

REPORTS

XVI MEDICHEM

International Congress on Occupational Health in the Chemical Industry

(Helsinki, Finland, 27—30 September, 1988)

The XVI International Congress on Occupational Health in the Chemical Industry, MEDICHEM, was held in Helsinki, Finland, from 27 to 30 September, 1988.

The Congress was opened by Kari Puro — Secretary-General, Ministry of Social Affairs and Health, prof. Sven Hernberg — President of the ICOH — and Sir Christopher Lawrence-Jones—Chairman of Medicchem. After the opening, the debates were organized into 9 sessions, of which four were devoted to: (1) *neurotoxicology* (4 reports), (2) *cancer risk in the chemical industry* (5 reports), (3) *pregnancy outcome in the chemical industry* (4 reports) and (4) *biological monitoring* (6 reports), while the remaining five sessions, including poster sessions, focused upon *the current problems of workers' health in the chemical industry* (21 reports altogether). In general, 40 reports and posters were presented by 13 countries: 11 by Finland, 6 by Great Britain, 5 by Japan, 4 by the USA, 4 by the FRG, 2 by Poland, 2 by Canada while Austria, Belgium, France, Israel, Sweden and Italy presented one report each.

The Chairman of the session on *neurotoxicology* was prof. Birgitta Haeger-Aronsen from Sweden. The first two reports, "*Neurological methods in clinical neurotoxicology*" (E. Matikainen) and "*Neurotoxicity assessment of industrial chemicals in vitro and in vivo*" were devoted to methodical issues. The first report was connected with studies on people, the second, with experiments on animals. The studies on humans occupationally exposed to organic solvents, which were discussed in the paper, entitled "*Occupational exposure to organic solvents and balance disturbances*" (M. Antti-Poika et al.) did not indicate any relationship between the exposure and disturbances in balance. It was pointed out that the effects of alcohol made it impossible to detect minor changes which might possibly be caused by solvents. Experiments within occupational medicine in the Federal Republic of Germany did not confirm the relatively high prevalence rates of toxic encephalography in painters exposed to organic solvents, which have been observed in other countries. The results of these experiments were presented in the report, "*Current aspects of solvent neurotoxicity: experience in occupational medicine in Germany*" (G. Friebig and H. Valentin).

The next four sessions devoted to "*Current problems of workers' health in the chemical industry*" were presided over by Henrik Nordman, MD from Finland, Renato Mattiussi, MD from Italy, prof. Alfred Thiess from the FRG and R. W. Ahlberg MD, from Finland. This section comprised reports, papers and poster sessions dealing with variety of issues including the effects of chemical substances in skin, experiments performed on animals, implementing large-scale epidemiologic studies and elaborating interesting organizational solutions.

One of the problems raised in several reports was the irritating and sensitizing

action of chemical substances. For instance, in the paper, **"Occupational dermatosis in workers exposed to epoxy-impregnated glass-fibre fabric"** (M. Bruze and G. Amgren), it was suggested that irritant contact dermatitis was caused not by epoxy resin but by fibre-glass dust. Three cases of an allergic response to reactive dyes, identified in workers of mixing kitchens of a textile factory, were the subject of the paper. **"Occupational allergy to reactive dyes in a textile factory"** (L. Djerrassi). As emerged from the tests, the black dye, Levafix-L-Schwartz, brought about the strongest dermal reaction. In the report, **"Possible sensitizing potentials of sinesto B^(R)"** (P. Jäppinen et al.) the distinct, though not very strong, sensitizing effects of Sinesto on skin was discussed. Sinesto is used to impregnate wood instead of chlorinated phenols.

The report **"Technical handling of proteolytic enzymes in the production of washing agents"** (K. Dietrich) proved that allergic diseases are caused by proteolytic agents during the manufacture of washing agents. The implementation of technical measures was then suggested in this paper.

The report, **"Process chemicals in the oil and gas industry: potential occupational hazards in the oil production process"** (M. K. W. Cottle and T. L. Guidotti) considered a large number of different chemical substances — many of which are known for their toxic properties — used during different procedures in the oil production process. The report presented a comprehensive list of these chemical substances, stressing that it was only a fraction of the hundreds of substances available to the oil industry in Canada.

Capacitors containing polychlorinated biphenyls (PCB) may result in the contamination of a plant during a fire, and this was observed in the paper, **"Toxicological assessment of PCB capacitor accidents"** (M. Luotamo and Y. Riihimäki). Since 1982, more than one hundred PCB capacitor accidents are known to have occurred in Finland. During a fire in a paper mill 100 l of PCB were released in the electricity room and then, the PCB penetrated through the ventilation system to the plant. These accidents brought about the adoption of the special series of tests which makes it possible to assess the workers' exposure to PCB itself, its impurities and pyrolysis products.

The important role played by skin in occupational exposure to herbicides formed the subject matter of the report, **"Comparative pharmacokinetics of a herbicide by the oral and dermal routes in human subjects"** (B. H. Woolen et al.). In the experiments, a herbicide, fluazifop-butyl, was administered orally or was applied in diluted form to skin in volunteers. It was demonstrated that the bioavailability of the preparation was much lower by the dermal route. These experiments were also performed on animals and have become the basis for a model describing the dermal absorption of fluazifop-butyl. The model was presented in the poster report, **"Mathematical modelling of skin absorption from in-vitro and in-vivo data in rat and man"** (J. D. Ramsey et al.).

In the paper, **"Excretion of phenol after accidental skin contact — five case reports"** (H. Schiebeler and A. Zober), it was demonstrated that victims of accidents in which hot phenol had been poured over them showed a rapid increase and then decrease of phenol concentration in urine. There were no signs of systemic intoxication.

The report, **"Changes in peripheral red cells of workers engaged in vinyl chloride processing"** (Y. Kudo et al.), showed that these changes consisted in the presence of basophilic stippled erythrocytes in workers exposed to vinyl chloride



whose concentration in the plant was around 2 ppm. The authors suggest that BSE presence may be a warning indication of the onset of Raynold disease.

The interaction between styrene and other substances encountered in the working environment was discussed in the report, **"Acetone induced increased metabolism and pulmonary toxicity of styrene in rats"** (E. Elovara et al.). Rats were pretreated with acetone, or well-known metabolic modifiers of the liver drug biochemistry — phenobarbital, 3-methylcholanthrene — and then subjected to styrene inhalation exposure. Only pretreating with acetone induced urine excretion of styrene metabolites and greater sensitivity of the lungs to styrene inhalation than that of the liver. In a similar study, **"Metabolism of antipyrine and m-xylene in rats after prolonged pretreatment with xylene or xylene together with ethanol, phenobarbital or methylcholanthrene"** (E. Elovara et al.) a distinct and significant induction of enzymes metabolizing antipyrine in the liver after the animals' pretreatment with xylene, ethanol, phenobarbital or 3-methylcholanthrene, was demonstrated. At the same time, no such effect was confirmed for m-xylene.

Studying the **"Metabolic fate of trimethylarsine oxide"** (Y. Yamamura et al.), it was observed that this compound is excreted very fast. After oral administration to male golden hamsters, about 90% of the dose was excreted in the urine during 24 hours. In the paper, **"Environmental arsenal exposure, a world problem"** (C. H. Hine and V. De Silva), the sources and the extent of this exposure were presented, while it was emphasized that the existence of a hygienic standard of arsene content in drinking water (amounting to 200 ppm) seems to have a preventative effect against an increased risk of some diseases which result from the ingestion of arsene.

The principles of 10-year prospective studies were discussed in the report, **"A cross-cultural epidemiology study: challenges and opportunities"** (R. J. McCunney). The aim of these studies was to provide a credible answer to the question: can carbon black cause pneumoconiosis?

The papers, **"The workplace hazardous materials information system in Canada — a chemical user's perspective"** (R. R. Orford and L. N. Batt) and **"Integrating occupational hygiene into process control-experience in pursuit of corporate expectations, developing legislation and personal ideas"** (J. R. Jackson), dealt with organizational measures connected with ensuring the safety at work. This subject also received some attention during a poster session. One of the reports dealing with this issue was, **"Man monitoring on the workplace. An original sampling strategy applied to an organic chemicals plant"** (B. Despres et al.). As a result of working out a strategy of sampling, it has become possible to calculate, according to the probability threshold, the range of concentrations of substances, grouping the working units into: (1) very safe, (2) rather safe, and (3) non safe, and also adopting particular measures and systems connected with this problem.

In the report, **"Computer-based medical surveillance"** (W. Rappaport), a system was presented which has been applied in the USA and then also in Norway, England, Holland and Belgium. The system has a data base of over 2500 data items related to employees, work places, exposure agents and protective devices.

An original and important problem of work safety was raised in the poster report, **"Drug screening in the chemical industry: the technical issues"** (J. R. McCunney). The report was devoted to the potential threat to safety in the chemical industry caused by tranquilizers or different narcotic drugs and alcohol abuse. All of them are mind-altering substances and can indirectly bring about accidents and explosions in the chemical industry. Therefore, in many industries in the



USA, urinary drug testing is used in the workplace. This sort of controlling raises many legal and ethical issues including "rights to privacy".

The session *"Cancer risk in the chemical industry"* was presided over by prof. Sven Hernberg from Finland. The first two reports were devoted to the general issues of cancer risk in the chemical industry and were presented by J. F. H. Purchase: *"Risk assessment of carcinogens in the chemical industry"* and by H. Vainio: *"Identification and hazard ranking of chemical carcinogens"*. In other papers, the occurrence and consequences of exposure to certain substances were discussed. *"A retrospective mortality study of substituted anthraquinone dyestuffs workers"* (S. A. Walker) did not show any excess in total or cancer-related mortality in the examined population of 1975 male workers employed in a dyestuff manufacturing plant in Scotland between 1956 and 1985. The report stressed that the results of short-term bacterial tests were positive for one-third of the anthraquinones studied, and an excess of hepatocellular carcinomas in rats fed with three anthraquinone dyestuffs was confirmed.

In the report, *"Mutagenicity of airborne particulates in a rubber industry plant"* (J. Indulski et al.) it was indicated that substances excreted with solvents from samples of particulate matter occurring at some work-posts of this plant were mutagenic in the Ames test using *Salmonella typhimurium* TA98 in the presence of metabolizing system S9. Genotoxic substances, potentially carcinogenic, occurred in air samples collected at the carbon station and at work-posts where the heating of rubber by-products took place.

The Chairman of the session *"Pregnancy outcome in chemical exposure"* was Sir Christopher Lawrence-Jones from the United Kingdom. The session was opened with the report, *"Outcome of pregnancy in relation to chemical exposure in industry"* (H. Taskinen et al.). In two other papers, studies concerning the relationship between spontaneous abortions and exposure to chemical substances were discussed. Although the connection between infertility and abnormal spermatogenesis in males exposed to lead has been proved in a report entitled *"Spontaneous abortions among the wives of men exposed to inorganic lead"* (M. Sallmen et al.), the results do not show a statistically significant relationship between paternal exposure to inorganic lead and spontaneous abortions in their wives. On the other hand, in the paper entitled *"Spontaneous abortions among the wives of men exposed to organic solvents"* (A. Anttila et al.), the authors suggested the existence of a positive link between spontaneous abortions and male preconceptional exposure to organic solvents, especially to mixtures of aromatic hydrocarbons, aliphatic hydrocarbons and a group of miscellaneous solvents.

In the paper, *"Effect of maternal trioxane exposures on prenatal and postnatal development in rats"* (B. Barański et al.), it was demonstrated that trioxane (an intermediate product in the manufacture of synthetic resins) administered to pregnant female rats in doses which did not induce toxicological effects in mothers, resulted in a delay in the postnatal development of offspring, induced changes in fetal brains, kidneys and skeletal system and brought about disturbances in the peripheral nervous system — represented by behavioural changes — in the adult offspring.

A session devoted to *biological monitoring* was presided over by Yesa Riikimäki, MD from Finland. In two reports presented by the FRG and Finland the biological monitoring of exposure to CS₂ was based on measuring its main metabolite — 2-thio-1,3 thiazotidine-4-carboxylic acid (TTCA) in urine. In the paper, *"First*



experience with biological monitoring for "carbon disulphide" (F. P. Freudlsperger and W. P. Madaus) they found an excretion of less than 8 mg TTCA/l urine with exposures up to the German TLV of 30 mg/m³. In another report, "Urinary TTCA as a biological indicator of worker exposure to CS₂ in viscose production" (H. Kivistö et al.), exposure to CS₂ up to the Finnish TLV of 10 ppm, corresponded to a TTCA concentration of about 4 µmol/mmol creatinine in a post-shift sample.

According to the report, "Biological monitoring of workers exposed to nitrobenzene" (D. Harmer and M. J. Taylor), measuring p-nitrophenol (nitrobenzene metabolite) in urine proved to be a much more valuable indicator than measuring methaemoglobin levels in blood, mainly because of the close correlation between p-nitrophenol levels in urine in end of shift urine samples and atmospheric concentration. Biological monitoring in exposure to nitrobenzene is very important because of the remarkable absorption of this substance by skin and through the airways.

In the report, "Effect of triarylphosphatases on the mononuclear phagocyte — possibilities for biological effect monitoring" (K. Miller and A. E. Smith), it was demonstrated that using the culture of macrophages of alveoli in guinea pigs treated with triarylphosphate, one of the examined macrophages functions — esterase activity — was impeded by high concentrations of triarylphosphate. Since a similar study, i.e. measuring the esterase activity, may be performed on the peripheral blood monocytes of humans, it was suggested that they be used to determine the exposure to organophosphate compounds and to assess any possible biological consequences.

The authors of "Environmental and biological monitoring of exposure to tetrachloroethylene in dry-cleaning shops" (G. L. Discalzi et al.) considered measuring the concentration of tetrachloroethylene (TET) in blood at the end of the working week, was better than measuring TET concentrations in air expired, mainly because of a better correlation with environmental exposure, as well as the simplicity and lower cost of sampling. In conditions involving a small exposure of 10 ppm (one-fifth of TLV) in examined females exposed in dry-cleaning shops, no effects on the nervous system (CNS) were detected although very sensitive methods were applied which made it possible to identify preclinical damage of the CNS.

The paper, "Kinetics of fluoride and elements in hair of hydrofluoric acid-exposed workers" (K. Kono et al.) comprised interesting information about higher levels (as compared to the control) of fluorine and other elements such as Na, Mg, Al, P, Ca, Ni, Zn and J in the hair of workers exposed to hydrogen fluorine in the washing of glass bulbs for TV picture tubes and the etching of semiconductors. A strong correlation between the fluorine concentration in hair and the fluorine concentration in urine after the working shift was established. Previous studies by these authors have shown that the fluorine concentration in urine after the working shift is a good indicator of occupational exposure.

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