

cancer in rats. Studies of worker populations with occupational exposure to airborne RCFs have shown an association between exposure and the formation of pleural plaques, increased prevalence of respiratory symptoms, decreases in pulmonary function, and irritation.

AFSSET-OEL committee considered that the carcinogenic potential of RCFs is linked to a genotoxic mechanism with no threshold mode of action. A model assuming a linear relationship between dose and the response (lung cancer) have been used to establish the occupational exposure limit.

Using the approach of benchmark dose modelling such as described by Maxim et al. (2003) which produced RCF unit potency values ranging from 1.4×10^{-4} to 7.2×10^{-4} , the model retained by AFSSET-OEL committee indicated that an excess cancer risk of 10^{-4} is associated with a concentration of 0.02 respirable f/cm³ based on 40 years of occupational exposure. The linear modelling approach in this analysis of the exposure–response relationship using the animal data takes into consideration possible differences in dosimetry and lung burden between rats and humans.

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P104-003

Dose-dependent neurologic abnormalities in workers exposed to 1-bromopropane

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Objectives: 1-Bromopropane (1-BP) is a neurotoxic compound in animal and human, but its dose-dependency in human remains elusive. The present study investigated the health effects of 1-BP and its dose-dependency in workers.

Methods: Data of 60 female and 26 male workers in three 1-BP factories in China and the same number of age-, sex- and region-matched controls were analyzed. Workers were interviewed and examined with a battery of neurobehavioral tests, nerve conduction velocity tests in lower limbs, vibration sense, hematological and biochemical tests. The time-weighted average (TWA) exposure levels of individual workers were estimated with passive samplers. The exposed workers were divided by the median value of the individual exposure level into two groups of equal number for analysis of variance (ANOVA) followed by regression analysis on exposure level.

Results: Regression analysis on exposure level following ANOVA showed dose-dependent increase in distal latency of tibial nerve and threshold for vibration sense in both toes in female workers. The analysis also showed dose-dependent decrease in scores of tension and fatigue of profile of mood status (POMS) in female workers. Blood urea nitrogen (BUN), aspartate aminotransferase, lactate dehydrogenase and follicle stimulating hormone increased dose-dependently in female workers and BUN increased dose-dependently in male workers. Red blood cell (RBC) and hematocrit showed dose-dependent decrease in female workers. Among parameters showing significant dose-dependency, DL, vibration sense in both toes, Fatigue of POMS and RBC showed significant difference from the control in low-exposure group (median of exposure level: 2.21 ppm) as well as high-exposure group (median of exposure level: 18.31 ppm) in female workers.

Conclusions: The results suggest that exposure to 1-BP induces dose-dependent neurotoxicity and possible hemato- and hepatotoxicities in female workers. The study suggests that the lowest adverse effect level is 2.21 ppm.

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P104-004

Risk assessment in occupational exposure to formaldehyde: Differences between anatomy and pathology laboratories and formaldehyde-resins production

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Formaldehyde (CH₂O), the most simple and reactive of all aldehydes, is colorless, and readily polymerizing gas at normal temperature. The most extensive use is in production of resins and has an important application as a disinfectant and preservative, reason why relevant workplace exposure may also occur in pathology and anatomy laboratories and in mortuaries.

A study was carried out in Portugal, in a formaldehyde production resins factory and in 10 pathology and anatomy laboratories. It was applied a risk assessment methodology based on Queensland University proposal that permitted to perform risk assessment for each activity developed in a work station. This methodology was applied in 83 different activities developed in the laboratories and in 18 activities of the factory. Also, Micronucleus Test was performed in lymphocytes from 30 factory workers and 50 laboratories workers.

In the factory, 94.5% of the activities were classify with low risk and 5.5% with high risk. In the laboratories, 1.41% of the activities were classified with very high risk, 36.32% with high risk, 15.49% with medium risk and, finally 46.48% with low risk. These results were confirm with the results of the Micronucleus Test perform in both groups that showed micronucleus mean in lymphocytes was significantly higher in the workers from the laboratories ($p < 0.05$).

Results obtained suggest that preventive and protective measures must be applied particularly in anatomy and pathology laboratories in order to reduce occupational exposure to this chemical agent and, subsequently to prevent adverse effects on workers health.

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Occupational exposure to formaldehyde in anatomy and pathology laboratories: Differences between exposure groups?

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Formaldehyde, also known as formalin, formal and methyl aldehydes, is a colorless, flammable, strong-smelling gas. It has an important application in embalming tissues and that result in exposures for workers in the pathology anatomy laboratories and mortuaries.

To perform exposure assessment is necessary define exposure groups and in this occupational setting the technicians and pathologists are the most important groups. In the case of formaldehyde, it seems that health effects are more related with peak exposures than with exposure duration.

A study was carried out in Portugal, in 10 pathology and anatomy laboratories where it was studied the exposure to formaldehyde in each activity and also the health effects in pathologists group ($n = 12$) and technicians group ($n = 32$) by applying the Micronucleus Test in lymphocytes in both groups.

The activity, in the pathologist group, that involve a higher exposure to formaldehyde is the macroscopic exam with 95.6% of the time of measuring with results bigger than the reference value for ceiling concentrations proposed by Occupational Safety and Health Administration (0.3 ppm).

The higher ceiling concentration (5.02 ppm) was found also during a macroscopic exam. However, the mean of ceiling concentrations it is higher in technicians group than in pathologists group. Concerning the health effect there was not found significantly difference between the mean of micronucleus in the two groups ($p > 0.05$).

The results are consonant with several studies that point these kinds of laboratories as the occupational setting where the workers are frequently exposed to high peak formaldehyde concentrations. Maybe exposure duration has also an important influence in the genotoxicity effect because it increases the probability of being exposed to high concentrations and, in this case, both groups have similar exposure duration.

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Child labor and health: Exploratory study from a public market in Valencia, Venezuela

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This study was done to determine life conditions, work practices, health effects and associated occupational risks factors in working children from a public market, in Valencia, Venezuela. A questionnaire was administered including demographic and exposure variables with special emphasis on occupational risks. A descriptive analysis was done with the data. Forty four (44) children (37 boys and 7 girls) were selected, mean age 14.4 ± 2.3 years old. The average workday was 9.25 ± 3.2 h/day. The most frequent activity was provisions and fruits retail sale (43.2%). There were 22.7% of the studied population with evident school delay. Work-related symptoms more reported were neurologic: headache (84%), stress (59.1%) and fatigue (68.2%). Skeletal muscle symptoms were feet ache (36.4%), followed by both legs ache (34%) and both shoulders (15.9%) related to carrying heavy load (40–50 kg bags). Occupational accidents were reported in 11.4% children and 2.3% suffered an occupational disease related to the present activity. Occupational risks more frequent were: heat discomfort (93.2%), noise (88.6%) and repetitive work (84.1%). Chemical risks more reported were environmental particles (40.9%) and organic toxic wastes (31.8%). Like publications that show that stress negative impact is more severe in children under 10 years old, it was found a significant, indirect correlation between age and stress ($p = 0.004$). Association of age and occupational risks exposure resulted also in a significant, indirect correlation with exposure to organic toxic wastes ($p = 0.017$) and work under pressure ($p = 0.04$). There is not a systematic data collection program to assess child labor in our country even though a variety of risk factors were identified and perceived for children. For further assessment of the problem, more

sensitive indicators are required in order to identify early effects and the way to control exposure to the above mentioned risks.

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Health based OELs of chemicals in Poland in 2009

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Objective: In 2009 The Group of Experts for Chemical Agents (GECA), worked in Nofer Institute of Occupational Medicine in Poland proposed health based Maximum Admissible Concentrations values (MAC) for 14 new dangerous chemical agents in the working environment: 2-(diethylamino)ethanol, 2-ethyl cyanoacrylate, butano-2,3-dione, trimelitic anhydride, 2-ethylhexyl acrylate, diethyl sulphate, bromoethene, trichloroacetic acid, nitroethane, trichloroethene; EDTA, tetrachloroethene, pentabromodiphenyl ether, tional chloride. Health based values, are derived from the most recent scientific data available and taking into account the availability of measurement techniques. The following categories of MAC values are used: NDS–MAC(TWA): maximum admissible concentration; NDSCh–MAC(STEL): maximum admissible short-term concentration; NDS–MAC(C): maximum admissible ceiling concentration.

Method: The MAC values in Poland have been set as follows: GECA within the Interdepartmental Commission for Maximum Admissible Concentrations and Intensities for Agents Harmful to Health in the Working Environment performs a critical evaluation of the documentation for the MACs prepared by individual members of the team. The experts prepare health-based documentation for recommended exposure limits along with analytical procedures, recommendations on pre-employment and periodical medical examinations and contraindications to exposure. The experts review all available data and information: experimental animal and human data, structure activity relationship, occupational (human) experience and select most relevant study and dose descriptor. In practice, the scientific data base to set an OEL is not ideal. GECA deals with this by using uncertainty factors. Those proposals are presented during a session of the Commission including representatives of the ministries of health and labor, and representatives of industry and of scientific institutions.

Results: Polish OELs are legally binding administrative norms. To 2009 there are 504 health based MAC values for chemical substances in Poland regulation. Conclusions: An improvement of working conditions is the aim of those activities.

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The ease estimating of occupational inhalation exposure to three organic solvents: Toluene, ethyl acetate and acetone

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Objective: The exposure assessment is based on representative measured data and/or on model calculations. The EASE (Estimation and Assessment of Substance Exposure) model implemented to EUSES 2.1. (The European Union System for the Evaluation of Substances) was used to estimate occupational inhalation exposure to three organic solvents: toluene, ethyl acetate and acetone