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EDITORIAL

Occupational health and safety is a multi-disciplinary field which is concerned with safety, health and welfare of people engaged in various working environment. The basic goal is to encourage a safe work environment. According to WHO there are 100 million occupational injuries causing 0.1 million deaths in the world. It has been estimated that in India 17 million occupational non-fatal injuries (17% of the world) and 45,000 fatal injuries (45% of the total deaths due to occupational injuries in world) occur each year (National Programme for Control & Treatment of Occupational Diseases). It is further estimated that out of 11 million cases of occupational diseases in the world 1.9 million cases (17%) are contributed by India and out of 0.7 million deaths in the world 0.12 (17%) is contributed by India. The occupational health, safety and risk scenario is very complex, here maximum number of work force is engaged in unorganised sector. The major concern in this sector are improper infrastructure and lack of adequate information with reference to occupational safety measures as well as legislation. Occupational Safety and Health (OSH) issues in India are governed by two different ministries 1- Health Ministry and 2- Ministry of Labour, so chances is always there that there may be lack of coordination. In order to address these problems, Government of India approved a National Policy on Safety, Health and environment in 2009.

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ODDS AND ENDS

Health risk factors in different seasons of carpet industry in Kashmir, India.

Carpet workers are exposed to different types of health risk factors in different seasons of the year. As the environmental conditions become harsh, risk for developing various types of diseases increases. These problems are further aggravated when the environmental conditions at the workplace deteriorate. An attempt has been made to study the health risk factors in the carpet industry in different seasons of the year. It has been concluded that in winter weavers are affected by several types of health risk factors as compared to the other seasons.

[Int J Occup Saf Ergon. 2012 ; 18 (4) : 571-7.]

Association of gene polymorphism in detoxification enzymes and urinary 8-OHdG levels in traffic policemen exposed to vehicular exhaust.

With rapid economic growth and massive development of transportation, the number of automobiles has greatly increased. Traffic police are the one of the vulnerable groups predominantly exposed to vehicular exhaust during traffic control. The present study is aimed to study the relation between occupational exposure to vehicular exhaust and oxidative stress (OS) in traffic police. Authors investigated the levels of 8-hydroxy-deoxyguanosine (8-OHdG), one of the most sensitive biomarkers for measuring OS and the association between polymorphisms in Cytochrome P450 (CYP) and Glutathione S-Transferase (GST) genes that are known to play a significant role in the activation and detoxification of xenobiotics. 148 non smoking male traffic policemen and 135 control subjects were selected for this study. The 8-OHdG levels were analyzed by liquid chromatography with electrochemical detection method. Gene polymorphism was detected by multiplex PCR and RFLP method. 8-OHdG levels were found to be increased in traffic police with increase in the years of service in traffic control ($p = 0.02$) when compare to the controls. The results showed a significant increase in urinary 8-OHdG levels in mutated CYP1A1m1 ($p < 0.007$) and null GSTM1 ($p < 0.01$) genotypes. However the genotype frequencies of CYP1A1 m2 and GSTT1 genes did not vary in both exposed and control groups. This study suggests that exposure to vehicular exhaust over a period of time increases oxidative stress and subsequently induces oxidative DNA damage in traffic policemen. Preventive and therapeutic strategies may be considered for traffic policemen to minimize the adverse effects due to vehicular exposure.

[Inhal Toxicol. 2013 Jan;25(1):1-8.]

Occupational safety and health in India: now and the future.

India, a growing economy and world's largest democracy, has population exceeding 1.2 billion. Out of this huge number, 63.6% form working age group. More than 90% work in the informal economy, mainly agriculture and services. Less than 10% work in the organized sector; mainly industry, mining and some services. New service industries like Information Technology (IT), Business Process Outsourcing (BPO) are increasing rapidly; so is the proportion of females in the workforce. The occupational safety and health (OSH) scenario in India is complex. Unprecedented growth and progress go hand in hand with challenges such as huge workforce in unorganized sector, availability of cheap labour, meager public spending on health, inadequate implementation of existing legislation, lack of reliable OSH data, shortage of OSH professionals, multiplicity of statutory controls, apathy of stakeholders and infrastructure problems. The national policy on OSH at workplace, adopted by the government in 2009, is yet to be implemented. Some of the major occupational risks are accidents, pneumoconiosis, musculoskeletal injuries, chronic obstructive lung diseases; pesticide poisoning and noise induced hearing loss. The three most important OSH needs are: 1. legislation to extend OSH coverage to all sectors of working life including the unorganized sector; 2. spreading the awareness about OSH among stakeholders; 3. development of OSH infrastructure and OSH professionals. Other issues include integration of occupational health with primary health care.

[Ind Health. 2012;50(3):167-71.]

Prevalence of permanent hearing threshold shift among workers of Indian iron and steel small and medium enterprises: a study.

Occupational noise exposure and noise-induced hearing loss (NIHL) have been recognized as a problem among workers in Indian industries. The major industries in India are based on manufacturing. There are appreciable numbers of casting and forging units spread across the country. The objective of this study is to determine the prevalence of permanent hearing threshold shift among the workers engaged in

Indian iron and steel small and medium enterprises (SMEs) and compared with control group subjects. As a part of hearing protection intervention, audiometric tests were conducted at low (250-1000 Hz), medium (1500-3000 Hz), and high (4000-8000 Hz) frequencies. The occurrence of hearing loss was determined based on hearing threshold levels with a low fence of 25 dB. Comparisons were made for hearing threshold at different frequencies between the exposed and control groups using Student's t test. ANOVA was used for the comparison of hearing threshold dB at different frequencies among occupation and year of experience. A P value <0.05 was considered as statistically significant. All data were presented as mean value (SD). Over 90% of workers engaged in various processes of casting and forging industry showed hearing loss in the noise-sensitive medium and higher frequencies. Occupation was significantly associated with NIHL, and hearing loss was particularly high among the workers of forging section. The analyses revealed a higher prevalence of significant hearing loss among the forging workers compared to the workers associated with other activities. The study shows alarming signals of NIHL, especially in forging workers. The occupational exposure to noise could be minimized by efficient control measures through engineering controls, administrative controls, and the use of personal protective devices. Applications of engineering and/or administrative controls are frequently not feasible in the developing countries for technical and financial reasons. A complete hearing conservation programme, including training, audiometry, job rotation, and the use of hearing protection devices, is the most feasible method for the protection of industrial workers from prevailing noise in workplace environments in the developing countries.

[Noise Health.2012 May-Jun;14(58): 119-28.]

Study on work load and work-related musculoskeletal disorders amongst male jute mill workers of West Bengal, India.

Work-related problems, many of which could be prevented with proper ergonomic techniques are particularly common in developing countries. The aim of this study was to evaluate the work stress and the development of the work-related musculoskeletal disorders (WRMSDs) of workers employed in the jute mills of India. About 219 male workers engaged in different departments of three jute industries in 24-Parganas (North) and Hooghly districts of West Bengal, India volunteered for this study. Questionnaires along with direct observation of work postures were conducted. Physical parameters such as body weight, height; physiological parameters like heart rate response, blood pressure and psycho-physiological parameters such as perceived exertion rating were studied during different tasks performed by them. It was observed that the 'hacklers' are mostly stressed. Analysis of working postures (OWAS) suggested that their adopted awkward postures were very stressful. A large number of hacklers (92.5% suffer from intense pain in different body parts as compared to workers in other departments of the jute industries. Workers report that the pain even lasts many hours after work. Since most of the workers perform repetitive tasks, so both the workplace as well as the work-rest schedule must be reorganized.

[Work. 2012;42(2):289-97.]

Assessment of health risks with reference to oxidative stress and DNA damage in chromium exposed population.

Trivalent chromium [Cr(III)] is widely used in tanning industrial processes. The population living in tanning industrial area is continuously exposed to Cr(III) which appears to be associated with both acute and chronic health problems. Therefore, the aim of this study was to evaluate the health risk with special reference to oxidative stress parameters (malondialdehyde- MDA, glutathione - GSH, and superoxide dismutase - SOD) and DNA damage in 100 Cr-exposed and 100 unexposed populations. The total blood Cr level, SOD level, MDA level and DNA damage were significantly ($p<0.05$) higher and GSH level was significantly ($p<0.05$) lower in exposed group as compared to the unexposed group. The altered oxidative stress parameters and DNA damage were found to be slightly higher in female population of both groups. In simple and multiple correlation analyses (adjusted with potential confounders), blood Cr level showed negative significant correlation with GSH level and positive significant correlation with level of MDA, SOD and DNA damage in both groups. The overall prevalence of morbidity was found to be significantly ($p<0.05$) higher in the exposed group as compared to the unexposed group. In the exposed group, the prevalence of respiratory illness is highest, followed by diabetes, gastrointestinal tract problems and dermal problems respectively. Results concluded that the Cr(III) exposed population is at high risk for health hazards and the female population is slightly more susceptible to Cr(III) exposure.

[Sci. Total Environ. 2012 Jul.15; 430; 68-74.]

Emerging health risks associated with modern agriculture practices: a comprehensive study in India.

In order to enhance food production, India has adopted modern agriculture practices and achieved noteworthy success. This achievement was essentially the result of a paradigm shift in agriculture that included high inputs of agrochemicals, water, and widespread practice of monoculture, as well as bureaucratic changes that promoted these changes. There are very few comprehensive analyses of potential adverse health outcomes that may be related to these changes. The objective of this study is to identify health risks associated with modern agricultural practices in the southern Indian state of Karnataka. This study aims to compare high-input and low-input agricultural practices and the consequences for health of people in these communities. The fieldwork was conducted from May to August, 2009 and included a survey carried out in six villages. Data were collected by in-depth personal interviews among 240 households and key informants, field observations, laboratory analyses, and data from secondary sources. The study identified four major visible impacts: occupational hazards, vector borne diseases, changing nutritional status, and inequity in development. In the high-input area, mechanization has resulted in more occurrences of serious accidents and injuries. Ecological changes due to rice cultivation in this area have further augmented mosquito breeding, and there has been a surge in the incidence of Japanese encephalitis and malaria. The traditional coarse cereals (complex carbohydrates, high protein) have been replaced by mill-polished rice (simple carbohydrate, low protein). The prevalence of overweight (BMI>25) has emerged as a new public health challenge, and this is most evident in large-landholding households, especially in the high-input agriculture areas. In all agro-ecological areas, it was observed that women faced a greater risk of both extremes of under-nutrition and being overweight. Output-driven and market-oriented modern agricultural practices have changed the ecology and disease pattern in this area in India, and our survey indicated significant health effects associated with these changes. There is a need for more extensive epidemiological studies in order to know the full impact on diseases and to understand the complex causal relationships.

[Environ Res. 2012 May;115:37-50.]

Systems biology approaches to evaluate arsenic toxicity and carcinogenicity: An overview.

Long term exposure to arsenic, either through groundwater, food stuff or occupational sources, results in a plethora of dermatological and non-dermatological health effects including multi-organ cancer and early mortality. Several epidemiological studies, across the globe have reported arsenic-induced health effects and cancerous outcomes; but the prevalence of such diseases varies depending on environmental factors (geographical location, exposure level), and genetic makeup (and variants thereof); which is further modulated by several other factors like ethnicity, age-sex, smoking status, diet, etc. It is also interesting to note that, chronic arsenic exposure to a similar extent, even among the same family members, result in wide inter-individual variations. To understand the adverse effect of this toxic metabolite on biological system (cellular targets), and to unravel the underlying molecular basis (at the level of transcript, proteome, or metabolite), a holistic, systems biology approach was taken. Due to the paradoxical nature and unavailability of any suitable animal model system; the literature review is primarily based on cell line and population based studies. Thus, here authors present a comprehensive review on the systems biology approaches to explore the underlying mechanism of arsenic-induced carcinogenicity, along with our own observations and an overview of mitigation strategies and their effectiveness till date.

[Int J Hyg Environ Health. 2013 Jan 19. pii: S1438-4639(12)00144-7.]

Occupational hearing loss of the workmen of an open cast chromite mines.

The present work aimed at to describe hearing threshold based on audiometry data of the mine workers based on their age, work station and years of working of an open cast chromite mine in Odisha, India at high fence. A cross-sectional study of hearing threshold of the subjects of the chromite mine was carried out. Audiometric data of 500 subjects were taken from the hospital of the mines of Sukinda Valley, Jajpur, Odisha, India. The latest audiometry data available during the period 2002 to 2008 was used in the statistical analysis. The age group 50-60 years is found to be the most influential age group suffering significant hearing loss on both the ears. Also, the Work Zone area is found to be most significant area affecting hearing loss on both the ears. However, the subjects having experience of 30-35 and 25-30 years have the most significant hearing loss on the left and right ears, respectively. The hearing loss is found to be at 6 kHz, thus the working areas of the subjects working at work zone should be regularly rotated in less noisy areas to reduce the exposure

duration. High frequency noise protective device should be advocated among all the subjects in general and HEMMs operators in particulars. Regular audiometry test of all the subjects should be performed to identify the hearing loss of the subjects occurring at 6 kHz. It is essential to perform periodic maintenance of all the HEMMs to keep all the vehicles in good condition those are generating noise at dominating frequency of 4 and 6 kHz.

[Indian J Occup Environ Med. 2012 Jan; 16 (1) : 18-21.]

Serum total immunoglobin-E and health hazards in workers involved in land fill and compost areas of hazardous waste management plants.

The exposures of bio-aerosols have reported higher occupational health hazards, the association between serum total IgE levels and job categories and occupational health hazards of waste disposal area was limited. The present study was undertaken to assess the relationship between occupational health hazards and Serum total IgE in waste disposal area.

One hundred eighty subjects working in waste disposal areas in different parts of Bangalore at Karnataka, India were enrolled into the study in 2009. Using questionnaire the respiratory morbidity and other work related problems in HWW was carried. The levels of serum total IgE in study subjects were determined by using Enzyme-linked -immunosorbent assay kits (DRG International Inc, USA). The differences of serum total IgE levels between the groups were computed by using non-parametric Mann-Whitney U test. SPSS 10.0 for windows version of statistical software was used in the analysis. The levels of serum total IgE was significantly increased in landfill area (P=0.027) compose plant workers (P=0.020). The morbidity conditions such as respiratory and musculoskeletal found significantly higher in waste disposal workers as compared to controls. The levels of serum total IgE was significantly increased in land fill area and compose plant workers but no significant relationship was found between the levels of serum total IgE and occurrence of health related symptoms or past respiratory disease.

[Indian J Occup Environ Med. 2012 Jan;16(1):9-13.]

Genotoxicity and oxidative stress in chromium-exposed tannery workers in north India.

Trivalent chromium (Cr) is an environmental contaminant, which is extensively used in tanning industries throughout the world and causes various forms of health hazards in tannery workers. Therefore, a cross-sectional study design was used to evaluate the DNA damage and oxidative stress condition in tannery workers exposed to Cr in north India. The study population comprised 100 male tanners in the exposed group and 100 healthy males (no history of Cr exposure) in the comparable control group. Baseline characteristics including age, smoking, alcohol consumption habits and duration of exposure were recorded via interviewing the subjects. Blood Cr level (measured by atomic absorption spectrophotometry), DNA damage (measured by comet assay) and oxidative stress parameters (malondialdehyde (MDA), glutathione (GSH) and superoxide dismutase (SOD)) were estimated in both the groups. As a result of statistical analysis, exposed group showed significantly higher level of Cr ($p < 0.0001$), DNA damage ($p < 0.0001$), MDA ($p < 0.0001$), SOD ($p < 0.05$) and lower level of GSH ($p < 0.001$) when compared with controls. Smoking, alcohol consumption habits and age had no significant effect ($p > 0.05$) on DNA damage and oxidative stress parameters in both the groups. In simple and multiple correlation analysis, DNA damage and oxidative stress parameters showed significant correlation with Cr level and duration of exposure in exposed group. The findings of the present study revealed that chronic occupational exposure to trivalent Cr may cause DNA damage and oxidative stress in tannery workers.

[Toxicol Ind Health. 2012 Aug 29, doi: 10.1177/0748233712457447 (Epub ahead of print)]

A key factor in increasing occupational hazard among bidi rollers: A population health research with respect to DNA damage.

The present investigation was undertaken to study the role of working conditions in occupational hazards among bidi rollers occupationally exposed to tobacco dust with reference to DNA damage in peripheral blood lymphocytes. Initially, biomonitoring was conducted by estimating urinary thioether to detect the extent of xenobiotic exposure, and genotoxicity was evaluated by assessing DNA damage and micronucleus frequency in buccal epithelial cells in female bidi rollers occupationally exposed to bidi tobacco dust. Student's t-test was used to test the significance between the means. Results showed a significant increase in urinary thioether level in during-shift urine samples as compared to pre-shift samples, which indicated exposure of bidi rollers to xenobiotic compounds. A significant increase in

DNA damage was observed in the rollers working in confined environment as compared to those who worked in open and mixed kind of working conditions. Keeping in view the adverse effects of tobacco inhalation on the genotoxic effects in bidi rollers as an occupational hazard and in order to minimize the hazardous effects, it is recommended that masks should be worn by the bidi rollers during work to minimize inhalation of tobacco dust. Gloves should be worn particularly if there are bruises etc. in the palm. To minimize the absorption through eyes, covered glasses should be worn. The entire process of bidi rolling may be done preferably under well ventilated conditions. Due care to be taken to sit in the direction facing the direction of wind to avoid inhalation of blown away tobacco dust.

[Indian J Occup Environ Med. 2011 Sep;15(3):139-41.]

Incidence of silicosis in flourmill workers.

Silicosis is an ancient occupational illness reported in silica mill workers, agate stone workers, slate pen workers and mining industry. However its association in flour mill workers has not been established. To study the incidence of silicosis and respiratory morbidity in flour mill workers. A prospective study of 56 flour mill workers working with open silica grinding stones was undertaken. 56 flour mill workers who volunteered following information regarding the study purpose were recruited from the community. Detailed clinical and occupational history, lung functions, chest x-ray, and high resolution computed tomography (HRCT) were done. Diagnosis was made on the basis of radiological findings. Data analysis was done with the help of the statistical package for social sciences software. The Chi-square test was used for determining the relationship between qualitative data and descriptive statistics was used where required. 93% had respiratory symptoms that included cough (66.1%), dyspnea (75%), chest pain (17.1%), and rhinorrhea (46.4%). Radiological abnormalities were noted in chest X-ray (60.7%) and HRCT (81.48%). A significant correlation was seen between duration of exposure and HRCT abnormalities. Lung functions revealed obstruction in 28.5% subjects, restriction in 19%, mixed ventilatory defects in 21.4%, while 18.9% had a reduced diffusion capacity. Incidence of silicosis in the study on flour mill workers working with silica containing grinding stones was 30.4%. They had high respiratory morbidity (93%) cough and dyspnea being predominant symptoms. Duration of exposure correlates with radiological findings and increased incidence of silicosis.

[Indian J Occup Environ Med. 2011 Sep;15(3):104-8.]

Organochlorine pesticide residues in blood samples of agriculture and sheep wool workers in Bangalore (rural), India.

To describe exposure level of organochlorine pesticides (OCP) among workers occupationally engaged in agriculture and sheep wool associated jobs, the present study was carried out in rural neighborhood of Bangalore city, India. Thirty participants were interviewed and obtained informed consent before blood sample collection. The maximum concentrations of OCP were detected in blood samples of agriculture workers than sheep wool workers. Among the metabolites of HCH and DDT, lindane (γ-HCH) and p,p'-DDE were the most contributed to the total OCP. There were no differences in pesticide residues found between sex and work groups. It was observed that about 30% of samples exceeded the tolerance limits of 10 µg/L prescribed for HCH under the prevention of food adulteration act. Therefore, the present study recommends continuous monitoring with larger sample size.

[Bull Environ Contam Toxicol. 2012 Apr;88(4):497-500.]

Effect of benzene exposure on fertility of male workers employed in bulk drug industries.

Industrial workers are constantly exposed to benzene, especially at the production unit. The present investigation explores any association of the outcome of various reproductive malfunctions in terms of infertility and other related factors as a result of benzene exposure. Blood and semen samples were collected from total 160 industrial workers exposed to benzene and 200 non-occupationally exposed control subjects. Authors investigated macroscopic and microscopic semen parameters in the present study population. Body fluid benzene analysis was done by Head Space chromatography. The sperm DNA integrity was determined by modified alkaline single-cell gel electrophoresis or the comet assay method. No significant changes were observed in macroscopic semen parameters. A duration-dependent decrement in total sperm count and the percentage of motility was observed among the benzene-

exposed industrial workers ($p<0.05$). A duration-dependent increment of abnormal sperm morphology was observed among the benzene-exposed industrial workers ($p<0.01$). A significant increase in comet tail length was observed in the exposed groups ($p<0.01$) in comparison to the controls. In regression analysis, the data were observed to be significant at the level of $p<0.05$ for Group II industrial workers ($t=2.301$). Sperm integrity is considered one of the major factors in male infertility. The sperm DNA damage is an important step from spermatogenesis to malfunctions such as infertility; therefore, the present study represents an important evaluation for correctly diagnosing the problem, precisely from the level of DNA itself.

[Genet Test Mol Biomarkers. 2012 Jun;16(6):592-7.]

Occupational health assessment of chromite toxicity among Indian miners.

Elevated concentration of hexavalent chromium pollution and contamination has contributed a major health hazard affecting more than 2 lakh mine workers and inhabitants residing in the Sukinda chromite mine of Odisha, India. Despite people suffering from several forms of ill health, physical and mental deformities, constant exposure to toxic wastes and chronic diseases as a result of chromite mining, there is a tragic gap in the availability of 'scientific' studies and data on the health hazards of mining in India. Occupational Safety and Health Administration, Odisha State Pollution Control Board and the Odisha Voluntary Health Association data were used to compile the possible occupational health hazards, hexavalent chromium exposure and diseases among Sukinda chromite mines workers. Studies were reviewed to determine the routes of exposure and possible mechanism of chromium induced carcinogenicity among the workers. Studies suggest all forms of hexavalent chromium are regarded as carcinogenic to workers however the most important routes of occupational exposure to Cr (VI) are inhalation and dermal contact. This review article outlines the physical, chemical, biological and psychosocial occupational health hazards of chromite mining and associated metallurgical processes to monitor the mining environment as well as the miners exposed to these toxicants to foster a safe work environment. The authors anticipate that the outcome of this manuscript will have an impact on Indian chromite mining industry that will subsequently bring about improvements in work conditions, develop intervention experiments in occupational health and safety programs.

[Indian J Occup Environ Med. 2011 Jan;15(1):6-13.]

DNA damage and cholinesterase activity in occupational workers exposed to pesticides.

The present study was designed to evaluate genotoxicity, acetyl cholinesterase (AChE) activity, hepatic and renal toxicity in occupational workers exposed to mixture of pesticides ($n=70$) with same number of healthy subjects as controls. The mean comet tail DNA % (TD %) and tail moment (TM) were used to measure DNA damage, while AChE activity and other biochemical parameters such as markers of nephrotoxicity (urea and creatinine) and hepatotoxicity (AST, ALT and ALP) were measured as biomarkers for toxicity due to exposure of pesticides. The occupational workers were continuously exposed to mixture of pirimiphos methyl, chlorpyrifos, temephos and malathion on a regular interval as per usage and activity. The comet assay using lymphocytes of exposed workers showed significantly higher TD percentage value (60.43% vs. 31.86%, $p<0.001$) and TM value (14.48 µm vs. 6.42 µm, $p<0.001$) in occupational workers as compared to controls. AChE activity in erythrocytes was found to be decreased (3.45 KAU/L vs. 9.55 KAU/L in controls, $p<0.001$) and associated with the duration of exposure to pesticides used by the workers. Enzyme levels for hepatic and renal functions were also found significantly different in occupational workers than healthy controls ($p<0.001$). These results suggest that the exposure to mixture of pirimiphos methyl, chlorpyrifos, temephos and malathion may induce DNA damage, decrease in AChE activity, hepatotoxicity as well as nephrotoxicity. Periodic biomonitoring of these biomarkers along with imparting education and training to occupational workers for safe application of pesticides is recommended for its potential hazards.

[Environ Toxicol Pharmacol. 2011 Mar;31(2):278-85.]

Genetic polymorphisms of GSTM1, GSTT1 and GSTP1 and susceptibility to DNA damage in workers occupationally exposed to organophosphate pesticides.

GSTM1, T1 and P1 are important enzymes of glutathione S-transferases (GSTs), involved in the metabolism of many endogenous and exogenous compounds. Individual genetic variation in these metabolizing enzymes may influence the metabolism of their substrates. The present study was designed to determine the genotoxic effects using DNA damage and its association with GSTM1, GSTT1, and GSTP1 (Ile105Val) genetic

polymorphisms in workers occupationally exposed to organophosphate pesticides (OPs). Authors examined 230 subjects including 115 workers occupationally exposed to OPs and an equal number of normal healthy controls. The DNA damage was evaluated using the alkaline comet assay and genotyping was done using individual PCR or PCR-RFLP. Significantly higher DNA tail moment (TM) was observed in workers as compared to control subjects (14.41 ± 2.25 vs. 6.36 ± 1.41 tail % DNA, p<0.001). The results revealed significantly higher DNA TM in workers with GSTM1 null genotype than those with GSTM1 positive (15.18 vs. 14.15 tail % DNA, p=0.03). A significantly higher DNA TM was also observed in workers with homozygous Ile-Ile GSTP1 genotype than heterozygous (Ile-Val) and mutant (Val-Val) GSTP1 genotype (p=0.02). In conclusion, the results show that null deletion of GSTM1 and homozygote wild GSTP1 genotype could be related to inter-individual differences in DNA damage arises from the gene-environment interactions in workers occupationally exposed to OPs.

[Mutat Res. 2011 Oct 9;725(1-2):36-42.]

Blood chromium levels of children working in gem-polishing industries in India.

The gem-polishing industry in Jaipur, India employs a substantial proportion of children. The process of polishing may result in exposure to chromium in working children. Thus, this study aims to find out the levels of chromium in these working children and the associated factors. Blood samples were analysed for chromium using atomic absorption spectrophotometer. The mean blood chromium levels were 2.51 ± 1.11 mg/100 ml and 2.33 ± 1.10 mg/100 ml in working and school children, respectively, which is well within the permissible levels. However, the practice of employing children should be totally curbed.

[Toxicol Ind Health. 2012 Mar;28(2):170-3.]

Effect of nickel and chromium exposure on buccal cells of electroplaters.

The electroplating industry commonly involves the use of nickel and chromium. An assessment of the genotoxic effects of these metals can be carried out by micronucleus (MN) test in buccal cells. Other nuclear anomalies (NA) observed in buccal cells viz., karyorrhexis, pyknosis and karyolysis are also the indicators of genotoxicity. The current study aims at determining the extent of genotoxic damage in relation to the duration of exposure to nickel and hexavalent chromium via micronuclei induction and other nuclear anomalies. The present investigation included 150 subjects of which 50 individuals with no history of nickel/chromium exposure (Group I) were taken as control, 50 electroplaters exposed to nickel and hexavalent chromium for duration of less than 10 years (Group II) and 50 electroplaters exposed for ≥10 years (Group III) were included. Slides of buccal cells were prepared and the frequency of MN (%) and NA (%) were calculated. ANOVA was applied to test significance. Results were considered significant at $p < 0.05$ and $p < 0.001$. Group III showed the highest MN frequency (1.08 ± 0.54%, $p < 0.05$), karyorrhexis (20.75 ± 6.29, $p < 0.05$), karyolysis (3.50 ± 1.91, $p < 0.001$), binucleate (4.75 ± 2.75, $p < 0.05$) and enucleated cells (5.75 ± 1.70, $p < 0.05$). Significant increase in frequencies between Group II and III was found as duration of exposure increased. Plasma nickel and chromium levels were also determined which showed a positive correlation with frequency MN and other nuclear abnormalities($p < 0.01$).

[Toxicol Ind Health. 2012 Feb;28 (1): 74-82.]

Pulmonary function and oxidative stress in workers exposed to styrene in plastic factory: occupational hazards in styrene-exposed plastic factory workers.

Styrene is a volatile organic compound used in factories for synthesis of plastic products. The pneumotoxicity of styrene in experimental animals is known. The aim of the present study was to study the effect of styrene on lung function and oxidative stress in occupationally exposed workers in plastic factory. Thirty-four male workers, between 18 and 40 years of age, exposed to styrene for at least 8 hours a day for more than a year were studied, while 30 age- and sex-matched healthy subjects not exposed to styrene served as controls. Assessment of lung functions showed a statistically significant reduction ($p < 0.05$) in most of the lung volumes, capacities (FVC, FEV(1), VC, ERV, IRV, and IC) and flow rates (PEFR, MEF(75%), and MVV) in the study group (workers) as compared to controls. Malondialdehyde (MDA) was observed to be significantly high ($p < 0.05$) while ferric-reducing ability of plasma (FRAP) was significantly low

($p < 0.05$) in styrene-exposed subjects. Reduced glutathione (GSH) level was significantly depleted in exposed subjects as compared to control group. The mean value of serum cytochrome c in styrene-exposed subjects was found to be 1.1 ng/ml (0.89-1.89) while in control its levels were under detection limit (0.05 ng/ml). It shows that styrene inhalation by workers leads to increased level of oxidative stress, which is supposed to be the cause of lung damage.

[Hum Exp Toxicol. 2011 Nov;30(11): 1743-50.]

Paraoxonase-1 genetic polymorphisms and susceptibility to DNA damage in workers occupationally exposed to organophosphate pesticides.

Human paraoxonase 1 (PON1) is a lipoprotein-associated enzyme involved in the detoxification of organophosphate pesticides (OPs) by hydrolyzing the bioactive oxons. Polymorphisms of the PON1 gene are responsible for variation in the expression and catalytic activity of PON1 enzyme. In the present study, authors have determined (a) the prevalence of two common PON1 polymorphisms, (b) the activity of PON1 and acetylcholinesterase enzymes, and (c) the influence of PON1 genotypes and phenotypes variation on DNA damage in workers exposed to OPs. They examined 230 subjects including 115 workers exposed to OPs and an equal number of normal healthy controls. The results revealed that PON1 activity toward paraoxon (179.19± 39.36 vs. 241.52±42.32nmol/min/ml in controls) and phenylacetate (112.74±17.37 vs. 134.28±25.49µ mol/min/ml in controls) was significantly lower in workers than in control subjects ($p<0.001$). No significant difference was observed in the distribution of genotypes and allelic frequencies of PON1(192)QR (Gln/Arg) and PON1(55)LM (Leu/Met) in workers and control subjects ($p>0.05$). The PON1 activity toward paraoxonase was found to be significantly higher in the R/R (Arg/Arg) genotypes than Q/R (Gln/Arg) and lowest in Q/Q (Gln/Gln) genotypes in both workers and control subjects ($p<0.001$). For PON1(55)LM (Leu/Met), PON1 activity toward paraoxonase was observed to be higher in individuals with L/L (Leu/Leu) genotypes and lowest in individuals with M/M (Met/Met) genotypes in both groups ($p<0.001$). No influence of PON1 genotypes and phenotypes was seen on the activity of acetylcholinesterase and arylesterase. The DNA damage was observed to be significantly higher in workers than in control subjects ($p<0.05$). Further, the individuals who showed least paraoxonase activity i.e., those with (Q/Q [Gln/Gln] and M/M [Met/Met]) genotypes showed significantly higher DNA damage compared to other isoforms in workers exposed to OPs ($p<0.05$). The results indicate that the individuals with PON1 Q/Q and M/M genotypes are more susceptible toward genotoxicity. In conclusion, the study suggests wide variation in enzyme activities and DNA damage due to polymorphisms in PON1 gene, which might have an important role in the identification of individual risk factors in workers occupationally exposed to OPs.

[Toxicol Appl Pharmacol. 2011 Apr 15;252(2):130-7.]

DID YOU KNOW

There are 100 million occupational injuries causing 0.1 million deaths in the world according to WHO. It is also estimated that in India 17 million occupational non-fatal injuries (17% of the world) and 45,000 fatal injuries (45% of the total deaths due to occupational injuries in world) occur each year. Out of 11 million cases of occupational diseases in the world 1.9 million cases (17%) are contributed by India and out of 0.7 million deaths in the world 0.12 (17%) is contributed by India.

Workplace health hazards can cause three kinds of reactions in the body:

- **Immediate or acute reactions,** like shortness of breath or nausea, can be caused by a one-time event, (e.g., a chemical spill). These reactions are not usually permanent.
- **Gradual reactions,** like asthma or dermatitis (skin rashes), can get worse and persist when you are exposed over days, weeks or months. These reactions tend to last for a longer time.
- **Delayed reactions** or diseases that take a long time to develop, like lung cancer or loss of hearing, can be caused by long-term exposure to a substance or work activity. These reactions can be noticed long after the job is over.
- **Occupational Diseases** There is no internationally accepted definition for the term "occupational disease". However, occupational diseases are usually defined as diseases arising out of

or in the course of employment. For convenience, they may be grouped as under:

I. Diseases due to physical agents:

1. Heat- Heat hyperpyrexia, heat exhaustion, heat syncope, heat cramps, burns and local effects such as prickly heat.
2. Cold-Trench foot, frost bite, chilblains
3. Light-Occupational cataract, miner's nystagmus
4. Pressure-Caisson disease, air embolism, blast (explosion)
5. Noise-Occupational deafness
6. Radiation-Cancer, leukaemia, aplastic anaemia, pancytopenia
7. Mechanical factors-Injuries, accidents
8. Electricity- Burns

II. Diseases due to chemical agents:

1. Gases- CO_2, CO, HCN, CS_2, NH_3, N_2, H_2S, HCl, SO_2 – these cause gas poisoning
2. Dusts- (Pneumoconiosis):
   Inorganic dusts: Coal dust- Anthracosis
   Silica- Silicosis
   Asbestos-Asbestosis, cancer lung
   Iron- Siderosis
   Organic (vegetable) dusts:
   Cane fibre- Bagassosis
   Cotton dust- Byssinosis
   Tobacco- Tobacossis
   Hay or grain dust- Farmer's Lung
3. Metals and their compounds- Toxic hazards from lead, mercury, cadmium, manganese, beryllium, arsenic, chromium, etc.
4. Chemicals-Acids, alkalies, pesticides
5. Solvents-Carbon bisulphide, benzene, trichloroethylene, chloroform, etc.

III. Diseases due to biological agents:

Brucellosis, leptospirosis, anthrax, actinomycosis, hydatidosis, psittacosis, tetanus, encephalitis, fungal infections, etc.

IV. Occupational cancer:
Cancer of skin, lungs, bladder

V. Occupational dermatosis:
Dermatitis, eczema

VI. Diseases of psychological origin: Industrial neurosis, hypertension, peptic ulcer, etc.

CURRENT CONCERN

In most places, occupational safety and health invariably means prevention of accidents; very little attention is paid to occupational diseases. An accident-free workplace by no means implies a safe workplace. Occupational diseases - including cancers caused by various materials in the workplace, including asbestos, carcinogenic (cancer-causing) chemicals, silica, cotton, dust, and radiation, job stress and work shifts -- usually take a long time to develop (from a few months to more than 10 years). And given changing work practices, most industries tend to hire workers on short-term contract. By the time they develop a disease, therefore, it is almost impossible to link it to their work.

Non-communicable diseases result in more deaths than communicable diseases, except in Africa. Overall, people are more likely to die of work-related diseases than childhood or infectious diseases. Not many doctors are able to correctly diagnose an occupational disease. In fact, certain occupational diseases like byssinosis (a lung disease caused by cotton dust) and silicosis (a lung disease caused by silica dust) are often wrongly diagnosed as tuberculosis. In a community where having a doctor is a privilege, an OSH specialist is simply out of the question.

REGULATORY TRENDS

Occupational health was one of the components of the National Health Policy 1983 and now also included in National Health Policy 2002 but very little attention has been paid to mitigate the effect of occupational disease through proper programme. Ministry of Health & Family Welfare, Govt. of India has launched a scheme entitled "National Programme for Control & Treatment of Occupational Diseases" in 1998-99. The National Institute of Occupational Health, Ahmedabad (ICMR) has been identified as the nodal agency for the same.

Occupational health Laws:

There is no comprehensive law on occupational health, though the Central Government has in its various policies stressed the need to effectively implement the existing laws.

The Factories Act, 1948, the Mines Act, 1952, The Dock Workers (Safety, Health & Welfare) Act, 1986 are some of the laws, which contain provisions regulating the health of workers in an establishment. Whereas the Employees State Insurance Act, 1948 and the Workmen's Compensation Act, 1923 are compensatory in nature.

ON THE WEB

http://www.haz-map.com/

A Relational Database of Hazardous Chemicals and Occupational Diseases. The database currently contains 7438 chemical and biological agents, 240 diseases. Haz-Map was designed to be a decision-support computer application for occupational safety and health professionals. Its aim is to assist physicians, physician assistants, occupational health nurses, and industrial hygienists in the recognition of diseases caused by toxic chemicals and infectious agents in the workplace. Since its publication on the website of the National Library of Medicine in 2002, Haz-Map has also served consumers seeking information about the health effects of exposure to chemicals and biologicals at work

http://www.envisnioh.org/index.html

Environmental Information System [ENVIS] Center, Housed at National Institute of Occupational Health [NIOH], is sponsored by Department of Environment, Ministry of Environment and Forests, Government of INDIA, New Delhi. The ENVIS center at NIOH is engaged in collection, collation, storage, retrieval and dissemination of Indian Information related to Occupational-Environmental Health. The center provides information to decision makers, policy planners, scientists, engineers, research workers, etc., all over the world.

ON THE LIGHTER SIDE

- A Government Employee sits in his office and out of boredom, decides to see what's in his old filing cabinet. He pokes through the contents and comes across an old brass lamp."This will look nice on my mantelpiece," he decides, and takes it home with him.

  While polishing the lamp, a genie appears and grants him three wishes.

  "I wish to be on a beautiful island in the Caribbean."POOF! He suddenly appears on a gorgeous beach.

  After overcoming his initial surprise, he states his second wish."I wish to be waited on hand and foot by beautiful women."POOF! A crowd of gorgeous women flock to him, attending his every need.

  He tells the genie his third and last wish: "I wish to never have to work ever again." POOF! He's back in his government office.

- A Traffic police officer pulled over an eighty-year-old teacher because her hand signals were confusing.

  "First you put your hand up, like you're turning right, then you waved your hand up and down, then you turned left," said the officer.

  "I decided not to turn right," she explained.

  "Then why the up and down?" asked the officer.

  “Officer," she sniffed, "I was erasing!"

FORTHCOMING CONFERENCES

WSO 26th International Environmental & Occupational Safety & Health Professional Development Symposium

OSHA Training and International Safety Education Institute

September 9 - 11, 2013

San Diego, California

http://www.worldsafety.org/pages/conference.html

XX World Congress on Safety and Health at Work 2014--Global Forum for Prevention

24 - 27 August 2014

Frankfurt, Germany

http://www.safety2014germany.com/en/home_1/index.html

BOOK STOP

Occupational Cancers

Clinical and Pathological Features, Assessment and Diagnosis

Anttila, Sisko L.; Boffetta, Paolo; Straif, Kurt (Eds.)

2013, Approx. 500 p. 70 illus. in color.

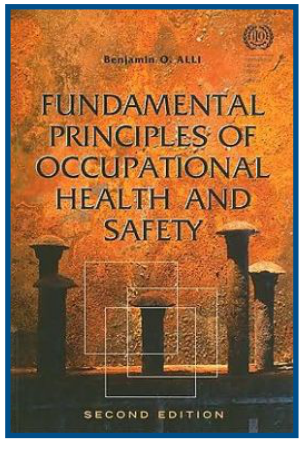
ISBN 978-1-4471-2824-3

Fundamental principles of occupational health and safety

Second edition

Author: Benjamin O. Alli, ILO, Sept. 2008

Fully revised and updated, this second edition introduces new ILO instruments promoting occupational safety and health (OSH) and new chemical safety information tools, and addresses OSH for preparing national OSH profiles and enterprise policies, selected excerpts from OSH instruments and up-to-date information sources.

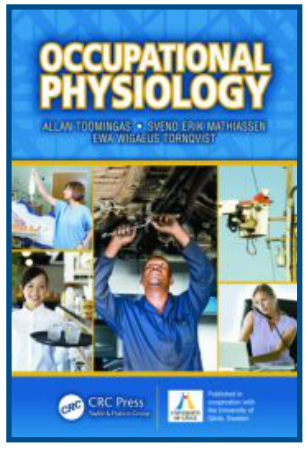


Occupational Physiology

Editor(s): Gävle, Sweden; Ewa Wigaeus Tornqvist, School of Health Sciences, Jönköping, Sweden

CRC Press, December 2011.

In a clear and accessible presentation, Occupational Physiology focuses on important issues in the modern working world. Exploring major public health problems–such as musculoskeletal disorders and stress–this book explains connections between work, well-being, and health based on up-to-date research in the field. It provides useful methods for risk assessment and guidelines on arranging a good working life from the perspective of the working individual, the company, and society as a whole.



MINI PROFILE OF SODIUM HYDROXIDE

SYNONYMS: Sodium hydroxide, Caustic soda, Aetznatron, Sodium hydrate, Soda lye, Soda, caustic.

CAS RN : 1310-73-2

MOLECULAR FORMULA : NaOH

MOLECULAR STRUCTUR : Na-O-H

MOLECULAR WEIGHT : 40

PROPERTIES: Colorless to white solid (flakes, beads, granular form), Odorless, BP 1388 deg C, MP 323 deg C, Very corrosive (caustic) to aluminum metal in presence of moisture, pH of a 0.05% wt/wt solution about 12; 0.5% solution about 13; 5% solution about 14, Solubilities 1 g dissolves in 7.2 mL absolute alcohol, 4.2 mL methanol; also soluble in glycerol and 1 g dissolves in 0.9 mL water, 0.3 mL boiling water.

USES: consumed in chemical processing and metal processing; paper and pulp manufacture; petroleum, textile, soap, food industries; rayon, cellophane production and other applications

TOXICITY DATA:
LD_{50} Oral Not listed
LD_{50} Dermal 1350 mg/kg (Rabbit)
LC_{50} Inhalation Not listed

PERSONAL PROTECTION: Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Avoid dust formation. Do not get in eyes, on skin, or on clothing.

STORAGE: Keep containers tightly closed in a dry, cool and well-ventilated place.

Route	Symptoms	First Aid	Target Organ
Inhalation/ Ingestion	Inhalation Causes Severe burns. May be harmful if inhaled. Ingestion Causes severe burns. May be harmful if swallowed.	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation. If victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required. Do not induce vomiting. Call a physician or Poison Control Center immediately.	Respiratory system, Gastrointestinal Tract (GI)
Contact Eye/Skin	Eyes Causes severe burns. May cause blindness or permanent eye damage. Skin Causes severe burns. May be harmful in contact with skin.	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.	Eyes, Skin

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&

Health and Service

to Industry"

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Information Database
Environmental Impact Assessment
Consultancy
Hazardous Waste Disposal
Environmental Management Plan
Health Status of Occupational Workers
Preparedness of Disaster Management

Technologies Developed/ Available

Water Analysis Kit
Mobile Laboratory Van for on spot water quality analysis
Argemone Detection Kit for rapid screening of Argemone in mustard oil
CD-Strip for detection of butter yellow an adulterant in edible oils
Arsenic Detection Kit

CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH
(Formerly - Industrial Toxicology Research Centre)
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To keep abreast with the effects fo chemicals on environment and health, the ENVIS Centre of
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Information collection, collation and dissemination

Toxic Chemical related query response service

Preparation of monograph on specified chemicals of current concern

Publishing Abstract of Current Literature in Toxicology

for further details do write to

Scientist In-Charge

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