

**Introduction** Brain-derived neurotrophic factor (BDNF) is involved in synaptic plasticity and may be modified by H3K4me3, thus affecting learning and memory. This study aims to investigate the influence of occupational aluminium exposure on cognitive function and its relationship with H3K4me3 and BDNF levels.

**Methods** By cluster random sampling method, 235 male workers from Shanxi Aluminium Company who occupationally exposed to aluminium were recruited in the study. A group of cognitive tests were performed, in which includes Mini-Mental State Examination (MMSE), CDT, DST, FOM and VFT. Concentration of Aluminium in plasma was tested by graphite furnace atomic absorption spectrometry. The subjects were divided into three groups by the 25, 50 and 75 percentile of the blood aluminium concentration, as low, middle and high aluminium concentration group. The contents of H3K4me3 in lymphocyte and BDNF in plasma were determined by enzyme-linked immunosorbent assay.

**Results** The levels of aluminium in plasma were 100.19, 134.36 and 178.96 µg/L respectively. The scores of MMSE, DSFT, DST of high blood aluminium concentration group were lower than those of low and middle blood aluminium groups (27.98±1.53 vs 28.68±1.54, 27.98±1.53 vs 28.23±1.53, 9.19±2.00 vs 10.61±2.90, 9.19±2.00 vs 9.95±2.32, 15.27±3.11 vs 17.59±4.63, 15.27±3.11 vs 16.17±3.86,  $p<0.05$ ). The scores of CDT, DSFB, FOM, VFT among three groups had no statistical significance ( $p>0.05$ ). The expression levels of H3K4me3 and BDNF of high blood aluminium group were lower than those of the low (20.95±3.91 vs 28.18±8.79 ng/µg protein, 26.07±10.18 vs 31.15±9.85 µg/L,  $p<0.05$ ) and middle blood aluminium groups (20.95±3.91 vs 25.78±6.30 ng/µg protein, 26.07±10.18 vs 26.91±10.27 µg/L,  $p<0.05$ ). Multiple correlation analysis showed that Blood aluminium concentration was negatively correlated to H3K4me3, BDNF, MMSE, DSFT, DST, respectively ( $r=-0.307, -0.175, -0.229, -0.206, -0.173, p<0.05$ ).

**Discussion** Long-term occupational exposure to aluminium may impair cognitive function, along with the decreasing of H3K4me3 level in lymphocyte and BDNF protein expression in plasma.

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#### MYOCLONIC SEIZURE AFTER ACUTE AND CHRONIC OCCUPATIONAL EXPOSURE TO 'THINNER' PRIOR TO DIAGNOSIS OF CHRONIC TOXIC ENCEPHALOPATHY – BELGIAN CASE-REPORT

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**Introduction** 'Thinner' is an industrial mixture of organic solvents (OS). Exposure to OS is usually not considered as possible cause of epilepsy. A case that shows a remarkable coincidence between exposure to OS mixture and occurrence of epileptic seizure is reported.

**Methods** We present the case of a Belgian woman, occupationally exposed to organic solvents for more than 20 years. She

was admitted to the hospital after a seizure with myoclonic movements at the workplace.

**Result** This event was her first epileptic insult. Classic signs and symptoms of acute solvent intoxication (e.g. headache, nausea, asthenia, feeling of drunkenness, sleeping disorder) were present since she worked permanently for over 2 months with 'Thinner', containing high toluene levels, neither with proper collective nor individual protection in a poorly ventilated workplace. Electroencephalogram and computed tomography of the head were within limits. Non-toxicological causes (craniocerebral trauma; infection; familial disposition; known history of prenatally, perinatally, or childhood disease) and some toxicological causes (alcohol or addictive substances abuse) were excluded. No anti-epileptic drugs were started because of this first epileptic episode. Seizures did not reappear after work removal, although intoxication signs and symptoms remained. Two years after the seizure, she was diagnosed with Chronic Toxic Encephalopathy (CFE) type 2b.

**Discussion** Being volatile, OS rapidly contaminate the working environment and pose a major health risk in occupational settings. Myoclonic encephalopathy has been reported in toxic conditions, e.g. after exposure to solvent Trichloroethylene. Epileptic discharges have been described on EEG recordings among CFE patients. This case emphasises a possible unusual neurological presentation of occupational exposure to toluene. This clinical picture may be explained by lowering of the threshold for seizures by the same mechanism as seen for alcohol. It should be kept in mind that OS exposure in badly-ventilated spaces and/or without appropriate protective measures may cause seizures.

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#### LITERATURE REVIEW ABOUT THE EFFECTS OF CHEMICAL EXPOSURE TO LEAD AND CADMIUM IN THE SLEEP-WAKE CYCLE

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**Introduction** The world of work has undergone significant changes, with the adoption of new technologies and the use of various chemicals and minerals in their processes and production methods, expanding and increasing the environmental hazards. A bibliographic survey about deleterious effects on exposure to the chemicals lead and cadmium was conducted in order to verify how this exposure may influence the population's sleep-wake cycle.

**Methods** This is an exploratory study through open access literature review, of systematic type. Search was conducted in the period from 2001 through October 2016. Search strategy has included the use and combination of descriptors and terms: Chemical Exposure; Exposure to Metals; Exposure to Lead; Exposure to Cadmium; Sleepiness; Sleep Disorders; Sleep Disturbances; Sleep-Wake Cycle.

**Results** Twenty-nine studies have been found from the referred theme. Several studies have been performed in animal models. Only three papers reported the effects of metals on sleep-wake cycle. The first one was carried out with a population living in the surroundings of a metal recycling plant, where authors have detected that the exposed population had 2.3 chances to report sleep complaints. The other two studies observed children and pre-teens with high levels of lead in the blood have been associated to delay in the onset of sleep, longer duration of nocturnal awakenings, shorter duration of sleep, insomnia (OR=2.01) and longer daytime sleepiness (OR=2.90).

**Discussion** There are effects which link the environmental exposure to lead and cadmium with sleep complaints. Considering there are several production sectors, such as mining, and manufacturing processing industries that work with such metals and whose workers are in continuous shifts, it is likely that workers in these industries may suffered the effects of metal exposure and those leading to changes in biological rhythms caused by shift work. Financial Support: Faperj (E-10/225.935/2016).

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#### ACQUIRED DYSCROMATOPSIA IN MEXICAN WORKERS OF A CHEMICAL INDUSTRY EXPOSED TO A MIXTURE OF ORGANIC SOLVENTS

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**Introduction** Acquired dyschromatopsia is an early and sensitive marker of ophthalmic neurotoxicity due to chronic exposure to various chemicals. The overall objective of this research was to identify changes in colour vision acquired the personnel occupationally exposed (POE) to a mixture of OS (benzene, toluene, xylene -BTX-).

**Material and methods** A cross-sectional study was conducted in two groups of workers; one occupational exposure to a mixture of OS and one without exposure to the chemical industry. The participants answered a questionnaire to explore risk factors acquired dyschromatopsia. Subsequently, the test Lanthony 15 desaturated (LD-15) in each eye was used to determine the ability of colour discrimination and Confusion Chromatic Index (CCI) was quantified. All ratio >1 was interpreted as abnormally increased. The data univariate and bivariate analysis were submitted. Association tests were implemented (*t* test, Chi<sup>2</sup> and logistic regressions).

**Results** The total population was 142 workers, 5.4% of whom had a profile consistent with congenital dyschromatopsia and were excluded from the final analysis. The group of 73 workers was exposed, while the unexposed group was 65. The average age was 43.9 years ( $\pm 10$ ) and 42.7 years ( $\pm 12$ ), respectively. The prevalence of acquired dyschromatopsia in both eyes was higher for the exposed group; 8% in right eye and 9% in left eye, however, no statistically significant differences from the unexposed group. Quantification of CCI was slightly higher in the exposure group (1.09) compared to the group without exposure (1.08), although the differences between groups were not statistically significant ( $p=0.73$ ).

**Discussion** The results are consistent with those of other investigators; ICC ratio is higher in the exposed group, as

well as the prevalence of acquired dyschromatopsia, being the most common for both groups.

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#### ELECTROENCEPHALOGRAPHIC STUDIES AMONG DRIVERS BEFORE AND AFTER TEST ON BUS SIMULATOR

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**Introduction** The aim of the study was to evaluate the effect of the test on the simulator on the bioelectric activity of the brain of professionally active drivers.

**Methods** Electroencephalography registration was performed with the 32-channel recorder. Electrodes locations were specified by the International 10–20 system. The records were performed before the start of the test on the simulator, which enables full simulation of real road conditions (Exam I) and after its completion (Exam II). A recording was performed, with eyes closed, for 30 min. At 2,5,6,23,25 min of the test, the eye was opened and closed, at the 8th min. – a test of deep breathing (hyperventilation test – 3 min) and intermittent photic stimulation. We used stimulation with frequencies of 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 Hz and back. 45 subjects were enrolled to study. All subjects were bus drivers aged 31–58 years ( $43.5 \pm 7.9$  years), seniority as a bus driver of  $13.3 \pm 8.6$  years. The frequency and amplitude of the basic activity of the brain was analysed and compared between left and right homologous EEG channels in Exam I and II.

**Results** The basic activity brain parameters were analysed at rest, 2–3 min hyperventilation and after activation attempts. In the Exam I hyperventilation revealed a statistically significant difference between basic rhythm frequencies ( $p=0.043$ ). In the left-side channels, the mean value was significantly higher than in the right-side channels ( $10.49 \pm 1.34$  vs  $10.30 \pm 1.19$ ), the difference was not observed in the Exam II ( $10.46 \pm 1.66$  vs  $10.29 \pm 1.64$ ,  $p=0.397$ ).

**Discussion** This difference could not be explained by the physiological response to hyperventilation. There were no differences between the baseline rhythm recorded at rest at both the first and second test. The explanation of these results requires further studies.

## Occupational Health and Development

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#### CALLING OCCUPATIONAL HEALTH TO THE FOREFRONT

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**Introduction** An overview was conducted of the exposure and impact Occupational Health has had in RSA when compared to Safety and the Environmental disciplines. Although Occupational Health eventually established a foothold in RSA during the industrial era of the early 1900's, the discipline appeared to have evolved much slower with limited recognition. A foundation to further develop evidence based strategies that could revitalise the