

2. Original Articles

A Pilot Study of Reference Vibrotactile Perception Thresholds on the Fingertip Obtained with Malaysian Healthy People Using ISO 13091-1 Equipment

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Industrial Health 42, 189-195, 2004

The purpose of this paper is to clarify the reference vibrotactile perception thresholds (VPT) for healthy people in Malaysia. The measurement equipment standard, ISO 13091-1, of the vibrotactile perception thresholds for the assessment of nerve dysfunction and the analysis and interpretation of measurements at the fingertips standard, ISO 13091-2, were published in ISO/TC108/SC4/WG8 on 2001 and 2003 individually. In the ISO 13091-2 standard, the reference VPT data were obtained from few research papers. Malaysian people's VPT data don't include to this standard. In Malaysia, when the VPT is using to diagnose of the hand-arm vibration syndrome, the reference VPT data need to compare with the worker's ones. But, Malaysia does not have the reference VPT data yet. So, in this paper, the VPT was measured by using ISO 13091-1 standard equipment to obtain the reference data for Malaysian people. And these data were compared with the ISO reference data on the ISO 13091-2 standard. From

the comparison of these data, it was clear that the Malaysian healthy people' s VPT data were consistent with the reference data of the ISO 13091-2 standard.

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Medial plantar nerve conduction velocities among patients with vibration syndrome due to rock-drill work

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Industrial Health, 42, 24-28, 2004.

Objective: The present study was aimed at clarifying the effect of vibration syndrome (VS) on the peripheral nervous system in the lower extremities of patients with VS due to rock-drill work. **Methods:** Fifty-three patients with VS due to previous exposure to vibration from rock-drilling work and 55 age-matched controls were examined for sensory nerve conduction velocities in the medial plantar nerve (SCV-P). The patient group was divided into three subgroups, outdoor rock-drill workers with vibration-induced white finger (VWF) (N = 10), tunnel workers with VWF (N = 27) and tunnel workers without VWF (N = 16). **Results:** ANOVA of SCV-P for the four groups showed F = 3.23 (dF = 3, 104, p = 0.0253). A significant difference was found between the controls and outdoor rock-drill workers with VWF group (p = 0.0261) by multiple comparison with Scheffe' s method. **Conclusion:** These findings suggest that peripheral nervous system function in the lower extremities of patient with VS is affected by cold exposure and circulatory disturbance manifested as VWF.

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A study on the effect of lead on event-related potentials among lead-exposed workers

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Industrial Health, 42, 431-434, 2004.

Objectives: In order to clarify the effect of lead on higher cerebral functions, lead-exposed workers (Pb group) and controls were examined for event-related potentials. **Subjects and Methods:** Fourteen lead-exposed workers with a mean age of 57.1 years (SD = 4.27, range 48 - 64; concentration of whole blood ranged from 33 to 106 μ g/dl with a mean of 58.6 and SD 28.6 μ g/dl) and 19 age-matched control workers with a mean age of 57.3 years (SD = 4.80, range 48 - 65) were examined. Visual P300 was recorded by button pushing to the target image (minute checkerboard pattern, 20%), and the NO-GO potential by no button pushing to the target image (same as above, 50%). **Results:** Latencies of P300 in the Pb group (475 \pm 46.0 ms) were significantly delayed compared with those in controls (407 \pm 42.4 ms, p<0.01 by Student' s t test). Amplitudes of the NO-GO potential in the Pb group (4.59 \pm 2.04 μ V) significantly increased compared with those in the controls (3.18 \pm 1.41 μ V, p< 0.05). **Conclusion:** The finding suggests that lead exposure affects high cerebral functions of cognition and attention, but is unclear in suppression of movement.

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Shape and Thickness of Cushion in a Standing Aid to Support a Forward Bending Posture: Effects on Posture, Muscle Activities and Subjective Discomfort

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Industrial Health 42, 15?23, 2004.

In order to prevent low back pain (LBP) during dishwashing, we developed three types of aid with a thick cushion for supporting the shins and evaluated the effects of the standing aid on the subjective discomfort and muscle activities. Nine female volunteers were asked to wash plates in each of four working postures: (a) without the standing aid, (b) with the round type of aid, (c) with the small rectangular type of aid, and (d) with the large rectangular type of aid. With the three types of aid, the subjects were instructed to support the shins with the standing aid and to support the abdomen with the edge of a kitchen counter. In the three postures with the standing aid, $21.5 \pm 10.0\%$ of the weight was supported with the standing aid and the kitchen counter. The subjective discomfort was milder and the muscle activity level in the low back was lower in the three postures with the standing aid than in the posture without the aid. It was thought that the round type of aid would be more effective in decreasing the discomfort in many of body regions and the muscle load on the low back than either of the rectangular types of aid. Therefore, it was suggested that the standing aid had the desired effect in decreasing discomfort and muscle load on the low back during dishwashing.

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Development of action checkpoints for comfortable computer work

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Industrial Health 42, 292-301, 2004.

We developed a manual including a checklist format for undertaking measures to prevent fatigue in visual display terminals (VDT) workers. With this manual, problems related to VDT work can be recognized by using checklists which allow for self-evaluation by the workers. The manual helps the workers to consider measures for improvement by themselves and will contribute to better occupational health education.

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Survey on Visual and Musculoskeletal Symptoms in VDT Workers

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Sangyo Eiseigaku Zasshi 46, 201-212, 2004.

With the spread of visual display terminals (VDT) in offices, the numbers of workers using VDT and the working hours at such equipment have increased rapidly in recent years. Also, preventive measures for fatigue have been proposed and the office-working environment has been improved. To examine the effects of the rapid changes in working conditions and environment on the health of VDT workers, we conducted a questionnaire survey in 2002. A self-reported questionnaire was distributed to 3,927 office workers; 2,374 (60.5%) responded. Subjects whose questionnaires had missing data were excluded from analysis. As a result, 1,406 (male: 1,069, female: 337) workers aged 20 to 59 were subjected to analysis. By a logistic regression model, we examined the association between VDT use and visual and musculoskeletal symptoms. Prevalence of eye strain and/or pain (72.1%) was the highest, followed by neck stiffness and/or pain (59.3%), low back stiffness and/or pain (30.0%) and hand or arm strain and/or pain (13.9%). Women consistently reported more discomfort than men. As a result of the logistic regression model, eye strain and/or pain was associated with dissatisfaction with airflow, but not with factors affecting visual symptoms as reported in previous studies, for example, reflection of light and blurred characters on the screen. It was thought that airflow appeared as a risk factor because the lighting environment had been improved in offices to prevent reflection of light on the screen. Neck stiffness and/or pain was associated with raising the shoulders during VDT work, the unsuitable shape

of the computer mouse for a hand, and the inconvenient arrangement of the mouse in relation to the body. Hand or arm strain and/or pain were associated with the arrangement of the mouse and inappropriate height of the desk. Low back stiffness and/or pain were associated with dissatisfaction with the chair and using the keyboard without a wrist rest. Although measures to prevent fatigue had been implemented for VDT workers, risk factors for musculoskeletal symptoms would be the same as in previous studies.

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Comparative Study on Picryl Chloride(PCL)-Induced Contact Dermatitis in Female IQI/Jic and BALB/c Mice

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Experimental Animals 53, 89-96, 2004.

Ear skin responses to picryl chloride (PCL)-induced contact dermatitis were compared in detail between IQI/Jic mice developed in Japan and BALB/c mice often used for the investigation of contact dermatitis. PCL was applied to the left ear of each mouse 4 (1st), 11 (2nd), 18 (3rd) and 25days (4th) after sensitization of the abdominal skin with PCL. Time course examinations were carried out on the ear swelling responses, total IgE levels, skin histology and immunohistochemistry for infiltrated cells after the 1st and 4th application. In IQI mice, the peak time of the ear swelling responses tended to shift from 24h to 9h with marked elevation of total IgE levels and marked increase of mast cells showing degranulation after the 4th application when CD8 cells as well as CD4 cells also prominently increased. In BALB/c mice, except for the total IgE levels and the number of mast cells, the degrees of ear swelling responses, histological changes and increase of CD4 and CD8 cells were much less severe. Female IQI mice are considered to be a useful mouse strain for future investigation on the role of CD4 and CD8 T cells in the pathogenesis of contact dermatitis.

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Increase of Olfactory Threshold in Plating Factory Workers Exposed to Chromium in Korea

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Industrial Health 41, 279-285, 2003.

Objective: To disclose the effects of chromium (Cr) on olfactory function. Methods: Olfactory threshold tests were conducted in 27 male plating workers (Cr workers) with signs and symptoms of olfactory irritation but without nasal septum perforation or ulcer and in 34 male control subjects in Korean plating factories. The Cr workers had been exposed to Cr fume for 0.9 to 18.2 (mean 7.9) years; their blood Cr concentrations (0.16-3.69, mean 1.29 μ g/dl) were significantly higher than those in 34 control subjects (0.04-1.95, mean 0.55 μ g/dl). Results: Scores on recognition thresholds in the Cr workers were significantly higher than those in the control subjects ($p < 0.05$) and positively related significantly to exposure period in 27 Cr workers ($p < 0.05$). Olfactory thresholds were not significantly different between the Cr workers with and without any of nasal signs or symptoms, excepting that the scores on the recognition threshold were significantly higher in those with difficulty in smell ($p < 0.05$). Conclusion: It is suggested that olfactory threshold is affected by Cr without development of nasal septum perforation nor ulceration.

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Effects of Seat-Back Angle and Accelerometer Height at the Seat-Back on Seat-Back X Axis r.m.s. Acceleration in Field Experiments according to The ISO 2631-1 Standard

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Ind. Health 42, 65-74, 2004

The effects of seat-back angle and accelerometer height at the seat-back on seat-back xaxis frequency-weighted root-mean-square (r.m.s.) acceleration have been investigated in field experiments. Experiment 1 investigated the range and variability, of frequency-weighted r.m.s. acceleration at the same measurement position, where the seat-back angle was 24 degrees from vertical on the floor and the accelerometer height was 38 cm up from the seat cushion surface. Experiment 2 investigated ranges of frequency-weighted r.m.s. acceleration between the reference position, which was the position used in experiment 1, and test positions at different seat-back angles, 4 degrees ahead of and 4 degrees behind the reference position. Experiment 3 investigated the range of frequency-weighted r.m.s. acceleration between the reference position which was the same as in experiments 1 and experiment 2, and test positions at different accelerometer heights at the seatback from a seat cushion surface, 2.5 cm higher, 2.5 cm lower and 5 cm lower than the reference position. This investigation clarifies that different seat-back angles and accelerometer heights at the seat-back affect the frequency-weighted r.m.s. acceleration at these measurement positions, which is beyond the exposure values at which people are able to distinguish different vibration acceleration magnitudes.

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Sleep-related risk of occupational injuries in Japanese small and medium-scale enterprises

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Industrial Health 43, 89-97, 2005.

A cross-sectional study evaluated the contribution of daily sleep habits to occupational injuries. A self-administered questionnaire solicited answers about sleep, symptoms of depression, occupational injury, demographics, presence of diseases and lifestyle factors from 2,903 workers between the ages of 16-83 (mean 45) yr in small and medium-scale enterprises. Eight sleep habits were queried and dichotomized: 1) less or more than 6 hr of daily sleep, 2) taking more or less than 30 min to fall asleep (Difficulty initiating sleep; DIS), 3) awakening during sleep more or less than 3 times/wk (Difficulty maintaining sleep; DMS), 4) early morning awakening more or less than 3 times/wk (EMA), 5) definitely/somewhat difficulty waking up or not, 6) sleeping very poorly/not so well at night or not, 7) definitely/somewhat insufficient nightly sleep or not, and 8) difficulty in breathing during sleep more than once/week or less. Occupational injury was assessed by asking subjects 'Have you ever been injured during your work, including minor scratches and cuts (Yes/No)?' Both sleep and injury were assessed over the previous one year period. One-third of workers answered that they had experienced injury. Workers with sleep features of DIS, sleeping poorly at night, insufficient sleep, and insomnia had a significantly higher prevalence for injury after adjusting for multiple confounders. The findings suggest that poor nocturnal sleep habits are associated with self-reported occupational injury.

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Association of sickness absence with poor sleep and depressive symptoms in shift workers

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Chronobiology International 21, 899-912, 2004.

A cross-sectional study was conducted to evaluate the contribution of daily sleep habits and depressive symptoms to sickness absences of shift workers. A self-administered questionnaire that solicited answers about sleep, symptoms of depression, sickness absence, diseases/injuries, and lifestyle factors was submitted to a sample of 522 rotating shift workers between the ages of 18-59 (mean 27) yrs of an electric equipment manufacturing company. The seven features of sleep queried were daily hours of sleep, time to fall asleep, awakening during sleep, early morning awakening, sleep well at night, sufficiency of sleep, and excessive daytime sleepiness at work. The responses were assessed over the subject's previous 1-yr period. Each sleep feature, except daily sleeping hours, was dichotomized by the following responses: (1) taking more than 30min to fall asleep (difficulty initiating sleep; DIS), (2) awakening during sleep almost every day (difficulty maintaining sleep; DMS), (3) early morning awakening almost every day (EMA), (4) sleeping very poorly or not so well at night, (5) definite or somewhat insufficient nightly sleep, and (6) excessive daytime sleepiness at work almost every day (EDS). Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression (CES-D) scale. Sickness absence was calculated by asking subjects "How many days in total have you been absent from work due to sickness, including paid vacation, in the last 1-yr period?" The responses were divided into three groups that included no (0 days) sickness absences (reference group, n=235 subjects), 1 to 4 days (short-term, n=199 subjects), and 5 days or more (long-term, n = 88 subjects). Compared to the prevalence of sleep features of the reference group, workers with short-term absence showed a significantly higher prevalence of EMA with an odds ratio (OR) of 5.3, 95% confidence interval (CI) 1.3-22.0. Long-term absence was significantly associated with DMS (OR = 2.1, 95%CI 1.0-4.6), EMA (OR = 5.6, 95%CI 1.0-28.7), sleeping poorly at night (OR= 2.6, 95%CI 1.4-5.0), and high depressive symptoms (OR = 2.0, 95%CI 1.0-3.7) according to the CES-D score of >16, after adjusting for multiple confounding variables. These data point to an association between both the parameters of poor sleep and symptoms of deep depression when self-reported sickness absence is frequent. The association is particularly strong with long-term absence in male shift workers.

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Job stress, social support, and prevalence of insomnia in a population of Japanese daytime workers

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Social Science and Medicine 59, 1719-1730, 2004.

To clarify the relationship between perceived job stress, social support and prevalence of insomnia in

Japanese daytime workers, 1161 male white-collar employees of an electric equipment manufacturing company (age, 23-60 years, mean age of 37.0) were surveyed by means of a mailed questionnaire. Perceived job stress was evaluated with the Japanese version of the generic NIOSH job stress questionnaire. Insomnia was diagnosed if workers had at least 1 of 3 types of symptoms on an almost nightly basis. The symptoms were (1) taking more than 30 min to fall asleep (Difficulty Initiating Sleep, DIS), (2) difficulty in maintaining sleep (DMS), or (3) early morning awakening (EMA). The overall prevalence of insomnia was 23.6% and the prevalences of the three subtypes were 11.3% for DIS, 14.2% for DMS, and 1.9% for EMA. Workers with high intragroup conflict (OR 1.6), high job dissatisfaction (OR 1.5), and high symptoms of depression (OR 2.0) (CES-D \geq 16) had a significantly increased risk for insomnia after adjusting for multiple confounding factors. Low employment opportunities, physical environment and low coworker support also were weakly associated with risk for insomnia among workers. Furthermore, high depressive symptoms significantly increased the risk of DIS (OR 2.4). Therefore in white-collar male daytime workers, psychological job stress factors such as interpersonal conflicts with fellow employees, job satisfaction, and social support were independently associated with a modestly increased risk of insomnia that included three different subtypes that were considered to be defining for the disorder.

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Lymphocyte subpopulations among passive smokers

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Journal of American Medical Association (JAMA) 291,1699-1700, 2004.

Passive exposure to environmental tobacco has been reported to be a risk factor for coronary heart disease (CHD), a relationship that may be mediated by chronic inflammation. Although an increase in memory and total CD4+ lymphocyte subpopulations of white blood cells (WBCs) in the blood of smokers has been documented, and an elevated WBC count is an independent risk factor for atherosclerotic vascular disease, a direct association between chronic exposure to passive smoking and immune status remains to be proven. We examined a sample of Japanese men to study the effects of passive and active smoking on lymphocyte subpopulations and WBCs. Methods. In 1997, we recruited a total of 670 of 783 (85.6%) healthy male workers (mean age, 36 years) in an electric power plant for our study. The plant did not contain any known hazardous chemicals that could affect immunological function. After providing written informed consent, participants were classified as current smokers (n=363), former smokers who had quit at least 1 year prior to recruitment (n=154), or never smokers (n=153). To determine passive smoking status for former and never smokers, we asked, "Does anyone who is close to you, either at work or at home, smoke cigarettes heavily?" Participants who answered "yes" were classified as passive smokers. We also assessed age, body mass index, alcohol consumption (1, non drinker; 2, occasional; 3, average intake of ethanol < 69g/day, but not daily; 4, average intake of ethanol \geq 69g/day, but not daily; 5, drinkers with average intake < 69g/day; and 6, drinkers with average intake \geq 69/day); and frequency of regular exercise (1, not regular; 2, 0 to 1 time/week; and 3, \geq 2 times/week). Blood samples for immune parameters including lymphocyte subpopulations and WBCs were collected one the questionnaire was completed. We assessed the relationship between smoking status and immune function with multivariate analysis of covariance controlling for the above variable. We used the Scheffe method to compare P values for individual comparisons between groups. Because our academic institution did not have an institutional review board for epidemiologic studies at the time of this study was initiated, our protocol was instead reviewed

and approved by the power plant's Committee of Safety and Health, which represented the labor union, workers, and the employer, and occupational health staff of the power plant. Results. Compared with current smokers, the counts of most lymphocyte subpopulations and total WBCs were significantly lower among former smokers and never smokers. Among never smokers, however, the counts of most lymphocyte subpopulations and WBCs were significantly higher in those exposed to passive smoking. Comment. Passive may be related to an increase in a number of lymphocyte subpopulations. Such immune alteration may accelerate intravascular tissue damage and increase the long-term risk of CHD.

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Effect of Lipopolysaccharid (LPS) Injection on the Immune Responses of LPS-Sensitive Mice

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Journal of Veterinary Medical Science 66, 1189-1193, 2004.

The effect of lipopolysaccharide (LPS) on humoral and cell-mediated immunity was assessed using LPS-sensitive C3H/HeN mice. A single injection of LPS significantly decreased the anti-sheep red blood cells (SRBC) antibody titers, but not the number of anti-SRBC antibody producing spleen cells. In contrast, double LPS injection did not significantly decrease the anti-SRBC titers and even increased the number of anti-SRBC antibody producing spleen cells. Similarly, single LPS injection significantly suppressed the swelling of the footpad, but double LPS injection caused milder suppression. These results suggest that a difference in the level and timing of exposure to LPS may influence the immune response to infection or vaccination

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Comparative Investigation of Several Sperm Analysis Methods for Evaluation of Spermatotoxicity of Industrial Chemical: 2-bromopropane as an Example

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Industrial Health 42, 219-225, 2004.

Reproductive toxicity of 2-bromopropane (2BP), a substitute for ozone layer-depleting chlorofluorocarbon, was found among the workers in an electronics factory in Korea in 1995. Furthermore the importance of testicular toxicity has been realized since the problem of endocrine disruptors arose all over the world, but manual methods must rely on subjective assessment. Recently, computer-assisted sperm analysis (CASA) was proposed but this system requires vast investment. We then investigated the applicability of the MTT method with a microplate and sperm quality analyzer (SQA) as simple, rapid, and economic instrumental methods for the examination of sperm quality in rats, comparing it with the manual microscopic method and CASA. Epididymal fluid derived from male F344/N Slc (Fischer) rats intraperitoneally injected with 2BP in the dose range of 125-1000 mg/kg/day twice a week (total 8 times) were examined by these methods as a model experiment. Sperm count measured by the manual method and CASA in the epididymal fluid, absorbance by the MTT method and sperm motility index value by the SQA method were significantly lower in the 2BP 1000 mg/kg administered group than in the control group. This result suggests that the MTT method can detect oligospermia. With the microplate and microplate reader, the efficiency of detection becomes much better. Sperm analyses by the MTT method with the microplate reader and the SQA method are available for reproductive toxicity

study in rats.

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Positive coping up- and down-regulates in vitro cytokine productions from T cells dependent on stress level

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Psychotherapy and Psychosomatics 73,243-251, 2004.

BACKGROUND: Specific coping styles have been shown to modulate stress-induced immune alterations and influence actual health outcomes. This study examined the effects of stressors and coping styles on human T-cell subpopulations and in vitro cytokine production using a cross-sectional design. **METHODS:** Seventy-one men (18-60 years old) were asked to complete a self-administered questionnaire that evaluates quantitative workload, mental demand and coping styles. The numbers of T-cell subpopulations and concentrations of interferon-gamma (IFN-gamma) and interleukin-4 (IL-4) after stimulation with phytohemagglutinin were measured. **RESULTS:** Positive and negative coping were negatively related to IL-4 and the number of CD4+ cells, respectively. Interactions between positive coping and mental demand significantly affected the number of CD8+ cells, IFN-gamma, IL-4 and the IFN-gamma/IL-4 ratio. Among men reporting high mental demand, positive coping was related to increased IFN-gamma and IFN-gamma/IL-4. Among men reporting low mental demand, positive coping was related to a decreased number of CD8+ cells and lower concentrations of IFN-gamma and IL-4. Analyses adjusting for the numbers of CD3+ and CD8+ cells revealed that the interactive effects of positive coping and mental demand on cytokine levels were attributable to the changes in T-cell function rather than the number of T cells. No modulating effect of anxiety on the associations of stressors and coping with immune function was observed. Depressive symptoms slightly, though not significantly, modulated the association of negative coping and the number of CD4+ cells. **CONCLUSIONS:** From the perspective of immunology, optimal stress characteristics were determined by an individual's coping styles, with positive coping being associated with stress-induced changes in the number of CD8+ cells and in vitro cytokine production from T cells. Our findings suggest that it is important to consider the interactive effects of the complexity of work and the individual coping style in stress management.

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Musculoskeletal complaints and psychosocial risk factors among Chinese hospital nurses

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Occupational Medicine 54, 579-582, 2004.

Musculoskeletal complaints represent a common occupational problem for health care workers throughout the world. Despite their sizeable numbers, however, few epidemiological studies have investigated musculoskeletal complaints among Chinese hospital nurses. To assess the prevalence of, and risk factors for, musculoskeletal complaints among hospital nurses in mainland China. A total of 282 female, registered nurses were surveyed (92% response rate) using a modified Chinese-language version of the Standardized Nordic Questionnaire. Body sites were divided into the neck, shoulder, upper back and lower back regions. The 12 month period-prevalence of musculoskeletal complaints at any of the four regions was 70%. The lower back was the most commonly reported body site (56%),

followed by the neck (45%), shoulder (40%) and upper back (37%). High mental pressure, boring or tedious tasks and limited work support were identified as significant risk factors (adjusted odds ratios: 1.79-2.52). No correlations were found

between manual handling or perceived physical exertion and increased reporting of musculoskeletal complaints. This study has shown that musculoskeletal complaints are prevalent among Chinese hospital nurses. The correlation with various psychosocial factors is also consistent with evidence from other countries.

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Needlesticks and Sharps Injuries Among Chinese Hospital Nurses

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In this study, we found nurses who indicated their departments were understaffed were 7.6 times more likely to have incurred a NSI (needlestick and sharp injury) than nurses who said their departments were adequately staffed (odds ratio 7.6, 95% confidence interval 2.5-33.3, P = 0.001). In the hospitals we surveyed, a “mixed shift” comprised one day shift, followed by one night shift, followed by a day off. Nurses working mixed shifts were 3.5 times more likely to have sustained a NSI than those who did not (OR 3.5, 95% CI 1.4-9.0, P = 0.007).

Nurses working in the gynecology department were only 0.3 times as likely to report an NSI as nurses in other areas (OR 0.3, 95%CI 0.1- 0.9, P = 0.033). However, the meaning of this finding is difficult to ascertain; it may simply reflect differences in reporting behavior between gynecology and other departments. Overall, our research supports previous studies that found a correlation between NSIs and low staffing and/or worker morale.

Our data also support the notion that NSIs do not simply occur at random among nursing staff.

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Musculoskeletal Disorders among Professional Nurses in Mainland China

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Journal of Professional Nursing, 20, 390-395, 2004.

Although musculoskeletal disorders represent a significant occupational issue for professional nurses worldwide, few epidemiological studies have been conducted in mainland China. Therefore, we investigated 180 nurses (84.1 percent response rate) from a teaching hospital in Shijiazhuang, Hebei Province, using a previously validated, self-reporting musculoskeletal disorder survey. The overall prevalence of musculoskeletal disorders was 70.0 percent, with individual categories reported as follows: lower back (56.7 percent), neck (42.8 percent), shoulders (38.9 percent) and upper back (38.9 percent). Period pain was shown to increase the risk of musculoskeletal disorders 23.8 times (odds ratio [OR] 23.8; 95 percent confidence interval [CI], 4.3-189.1; P =0.008). Excessive mental pressure incurred a 10.5-fold risk increase (OR 10.5; 95 percent CI, 2.2-67.5; P =0.0058). Interestingly, occasional consumption of alcoholic drinks reduced the risk of musculoskeletal disorders 10-fold (OR 0.1; 95 percent CI, 0.01-0.4; P =0.0046), as did working in the gynecology department (OR 0.1; 95 percent CI, 0.01-0.7, P =0.0240). Overall, our study showed that musculoskeletal disorders are common among nursing professionals in mainland China and represent an important occupational issue for this Asian demographic.

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Work Environment and Hand Dermatitis among Nurses in a Chinese Teaching Hospital

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Environmental Health and Preventive Medicine 9, 181-184, 2004.

Objective: The aim of this study was to investigate the effects of the working environment on hand dermatitis (HD) prevalence among nurses in a Chinese teaching hospital. Methods: We utilised a previously validated, self-reporting survey which was translated into Chinese. Results: The prevalence of HD among nurses was 18.3%, although this rate varied between departments, ranging from 9.4% in gynecology to 26.7% in intensive care (P for Trend=0.3167). Logistic regression indicated that wet work was the most important HD risk factor, with a 9-fold increase (OR 9.0, 95%CI 1.2-74.9, P=0.0342). Allergic disease was also related to HD, with a 4.6-fold increase noted (OR 4.6, 95%CI 1.4-15.0, P=0.0096). Conclusions: Overall, the prevalence of HD among Chinese hospital nurses appears to be less than that of their foreign counterparts. Nevertheless, the burden of this disease does seem to vary with respect to department of employment within the hospital.

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Musculoskeletal disorders among Chinese nursing students: results from a pilot study

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Ergonomics Australia 18,18-22, 2004.

Although nursing students may be affected by Musculoskeletal Disorders (MSD), no research from Mainland China has yet been published in the English-language literature. Therefore, we investigated MSD among students within a typical Chinese nursing school using a questionnaire survey. By location, lower back MSD was the most common condition, affecting 28.1%. This was followed by MSD of the feet (19.3%), neck (15.8%), knee (12.3%), shoulder (8.8%), wrist (8.8%), upper back (7.0%) and upper legs (5.3%). The period-prevalence of any MSD over the past 7-days was 31.6%, and over the past twelve months 49.1%. Students reporting an MSD within the previous seven days were more likely to report an MSD occurring in the previous twelve months (OR 6.0, 95%CI 1.7 - 25.1, P = 0.0079). Depression was found to increase the risk of any twelve month MSD nine times (OR 9.0, 95%CI 1.6 - 74.7, P = 0.0198), as too, increasing BMI (OR 11.9, 95%CI 1.3 - 142.3, P = 0.0357). Interestingly, undertaking regular exercise reduced the twelve month MSD risk among students within our investigation (OR 0.1, 95%CI 0.02 - 0.5, P = 0.0090). Overall, this pilot study provides some interesting ergonomics data regarding Chinese nursing students, for what appears to be the first time.

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Epidemiology of hand dermatitis among rural nursing students in mainland China: results from a preliminary study

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Rural and Remote Health 4(online), no.270, 2004.

Although Hand Dermatitis (HD) is known to affect nursing students worldwide, no studies of this nature have yet been conducted among their Chinese counterparts. Therefore, we conducted a preliminary study of female students from both grades of a hospital-based nursing school in Hebei Province, China. There were 27 students from the 2nd year (47.4%) and 30 from the 3rd year (52.6%). HD prevalence fell from 29.6% in the 2nd year to 13.3% in the 3rd year and averaged 21.1% across both

grades. Systemic allergic disease among family members was found to be statistically associated with HD ($P < 0.05$). Overall, our pilot study showed that HD probably affects Chinese nursing students at rates similar to that of their Japanese counterparts, but higher than other investigations from Germany, Holland and Australia. The identification of familial allergic disease as a possible risk factor for HD was also novel. Nonetheless, this investigation was conducted as a preliminary investigation, and as such, our results need to be treated with caution. Further research is recommended to more carefully elucidate the prevalence of HD among larger groups of Chinese nursing students.

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Post-lunch nap as a worksite intervention to promote alertness on the job

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Ergonomics 47, 1003 ? 1013, 2004.

A worksite study was conducted to examine whether a 15-min nap during a postlunch rest period would affect subsequent alertness, performance, and nocturnal sleep in eight factory workers under a 3-week protocol. Subjects were asked to take the nap at 12:30 h on a reclining chair during the nap week, and to remain awake during the no-nap week. The order of these 2 weeks was counterbalanced between the subjects. During the third, follow-up week, each subject determined whether or not she/he would nap. Alertness on the job and nocturnal sleep were assessed using a sleep diary. Wrist activity was also recorded during sleep at night. Choice reaction time task (RT) was performed at 10:00 and 15:00 h every day of the nap week and every other day of the no-nap and follow-up weeks. Perceived alertness was significantly higher in the afternoon after nap than after no nap at the end of the week. Similar effects were observed during the follow-up week where almost half of the subjects napped. No significant differences between the three weeks were found for RT performance or nocturnal sleep. Workers' attitudes toward the nap were favourable. Although further intervention research is required, our results suggest that post-lunch napping may have the potential to promote daytime alertness at work.

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Measurement of Human Body Surface Vibrations Induced by Complex Low-frequency Noise Composed of Two Pure Tones

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Journal of Low Frequency Noise, Vibration and Active Control 22, 209?223, 2003.

To clarify the mechanical responses of the human body to airborne vibrations, six male subjects were exposed to eight kinds of low-frequency noise stimuli: airborne white noise, two pure tones (31.5 and 50 Hz), and five complex noises composed of pure tones. The vibrations induced on the body surface were measured at five locations: the forehead, the right and left anterior chest, and the right and left anterior abdomen. It was found that the vibration acceleration levels of both the 31.5- and 50-Hz components in the chest vibration increased as an approximately linear function of the sound pressure levels of each corresponding frequency component in the noise stimulus. No clear interference was found between the 31.5- and 50-Hz components in the chest vibration. Similar characteristics were also found in the vibrations induced at the forehead and abdomen. These findings suggest that within the limited range of frequency and sound pressure level used here, the human body acts as a mechanically linear system in response to airborne vibrations induced by complex low-frequency noise.

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An Improved Gold Amalgam Method for Measurement of Mercury Vapor in the Workplace

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Journal of Occupational and Environmental Hygiene, 1:D75-D79, 2004.

In present study, analytical method for mercury vapor in the workplace air based on gold amalgam collection was evaluated and compared to AnasorbR C300 which is based on air oxidation catalyst. The air oxidizing mercury collection method has been widely used as mercury analysis for measurement of personal exposure in workplace. This method is now prepared as an ISO method as ISO 17733. Although, the gold amalgam method has excellent ability, e. g. higher sensitivity and easier operation than the air oxidizing mercury collection method, there has been a few applications to workplace.

In a battery factory where workers have treated zinc amalgam, the gold amalgam method and air oxidizing mercury collection method were simultaneously carried out. It was revealed that the mercury concentration in the workplace was 0.0001mg/m³. The results obtained by the both methods were the same each other when the sampling were done for 3.5h sampling. However, in the case of short-term sampling, 15 and 30minutes, the amount of collected mercury was below the quantitative limit of air oxidizing mercury collection method but was enough for the gold amalgam method.

Based on these results, present paper describes the cases which should be taken into consideration whether a gold amalgam method or air oxidizing mercury collection method are well suitable.

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Association of lymphocyte sub-populations with clustered features of metabolic syndrome in middle-aged Japanese men

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Atherosclerosis 173, 295-300, 2004.

To examine the relationship between altered cellular immune status and clustered features of the metabolic syndrome, we measured body mass index (BMI), serum concentrations of high-density lipoprotein-cholesterol, triglycerides, fasting plasma glucose, and blood pressure levels as well as differential leukocyte counts and lymphocyte sub-populations among 439 apparently healthy Japanese men aged 35-60 years. The components of the metabolic syndrome were defined based on the following criteria: BMI ≥ 25.0 kg/m², fasting plasma glucose ≥ 6.11 mmol/l, systolic blood pressure ≥ 130 mmHg and/or diastolic blood pressure ≥ 85 mmHg, high-density lipoprotein (HDL)-cholesterol < 1.03 mmol/l, and fasting triglyceride ≥ 1.69 mmol/l. Counts of total leukocyte, total lymphocyte, CD3 + T cell, CD4 + T cell, and CD4 + CD45RO + T cell significantly correlated with the number of components of the metabolic syndrome (0, 1, 2, and 3+) after adjustment for age and smoking status. These findings were more evident among smokers than among non-smokers. The counts of total leukocytes, total lymphocytes and more specifically memory (CD4 + CD45RO + T) cells were elevated with clustered features of the metabolic syndrome in middle-aged men, which suggest the involvement of altered cellular immune status in the pathogenesis of atherosclerosis.

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Relationships of differential leukocyte and lymphocyte subpopulations with carotid atherosclerosis in elderly men

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Journal of Clinical Immunology 23, 469-476, 2003.

To examine the relationship between systemic immune status and carotid atherosclerosis in elderly men, differential leukocyte counts and lymphocyte subpopulations were measured in 557 apparently healthy Japanese men aged 60-75 years. Each individual also underwent high-resolution ultrasonography for measurement of intima-media thickness (IMT) of the common carotid arteries. The increased numbers of circulating lymphocyte subpopulations, including memory T cells (CD4+CD45RO+T cells) and late-phase activated B cells (CD19+CD80+B cells) correlated significantly and positively with the mean IMT of the common carotid artery after adjustment for age, smoking, and other cardiovascular risk factors. The positive associations of CD19+CD80+B and CD4+CD45RO+ T cell counts with mean IMT were more evident among nonsmokers, hypertensives, and men with lower HDL-cholesterol levels. The present epidemiological study provided the evidence that alterations in lymphocyte subpopulations, in particular memory T cells and late-phase activated B cells concur with carotid atherosclerosis among free-living elderly men.

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Naive CD4+CD45RA+ T cell subpopulation is susceptible to various types of hazardous substances in the workplace

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International Journal of Immunopathology and Pharmacology 17, 109-114, 2004.

To find the most susceptible lymphocyte subpopulation with exposure to various occupational hazardous substances, we reanalyzed our previous data. We measured T, B and natural killer (NK) cell subpopulations by means of flowcytometry among workers who were exposed to aromatic amines, chromate, mercury lead and organic-solvents. The exposed/non-exposed ratio was defined as the mean value of the absolute number of lymphocyte subpopulations in the exposed workers divided by the corresponding value of the non-exposed control group in 5 studies reported previously by us. The ratio of CD4+CD45RA+ T cells in all the exposed groups examined in this study was less than 1.0, and the mean of these ratios was 0.77, which was the lowest among lymphocyte subpopulations examined. The mean ratio was 1.06 for CD4+CD29+ T cells, 0.91 for CD4+ T cells, 0.99 for CD8+ T cells, 0.93 for CD3+ T cells, 0.99 for CD19+ B cells, 0.96 for CD57-CD16+ NK cells, 0.82 for CD57+CD16+ NK cells, 1.25 for CD57+CD16- NK cells and 0.89 for total lymphocytes.

With regard to the difference between exposed and non-exposed workers The estimated overall difference in the mean absolute number of CD4+CD45RA+ T cell subpopulation between exposed and non-exposed workers among five studies was 2135 (99% confidence interval, CI: (-194, -75)) cells/mm³ (p<0.01). In conclusion, naive (CD4+CD45RA+) T cell subpopulation was the most susceptible to the effects of various toxic substances as compared with other lymphocyte subpopulations. This lymphocyte subpopulation may be useful for monitoring immune system of workers exposed to various types of substances in the workplace.

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Effects of Static Load on the Weight and Protein Content in the Leg Muscles of the Mouse: a Simulation of Prolonged Standing in the Workplace

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Industrial Health 42,401-407, 2004.

To simulate the effects of prolonged standing in the workplace on the leg muscles, we subjected mice to centrifugation for 6 weeks. The absolute wet weight of leg muscles and internal organs of mice were measured after exposure to 3G by centrifugation for 6 weeks and at 2 weeks after removal of centrifugation. The weight of the soleus muscle (antigravity muscle) significantly increased after 6-week exposure to centrifugation, but it decreased to its control weight 2 weeks after removal of centrifugation. In contrast, the wet weights of the anterior tibial muscle, liver, and kidneys of mice centrifuged for 6 weeks were significantly lower than those of the control mice; they had returned to control levels 2 weeks after removal of centrifugation. It was therefore suggested that prolonged standing enlarged the leg muscles but its effect did not last for a long period of time after stopping prolonged standing. Western blot analysis of proteins extracted from the soleus muscle showed that vinculin and β -actinin in the centrifuged mice increased slightly, but there were no differences in the heat shock protein 70 (HSP70) and desmin levels between the centrifuged mice and control mice. No difference in HSP 70 suggested that muscle damage did not exist after 6 weeks centrifugation.

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Health Effects of Exposure to Ethylene Glycol Monoethyl Ether in Female Workers

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Industrial Health 42, 447-451, 2004.

Ethylene glycol monoethyl ether (EGEE) is a solvent commonly used in industry. To find the health effect of the solvent exposure in women, we did an investigation on 32 female workers exposed to EGEE in factories manufacturing photopolymer sensitization plate, and 20 subjects working in the same companies without potential exposure to the solvent. The mean age was 35.0 and 33.9 yr in the two groups, respectively. The mean concentration of the urinary metabolite (ethoxyacetic acid) was 120.87 mg/g creatinine (geometric mean) in the exposed group, and 2.71 mg/g creatinine in the control group. Average RBC count and hemoglobin levels were normal in both groups. However, there were 2 subjects in the exposed group with an RBC count and hemoglobin concentration slightly lower than the standard. Out of 20 controls, 5 subjects reported irregular menstruation, and in comparison, 4 out of 32 exposed females had the same complaint. The most common health complaints were dizziness and swelling of the legs, with the same frequencies seen in both groups.

Overall, our study suggests that although female workers were exposed to high concentrations of EGEE, subsequent health problems possibly due to such exposure were not significant.

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Ultraviolet irradiation increases the sensitivity of cultured human skin cells to cadmium probably through the inhibition of metallothionein gene expression

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Toxicology and Applied Pharmacology 200, 251-257, 2004.

We previously developed an apparatus that can irradiate cultured cells with monochromatic ultraviolet (UV) rays to exactly assess the biological effects of UV components on mammalian cells. Using this device, we studied the effects of UV in and near UVB region on the general as well as specific protein synthesis of the human skin-derived NB1RGB cells. We found that Cd-induced synthesis of metallothioneins (MTs), which are the proteins involved in the protection against heavy metals and oxidative stress, is inhibited by UV at 280 nm more extensively than total protein synthesis. Such an inhibition was observed when MTs were induced by different inducers such as Cd, Zn and dexamethasone in three human cell lines indicating that it is not an event specific to a certain inducer or certain cell type. By contrast, UV at 300 nm or 320 nm showed only a marginal effect. UV at 280 nm was likely to block MT gene transcription because Cd-induced increase of MT mRNA was strongly inhibited by irradiation. Cd induction of 70-kDa heat shock protein mRNA was also inhibited by UV irradiation, suggesting that the expressions of inducible genes are commonly sensitive to UV. Furthermore, we observed that the irradiation of UV at 280 nm renders NB1RGB cells extremely susceptible to Cd probably due to the reduced MT synthesis. These observations strongly suggest that UV at 280 nm severely damages cellular inducible protective functions, warning us of a new risk of UV exposure.

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World at work: Manufacturing “Tatami” mats in China

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Occup Environ Med 2004; 61, 372-373, 2003.

Tatami matting produced from rush is used in almost all households in Japan. Now, most matting products are imported from China. Rush cultivation and processing began in the 1980s in China, being introduced from Japan. In 1999, the cultivation area had increased to 5980 hectares, and exports of matting to Japan were 45,000 metres in a local area of China. Chinese researchers have recently found some serious occupational hazards in the industry.

In the late 1990s, it was found that workers were heavily exposed to dust from the mud during the process in the rush matting enterprises in China. The geometric mean of total dust concentration in the workplace was 20.00 mg/m³, and that of respirable dust was 8.22 mg/m³. The content of free silica in the worksite sedimentation dust was 25.6% on average. Among 661 workers who underwent chest x-ray examination, the prevalence of small opacities of profusion category more than 1/0 was 2.57%.

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Effects of urbanization, economic development, and migration of workers on suicide mortality in Japan

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Social Science & Medicine 58, 1137-1146, 2004.

The relationships between male or female age-adjusted suicide mortality and social life factors for all 47 Japanese prefectures in 1980, 1985 and 1990 were investigated by stepwise multiple regression analysis after classification of 20 social life indicators by factor analysis. During this period, Japan experienced the second economic crisis (the so-called secondary oil crisis) in 1980-1983 and economic prosperity (bubble economy) in 1986-1990. In all the three years, male suicide mortality was significantly related inversely to the urbanization and economic development factor, the result of which was consistent with the data in our previous study for the years 1970 and 1975. Similarly, the male mortality was positively related to the factor of migration of workers in the three years. No factor significantly related to female

mortality for all the three years was found. It is suggested that (1) urbanization was a major determinant which prevented male suicide mortality during the past 20 years (1970-1990) in Japan; (2) migration of workers became an important factor for male suicide mortality during these 10 years; and (3) female suicide mortality was less vulnerable to social life factors for these 20 years than the male mortality.

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Relationship between increased blood lead and pregnancy hypertension in women without occupational lead exposure in Tehran, Iran

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Arch Environ Health 59, 70-75. 2004.

This study was conducted to assess the relationship between blood lead levels and pregnancy-induced hypertension. Participants were 110 pregnant women, of whom 55 were hypertensive, 27 ± 5.6 yr of age (mean \pm standard deviation) (range = 17-40 yr); the other 55 women were age- and gravidity-matched normotensive controls. Participants were selected on the basis of their medical history and the results of a questionnaire-based interview. Subjects were at gestational ages 37 ± 2.5 wk (range = 30-41 wk) and were not occupationally exposed to lead. Blood samples were collected within 24 hr after delivery, and blood lead levels were measured.

For the hypertensive cases, blood lead levels were $5.7 \pm 2 \mu\text{g/dl}$ (range = $2.2\text{-}12.6 \mu\text{g/dl}$ [$0.27 \pm 0.10 \mu\text{mol/l}$; range = $0.11\text{-}0.60 \mu\text{mol/l}$]), which were significantly higher than those of the control group (i.e., $4.8 \pm 1.9 \mu\text{g/dl}$; range = $1.9\text{-}10.6 \mu\text{g/dl}$ [$0.23 \pm 0.09 \mu\text{mol/l}$; range = $0.09\text{-}0.51 \mu\text{mol/l}$]). There were no significant differences in blood lead concentrations among hypertensive subjects with proteinuria (n = 30) and those without proteinuria (n = 25). Results of this study indicated that low-level lead exposure may be a risk factor for pregnancy hypertension.

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