised and non-plasticised polyvinyl chloride stabilised with ethyl crotonate (Cercetari cu privire la toxicitatea extractelor din clorura de polivinil plastifiata si neplastifiata, stabilizata cu crotonat de etil). Spron A., et al. "Igiene", Bucurest, Rumania, June 1971, Vol.20, No.6, p.323-330. 9 ref.

The authors studied the acute and subacute toxicity of extracts of PVC 2 and 4 months old, which contained ethyl crotonate or organic tin compounds as stabilisers and dioctyl phthalate as a plasticiser (or containing no plasticiser). Experiments were carried out on 240 white mice to study mortality and the weight of the various organs of the body after repeated intraperitoneal administration of 1 ml of extract in water or oil, or of a 10 times stronger concentration of the extract. In order to elucidate the subacute effect, the authors studied the action of the extracts on the growth of white rats, the weight of their organs, the ascorbic acid content of the suprarenals, and the activity of the liver enzymes (aldolase, glutamic-oxalacetic transaminase, succinic dehydrogenase, succinic oxydase, acid and alkali phosphatase). Their findings demonstrated the limited toxicity of ethyl crotonate and disclosed a number of biochemical modifications caused by substances given off by the plastics in the extraction media.

CIS 71-2066 Acro-osteolysis in PVC workers. Givios C.T. "Medical Bulletin", Standard Oil Company (New Jersey), New York, N.Y., USA, Mar. 1971, Vol.31, No.1, p.49-56. Illus. 4 ref.

Cases of acro-osteolysis of the distal phalanges associated with symptoms similar to those ascribed to Raynaud's disease have been reported among chemical workers engaged in the polymerisation of vinyl chloride monomer. The author reviews the existing literature and refers inter alia to a comprehensive survey carried out in 1966 in the USA; of the 5011 workers examined, 1302 were found to have some X-ray abnormality of the hands. The last part of the article is devoted to a description of the operations and control measures carried out since 1967 at the Esso Pappas PVC plant. Medical examinations failed to reveal any abnormal X-ray or clinical finding related to acro-osteolysis.

CIS 71-1529 The state of the bronchi and lungs in workers employed in the manufacture of polyvinyl chloride articles (O sestojanilbronholegocnogo soprota u rabotajuschih na proizvodstve izdelij iz polivinilchlorida). Verdnik Ju.I., Mamonov Ju.M. "Gigiena truda i professional'nye zabolevaniya", Moskva, USSR, Oct. 1970, Vol.14, No.10, p.29-32. 6 ref.

Respiratory function tests and radiological examinations carried out on 96 workers producing PVC articles disclosed changes in the airways, which were most pronounced in persons with long exposure to dust. The changes observed (fibrotic changes in the lung pattern, increased minute volume) are clearly attributable to many years' exposure to PVC dust.

CIS 71-1461 Rheographic observations among workers in the plastics industry (Osservazioni reografiche in lavoratori dell'industria di materie plastiche). Nitti G., Petruzzelli V., Farnio V. "Securitas", Rome, Italy, Aug. 1970, Vol.58, No.8, p.683-694. Illus. 10 ref.

Following the publication of a number of papers on acro-osteolysis of the finger-ends among workers employed in cleaning autoclaves used in the polymerisation of vinyl chloride monomers, the authors carried out haematocrit, rheographic and X-ray studies of the upper limbs of 20 such workers. Although they found no case of acro-osteolysis of the fingers - probably because the period of exposure had been too short - they detected sympathetic neurocirculatory dystonia in 14 of the 20 subjects. They interpret this manifestation, which is attributable to an inexplicable mechanical, chemical or even mechanical-chemical factor, as a factor in the pathogenesis of bone lysis.

CIS 71-1375 Threshold limit values of airborne contaminants and intended changes adopted by ACGIH for 1970. American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, Ohio 45202, 1970. 27p. Price: US\$0.50.

The preface to the list of adopted values presents introductory considerations on threshold limit values, ceiling values, the contribution of skin absorption to overall exposure, mixtures, asphyxiating gases, and physical factors influencing the effects of exposure. The designation "nuisance dusts" is to be preferred to "inert dusts" which is inappropriate. The list covers 440 substances, including 17 additions; and changes are indicated for 30 substances (see also CIS 1373-1971, Gzt Qem (203)) and for asbestos, coal dust, nuisance particulates, quartz, and fused silica. Appendices contain data on carcinogenic substances, nuisance dusts and asphyxiating gases, and guidance on the determination of TLV's of mixtures and permissible excursions for time-weighted average (TWA) limits.

CIS 71-1373 Supplemental documentations of threshold limit values, 1970. American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, Ohio 45202, USA, 1970. 27p. 119 ref.

Toxicological and chemical data on the following substances, for which changes are proposed in the list of threshold limit values for 1970 (see CIS 1375-1971, Gzt Qem (203)) allyl glycidyl ether, ammonia, ammonium chloride, asbestos, asphalt (petroleum) fumes, butyl lactate, synthetic camphor, butyrous coal dust, diazinon, 2-N-diethylaminoethanol, diethylenetriamine, formaldehyde, nuisance aerosols, iron penta-carbonyl, alkyl mercury compounds, methyl chloride, 2-methyl cyclopentadienyl manganese tricarbonyl, rosin, subtilins, vanadium, vinyl chloride, and wood dust.

CIS 71-1361 Occupational acroosteolysis Dinman S.D., et al. "Archives of Environmental Health", Chicago, Illinois, USA, Jan. 1971, Vol.22, No.1, p.61-61. Illus. 29 ref.

This study is in 3 parts entitled: (I) An epidemiological study, (II) An industrial hygiene study, and (III) A clinical study. The epidemiological study covered 5 011 employees in various phases of vinyl chloride (VC) and polyvinyl chloride (PVC) manufacturing in 32 plants in the USA and Canada. Acroosteolysis (25 definite cases) was clearly associated with the hand cleaning of reactor vessels, at present, neither the aetiological agent nor its route of entry is known. The industrial hygiene survey was carried out in the same plants; it covered all processes and all chemicals used. Recommendations are made as regards technical preventive measures. Finally, 4 subjects with acroosteolysis were studied clinically. Raynaud's phenomenon was the first manifestation noted. Suggestions are made as regards medical prevention of the disease.

CIS 71-960 Pneumoconiosis caused by the inhalation of polyvinylchloride dust. Szende S., et al. "Medicina del lavoro", Milan, Italy, Aug-Sep 1970, Vol.61, No.8-9, p.433-436. Illus. 4 ref.

Lung biopsies performed on a 31-year-old worker who had inhaled polyvinylchloride dust over a period of a year disclosed granulomatous lesions caused by reaction to a foreign body. The authors consider the possibility of pneumoconiosis caused by inhalation of polyvinylchloride.

CIS 71-744 The toxicology of vinyl chloride (Zur Toxikologie des Vinylchlorids). Schottok W. "Chemische Technik", Leipzig, Germany (Dem.Rep.), Nov. 1969, Vol.21, No.11, p.708-711. 24 ref.

Review of recent literature published on this subject and presentation of results of animal experiments and medical examinations of workers in factories producing PVC. It appears that vinyl chloride has a stronger toxic effect than was formerly assumed. Short-term exposure to vinyl chloride concentrations exceeding 1 000 ppm is sufficient to cause disorders of the central nervous system, which may induce human failures such as the underestimation of risks or wrong reactions to dangerous situations. There is also reason to believe that long-term exposure to vinyl chloride concentrations of approximately 200 ppm may lead to liver and kidney damage and to neurovascular disorders. The author therefore recommends further research in this field, and suggests that it might be necessary to lower the present TLV for vinyl chloride.

CIS 71-62 Pathology
Italy, Mar. 1970, Vc

This investigation
tissue and connective
acro-osteolysis of the
chondroid metaplasia
threads containing few
the small vessels of the
the vascular lumen is
surrounded and infiltrated
are observed in the brain.

CIS 70-1441 Monitoring exposures to vinyl chloride vapor: Breath
analysis and continuous air sampling. Beretta E.D., Stewart R.D.,
and Mutchler J.E. "American Industrial Hygiene Association Journal", Detroit,
Michigan, USA, Nov.-Dec. 1969, Vol.30, No.6, p.537-544. Illus. 7 ref.

Report on an environmental survey to determine the time-weighted average exposure
to vinyl chloride (VCI) of a group of chemical plant workers. The survey took the form
of continuous, multipoint air sampling, analysis by infrared spectrophotometry, and
breath sampling. Breath decay curves relating post-exposure breath concentration to
vapour concentration were derived from the data. The breath curves were checked
against data from experimental human exposures to controlled concentrations of VCI.
The investigations show that continuous air monitoring and breath analysis are both
valid methods for estimating individual daily exposure to VCI, and suggest that the use
of breath analysis should be expanded to other volatile organic chemicals in common
usage.

CIS 70-147 Pathology of polyvinyl resins (Patologia de resine polivinilice).
Grossard G. "Folia medica", Naples, Italy, February 1969, Vol. 52, No.2,
p.102-108. 7 ref.

Considerations regarding working conditions in the plastics industry and the production
and processing of polyvinyl resins, especially polyvinyl chloride. The pathological conditions
observed in workers in this field are attributable mainly to the incorporation of
toxic substances in the plastics. The author discusses changes produced mechanically
in the respiratory system by PVC dust and calls attention to the effects of plasmas on the
skin, which depend on the chemicals used. Considerations on occupational hygiene and
health measures.

CIS 69-2165 Polyvinyl chloride (PVC) (Cloruro di polivinile (PVC)). Note
tecnica n.9. Ente nazionale per la prevenzione degli infortuni (ENPI), Direzione
generale, Servizio sanitario, Rome, Italy, undated. 7p. Gratis.

Brief review of the characteristics of this thermoplastic material and of the various
substances used in the production of PVC articles. Consideration of the hazards inherent
in the production and processing of PVC and of appropriate preventive measures.

CIS 69-1224 Acropathy of the extremities associated with vinyl chloride
polymerisation - A new occupational disease (Acropathia extremitatum in
polimerizzazione vinil-cloridi - nova profesionalna bolest). Kovac A., Kurajica L.,
Juric-Ruzic D., and Parac B. "Liječnički vjesnik", Zagreb, Yugoslavia, Jan. 1969
Vol.91, No.1, p.5-17.

The authors describe a new occupational disease, acropathy of the extremities, ob-
served in workers employed in vinyl chloride polymerisation in a Yugoslavian plastics
factory. The disease normally begins with symptoms of Raynaud's disease (pallor,
numbness of the fingers) followed by bone changes (cyanosis and atrophy) and, finally,
bone changes in the ends of the fingers (bone lesions caused by osteolysis). This dis-
ease affects workers in the polymerisation section and others employed in cleaning
polymerisation autoclaves. The authors consider that, in addition to the chemical ef-
fects involved, predisposition of workers to circulatory disorders, individual hyper-
sensitivity and local microtraumas play a part in the development of this disease.

CIS 69-815 Acro-osteolysis - A new occupational disease of the plastics
industry (L'acro-osteolyse - Une nouvelle manifestation pathologique dans
l'industrie des matieres plastiques). Benoit J.P. "Cahiers de notes documentaires
Sécurité et hygiène du travail", Paris, France, 1st quarter 1969, No.54, Note
No.629-64-69, p.83-89. Illus. 5 ref.

A greatly abridged version of the doctoral thesis abstracted on CIS 2225-1968, Muh
Nik Xiz Dubj. Description of a new disease which has appeared in workers responsible
for cleaning polymerisation autoclaves for vinyl monomers, after fairly long contact
with the vinyl chloride and lauroyl peroxide contained in the residues on the walls of the
autoclaves. The article includes a table showing the clinical picture, the biological bal-
ance, X-ray symptoms and an arterial and histo-pathological study. Evolution, treat-
ment, prognosis. Nosological discussion and pathogenic hypotheses. Brief discussion
on the repair of lesions and on preventive action, consisting mainly of limiting exposure.

CIS 68-2225 Occupational-induced acro-osteolysis (L'acro-osteolys
d'origine professionnelle). Benoit J.P. Imprimerie Boss Frères, 42 quai Galliéron,
69-Lyon, France, 1967. 88p. Illus. 187 ref.

Medical thesis. On the basis of 2 case histories from Belgium and of personal ob-
servation of 5 cases of chemical workers employed in cleaning polymerisation autoclaves
for vinyl monomers, the author defines clinical, radiological and histopathological cri-
teria for acro-osteolysis accompanied by painful vasomotor syndromes and trophic af-
fections of the hands. The physiopathological changes affect the arterioles or arterial
capillaries. Various criteria suggest that a new occupational disease is involved, re-
lating to a determined workplace but not attributable definitely to the effect of any toxic
substance. Pre-employment and subsequent periodical medical examinations should be
conducted to eliminate persons predisposed to this disease. Until improved preventive
measures are developed, gloves must be worn.

CIS 68-1222 Occupational acro-osteolysis. Report of 31 cases. Wilson
R.M., McCormick W.E., Tetum C.F., Crouch J.L. "Journal of the American
Medical Association", Chicago, Illinois, USA, 21 Aug. 1967, Vol.201, No.8,
p.877-881. Illus. 4 ref.

Study of occupational acro-osteolysis in workers associated with vinyl chloride
(CH₂CHCl) polymerisation processes. Of the 31 workers exhibiting acro-osteolysis
(out of 3000 examined) 17 were or had been employed in cleaning polymerisation equip-
ment, generally involving manual scraping for several hours a day. Osteolysis was
specific to the distal phalanges of the hands and was frequently associated with Raynaud's
disease. The remaining 14 cases occurred in the 30-49 year age group. The polymeriza-

chloride. Viola P.L. "Medicina del lavoro", Milan,
174-180. Illus. 7 ref.

ence that animals exposed to vinyl chloride exhibit
a similar to those observed in persons suffering from
mass proliferation of the peritoneum and diffuse,
connective tissue becomes separated into collagenous
elastic reticulum becomes fragmented. The walls of
some connective tissue become hypertrophied, while
and sometimes completely closed; nerve ends are
free tissue. Degenerative changes in the parenchyma
and kidneys.

tion processes themselves allowed no possibility of worker exposure to vinyl chloride and
no cases were observed in 1000 workers handling the polymer or manufacturing PVC
products. The disorder was attributed to a combination of physical insult, chemical in-
sult and personal idiosyncrasy. Cleaners should undergo pre-employment medical ex-
amination to discover any evidence of collagen disease, osteolysis of the hands, or ab-
normal response of the hands to cold insult.

CIS 68-511 Occupational acro-osteolysis (Acro-osteolys d'origine profession-
nelle). Marin A., Strauss J., Michiels R., Benoit J.P., Balle R., Pierre C. "Revue
de rhumatisme", Paris, France, June 1967, Vol.34, No.3, p.340-351. Illus. 18 ref.

The authors describe 5 cases of acro-osteolysis in workers employed in cleaning
polymerisation autoclaves in the plastics industry. After reviewing the clinical, radio-
logical and histological aspects of the lesions, they reach a diagnosis of vascular disease
with concomitant secondary osteal resorption, probably caused by general chemical poi-
soning. The lesions are regarded as the possible consequence of an immunological dis-
order, such as has been suggested might account for cases of sclerodactylitis in which the
injuries are comparable. Although the occupational hazard is a substantial one, the
offending chemical has not yet been identified. Treatment consists mainly in vasodila-
tion therapy.

CIS 68-334 Study of diseases caused by vinyl chloride (Etude des maladies
dues au chlorure de vinyle). Suciu I., Drejman I., Velaskai M. "Medicina del
lavoro", Milan, Italy, Apr. 1967, Vol.58, No.4, p.261-271. 12 ref.

The authors report on research on clinical symptoms and biochemical changes, per-
formed in Rumania on 168 workers employed in polyvinyl chloride production, for the
purpose of clarifying the clinical pattern of the diseases induced by this substance. The
findings included a narcotic syndrome, symptoms suggestive of neurasthenia, enlarged
liver (30.2% of cases), Raynaud's syndrome (6% of cases), and skin affections (che-
mical and allergic dermatitis, and scleroderma). The initial appearance of the ner-
vous signs and digestive, angioneurotic and cutaneous phenomena indicate that disorders
of the cerebral cortex, with subsequent discephalic and endocrine involvement, play an
important part.

CIS 67-64 Colorimetric determination of vinyl chloride in air (Kolorime-
trickoe opredelenie hloridnogo vinila v vozduhe). Gronberg E.S. "Himicheskaja
promyshlennost", Moscow, USSR, July 1966, Vol.42, No.7, p.30-31. 3 ref.

A method of determining atmospheric concentrations of vinyl chloride is described,
based on the capacity of ethylene compounds to oxidise with permanganate, forming
glycols, which in turn form formaldehydes when subjected to further oxidation with iodic
acid. The author assumed that the chemical process in the latter case corresponds to
that involved in ethylene oxidation. The formaldehyde can be determined colorimetri-
cally, using chromotropic acid as a reagent. The average values of the results of numerous
series of experiments in determining vinyl chloride in solutions and in the air are repro-
duced, and the preparation of the standard solution is described. The method is much
more sensitive than a procedure described in 1953, based on the photochemical bromide
treatment of vinyl chloride, the bromide residue being determined iodometrically.

CIS 65-2351 Atmospheric contamination by phthalic acid esters during
the processing of polyvinyl chloride (Estary kyslyny ftalove v ovzduhi pri
zpracování polyvinylchloridu). Zdravil J., Picha F. "Pracovní lékařství", Prague,
Czechoslovakia, Aug. 1966, Vol.17, No.6, p.257-260. Illus. 9 ref.

A clearly visible mist having been observed at workplaces where PVC is processed,
samples were collected on ultra-fine membrane filters. The filters were dissolved in
alcohol and the esters determined by polarography in a 75% alcohol solution to which was
added 1 M tetraethyl ammonium bromide. In shops engaged in calendaring soft PVC,
phthalic acid ester concentrations of 2.86 to 5.84 mg/m³ were found; in shops manu-
facturing hard PVC sheet (Novodur), the concentrations were only half as high, but in
one shop with an inadequate ventilation system manufacturing floor coverings, they
reached 44 mg/m³. With concentrations no greater than 5 mg/m³ at ambient tempera-
tures exceeding 30° C, workers complained of irritation of the upper respiratory tract.
At concentrations of 40 mg/m³ the limit of tolerability is reached.

CIS 64-2611 Vinyl chloride (chloroethylene, chloroethene) - CH₂CHCl.
Hygienic Guide Series, American Industrial Hygiene Association, Detroit, Michigan.
"American Industrial Hygiene Association Journal", Detroit, USA, July-Aug. 1964,
Vol.25, No.4, p.421-423. 12 ref.

Recommended maximal atmospheric concentrations for 8-hour exposure is
500ppm. The major hazards are fire and explosion. Vinyl chloride polymerises
readily in the presence of air, sunlight, oxygen or heat, but is safely shipped without a
polymerisation inhibitor. Mild exposures require no treatment other than removal
from the contaminated area. Severe exposures may produce deep anaesthesia. If
this occurs, patient must be removed from the area and kept in supine position. If
breathing has stopped, mouth-to-mouth resuscitation must be begun. Contaminated
clothing must be removed and skin thoroughly washed with water. If eye contact
has occurred, irrigation with copious quantities of water must be immediately
performed.

CIS 64-790 Effects of single and repeated exposure of humans and rats
to vinyl chloride. Center D., Greenberg L.A., Adams W.R. "American
Industrial Hygiene Association Journal", Detroit, USA, May-June 1963,
Vol.24, No.3, p.265-275. Illus. 8 ref.

Rats exposed 8 hours daily to vinyl chloride at concentration of 2% for 3 months and
5% for 19 days exhibited changes in liver and spleen weight and in red and white cell
counts. Except in the case of liver, tissue alterations did not accompany these changes.
The alterations in liver morphology were within the normal range and not pathologic in
character. Because other facets of the animals' response, such as rate of growth, serum
transaminase and haemoglobin, were unchanged, it is suggested that the present thresh-
old limit value of 500 ppm need not be lowered.

CIS 62-1780 Occupational health in the production of vinyl chloride
acetylene (Voprosy gigeny truda v proizvodstve hloridnogo vinila iz acetilena
Filatov V.S., Gronberg E.S., Babokina M.S. "Gigieny truda i professional
zabolevaniya", Moscow, USSR, Feb. 1962, No.2, p.10-15. 8 ref.

Evidence is produced that the atmosphere in industries engaged in the production of
vinyl chloride from acetylene and hydrochloric acid is subject to contamination with
acetylene, hydrogen chloride, vinyl chloride, corrosive mercuric chloride, mercury,
methanol and ammonia, the concentrations of which, in the majority of cases, did not
exceed maximum allowable levels. The extent and nature of contamination varied accord-
ing to the operations involved. Data derived from periodic medical examinations of
workers failed to show any changes in their health condition.

CIS 62-848 Occupational skin lesions due to polyvinyl chloride
(Berufsschädigung Hautschäden durch Polyvinylchlorid). Sonnack H.J.
"Berufsdermatosen", Aulendorf/Württemberg, Germany (Fed.Rep.), Feb. 1962.
Vol.10, No.1, p.38-43. 4 ref.

The author reports on two cases of occupational skin lesions in the polyvinyl chloride processing industry. It is presumed that an allergy to toxicity plays a part, and in this process the emulsifier with its strong degreasing properties or the solvents used increased sensitisation to polyvinyl chloride, which otherwise can scarcely be considered as a sensitizer.

CIS 62-800 The toxicity of vinyl chloride as determined by repeated exposure of laboratory animals. Torkelson T.R., Oyen F., Rowe V.K.
"American Industrial Hygiene Association Journal", Baltimore, USA, Oct. 1961.
Vol.22, No.5, p.354-361. Illus. 12 ref.

Male and female rats showed micropathological liver and kidney changes after repeated daily 7-hour exposures at 500 ppm for 4.5 months. Repeated 7-hour exposures at 200 ppm for six months resulted in micropathological changes in the livers of rabbits and statistically significant increases in the average weight of the livers of male and female rats but no detectable changes in dogs and guinea pigs. The value of 100 ppm is suggested as the limit for regular daily 7- to 8-hour exposures.

CIS 61-668 Acute inhalation toxicity of vinyl chloride to laboratory animals. Mastromatteo E., Fisher A.M., Christie H., and Danziger H. American Industrial Hygiene Association Journal, Baltimore, Md., USA, Oct. 1960, Vol.21, No.5, p.394-398. Ref.

Mice, rats and guinea-pigs were exposed to various inhalation concentrations of vinyl chloride in air. Exposure to 10% concentrations produced narcosis and 40% concentrations killed all but three of the animals. Autopsy revealed hyperaemia, atelectasis, oedema of the lungs, and tubular changes in the kidneys of animals who inhaled 10 and 20% concentrations for 30 minutes; exposure to 30% concentrations caused pulmonary congestion and haemorrhage, liver and kidney congestion, and desquamation of the tracheal epithelium. The guinea-pigs surviving exposure to 40% concentrations showed similar pulmonary and renal changes, complete destruction of the tracheal epithelium, and fatty infiltration of the liver.

CIS 60-1363 Accidental poisoning by vinyl chloride. Danziger H.
Canadian Medical Association Journal, Toronto, Ont., Canada, 16 Apr. 1960.
Vol.82, No.16, p.828-830. Refs.

Two cases of fatal accidental poisoning by vinyl chloride are described.

Supplementary references

- Adam Y.G., Huvoş A.G., Hajdus S.I. - Malignant vascular tumors of liver. *Annals of Surgery*, Philadelphia, USA, 1972, No.175, p.375-383.
- Angheliescu F., Otoiş M., Dobrinescu E., Hagi-Paraschiv-Dossios L., Dobrinescu G., Ganea V. - Consideratii clinico-patogenice asupra fenomenului Raynaud la muncitorii din industria policlorurii de vinil. *Medicina interna*, Bucuresti, Romania, 1969, Vol.21, No.4, p.473-482.
- Antonyuzhenko V.A. - Professional intoxication with vinyl chloride. *Gigiena truda i professional'nye zabolovaniya*, Moskva, USSR, 1968, Vol.12, No.3, p.50-52.
- Arena J.M. - Vinyl chloride poisoning; Toxicology ... Symptoms ... Treatment, 2nd edition, Charles C. Thomas, Springfield, Illinois, USA, 1970,
- Basalaev A.V., - Experience with the use of large-frame photofluorography in examining skeletal bones of persons occupationally dealing with unsaturated hydrocarbons of the ethylene series (olefins) and their chlorine derivatives (vinyl chloride, trichloroethylene). *Gigiena truda i professional'nye zabolovaniya*, Moskva, USSR, 1970, Vol.14, No.11, p.34-37.
- Basalaev A.V., Vazin A.N., Kochetkov A.G. - On the pathogenesis of changes developing due to a long-term exposure to the effect of vinyl chloride. *Gigiena truda i professional'nye zabolovaniya*, Moskva, USSR, 1972, Vol.16, No.2, p.24-27.
- Bloch-Michel H., Brizard J. - L'acroostéolyse. *Revue du praticien*, Paris, France, 1960, Vol.10, No.19, p.2059-2065.
- Boytsov A.N. - Problems of industrial hygiene in new plants for the manufacture of synthetic resins and plastics. *Gigiena truda i professional'nye zabolovaniya*, Moskva, USSR, 1963, Vol.7, No.11, p.20-27.
- Chatelain A., Motillon P. - Un syndrome d'acro-ostéolyse d'origine professionnelle et de constatation nouvelle en France. *Journal de radiologie d'électrologie et de médecine nucléaire*, Paris, France, 1967, Vol.48, No.5, p.277-280.
- Cheney W.D. - Acroosteolysis. *American Journal of Roentgenology, Radium Therapy and Nuclear Medicine*, Springfield, USA, July 1965, No.94, p.595-607.
- Chlorure de polyvinyle. *Informations-Chimie*, Paris, France, 1971, 99, p.131-147.
- Cordier J.M., Fievez C., Lefevre M.J., Sevrin A. Acroostéolyse et lésions cutanées associées chez deux ouvriers affectés au nettoyage d'autoclaves. *Cahiers de médecine du travail* - *Cahiers voor bedrijfsgezondheidskunde*, Gand, Belgium Jan 1966, 4, p.3-39
- Crasselt C. Die Akroosteolyse. I. Zur Differentialdiagnose der generalisierten Akroosteolyse. *Zeitschrift für Orthopädie und ihre Grenzgebiete*, Stuttgart, Germany (Fed.Rep.), 1960, 93, p.540-565.
- Crasselt C. - Die Akroosteolyse. II. Zur Differentialdiagnose der lokalisierten Akroosteolyse und die Aetiologie der Akroosteolyse-Syndrome. *Zeitschrift für Orthopädie und ihre Grenzgebiete*, Stuttgart, Germany (Fed.Rep.), 1961, 94, p.33-50.
- Croccel L. - La maladie de Raynaud existe-t-elle? *Concours médical*, Paris, France, 1959, p.4515-4522.
- Cylwik B. - Histological and histochemical changes in liver during experimental poly (vinyl chloride) pneumoconiosis. *Rocznik akademii medycyny*, Bialystoku, Poland, 1972, 17, p.93-111.
- Dehaan R.L. - Toxicity of tissue culture media exposed to polyvinyl chloride plastic. *Nature New Biology* London, United Kingdom, 1971, 231, 20, p.85-86.
- Deichmann W.B. - Toxicology of drugs and chemicals, 4th edition, Academic Press, New York, USA, 1969, p.620-621.
- Dupas J., Badelon P., Dayde G. Sur un cas d'ostéolyse progressive de la main gauche d'origine indéterminée. *Revue orthopédique*, 1936, 23, p.333-342.
- El-Domeiri A.A. et al. - Primary malignant tumors of the liver. *Cancer*, Philadelphia, USA, 1971, 27, p.7-11.
- Fairhall L.T. - Industrial toxicology 2nd edition, Hafner Publishing Co., New York, USA, 1969, p.356-357.
- Falk H., Creech J.L., Heath C.W., Johnson M.N., Key M.M. - Hepatic disease among workers at a vinyl chloride polymerization plant. *Journal of the American Medical Association*, Chicago, USA, 1974, 230, p.59-63.
- Filatova V.S. - The hygienic evaluation of new technological processes in the chemical industry. *Labor Hyg and Occ Diseases*, 1966, 11, p.1-6.
- Filatova V.S., Antonyuzhenko V.A. - Hygienic conditions of work and occupational disease incidence among workers engaged in production of suspension polyvinyl chloride reviewed dynamically for a number of years. *Gigiena truda i professional'nye zabolovaniya*, Moskva, USSR, 1971, No.4, p.32-34.
- Filatova V.S., Balakhonova L.J., Gronsberg E.S. - Hygienic conditions in the production of vinyl chloride. *Gigiena truda i professional'nye zabolovaniya*, Moskva, USSR, 1958, No.1, p.6-9.
- Filatova V.S., Gronsberg E.S. Sanitary-hygienic conditions of work in the production of polychlorvinyllic tar and measures of improvement. *Gigiena i sanitariya*, Moskva, USSR, Jan. 1957, Vol.22, No.1, p.36-42. - Traduction 22-57, Institut National de Sécurité, Paris, France.

Filatova V.S. et al. - Occupational hygiene and health condition of workers engaged in the production of latex polyvinyl chloride. *Gigiena truda i professional'nye zabollevaniia*, Moskva, USSR, 1965, No.8, p.9-14.

Gabor S. et al. - Comments on the biochemical alterations in workers of the vinyl chloride synthesis and polymerization industry. *Igiena*, Bucuresti, Romania, 1964, Vol.13, No.5, p.409-418.

Hardie D.W.F. - Chlorocarbons and chlorohydrocarbons. Vinyl chloride. Encyclopedia of chemical technology, 2nd edition, John Wiley and Sons, New York, USA, 1964, Vol.5, p.171-178.

Harnasch H. - Die Akroosteolyse - Ein neues Krankheitsbild. *Fortschritte auf dem Gebiete der Röntgenstrahlen und der Nuklearmedizin*, Stuttgart, Germany (Fed.Rep.), 1949, 72, p.352-359.

Harris D.K. - Health problems in the manufacture and use of plastics. *British journal of industrial medicine*, London, United Kingdom, 1953, Vol.10, p.255-268.

Harris D.K. - Quelques risques de la fabrication et de l'emploi des matières plastiques. *British Journal of Industrial Medicine*, London, United Kingdom, 1959, Vol.16, No.3, p.221-229.

Harris D.K., Adams W.G.F. - Acro-osteolysis occurring in men engaged in the polymerization of vinyl chloride. *British medical journal*, London, United Kingdom, 1967, 3, No.5567, p.712-714.

Heath C.W., Falk H., Creech J.L. - Characteristics of cases of angiosarcoma of the liver among vinyl chloride workers in the United States. *Annals of the New York Academy of Sciences*, New York, USA, 1974.

Heidrich H. - Primäres und sekundäres Raynaud-Syndrom. *Deutsches medizinisches Journal*, Berlin (Westsektoren), 1972, 23, 375.

Henschler H. - Vinylchlorid. Gesundheitsschädliche Arbeitsstoffe. Toxikologisch-arbeitsmedizinische Begründung von MAK-Werten. Verlag Chemie, Weinheim, Germany (Fed. Rep.), 1972. 4p.

Houten R.W. van, Cudworth A.L., Irvine C.H. - Evaluation and reduction of air contaminants produced by thermal cutting and sealing of PVC packaging film. *American Industrial Hygiene Association Journal*, Akron, USA, 1974, Vol.35, No.4, p.218-222.

Jablowska S., Bubnow B., Szczepanski A. - Diffuse scleroderma and Raynaud's disease. *British Journal of Dermatology*, Oxford, United Kingdom, 1962, 74, p.174-182.

Jaeger R.J., Rubin R.J. - Migration of a phthalate ester plasticizer from polyvinyl chloride blood bags into stored human blood and its localization in human tissues. *New England Journal of Medicine*, Boston, USA, 1972, Vol.287, p.1114-1118.

Jesserer H. - Zum Erscheinungsbild der Akroosteolyse. *Fortschritte auf dem Gebiete der Röntgenstrahlen und der Nuklearmedizin*, Stuttgart, Germany (Fed.Rep.), 1952, 77, p.544-552.

Jühe S., Lange C.E. - Sklerodermieartige Hautveränderungen, Raynaud-Syndrom und Akroosteolysen bei Arbeitern der PVC-herstellenden Industrie. *Deutsche medizinische Wochenschrift*, Stuttgart, Germany (Fed.Rep.), Dec. 1972, Vol.97, No.49, p.1922-1923.

Jühe S., Lange C.E., Stein G., Veltmann G. - Über die sogenannte Vinylchlorid-Krankheit. *Deutsche medizinische Wochenschrift*, Stuttgart, Germany (Fed.Rep.), 1973, Vol.98, p.2034-2037.

Klinge O., Altmann H.W. - Morphologie toxischer Hepatosen. *Münchener medizinische Wochenschrift*, München, Germany (Fed.Rep.), 1971, Vol.113, p.1529.

Kogan A.K., Tugarinova V.N. - On the blastomogenic action of polyvinyl chloride. *Voprosy Onkologii*, Leningrad, USSR, 1959, Vol.5, p.540-545.

Lange C.E., Jühe S., Veltman G. - Über das Auftreten von Angiosarkomen der Leber bei zwei Arbeitern der PVC-herstellenden Industrie. *Deutsche medizinische Wochenschrift*, Stuttgart, Germany (Fed.Rep.), 1974, Vol.99, p.1598.

Langeron L., Crocchel L., Langeron P. - Syndrome de Raynaud et sclérodémie. *Journal des Sciences Médicales de Lille*, Lille, France, 1959, 77, p.380-385.

Laroche G., Hochfeld M. - Un cas d'acroostéolyse associée à un syndrome ostéo-neuro-endocrinien complexe. *La semaine des hopitaux*, Paris, France, 1948, 24, p.984-991.

Laroche G., Hochfeld M. - Un nouveau cas d'acroostéolyse avec syndrome neuro-endocrinien complexe. *La semaine des hopitaux*, Paris, France, 1950, 26, p.1500-1502.

Lièvre J.A., Gama G. - L'acroostéolyse. *Bull. Soc. Méd.*, Paris, France, 1957, 73, p.109-121.

Makk L., Creech J.L., Whelan J.G., Johnson M.N. - Liver damage and angiosarcoma in vinyl chloride workers. *Journal of the American Medical Association*, Chicago, USA, 1974, 230, p.64-68.

Marsteller H.J., Leibach W.K., Müller R., Gedigk P., Lange C.E. - Klinische und laparoskopische Aspekte der Leberschäden bei Chemiearbeitern in der Vinylchlorid-Polymerisation. *Leber - Magen - Darm*, Germany (Fed.Rep.), 1975, 5, 196.

May J.P. - Syndrome de Raynaud. *Lille Médical*, Lille, France, 1962, 10, p.386-390.

Meyerson L.B., Meier G.C. - Cutaneous lesions in acroosteolysis. *Archives of Dermatology*, Chicago, USA, 1972, 106, 2, p.224-227.

Morris G.E. - Vinyl plastics - Their dermatological and chemical aspects. *Archives of Industrial Hygiene and Occupational Medicine*, Chicago, USA, 1953, 8, p.535-539.

Neergaard J., Nielsen B., Faurby V., Christensen D.H., Nielsen O.F. - Plasticizers in PVC and the occurrence of hepatitis in a hemodialysis unit. *Scandinavian Journal of Urology and Nephrology*, Stockholm, Sweden, 1971, Vol.5, p.141-145.

Nelson R.S., Eleyalde R.D., Howe C.D. - Clinical aspects of primary carcinoma of the liver. *Cancer*, Philadelphia, USA, 1966, 19, p.533-537.

Oppenheimer B.S., Oppenheimer E.T., Danishefsky I., Stout A.P., Eirich F.R. - Further studies of polymers as carcinogenic agents in animals. *Cancer Research*, Chicago, USA, 1955, Vol.15, p.333-340.

Oppenheimer B.S., Oppenheimer E.T., Stout A.P. - Sarcomas induced in rodents by imbedding various plastic films. *Proceedings of the Society of Experimental Biology and Medicine*, Utica, USA, 1952, 79, p.366-369.

Patty F.A., Yant W.P., Waite C.P. - Acute response of guinea pigs to vapors of some new commercial organic compounds V. Vinyl Chloride. *Public Health Reports*, Washington, D.C., USA, Aug. 1930, 45, p.1963-1971.

Popov L.A., Yablochkin V.D. - Characteristics of gases released by polyvinyl chloride film. *Gigiena i sanitarija*, Moskva, USSR, 1967, Vol.32, No.7, p.114-117.

Prodan L., Pislaru V., Ilea E., Pascu L., Rusu V., Pop C., Dobos S. - Intoxicatia cronica cu clorura de vinil. *Comunicare Sesiunea Stiintifica a Institutului Medico-Farmaceutic*, Cluj, Romania, Dec. 1969.

Raucher C., Suciul I., Pislaru V., Petre I. - Cercetari clinice, fiziologice si igienico-sanitare privind fabricarea maselor plastice acrilice si vinilice. *Igiena*, Bucuresti, Romania, July 1962.

Ravault P.P., Roche L., Lejeune E., Grandmottet P. - Les ostéopathies toxiques. *Revue du rhumatisme et des maladies ostéo-articulaires*, Paris, France, 1959, 26, p.382-393.

Ravault P.P., Viala J.J. - La maladie de Raynaud. *Revue du praticien*, Paris, France, 1957, 7, p.15-22.

Shelley P.G., Sills E.J. - Monomer storage and protection. *Chemical Engineering Progress*, New York, USA, 1969, 65, 4, p.29-35.

Stankevich K.I. - Experimental data on the blastomogenic effect of coumarone on polyvinyl chloride plates. *Vračebnoe delo*, Har'Kov, USSR, 1962, 11, p.108-114.

Stein G., Jühe S., Lange C.E., Veltman G. - Bandförmige Osteolysen in den Endphalangen des Handskeletts. *Fortschritte auf dem Gebiete der Röntgenstrahlen und der Nuklearmedizin*, Stuttgart, Germany (Fed.Rep.), 1973, 118, 60, p.60-63.

Stein G., Jühe S., Lange C.E., Veltman G. - Skelettveränderungen bei der sog. Vinylchlorid-Krankheit. *Röntgen-Blätter*, Wuppertal, Germany (Fed.Rep.), 1973, 26, 350.

Stewart R.D., Dodd H.C., Baretta E.D., Schaffer A.W. - Human exposure to styrene vapor. *Archives of Environmental Health*, Chicago, USA, May 1968, 16, No.5.

Stulova E.A. - Characteristics of the state of thermal regulation in chronic vinyl chloride intoxication. *Gigiena truda i professional'nye zabolevaniia*, Moskva, USSR, 1973, Vol.17, p.53-55.

Suciul I., Drejman I., Valaskai M. - Contributii la studiul imbolnavirilor produse de clorura de vinil. *Medicina interna*, Bucuresti, Romania, Aug. 1963, Vol.15, No.8, p.967-978.

Trotel-Sabatier J. - Contribution à l'étude de l'acroostéolyse. *Thèse*, Paris, France, 1957, No.392.

Truffert L. - Aspect toxicologiques de l'industrie des matières plastiques. *Archives des maladies professionnelles, de médecine du travail et de sécurité sociale*, Paris, France, 1959, 20, p.43-50.

Usher F.C., Wallace S.A. - Les réactions tissulaires aux matières plastiques. *Archives of Surgery*, Chicago, USA, 1958, 76, p.997-999.

Vazin A.N. - Changes in the rate of incoercation of conditioned reflexes in rats on prolonged exposure to vinyl chloride vapour in concentrations approaching the maximum permissible concentration. *Gigiena i sanitarija*, Moskva, USSR, 1970, Vol.35, No.6, p.434-435.

Vazin A.N., Plokhova E. - Dynamics of the level of adrenaline like substances in the blood of rabbits under the chronic effect of vinyl chloride vapour. *Gigiena truda i professional'nye zabolevaniia*, Moskva, USSR, 1969, Vol.13, No.6, p.46-47.

Vazin A.N., Plokhova E.I. - Changes in the cardiac activity of rats chronically exposed to vinyl chloride vapours. *Farmakologija i toksikologija*, Moskva, USSR, 1969, Vol.32, No.2, p.320-322.

Vazin A.N., Plokhova E.I. - Pathogenic effect of chronic exposure to vinyl chloride on rabbits. *Farmakologija i toksikologija*, Moskva, USSR, 1968, Vol.31, No.3, p.369-372.

Vazin A.N., Plokhova E.I. - On obtaining an experimental model of the "toxic angioneurosis" arising under the chronic effect of vinyl chloride vapour on the organism. *Gigiena truda i professional'nye zabolevaniia*, Moskva, USSR, 1968, Vol.12, No.7, p.47-49.

Viola P.L., Bigotti A., Caputo A. - Oncogenic response of rat skin, lungs and bones to vinyl chloride. *Cancer Research*, Chicago, USA, Vol.31, p.516-522.

Vittet A. - Contribution à l'étude de l'acroostéolyse. *Thèse Médicale*, Lyon, France, 1963, No.151.

Waszner U.J. - Ein weiterer Fall von einer Akroostéolyse zugleich ein Beitrag zu ihrer Differentialdiagnose. *Fortschritte auf dem Gebiete der Röntgenstrahlen und der Nuklearmedizin*, Stuttgart, Germany (Fed.Rep.), 1954, 80, p.186-191.

Williams F.W., Umstead M.E. - Determination of trace contaminants in air by concentrating on porous polymer beads. *Analytical Chemistry*, Washington D.C., USA, 1968, Vol.40, p.2232-2234.

Winkelman R.W. - Classification and pathogenesis of scleroderma. *Mayo Clinic Proceedings*, Rochester, USA, 1971, 46, p.83.

Chlorure de polyvinyl. *Informations-Chimie*, Paris, France, 1971, 99, p.131-147.

Vinyl chloride Data Sheet. Air Products and Chemicals, Inc., Specialty Gas Dept., Allentown, Pennsylvania 18105, USA.

Vinyl chloride (chloroethylene, chloroethane) Hygiene Guide Series. *American Industrial Hygiene Association Journal*, Akron, USA, 1964, Vol.25, No.4, p.421-42