

4. Abstracts in International Scientific Meetings

Nation-wide Survey on Occupational Health Activities in Small-scale Enterprises

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International Symposium on Occupational Health in Small-scale Enterprises and Informal Sector, 12-15 November 2004, Abstract p61.

Objectives: In order to clarify the real condition of OH activities in SSEs at the nationwide level, we conducted a questionnaire study sent to SSEs. We selected SSEs according to the rate of scale by employee number in “Census of Workplaces in 1999”. Subjects and Methods: Two thousand enterprises were selected from the list in the “Census” describing the names and addresses of enterprises with 5 or more employees. The questionnaire included type of business, number of employees, independence, OH competent person, conduction of health examination, potential hazardous works and countermeasures (chemicals handling, computer work, etc), committee or other types of organizations for OH, and others. Questionnaires were distributed to enterprises listed with 5 or more employees by coordinators in Regional Occupational Health Centres in 29 prefectures.

Results: One thousand six hundred seventy three enterprises with 1-49 employees responded to the questionnaire. The numbers of employees in some enterprises at the study time were different from those in 1999. Many SSEs with less than 50 employees had no OH competent person (1-4, 5-9, and 10-49 employees: 84.3, 80.6, and 56.1%, respectively). In enterprises with more than 50 employees, the representation of OH competent persons was higher (50-99, and more than 100 employees: 20.0 and 15.8%, respectively). Periodical health examinations, special health examinations for occupational health risks, OH education against the occupational health risks were poorly conducted by SSEs, and the OH guideline for computer work was poorly known among SSEs. Discussion and Conclusions: The differences of OH activities by scale of number of employees were clarified at a nationwide level. However, OH activities in SSEs with 1-4 employees were not clarified sufficiently. Various policies and methods should be established and implemented to improve the low level of OH activities in SSEs.

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Occupational health issues in medium- and small-scale enterprises (MSEs) in Japan

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15th Japan-China-Korea Joint Conference on Occupational Health, 20-22May, 2004, Programme and Abstracts, p39.

Definition of MSEs: Medium-scale, enterprises with less than 100 employees; small-scale, enterprises with less than 50 employees. 1. Current conditions of occupational health (OH) in MSE in Japan 1) About 70% of work accidents arose in MSEs. 2) Poor activities of OH in MSE (nation-wide survey by Furuki, local survey by Hirata et al. and others) (1) Poor risk management. (2) Heavy burden of general health management (3) Poor manpower for OH activities 2. Needs for OH among workers and employers 1) Mental health in SSEs (local surveys by Nakata and Ikeda) 2) Musculoskeletal disorders including low back pain and ergonomic measures 3) Work-related diseases including circulatory diseases 4) General health management (but, conflict with privacy) 3. Current measures for improve OH in MS 1) Regional OH Center (ROHC) and OH Promotion Center (OHPC), 2) Subsidies to grouped SSEs (employment of OP, OSH activity and others) 4. Direction of improvement of OH in MSEs 1) All enterprises cared by OPs, OHN and/or IH for calculated hours based on number of workers and risks 2) General health management supported by community health or statutory health insurance 3) OH

services provided by OH organization through supporting to risk management and subsidies by statutory accident insurance 5. Current trials to improve OH activities in MSEs

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Improvement against hazards in small-scale enterprises on their own initiatives

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Introduction: In the small-scale enterprises (SSEs), many types of improvements of work conditions or methods to reduce workers' load or pain have been achieved by their own initiative without the helps of experts. In order to clarify the improved conditions and to distribute them as references of improvements to work conditions or methods, we collected them through visiting SSEs. Subjects and Results: Subjects: Subjects were 27 metal processors, 3 plastics processors, 1 coater, 1 plate maker and 1 food processor. Methods: We visited the SSE and received explanation by responsible person in the SSE, and then we walked through the workplaces in the SSE. Our inspection was as follows: 1) improvement against chemical hazards 2) improvement against physical hazards, 3) improvement by ergonomic method to reduce the risks of musculo-skeletal disorders, 4) improvement to amenities in the workplace, 5) arrangement of tools, products or passages, 6) improvement to safety of press machine, etc. We collected some examples of increased productivity together with improvement of workers' conditions as a result of the improvement. Results: We collected 21 improvement cases against chemical hazards (20 cases of local exhaust), 10 cases against physical hazards (9 cases against noise), 38 cases against ergonomic hazards (18 cases to help transference of heavy items), 12 cases of amenity, 8 cases of arrangement, 9 cases of safety and 4 cases regarding other factors. Discussion and Conclusion: We could not confirm the usefulness or effectiveness of these improvements. However, since the workers were using improved tools or devices, these improvements looked likely to be accepted by workers. Through the collection of the improvements, we considered that the motivation of employers and employees (E & E), the sharing of information between E & E, and other SSEs, and the participation of experts in occupational health are of importance.

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A compact checklist for assessing the degree of accumulated fatigue due to overwork

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Long Working Hours, Safety, and Health: toward a National Research Agenda, University of Maryland, Baltimore, April 29 - 30, 2004.

Background: In Japan there is a social problem of health hazards that are associated with overwork. According to the 2002 Labor Force Survey, more than 6 million people work more than 60 hours a week. In fiscal 2002, 317 cases of cerebrovascular diseases and ischemic heart diseases were recognized as occupational ones resulting from overwork (Karoshi). Comprehensive health program: In 2001, based on medical research findings, the Ministry of Health, Labor and Welfare (MHLW) amended the compensation criteria for occupational cerebrovascular diseases and ischemic heart diseases. Furthermore, in 2002, MHLW launched a "Comprehensive Program for the Prevention of Health Impairment Due to Overwork". In this program, employers make efforts to reduce overtime work to 45 hours or less a month. When overtime work exceeds 45 hours a month, employers receive guidance from occupational physicians on workplace health management. If overtime work exceeds 80-100 hours

a month, workers receive health guidance through an interview with occupational physicians. Fatigue checklist: The occupational physicians providing guidance are required to assess the health effects of long working hours. The physicians will provide additional information about other job stressors such as psychological stressors, night work, etc. and sleep-rest because the health effects of long working hours can be either aggravated or mitigated by these two factors. To assist physicians in this effort, the authors have made a checklist that evaluates overtime work, other job stressors, sleep-rest, and subjective symptoms for assessing accumulated fatigue.

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Effects of Prenatal Exposure to 2,2',4,4',5,5'-Hexachlorobiphenyl (PCB153) on Somatic Growth and Thyroid Status in Male Rat Offspring

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10th International Congress of Toxicology (ICTX-2004), Toxicol Appl Pharmacol 197, 230, 2004.

Polychlorinated biphenyls (PCBs) are a group of most widespread environmental contaminants due to their persistence and ubiquitous presence in wildlife and humans. Exposure to PCB mixtures at an early stage of development has been reported to affect the endocrine glands, however, little is known about the exact toxicological properties of each PCB. This study was undertaken to determine whether prenatal exposures to 2,2',4,4',5,5'-hexachlorobiphenyl (PCB153), a di-ortho-substituted non-coplanar congener, exert any effect on postnatal development in F1 rat offspring. Pregnant Sprague-Dawley rats (Crj: CD (SD) IGS) were dosed with PCB 153 (0, 16, 64 mg/kg/day) via oral gavage from gestation day (GD) 10 through GD 16, and general developmental parameters in the male offspring were measured. Gestation periods were not differed between the control and PCB-exposed dams. No significant differences in body weights during gestation and lactation were found between the control and the PCB dams. There were no dose-dependent changes in body weight, body length, tail length and organ weights (liver and kidney) in offspring of all ages. Anogenital distance was unaffected. Exposures of PCB153 caused a decrease in the circulating levels of thyroxine (T4) and tri-iodothyronine (T3) in a dose-dependent manner until weaning. These findings suggest that prenatal exposure to PCB153 may change the thyroid status in offspring in some extent without affecting somatic growth. The effect of prenatal exposure (GD10-16) to PCB153 needs further clarification, in relation to thyroid toxicity in the postnatal development of male rat offspring.

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Comparison of Stress Factors Among Children of Japanese Expatriates Living in Duesseldorf in 1991 and in 2003.

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XVIII World Congress of World Association for Social Psychiatry, Program & Abstracts, p304, 2004.

[Background] Globalization of the business world has made a lot of companies expand their activities abroad.

Duesseldorf, where over 6,000 Japanese people live, is one of the base cities in Europe for Japanese companies.

The Japanese school in Duesseldorf is one of the oldest and biggest Japanese schools in Europe. Students from the 1st grade to the 9th grade are studying there. More than half of those who finished compulsory education there go on to Japanese high schools. It is said that one of their biggest stressors is the entrance examination of high schools in Japan.

[Objective] 1) To clarify stress factors among children of Japanese expatriates in Duesseldorf; and 2) To compare their stress factors in 2003 with those in 1991.

[Subjects and Method] A total of 353 students (155 in 2003 and 198 in 1991) in the Japanese school in Duesseldorf were surveyed by means of a self-administrated questionnaire containing stress factors and both mental and physical signs. From each of the 4th, 5th, 6th, 7th, 8th and 9th grades, one classroom was randomly selected in both 2003 and 1991. Then all students in each classroom were surveyed during a homeroom session in their school. The subjects were between nine to fifteen years of age.

[Results] Among fifteen stress factors, the issues of study, language, friends and the next stage of education were the biggest four factors for both students in 1991 and in 2003. Significantly more students in 2003 than those in 1991 have chosen language and friends as stress factors, and wanted to return to Japan.

[Conclusion] Main stress factors were common for both the students in 1991 and those in 2003. However, there were some differences between them. Further studies are necessary to clarify the background of the

change of stress factors in these twelve years.

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Comparison of 12 Axis Vibration Measurement Data for Evaluating Ride Comfort of Mobile Machinery Vehicles According to the ISO 2631-1 Standard

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Program and Abstracts of 15th Japan-China-Korea Joint Conference on Occupational Health, p.62-63, 2004

ISO 2631-1 was published in 1997 for evaluating ride comfort of mobile machinery vehicles on the seat. This standard is specifying to measure simultaneously 12 axis vibration of seat back, on the seat and a foot, which influence a ride comfort on a seat. Although the ride comfort evaluation based on this standard, there is no commercially available measurement system in the world. Therefore, there is no measured and evaluated data by this standard in a riding type machine. Mainly the National Institute of Industrial Health newly developed the ride comfort evaluating system according to this standard. Since developed the ride comfort evaluation system, we measured and evaluated vibration of a riding type machine in order to consider to the ride comfort of machine work. In this paper, the 12 axis vibration measurement data of the mobile machinery vehicles on the seat is compared.

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Strategy for prevention of hand-arm vibration injuries

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Program and Abstracts of 15th Japan-China-Korea Joint Conference on Occupational Health, p.28-29, 2004.

In general, the following vibration control is considering as a view for aiming at the reduction of hand arm vibration injuries. 1) Using and selecting hand held vibration tools designed for low Vibration, 2) Minimize the time working with vibrating tools by job rotation, 3) Using Personal Protective Equipment (Anti-vibration gloves). It might be thought that it is inadequate as the information and measure as a method of decreasing hand-arm vibration injuries. EC Directive is published on June 25, 2002, and the vibration exposure limit value and the vibration exposure action value of a vibrating tool are enacted to an employers or laborers.

Moreover, the permissible values of vibration exposure are also enacted in Japan Society for Occupational Health. In this paper, the strategy for prevention of Hand-Arm Vibration Syndrome was described.

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Asbestos in Japan

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The Proceedings of the European Asbestos Conference 2003, the BG-Akademie, 3-6 September, p101-104, 2003.

Asbestosis is compensable as one of the pneumoconiosis since 1952. The criteria of the compensation for asbestos induced lung cancer and malignant mesothelioma was established in 1978, and since then these two cancers were prescribed as occupational one by Enforcement Ordinance of Labor Standards Law. Up to the end of March 2002, a total of 235 cases for lung cancer and 230 cases for malignant mesothelioma (pleura, peritoneum) were compensated as occupational asbestos-related cancers (1977-81 11 for lung cancer, 1 for mesothelioma; 1982-86 26, 17; 1987-91 44, 29; 1992-96 54, 61; 1997-2001 90, 122). The latent period between the first contact with asbestos and the occurrence of the mesothelioma was 38.0 years on average (median 39.5) for recent 93 compensated cases (all males, 1999-2001). Among these cases, one had para-occupational exposure to chrysotile, which had been used for the filter as the first process of brewing "sake" (Japanese wine) between 1956 and 1959. Another interesting case was a pleural mesothelioma of the iron plate cutter, who had been exposed to talc contaminated with actinolite.

National Institute of Industrial Health

Compensated cases of malignant mesothelioma in Japan between 1999 and 2001

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The 15th Japan-China-Korea Joint Conference on Occupational Health, kitakyusyu, p44, 2004.

Since 1978, asbestos induced mesothelioma was prescribed as occupational cancer by Compensation Board, Ministry of Health, Labor and Welfare in Japan as well as lung cancer. Up to the end of March 2002, 285 cases of mesothelioma (all sites) were compensated. During the recent 3 years (1999 and 2001), 93 cases of malignant mesothelioma were compensated. Seventies were pleural origin, and 23 were peritoneal one. All were males. As for pleural mesothelioma, mean exposure duration was 19.8 years ranging from 2.3 to 42.7 years. Age at the onset was 60 years old on average (30 - 90). The latent period from the first asbestos exposure was 36.9 years on average (11.5 - 54.2). As for peritoneal mesothelioma, mean exposure duration was 21.3 years ranging (4.3 - 47.0). Age at the onset was 63 years old on average (49 - 76). The latent period from the first asbestos exposure was 41.1 years on average (27.3 - 52.2).

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Compensated cases of malignant mesothelioma in Japan between 1999 and 2002

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7th Meeting of the International Mesothelioma Interest Group, University of Brescia School of Medicine, 24-26 June, p110, 2004.

Up to the end of March 2003, 340 cases of mesothelioma (all sites) were compensated since 1978. During the recent 4 years (1999 and 2002), 148 cases of malignant mesothelioma were compensated. One hundred and sixteen were pleural origin, and 31 were peritoneal, and one pericardial one. All were males. As for pleural mesothelioma, mean exposure duration was 19.9 years ranging from 2.2 to 46 years (median 17.1). Age at the onset was 61 years old on average (30 - 90, median 61). The latent period from the first asbestos exposure was 38.2 years on average (11.5 - 70 median 39.3). As for peritoneal mesothelioma, mean exposure duration was 19.8 years ranging (4.3 - 47, median 18.0). Age at the onset was 64 years old on average (49 - 76, median 64).

The latent period from the first asbestos exposure was 41.6 years on average (27.3 - 52.2, median 42.2). On 19th September, 2003, benign asbestos effusion and diffuse pleural thickening due to occupational asbestos exposure were added in the list of prescribed diseases by Ministry of Health, Labor and Welfare, Japan.

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Relation between blood dioxin concentration and dioxin related gene expression among incinerator workers

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17th EPICOH, Melbourne, 2004, Oct. 13-16, Poster 3-40.

Introduction: We studied the relation between blood dioxin concentration and dioxin related gene expression among incinerator workers. Methods: Blood samples were corrected from fasted workers in the morning and allocated to two tubes. One was for RNA extraction and another was frozen for later analysis of dioxins.

CYP1A1, CYP1B1, AhR, hOGG1, α -Actin, and GAPDH were analysed by Real Time PCR technique. Lipid extracted from blood was purified and analysed by HRGC/HRMS to get blood dioxin levels. Results: Study population consists of 35 workers including one female. Age ranges from 22 to 63, averages 46.3. Total blood dioxin level ranges from 4.0 to 21.1pg-TEQ/g-fat, averages 11.8. Dioxin congeners of which all 35 samples were detected above detection limit were 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,4,6,7,8-HpCDD, OCDD, and 2,3,4,7,8-PeCDF. We divided the amounts of gene expressions of CYPs by each dioxin concentration, which describes induction rate, and drew the histograms. Double peak distribution instead of single peak distribution appeared in 1,2,3,7,8-PeCDD and 2,3,4,7,8-PeCDF data sets. Two groups, those were high and low induction rate groups (HG/LG), were separated by cluster analysis. High correlation existed between the amount of CYP1B1 expressed and blood dioxin levels in HG but there were no those correlations in LG.

Conclusion: Two groups HG and LG were classified according to CYP induction rate. HG has high CYP expression, low blood dioxin level and has correlation between CYP1B1 and blood dioxins. Our results suggested that two groups have different characteristics depending on some kinds of gene polymorphism.

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The Occupational Safety Culture Scale in Japan: Current Situations and Future Directions

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Eighth International Congress of Behavioral Medicine (2004), Abstracts, p315.

The aim of this study was to review the occupational safety culture scale in Japan and determine what kind of concepts had been measured. The data of 12 papers published between 1985 and 2001 in Japan were reviewed.

As a result, 10 of the 12 studies investigated employee consciousness of safety, as in “my top priority is given to safety”, which was the most frequently measured concept in Japanese workers. Next, 7 of the 12 studies inquired about the degree of fruitfulness of safety controlled by organization, such as the work environment or rules, 7 inquired about the organizational climate, such as performance-based climate or cooperative climate, 4 about the quality of human relations with the boss or coworkers, 3

about human characteristics, such as egocentricity or aggression, and 1 about safety behavior such as obeying the fixed process of work or consulting the boss. In many studies, it was found that the factor most directly relevant to preventing accidents is safety behavior. Taking these suggestions into consideration, a questionnaire that can measure the level of each laborer's concrete safety behavior should be developed in Japan.

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Effect of Alternately Repeated Exposure to Cold and Warm Environments on Manual and Mental Performance

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The 1st Integrated Meeting on Thermal Physiology and Pharmacology of Thermoregulation (PPTR 2004), Book of Abstracts, p88.

To examine how alternately repeated exposure to cold and warm environments affects manual and mental performance, ten young adult men aged 21 to 23 years were exposed six times to a temperature of 10° C for 10 minutes, followed by 10 minutes' exposure to a temperature of 30° C. As the control experiment, they were also exposed six times to a temperature of 28° C for 10 minutes, followed by 10 minutes' exposure to a temperature of 30° C. During these experiments, the subjects carried out the finger tapping and mental calculation work in the largest effort in order to evaluate manual and mental performance, respectively. The finger tapping performance significantly decreased with the repetition of cold exposure and did not recover to the control level even during the final warm exposure. The finger tapping performance was significantly influenced by both finger skin temperature and tympanic temperatures. But it was much more correlated with tympanic temperature (R²=0.96) than with finger skin temperature (R²=0.56). The number of error and speed in mental calculation work were not significantly different from the control values. These results suggest that finger manual performance is liable to be more affected than mental calculation performance under such body cooling conditions as caused by alternately repeated exposures to cold and warm environments in this study. They also suggest that under these intermittent cold exposure conditions finger manual performance may be much more influenced by body core temperature than by finger skin temperature.

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The Definition of Occupational Safety Culture in Japan

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Eighth International Congress of Behavioral Medicine (2004), Abstracts, p317.

Purpose The purpose of this study was to examine the definition of occupational safety culture in Japan after reviewing significant international definitions and dismantling the problems of Japanese studies. **Method** We reviewed the major definitions of occupational safety culture. The first was the definition by the International Atomic Energy Agency (IAEA, 1991). The second was by the Human Factors Working Group of the Advisory Committee on Safety in Nuclear Installations (ACSNI, 1993). Then, we examined the study concerning factors that create occupational safety culture in Japan (Hasegawa & Takano, 2001). **Results** The most widely used definition was that of ACSNI. Hasegawa & Takano (2001) pointed out that the measures and assessment methods to create safety culture have not been established in Japan. **Conclusion** We must be aware of many factors to accurately evaluate occupational safety culture, since the ACSNI definition enumerates various factors needed to create safety culture and its background factors. Safety culture is elicited by factors like concrete organizational policy and the attitudes, cognitions, or behaviors of individuals, so it is practical to first consider the explicit factors

quantitatively. In conclusion, our suggestion is to define occupational safety culture as ‘organizational culture in which safety is regarded as a top priority and is elicited by factors like concrete organizational policy and the attitudes, cognitions, or behaviors of individuals. This can be provided by communication based on mutual trust, common recognition of the importance of safety, and the assurance of effectiveness of preventive measures’ .

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Environmental Factors for Mental Health among Japanese Overseas Workers in Bangkok

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XVIII World Congress of World Association for Social Psychiatry, Program & Abstracts, p305, 2004.

The number of Japanese living abroad could reach one million by 2006. The mental health state of Japanese residents overseas is assumed to be affected by various environmental factors including the cultural distance, the stability of the Japanese society in the country, and the quality of the local medical systems. We conducted a questionnaire survey to determine region-specific stress factors among Japanese male workers living in Bangkok (n=310, the average age 50.71 ± 8.82 years), and compared the results with data among Japanese male workers from five other cities (Ho Chi Minh, Jakarta, Duesseldorf, Sydney, and Melbourne). We also conducted a hearing survey to investigate local medical systems that were able to support Japanese psychiatric emergency cases. The questionnaire consisted of three sections using subjective rating scale for 17 stressors , GHQ-12, and WHO-QOL-26. Among the stressors, “verbal communication with local people” , “differences in infrastructure” , and “social discipline” were found to be as major stressors in Bangkok. This coincided with the results in Ho Chi Minh. However, priority of the other stress factor categories was markedly varied in each city.

The mean GHQ score in Bangkok was 1.29 ± 2.21 (Ho Chi Minh: 2.4 ± 2.9, Jakarta: 1.9 ± 2.7, Duesseldorf: 1.9 ± 2.7, Sydney: 0.6 ± 0.9, Melbourne: 1.1 ± 2.1), and the mean QOL score was 3.19 ± 0.71 (Ho Chi Minh: 2.9 ± 0.4, Jakarta: 3.2 ± 0.5, Duesseldorf: 3.0 ± 0.4, Sydney: 3.7 ± 0.3, Melbourne: 3.7 ± 0.4). For the hearing survey, crisis interventions into Japanese psychiatric emergency cases were carried out in cooperation with Japanese consuls and Japanese nurses and psychologists who worked for private general hospitals in Bangkok. Also, telephone helplines, set up and run by Japanese volunteers, have been available since 2002. These results suggest that there is a strong correlation between the mental health of overseas workers and the region-specific stress factors, and local networks with linguistic and cultural awareness are important environmental factors of the mental health support system for overseas workers.

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Prevalence of Ventricular and Supraventricular Premature Beats with 24-hour Holter Electrocardiography in Japanese Healthy Workers

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The 17th International Symposium on Epidemiology in Occupational Health

Introduction: In the workplace, resting electrocardiograms (ECGs) are often performed. However, these ECGs are done for short duration, their ability to detect arrhythmias is minimal. Longer recordings of ECGs lead to the increase of the possibility of detecting arrhythmias. There are not so many data in healthy workers recorded by 24-Holter ECGs. This paper reports a preliminary investigation in 105

healthy workers to clarify the prevalence of arrhythmias with 24-hour Holter ECGs. Methods: We recorded a 24-hour Holter ECG for each of the 105 workers aged 20-62 years using a cardiomemory RAC-102 (Nihon Kohden Co., Ltd., Japan). Data were then analyzed with an electrocardiograph analyzing system DSC-3100 (Nihon Kohden Co., Ltd., Japan).

Results: The prevalence of isolated ventricular (VPBs) and supraventricular premature beats (SVPBs) were 62.9 and 85.9 %, respectively. However, the number of isolated VPBs and SVPBs in the vast majority of workers was under 10 per 24 hours. Conclusions: The prevalence of isolated VPBs was higher than that reported before. However, the number of isolated VPBs was similar to that of another data. Long hours recording of ECG leads to increase the possibility of detection of arrhythmias and to promote the motivation of relevance of cardiovascular diseases in office worker

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Napping and perceived alertness on extended night shifts in nuclear power plants

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Long Working Hours, Safety, and Health: Toward a National Research Agenda, National Conference, April 29-30, 2004, Baltimore, MD, USA

Napping before and during night shift, prophylactic and maintenance napping, respectively, has potential for counteracting diminished alertness on the shift. The present study of nuclear power plant operators sought to evaluate the role of those naps in perceived alertness during two successive shifts of the night (21:00 - 8:30).

The operators (n=608, all men) rated their alertness during the shift using the retrospective alertness rating scale and reported their usual episodes of sleep and naps in a shift cycle. Workers that took any duration of naps before night shifts were defined as prophylactic nappers, and maintenance nappers if they napped during more than half the night shifts in the past one month. Participants were divided into four nap groups by stratifying them according to the above napping behavior. A repeated-measures analysis of variance (factors: nap group and time points) by age group (<40 or ≥40 yrs) showed significantly higher alertness at 8:30 on the first night shift for the younger workers with both prophylactic and maintenance naps than for those with the maintenance nap only. On the second night shift, however, alertness of no nappers was significantly greater at 2:30 and 4:30 than that for the younger workers who took a maintenance nap only, which may be attributed to a longer total sleep time before the shift. No between-group differences in alertness were significant for the older operators.

Our findings highlight both the use of napping on shift and sleeping before the night shift for improved alertness among younger workers.

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Frequency-dependence in the Relationship between Subjective Unpleasantness and Body Surface Vibrations Induced by Low-frequency Noise

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18th International Congress on Acoustics (ICA 2004), Abstracts, V-3737-V-3740, 2004.

To investigate the frequency-dependence in the relationship between subjective unpleasantness and body surface vibrations induced by low-frequency noise, we conducted three experiments in which low-frequency pure tones and complex noises were used as low-frequency noise stimuli. The results obtained for pure tonal stimuli showed that the vibration acceleration levels (VALs) measured at the

chest closely correlated with the rating of subjective unpleasantness when applying a frequency-weighting with a slope of -8.5 dB/oct. In contrast, at the abdomen, a frequency-weighting with a slope of -3.0 dB/oct. was found to be 'suitable'. Based on the hypothesis that a 'suitable' frequency-weighting should be determined when the contribution of the 50-Hz vibration to the correlation is not dominant, it was proposed that these frequency-weightings are consistently applicable to the correlation obtained for complex noise stimuli. These consistent results suggest that not only auditory perception but also mechanoreception contribute to the unpleasantness induced by exposure to low-frequency noise.

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A Study on the Relationship between Subjective Unpleasantness and Body Surface Vibrations Induced by High-level Low-frequency Tones

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The 33rd International Congress and Exposition on Noise Control Engineering (Inter-Noise 2004), Abstracts (CD-ROM), Paper number 592, 2004.

Human body surface vibrations induced by high-level low-frequency tones ('noise-induced vibrations') were measured at the chest and abdomen. At the same time, subjects rated their perceived unpleasantness during the exposure to a low-frequency noise stimulus. The relationships between the measured vibrations and the ratings of unpleasantness were examined, revealing that the unpleasantness correlated significantly with the vibration acceleration level (VAL) of the measured vibrations. In addition, the ratings of unpleasantness were found to correlate with the VALs more significantly than with the A-weighted sound pressure levels of the noise stimuli.

These results suggest that not only the loudness of the noise but also noise-induced vibrations may play an important role in inducing unpleasantness in persons exposed to high-level low-frequency noise. As such, in evaluating high-level low-frequency noise, the effects of noise-induced vibrations should be taken into account.

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A Consideration of the Relationship between Subjective Unpleasantness and Body Surface Vibrations Induced by Complex Low-frequency Noise

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To investigate the relationship between subjective unpleasantness and body surface vibrations induced by complex low-frequency noise, we performed two experiments. In Experiment 1, we used seven types of low-frequency noise stimuli: 2 pure tones (31.5 and 50 Hz) and 5 complex noises composed of the pure tones.

In Experiment 2, we used seven types of noise stimuli in which a 31.5-Hz tone was replaced with a 25-Hz tone. The sound pressure level of each noise component in the noise stimulus was equal to or higher than 90 dB(SPL). The body surface vibrations were measured at the right and left anterior chest, and the right and left anterior abdomen of male subjects. Subjective unpleasantness was rated on a scale of 1 to 5, and correlated with the vibration acceleration levels (VALs) of the vibrations measured on the body surface. As a result, it was found that the ratings of the unpleasantness were, on the whole, in significant correlation with the VALs. In addition, we estimated the 'suitable' frequency-weightings for the VAL to optimize the correlation with the unpleasantness. The results of the estimation were not conclusive but, based on a reasonable hypothesis, consistent with the results of another study in which low-

frequency pure tones were used as the noise stimuli.

These results supported the idea that not only the loudness of the noise but also the vibrations induced by the noise contributed to the subjective unpleasantness of persons exposed to high-level low-frequency noise.

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On the Muscle Activity During a One Hour Tapping Task

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Extended use of keyboard or computer mouse are known risk factors for pain in the finger extensor muscles. It also is well established that the combined exposure to repetitive movements and high force exertion is a risk factor for musculoskeletal disorders. We studied changes in tapping performance and in the finger extensor muscle during a one hour tapping task by continuous registration of intramuscular electromyography (EMG), surface EMG, tapping force and movement of the index finger. We report the results from two subjects (A, B).

The experimental task consisted in uninterrupted tapping with the right index finger at 3 strokes per second (comfortable speed) during one hour, and at 5% maximal voluntary finger flexion pressure force. Surface EMG signals of the extensor digitorum longus were detected by a 2D electrode array developed at the Helmholtz Institute in Aachen. Three channels of intramuscle EMG were recorded in differential mode (Dantec Key-pointR), sampled at 20 kHz and stored on hard disk. At the start of the experiment, the activation of the extensor muscle was much earlier in subject A than in subject B, but was similar at the end of the experiment.

The experiment investigated stress-free repetitive movements and aimed at avoiding any demands on precision or concentration. Under these conditions a high variability of performance and of single motor unit activity was observed. In subject A, press duration continuously increased and activation of the finger extensor muscle was delayed, probably indicating an optimisation of the motor program, but fatigue effects cannot be excluded. We conclude that the motor program of repetitive finger movements is susceptible for continuous and potentially damaging single motor unit activity if additional tension is provoked by demands on concentration, speed or on postural adaptation due to bad ergonomics.

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Effect of ALDH2 polymorphisms on the toxicity of ethylene glycol monoethyl ether in man

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Exposure to the solvent ethylene glycol monoethyl ether (EGEE) is known to cause haematological and reproductive disorders. The main metabolic pathway of the solvent is oxidation to ethoxyacetic aldehyde by alcohol dehydrogenase, followed by oxidation of the aldehyde to ethoxyacetic acid by aldehyde dehydrogenase (ALDH), which is subsequently excreted in urine. The biotransformation of EGEE plays an important role in the expression of its toxicity. ALDH2 is the major enzyme in the metabolism of many short chain aliphatic aldehydes including ethoxyacetic aldehyde. On the other hand, approximately 30% of Asians possess the ALDH2*2 allele encoding the inactive enzyme, in relation to the wild type ALDH2*1 allele. The allele ALDH2*2 is from the single nucleotide polymorphisms at

nucleotide 1510 (G/A) of the gene, resulting in a substitution of Glu to Lys at the amino acid position 487. The aim of our study was to investigate whether ALDH2 polymorphisms influenced the toxic effects of EGEE among exposed Chinese workers. It was shown that sperm count, progressive vitality and normal morphology percentage were all decreased in males exposed to high concentrations of EGEE. Blood concentrations of the sex-related hormones such as testosterone, LH and FSH were not affected by the organic solvent at current exposure levels. RBC count and haemoglobin content were lower in the exposed group when compared to non-exposed controls. Genetic polymorphisms of ALDH2 affected the toxicity of EGEE in both spermatogenesis and hematopoiesis. Overall, our study suggests that ALDH2 *2 may be a protective factor against damage caused by EGEE.

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