



# Book of Abstracts

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## Poster Number 181 – 184

CHEMICAL SUBSTANCES, WORK AND NEUROLOGIC ALTERATIONS:  
POSSIBLE RELATIONS EXISTING BETWEEN THESE VARIABLES

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**Aim.** To look for written information in hospital medical records of patients with neurologic alterations, mainly of unknown etiology to demonstrate possible relations between the use of chemical substances on the present/previous job of the patients and their neurologic problems.

**Method.** The incidence of patients seen at a 300-bed general hospital in the city of Ribeirão Preto, Brazil, in 1994 with medical diagnoses nos. 333 to 337, 341, 342, 344 and 353 to 359 of the International Disease Classification (ICD) and their identification data were surveyed, and the hospital medical records for individuals seen during the first trimester of 1994 had been examined by December 1995.

**Results.** The medical records of 239 of the 926 patients with the IDC diagnoses listed above have been examined thus far (25.8%; diseases nos. 333 to 337, 342 and 344). For 33 of these 239 patients (13.80%) there was some written information about manipulation of chemical products by the patients themselves or in services where they worked/worked. Fifteen of these 33 patients (45.45%) were involved in activities related to agriculture, i.e., they were laborers, sugar-cane cutters, farm vehicle drivers and custodians of large or small farms. Of these 15 subjects (all of them males) who were in contact with pesticides, 53.3% were single, 80.0% were white and 40.0% were 20 to 39 years old. Eight of them (53.33%) received diagnoses of degenerative diseases of basal ganglia, essential tremors, myoclonia, idiopathic distortion dystonia and other pyramidal diseases; 4 (26.6%) were quadriplegic, had neurogenic bladder and unspecified paralytic syndrome, and 3 (20.0%) had motor neuron diseases and other myopathies. Of the remaining 18 patients (54.54%), 11 (33.33%) were maids or housewives. Seven of these (63.0%) were married, 10 (90.9%) were white and 27.2% were 39 to 49 years old. One had a history of previous occupational exposure to pesticides and another had attempted suicide by ingesting a chemical product. Four of the last 7 patients (12.12%) were construction workers, most of them white, married and 30 to 65 years old; one of them had a previous history of pesticide manipulation. The other 3 (19.09%) were a shoemaker, a saddle maker and a carpenter with essential tremors, cerebellar atrophy and amyotrophic lateral sclerosis. In the other 206 medical records there was no information about work, and some of them were for children who are assumed not to work.

**Conclusion.** The scarce information about the patient's job in the medical records impaired the determination of possible relations between job and neurologic disease of unclear diagnosis and demonstrated the low importance attributed to these two items. Since the Ribeirão Preto region produces the largest amount of sugar-cane in Brazil, probably a larger number of patients had contact with pesticides, a fact that would probably increase the series and would permit us to infer that contact with these substances may favor the onset of these diseases. When all records will have been examined, we intend to interview the patients and/or their relatives to investigate previous/present contact with chemical products. The hospital staff should properly appreciate the question of occupation in order to obtain data for the investigation of probable relations between work and diseases of unknown etiology.

MULTICENTER STUDY ON NEUROBEHAVIORAL EFFECTS OF  
OCCUPATIONAL EXPOSURE TO ANESTHETIC GASES

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**Aim.** To evaluate neuropsychological symptoms, subjective stress and response speed functions in subjects occupationally exposed to low levels of anesthetic gases.

**Methods.** A group of 112 operating room personnel and 121 hospital workers not exposed to anesthetic gases from 8 hospitals in Northern Italy were examined before and after the shift of the first and the last day of the working week. Three different tasks were administered: a complex reaction time test (the Stroop Color Word from the EURONEST battery); a questionnaire for neuro-psychological symptoms (EUROQUEST); the block design subtest (WAIS). Biological and atmospheric indicators of exposure were measured.

**Results.** The geometric mean of atmospheric nitrous oxide was respectively 23.2 ppm (95% upper 44.3) and 20.6 ppm (95% upper 39) on the first and the last day of the working week. On the same days, the geometric mean of urinary nitrous oxide was respectively 7.1 (95% upper 9.7) and 7.8 µg/l (95% upper 12.9). The exposed and control subjects were comparable for both basic abilities and subjective stress levels. Although a slight tendency towards slower response speed was noticeable in the oldest age class (between 42 and 60 years), no statistical differences resulted between exposed and control subjects on neuropsychological tests and symptoms. No dose-effect relationship were observed between the exposure indicators and the test results.

**Conclusions.** No early behavioral effect on the central nervous system was detectable at low exposure levels to nitrous oxide. The concentration of 25 ppm, which corresponds to the NIOSH exposure limit value for nitrous oxide, seems to be protective enough for the integrity of workers' neurobehavioral performance.

SUBCHRONIC NEUROBEHAVIOURAL EFFECTS OF OCCUPATIONAL STYRENE EXPOSURE:  
REVERSIBILITY

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**Background.** Fifteen cross-sectional studies report neurobehavioural effects in workers exposed to styrene. Diminished attention, impaired learning capacity and memory and effects on visuo-motor performance are the most reported effects of chronic exposure. Reversibility has only been studied after short-term cessation of exposure, and the results of these studies are conflicting. To study this item, a group of previously exposed workers had to been found, which had not ceased laminating on medical grounds.

**Methods.** We contacted a group of 185 workers, who had been laminating in 1984-1985. Of these workers 19 (10.2%) were deceased or couldn't be traced and 31 (16.8%) refused to participate. Of the 135 (73%) participating workers, 17 were excluded due to study criteria, 28 were still exposed and 90 had not been exposed for more than 2 years. The ex-styrene exposed workers had been fired in 1988-1989, due to a reorganisation. This had been supervised by the unions, handling pure socio-economic rules. An age and education matched control group was asked to participate (n=64). A self-administered questionnaire was given to evaluate possible other co-variables and neurological complaints (NSC-60). Computerised neurobehavioural tests (NI 8) were done. A semi-quantitative exposure index was calculated by counting the hours that every single individual had been doing a specific laminating task during the period 1982-1989. Of every laminating task historical exposure levels had been investigated. Exposures were general well below the TLV. The exposure index of the control group was defined as zero.

## Results:

1. Vocabulary scores correlated with the exposure index, even after correction for educational level and other factors which might have influenced the results ( $p=0.02$ ).  
2. Even after correction for motivation, educational level, hobby-solvent use, alcohol-use and age, Symbol Digit Substitution ( $p=0.02$ ) and Hand-Eye Coordination results ( $p<0.01$ ) were correlated with the exposure index.

## Conclusions:

1. Vocabulary test scores seem to be influenced by styrene exposure, and are therefore not suitable as an independent co-variable, measuring intelligence.  
2. The subchronic neurobehavioural effects of chronic styrene exposure seem to be irreversible even after complete cessation of exposure, and seem to be dose related, making it possible to build up a 'neurotoxicological debt'.

LONG-TERM NEUROBEHAVIOURAL EFFECTS OF 28 DAY INHALATION EXPOSURE  
TO PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE) IN LABORATORY RATS

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**Aim.** Pseudocumene (1,2,4-Trimethylbenzene) is a component of some paint solvents and high octane fuels. There are no literature data confirming or denying a role of this hydrocarbon in induction of long-lasting neurobehavioural disturbances which may develop in workers exposed occupationally to organic solvents. The purpose of this study was to look for behavioural and EEG consequences of 28 day inhalation exposure to pseudocumene in rats.

**Methods.** In 60 male LOD-Wist rats effects of four-week inhalation exposure to pseudocumene vapours (6h daily for five days a week at concentrations 0, 25, 100 and 250 ppm) on electrocortical activity and on behavioural performance in some test situations were studied starting two weeks after cessation of the exposure. The following behaviours were assessed: 1) radial-maze performance, 2) spontaneous activity in an open-field, 3) passive avoidance learning, 4) hot-plate behaviour, and 5) acquisition of a conditioned active avoidance response in a shuttle-box. One-hour EEGs were performed three times: before the exposure, on day 1 and day 30 after the exposure.

**Results.** No effects of exposure on radial maze performance and open field activity were noted. In rats exposed to 100 and 250 ppm of pseudocumene, however, learning of the passive avoidance as well as active avoidance response was impaired, and the paw-lick latency to the thermal stimulus was prolonged but only on repeated testing. Moreover, as the analysis of electroencephalograms revealed, the occurrence of bursts of spike-wave discharges, a frequent component of the rat ECoG, was markedly inhibited in these rats.

**Conclusion.** The results suggest that inhalation exposure to pseudocumene may result in a long-lasting, if not permanent, functional disturbances within the central nervous system.