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MEDICHEM 1995

THE CHEMICAL INDUSTRY AS A GLOBAL CITIZEN - BALANCING RISKS AND BENEFITS
Cambridge, Massachusetts, USA September 19–22, 1995

During the Congress 41 papers and 22 posters were presented. The list of subjects mentioned during seven general and two poster sessions is very long, therefore, I will try to focus on the most important issues discussed by individual speakers.

J. LaDou (International Centre for Occupational Medicine, University of California, San Francisco, USA) discussed broadly the role of multinational industrial corporations in providing occupational health and safety in developing countries. The author turned attention to the fact that there are 35,000 multinational corporations with 147,000 affiliates. Much of the investment in the developing word comes from these corporations. The total annual sales of the 350 biggest multinational corporations are equal to one third of the combined gross domestic products of the industrial world, and exceeds by far that of the developing world. Although, the investment provided by foreign investors is expanding rapidly in developing countries, the majority of industrial activity is sponsored by these usually nameless sources whose record of attention to workplace health and safety and to the environment is far less acceptable than that of the multinationals. Migrating industries, including many of the multinationals, conform to the inadequate environmental and occupational health and safety standards of the host country. Consequently, worker fatality rates are much higher in newly industrialized countries than in the developed ones and workplace injuries occur with rates common to the developed nations during the Industrial Revolution.

The dangerous and shameful practice of exporting obsolete and hazardous technologies to developing countries when these processes can no longer satisfy the environmental standards of the developed countries must be stopped. There are, however, great multinational corporations which agree to operate plants according to more strict home-based regulatory standards, bringing their home health and safety practices to the developing world. They are a powerful force for improvement in working conditions in newly-industrialized countries.

A.N. Weinberg (Medical Department, MIT, USA) presented data on the incidence of infectious diseases in the developing countries during the last 25 years. Despite immunizations, higher living standards, antibiotics and better medical service, old diseases like tuberculosis, cholera and plague still emerge. Notwithstanding that most infectious diseases are old and familiar subjects, some newer microbial enemies causing Legionnaire's disease, Lyme disease, ehrlichiosis, AIDS and viral hemorrhagic fevers like Ebola virus disease are identified. As we have altered virgin environments in areas like the Amazon, viruses that cycled between arthropods and animals were free to infect people building roads and towns. Similar

infections are observed in Papua and New Guinea among individuals building new roads in tropical forests who because of lack of immunity become susceptible to new pathogenic microorganisms.

N.A. Ashford (Department of Engineering, MIT, USA) focused on a growing problem of sensitivity even to low levels of an increasing number of chemicals, people are exposed to in food, water, the outdoor environment, the work environment, indoor air and consumer products. Evidence for significant and increasing chemical sensitivity is provided by recent dramatic increases in synthetic organic chemical production and pesticide use, decreased ventilation in industrial plants increased outbreaks of sick-building illnesses, and increases in the number of people reporting sensitivity.

Four general classes of mechanisms have been suggested to explain chemical sensitivity:

1. neurological
2. immunological,
3. biochemical and endocrinological,
4. psychological.

Different mechanisms can be at play and different pathways can lead to what appears to be a common symptomatology and the relationship between symptom occurrence and sensitivity to chemicals is paticularly difficult to be identified.

M.R. Elin (Tufts School of Medicine, Baystate Medical Centre, Springfield, USA) stressed that exposure to neurotoxins from solvents, fuels pesticides and metals is an evergrowing hazard of modern life. These poisons damage the central nervous system, peripheral neuron, and information processing systems-memory and learning -in the brain. These toxins can also damage subcortical and cortical structures that process affective behavior. The assessment, treatment, and evaluation of patients exposed to such toxins as toluene, radiation, carbon dioxide, DDT, lead and polyvinylalcohol are becoming icreasingly important areas of clinical neuropsychological practice. New laboratory procedures such as MRI and neuropsychological evaluations provide the ground for a thorough diagnosis. Neuropsychological testing instruments are used to assess state-dependent and channel-dependent functions for attention/concentration, resistance to interference, and motor, perceptual, spatial, cognitive, linguistic and problem-solving skills, and personality performance (dissociation, etc.).

E.M. Cordasco (St. Lukes Medical Centre, Ohio, USA) discussed effects of accidental spread of potentially toxic gases, fumes and particulate chemicals such as tank explosions, mainline gas leaks or natural gas explosions, involving sometimes several thousand people. Moreover, environmental pulmonary edema from drug intoxication, cerebral trauma and septic shock (ARDS) were also mentioned. Newer modalities of treatment, namely, earlier fiber optic bronchoscopy, mask continuous positive airway pressure (CPAP), surfactant pentoxifylline, and newer experimental agents such as nitrous oxide or even antitumor necrosis factor (TNFA) as well as extracorporeal carbon dioxide unit with low frequency positive pressure improve health prognosis.

L.K. Lowry (Midwest Research Institute, Kansas City, USA) presented the World Health Organization Global Project on Biological Monitoring of Chemical Exposure at the Workplace. In 1992 the World Health Organization, in cooperation with the International Program on Chemical Safety, started to collect material for providing reference principles and methods for biological monitoring of chemical exposure with emphasis on promoting relevant basic knowledge on toxic effects and toxicokinetics, sampling and recommended analytical methods with quality assurance and interpretation of results. A four-volume guidelines has been drafted. Two volumes have been already prepared and they are now reviewed by a group of experts. It is expected that they will be published by the end of 1995 or the beginning of 1996. The first volume is dedicated to the biological monitoring of exposure to individual chemicals grouped at selected metals, solvents, pesticides and other chemicals. A detailed description of biological monitoring of selected individual chemicals is presented in the second and third volumes. The fourth volume is devoted to biological monitoring of exposure to mutagenic/carcinogenic chemicals in the workplace.

A. Zober (Occupational Medical and Health Protection Dept., BASF Aktiengesellschaft, Ludwigshafen, Germany) discussed the significance of permament biological monitoring of exposure to polycyclic aromatic hydrocarbons (PAHs) carried out in the BASF Aktiengesellschaft in Germany. The program employs measurement of 1-hydroxypyrene concentrations in urine as an exposure indicator.

P.W. Brandt-Rauf (Columbia University School of Medicine, New York, USA) presented studies carried out in cooperation with researchers in Lyon, France, on mutations in cellular oncogenes and tumor suppressor genes in workers occupationally exposed to high levels of vinyl chloride (VC) who are at risk for the development of angiosarcoma of the liver (ASL). The active metabolites of VC are capable of inducing mutations which result in the expression of the corresponding mutant protein products which can be identified using specific monoclonal antibodies. Since these mutant proteins are released into the extracellular environment, the immunological detection of these proteins in serum represents potential biomarkers for the study of this carcinogenic process *in vivo*.

C. Laurent (Oncology, Radiology and Experimental Mutagenesis Laboratory, Institute of Pathology, University of Liege, Belgium) presented data on genotoxic effects of organophosphorus and carbamate pesticides in animals and *in vivo* test systems. Relatively few studies have applied to workers occupationally exposed to such agents. Most studies concerned endusers such as sprayers in fields or in green houses. However, many pesticides have been tested *in vitro* as mutagenic compound, the results reported from biomonitoring studies, using genetic biomarkers, are, so far, not conclusive. The authors have studied sister chromatid exchanges in workers potentially exposed to pesticides in a production plant from February through April. During these months production of organophosphorus and carbamates is much higher than during the rest of the year. Blood samples were taken twice from 17 subjects: before and at the end of the high production period. Beside sister chromatid exchanges frequencies (SCEs), high frequency cells (HFCs) and proliferating rate index (PRI) were measured. Both SCEs and HFCs were significantly higher in the

exposed group than in the control group. The authors confirm that organophosphorus should be considered as genotoxic agents.

T.N. Markham (Brush Wellman, Inc. Cleveland, USA) focused on workers exposed to beryllium in the past. Chronic beryllium disease (CBD) is a pulmonary disease manifested by an active alveolitis progressing to interstitial fibrosis. Recent studies have shown that there is a significant number of workers with past beryllium exposure who have developed subclinical asymptomatic or minimally symptomatic disease in the absence of radiographic changes. The authors examined 641 workers at a primary beryllium processing facility using voluntary screening with the blood lymphocyte proliferation testing (BLPT). Fifty two persons were identified for further clinical evaluation which consisted of high resolution computed tomography of the chest, exercise pulmonary function (PFT) with arterial blood gases, bronchoscopy with bronchoalveolar lavage, lung lymphocyte proliferation testing and transbronchial biopsy. This battery of clinical examinations facilitated the detection of CBD in 20 persons.

J.A. Bond (Chemical Industry Institute of Toxicology, Washington, USA) investigated the effects of exposure to butadiene which was listed as one of 189 hazardous air pollutants under the 1990 Clean Air Act Amendments. Butadiene is a carcinogen in rats and mice with mice being substantially more sensitive than rats. Butadiene requires metabolic activation to DNA-reactive epoxides to exert its mutagenic and carcinogenic effects. The author has carried out *in vitro* studies of toxic butadiene epoxide metabolites, epoxybutene and diepoxybutane using tissues from humans, rats and mice as well as physiological model predictions for butadiene in blood and butadiene epoxides in blood, lung and liver after exposure of rats and mice to inhaled butadiene. The findings suggest that humans would be more like rats and less like mice regarding the formation of butadiene epoxides.

W. Farland (National Centre for Environmental Assessment, US Environmental Protection Agency) stressed that past practice of identifying hazards through toxicologic testing is being replaced by efforts to characterize hazards by evaluating mechanic data and developing biologically-based models. Hazard characterization involves the integration of empirical observations in human studies and toxicity tests with *in vivo* and *in vitro* data in order to develop references regarding the biological basis for potential hazards in humans. Identification of hazards should provide data on measurable biochemical or cellular endpoints which can serve as biomarkers of response for more complex adverse biological effects. An effort should be made to provide insights into the shape of the dose-response relationship. Ideally *in vitro* data should be able to extend the dose-response relationship established by *in vivo* studies to lower the levels based on increased ability to detect responses in individual cells. It is essential to identify potentially sensitive populations on the basis of molecular or cellular characteristics, and to obtain maximum data for quantitative assessment and the use of meta-analysis and other approaches to combining data sets in dose-response assessment should be developed. Finally, attention should be focused on better characterizing risks through more robust discussions of strengths and weaknesses of both data and inferences, and the impacts of assumptions and uncertainties in the assessment of the process.

W.W. Greaves (Department of Preventive Medicine, Medical College of Wisconsin, USA) presented objectives and standardization methods for the Material Safety Data Sheet (MSDS) developed with a multinational chemical corporation. Each chemical undergoes a health hazard determination in view of its carcinogenity, corrosity, acute toxicity, including oral LD50, dermal LD50 and inhalation LD50, skin irration, sensitization, target organ effects, mutagenicity, teratogenicity, neurotoxicity and epidemiology, permissible exposure limit and threshold limit value, synergistic products/conditions aggravated by exposure, health hazard as defined by OSHA and reference list. Once a health hazard determination is completed with all available data about a chemical material, the toxicology review of the MSDS for that material should take into consideration: ingredients and their percentage, route of exposure, exposure limits, effects of overexposure including acute and chronic. The Sheet should also include all legal regulations, especially those applying to potential carcinogens, and finally the first aid/medical notes to doctor statements, including separate statements for eyes, skin, inhalation and ingestion. The first aid statements have been standardized for use in Canada, the EEC and the US. Setting of exactly precised criteria has improved uniformity of first aid recommendations, very helpful particularly for non-professionalists.

C.S. Schwartz (Pfizer Inc. New York, USA) discussed the research-based establishment of occupational exposure limits (OELs) for active pharmaceutical agents within the pharmaceutical industry. The results of extensive pre-clinical (i.e., animal) and clinical (human) studies are used for identifying the criteria for the distribution of toxic substances. The author mathematically extrapolated experimental data obtained in animal experimentation or clinical trials to a "healthy" worker population in order to identify safety limits. A recommended OEL is generated, using a standard mathematical algorithm in order to calculate concentrations which do not induce any morphological or physiological changes. OELs are submitted before an internal, technical review committee for corporate adoption before being disseminated worldwide.

R. Bluhm (Occupatient Medical Services, Centre of Clinical Pharmacology, University of Pittsburgh Medical Centre, USA), an outstanding researcher in the area of occupational mercury poisoning, presented the results of the long term evaluation of 26 men acutely exposed to elemental mercury vapor during the period ranging from 19 to 570 days. All patients had serial measurements of blood mercury, urinary excretion of mercury and serum and urinary biochemistry. A battery of neuropsychological tests was conducted over this same period of time. A short comparative trial of N-acetyl-D, L-penicillamine (NAP) and 2,3-dimercaptosuccinic acid (DMSA) was conducted in a selected sub-group of the patients with persistently elevated urinary mercury concentrations.

Clinical symptoms relating to occupational exposure to mercury vapor were manifested by headache, fatigue, fever, chills, decreased appetite, and respiratory congestion. Most subjects also experienced gastrointestinal symptoms of diarrhea, abdominal cramping and stomatitis. Genitourinary symptoms, including dysuria and ejaculatory pain were also reported. New and sustained psychological symptoms of irritability, increased temper, mood changes, decreased sociability and uncharacteristic behavior were common.

Mercury blood did not correlate with the severity of symptoms observed in exposed workers. During chelation therapy there were no measurable increases in blood mercury. Urinary mercury excretion was expressed either as mcg/g creatinine or urine mercury mcg/24 hours. In more than half the subjects initial urine mercury excretion was about 100 mcg/day, indicative of significant exposure. During the time of chelation therapy, treatment with DMSA produced a 3 fold increase in mercury excretion while the increase with NAP was 2 fold in comparison with excretion in subjects non-treated but removed from further exposure to mercury vapor. There was significant association between excretion rates before and during chelation, but the quantitative amounts of mercury removed by chelation therapy were negligible in comparison with the exposure. The quantitative relationship between mercury measurements and neurotoxicity was evaluated with the use of tests of neuropsychological function. Tests measuring psychological distress and tests involing motor function appeared most affected throughout the evaluation period. Data was consistent with a dose-response relationship between the extent of mercury exposure and sustained neuropsychological deficit.

Renal dysfunction was manifested by hyperchloremia with a low or normal bicarbonate level. This was noted in all patients and correlated with the period of time during which urinary mercury excretion was elevated, suggesting a reversible renal tubular deficit.

In summary, clinical symptomatology, serial mercury measurements, serum biochemistry and specific tests of neuropsychological function aid in the interpretation of elevated mercury levels and the prediction of prognosis. Following dosing with chelation agents, mercury excretion is transiently increased but it remains to be proven that this confers benefit to the patient.

When measured late after exposure, mercury levels may not be elevated in clinical toxicity even when neuropsychological tests are still abnormal. Therefore, persistent neurological disorders can be expected after longer exposure even it is already ceased.

R.O. McClellan (Chemical Industry Institute of Toxicology, USA), giving an overview of health risk assessment in the chemical industry, stressed that this problem is very old – how else could humans have survived if they had not made decisions that tended to minimized risks and maximized safety. Such decisions have been made since time immemorial and continue to be made on an *ad hoc* basis everyday by all of us. On the other hand, the more formalized process of risk assessment is a relatively new phenomena that came into vogue during the last two decades. This new formalized risk assessment process is largely concerned with what might happen with lifetime exposure even to low levels. The present formalized structure includes: research, risk assessment, and risk management, and risk communication as added by the author. In his opinion excessive attention directed to the relationship between risk assessment and risk management and underestimation of the relationship between research and risk assessment, observed during the past decade, has contributed to a slow rate of progress in replacing conservative default options with specific science. With legislative reform calling for increased use of risk assessment, there is a special need to focus research activities so that the results will have impact in reducing the uncertainity in assessing human health risks of chemical exposures. The reseach should, first of all deal with risks of chemical exposures to specific and not commonly used chemicals.

F. Schuckmann (Hoechst Aktiengesellschaft, Department of Occupational Medicine, Frankfurt am Main, Germany) presented the problems of efficient occupational health care for certain carcinogenic substances on the example of dichlorobenzidine (DCB), classified as carcinogenic in animal studies. It requires particular attention on account of its skin absorption. Special studies have been dedicated to the relationship between DCB concentration in air and urine changes. The Hoechst Laboratory has developed a method for detecting DCB in urine and has established on this basis an internal tolerance value. Any value above the detection limit means that exposure must be ceased. Routine biomonitoring is supplemented by frequent tests of the urine for blood and pathological bladder cells. Two large mortality studies have not yielded elevated incidence of bladder cancer in persons exposed to dichlorobenzidine.

P.A. Valberg (Harvard School of Public Health, Cambridge, Massachusetts, USA) discussed the up-dated results of epidemiological studies of exposure to electric and magnetic fields. Some epidemiological studies showed association between exposure to electric and magnetic fields and leukemia or brain cancer in electrical workers. Other studies showed an association of childhood cancer with utility-wire configuration outside the child's home. The present epidemiological studies joined with a very precise measurement of EMF have not established a causal relationship between exposure to EMF and adverse health effects. A mechanism by which ambient, power-line EMF could modify biological function has not been identified. Studies of EMF health effects within a context of causes of morbidity and mortality in the US population are being carried out.

D.H. Marks (Technology and Policy Program, MIT, USA) stressed that for almost ten years, various environmental groups have been calling for a ban of chlorine use in industrial chemistry on the grounds that such use inevitably leads to the production of persistent, bioaccumulative toxins. Chlorine is used in the pulp and paper industry and also as a water treatment disinfectant. Recently, biologists and medical researchers have turn attention to some endocrine disruption (especially estrogen mimicking) in humans and mammals, however, these observations have not yet been fully confirmed and it is still unclear whether endocrine disruption is induced by chlorine or by other factors. The author focuses on the controversy between industry and environmentalists, however, in his opinion there is no evidence to-date that chlorine is a harmful environmental pollutant. This issue requires further investigations.

D.R. Cohn (MIT, USA) described a new method for medical waste treatment using electrically conducting gases (plasmas). Relative to incineration, plasma treatment can be significantly more controllable and can be carried out over a much wider range of temperatures up to 1700° C. The research furnace has capability for operation at power levels up to one megawatt and continuous processing rates of up to 700 pounds of material per hour.

Cold plasma technology operating with gas temperatures near room temperatures can be used for highly efficient, selective treatment of gaseous waste streams with dilute concentrations of toxic compounds. An electron-beam generated cold plasma has been developed at MIT for treatment of 1 – 1000 ppm concentration

levels of chlorinated compounds in air streams. Using this technology very toxic carbon tetrachloride can be efficiently destroyed.

A device has been also developed for continuous measurements of metals in the off-gas produced by plasma furnaces, incinerators, and other types of thermal treatment facilities. This system could have application in several areas for real-time monitoring of toxic effluents in many industries.

S.H. Lamm (Consultants in Epidemiology and Occupational Health Inc., Washington DC, USA) discussed occupational exposure to sodium azide used as a therapeutic hypotensive agent in the 1950–60s. In the 1990s, it is the primary active ingredient for automobile air bags. Workers in the manufacture of sodium azide are at risk of hypotensive episodes from occupational exposure.

The initial phase of an occupational health surveillance system established at a new sodium azide plant in the United States monitored the occurrences of headaches related with blood pressure decrease; the second phase entailed the daily recording of pre- and post-shift blood pressures, and the third phase entailed the ascertainment of task-specific short-term industrial hygiene measurements with blood pressure measurements taken immediately before and after the industrial hygiene sampling. This strategy was designed to permit the development of a dose-response curve to determine the exposure levels at which a change in the frequency of hypotensive changes could be observed.

J.S. Weiss (Division of Occupational and Environmental Medicine, University of Califoria, San Francisco, USA) focused on reactive airway dysfunction syndrome (RADS) due to sodium azide inhalation, stressing that sodium azide is a highly toxic cellular poison which inhibits iron-containing respiratory enzymes such as cytochrome oxidase, causing cellular asphyxia. The author presented two cases of previously healthy, nonsmoking workers with eye and mucose membrane irritation, shortness of breath, cough, dizziness, lethargy and headache after cleaning up a spill of sodium azide powder. Chemistry studies showed an elevated creatine kinase (> 1500) but not other abnormalities. CBC and chest x-rays were normal. Both were treated with 100% oxygen. The next day both workers were severely dyspneic, and required inhaled bronchodilators. Methocholine challenges done two weeks, three months and one year after the incident were positive in both workers. Despite treatment with inhaled steroids and bronchodilators, they remained symptomatic as of two year post-incident follow-up.

Sodium azide powder was converted to hydrozoic acid in the moist environment of the bronchial airways, and the acid is the most likely agent responsible for causing RADS. The persistence of symptoms in these workers two years after exposure is consistent with other studies of occupational asthma.

E. Radek (Bureau of the ISSA Section of Chemistry and Employment Accident Insurance Fund for the Chemical Industry, Heidelberg, Germany) informed about the activities of the International Social Security Association (ISSA). On 12 June 1995, leading members of the Medical Board and the ISSA International Section for Preventing of Occupational Risks in the Chemical Industry met in Heidelberg. The Chemical Section deals with preventive measures in the chemical industry, including the plastic, paint and coatings, explosives, mineral oil and rubber industries. It is

active internationally in those fields which are suitable for promoting the prevention of occupational accidents and illnesses in its areas of competence, and particularly through international congresses, work-groups and publications. The Section's working languages are German, English and French. All brochures are translated into at least these three languages.

Medichem and ISSA Section of Chemistry wish to promote future cooperation with other relevant organizations, particularly through exchanging information on their events and activities.

Among presentations of poster session the following ones deserve to be briefly mentioned.

M. Coombs (Sentrachem Ltd., Sandton, South Africa) discussed results of the studies carried out in a plant that converts cobalt metal to cobalt oxide for the pigment industry. The environmental and urinary cobalt monitoring indicated environmental exposure of up to 100 times the threshold limit values which according to the American Conference of Governmental Industrial Hygiene (ACGIH) should not exceed 0.02 mg/m^2, and urinary cobalt levels of up to 30 times the biological exposure index (30 μg/g of creatinine according to ACGIH). Periodical closure and cleaning-up of the plant as well as improved personal protective equipment decreased considerably environmental and urinary levels of cobalt. In persons exposed, only two health problems were found: cardiomyopathy with indications of alcohol abuse and one heart failure (post mortem diagnosis).

K. Kotseva (Clinic of Occupational Disease, Medical University, Sofia, Bulgaria) presented a five year follow-up study of the incidence of arterial hypertension and coronary heart disease in vinylchloride monomer and polyvinylchloride production workers. The study was performed on 105 workers (68 men and 37 women) aged 20–60. The results were compared with the control group ($n = 105$, matched by age and sex) without occupational contact to noxious chemicals. The results indicated that a five-year cumulative incidence of arterial hypertension was 15.24% in exposed and 6.67% in nonexposed workers (relative risk = 2.28; 95% confidence interval 1.67 – 3.11; $p < 0.05$; population attributable risk = 39.12%). In regard to coronary heart disease the results were: 7.62%, 5.71%; 1.33; 0.83–2.14; $p < 0.05$, respectively. No significant differences were observed between the two groups of exposed and not exposed persons. Data on salt consumption, body mass index, tobacco smoking and hypercholesterolaemia were also taken into account. Incidence of arterial hypertension was singiciantly higher in the group of exposed workers.

T. Kubo (Department of Hygiene, St. Marianna University School of Medicine, Kawasaki, Japan) presented a case study of a worker engaged in antimold spraying of 1% solution of preventol diluted with methanol and ethanol. The solution was sprayed in a closed living room. Twelve hours after the initial spraying, he began to complain of fuzzy and heavy feeling in the head, and developed a tendency to sway although he tried to look directly at the work area. Since the work generally continues for several days, the signs and symptoms persisted, however, within 10 days after completing the work the signs and symptoms completely disappeared.

Antimol spraying work was performed both in the morning and in the afternoon and all the members of a residence, including children were prohibited from entering the living room for about one hour after spraying. After one hour, the room was fully open, and 30 minutes thereafter all the residents were permitted to enter the living room. These family members have never developed the signs and symptoms described above.

The use of methanol was then prohibited and workers were advised to wear a face mask during spraying and to breathe fresh air frequently. After excluding methanol for diluting the antimold, no workers of this company have developed signs and symptoms which could be attributed to methanol inhaling.

M.C. Saxena (Environmental Research Laboratory, Lucknow, India) presented alarming statistical data on mortality in developing countries due to the use of pesticides in agriculture which accounts for half of the global mortality despite the fact that only one sixth of the world production is consumed in those countries. He also stressed that pesticides banned long time ago in developed nations are still used in the Third World countries.

Placental transfer of chlorinated pesticides and a possible involvement of DDT and its metabolites in premature labour/abortions in women from developing countries associated with pesticides offer a new challenge to health education in these countries.

R.J. Wrbitzky (Institute and Out-Patient Clinic for Occupational, Social and Environmental Medicine, University of Erlangen, Erlangen-Nuremberg, Germany) discussed external and internal monitoring in workers exposed to N,N-Dimethylformamide (DMF). Due to its miscibility with water and various organic compounds, DMF is one of the most broadly used solvents mainly in the pharmaceutical and chemical industries, first of all, in the production of synthetic fibres and synthetic leather.

N-Methylformamide (NMF) and N-acetyl-S(N-methylcarbamyl) cysteine (AMCC) can be dedected as metabolites or their transformation products in urine of exposed workers. In Germany MAK value for DMF is 10 ppm (ml/m) or 30 mg/m^3 (since 1992). In 1993 it was set that NMF concentration should not exceed 15 mg/l urine. This is the value resulting from exposure to 10 ppm providing only inhalation uptake of DMF. It should be also taken into consideration that DMF is almost completely absorbed by the skin. The author presented results of the studies carried out in a fibre-producing factory in which DMF levels in the air did not exceed MAK value, however, in more than half of workers' excretion of metabolites in urine was significantly increased, in some cases even up to ten times. Detection of NMF before the beginning of the shift with concentrations up to 15 mg/l urine indicates a relatively long half-life and possible accumulation of DMF.

Oin Yongmei (Occupational Safety and Health Institute, Qingdao, China) focused on the liver damage by exposure to chromium (CrO_3). The study covered 211 workers (174 males and 37 females). The results were compared to a matched control group composed of 322 workers (202 males and 120 females) not exposed to chromium. In the exposed group prevalence of hepatitis was 10.4% (22/211) and in the control group 4,5% (14/322) and the rate of hepatomegaly was 25.6% and 7.1%, respectively.

The decision has been taken that the next four MEDICHEM Congreses will be organised in Stokcholm (1996), Varna (1997), South Africa (1998) and Singapur (2000).

J.A. Indulski

P.S. The report would not be complete without stressing excellent organization, friendly care, nice attractions and kind hospitality experienced at Professor B. Cunney's home. In congratulating him, I would like to express my warm appreciation for his enormous contribution to the success of the event and for his warmhearted attitude.

Dinner for all MEDICHEM Participants. At the centre, Mr. President himself savouring lobsters!!!