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Overview of Occupational Safety and Health System of D Company in the United States: Implications of Korean Occupational Health

Seoung Hoon Lee, M.D., M.P.H.

Department of Occupational and Environmental Medicine,
Dongsan Hospital, Keimyung University and Institute for Medical Science,
Taegu, Korea

= Abstract =

This study was aimed at understanding occupational safety and health system in the United States. For this purpose, the Technical Operations Center (TOC) of D company (Atlanta), which is representative of the air transport business in the US was selected. At D company, occupational safety and health services are cooperatively conducted at two departments, the Department of Health Service (DHS) and the Department of Corporate Safety and Compliance (DCSC), and a private health center, the Cigna Health Center. According to the Occupational Safety and Health Act (OSHAct), the company provides 3 kinds of medical surveillance programs to TOC employees: cadmium, audiometric testing program, and respirator user screening program. The company provides comprehensive health services by including employees' family members to the Health Benefit Plan and the Health Risk Assessment program. The company compensates all cases of work-related conditions of injuries and illnesses. The company shows the greatest concern about ergonomic issues such as cumulative trauma disorders and occupational injuries during the job. The work-site wellness program, which emphasize primary prevention of illnesses seems to be well organized. But, considering a variety of toxic substances in TOC, the company should provide more medical examination services. As one certified industrial hygienist seems to be insufficient in number, D company should hire more industrial hygienist. Also, to maximize the effectiveness, the company should open work-site wellness classes at TOC in place. As for Korea, the results suggest the following areas should be improved in the future. Considering the high rates of alcoholic consumption and smoking, more systematic work-site wellness program that emphasizes lifestyles should be implemented. To increase the effectiveness of current periodic health examination, more systematic health education should be provided. For these parts, the roles of occupational health nurses should be increased. Also, Korean workers' compensation plans should be expanded in the future. It might take long time to improve the

effectiveness of these parts, because it is related to the national economic status and wellness. However, we should continuously try to set up better occupational health system in Korea.

Key Words: Occupational safety and health system, the United States.

Introduction

In Korea, as the industry expands from the 1960s, cases of occupational disease caused by heavy metals or organic solvents poisoning(e.g. benzene, n-hexane, carbon tetra chloride, mercury poisoning) began to be reported in the early 1970s. In response to these problems, the Korea Industrial Safety and Health Act(ISH-Act) was created in 1981(Cho, 1991). Although the regulations on the provision of medical examinations, exposure monitoring, and biological monitoring services are different between the OSHAct and the ISHAct, such legislations seem to have contributed greatly to decrease the number of occupational disease in two countries.

However, the profiles of occupational disease are quite different between the United States and Korea. In the US, disorders associated with by repeated trauma(e.g. conditions due to repeated pressure, vibration, or motion such as carpal tunnel syndrome) are the most commonly reported occupational disease. The number of such disorders were 302,000 cases (60% of all occupa-tional diseases) in 1993 (Webster & Snook, 1994). Occupational skin disor-ders are also on the rise. From a 1983-87 baseline of 64 per 100,000 full-time workers, the 1992 rate increased to 82 per 100,000 workers (US Department of Health and Human Services, 1995). According to the 1995 statistics of Korean Labor Ministry, there were 3,166 cases of occupational disease and the most commonly detected occupational diseases are noise induced hearing loss (60.5%) and pneumoconiosis (37.1%) (Korean Ministry of Labor, 1994). These differences might be related to the history and background of occupational safety and health in two countries. For example, Korean occupational health has been in existence for a much shorter time than that of the US. Thus, the levels of technology, research capability are not strong as those of the US. Also, the workers' compensation system in the US covers more occupational diseases than that in Korea.

However, in spite of these differences, the primary purpose of occupational health practice would not be different in two countries. In this regard, a study on the US system might help us understand the importance of occupational health practice. Furthermore, such study might give us valuable lessons that we might pose with occupational health problems in Korea in the future. Therefore, it might help us develop appropriate strategies in the future. For these purposes, a study on the occupational safety and

health system in a large business company in the US was conducted. The system in a large business would be better organized compared to the small one. Also, as it may be more representative of national policies than small business company. On these bases, the Technical Operations Center (TOC) of D company (Atlanta, the US) was selected for an investigation. it is hoped that the results of this study will lead to better understanding about the background and strengths of the system in the US, and help in understanding the impo-rtance of occupational health in work-places in Korea.

Materials and Methods

For a general overview of occupational safety and health services, overall organization and staffing were examined. Medical examination such as physical examination and biological monitoring for toxic substances is conducted for the purpose of early detection and treatment of occupational and non-occupational illness. From the aspects of worker's autonomy and justice as well as physical health, the medical examination has important meaning because workers are exposed to various types of toxic substances on the job. Therefore, the medical examination system for the TOC employees was studied. The injury and illness management system is a critical part of occupational practice in the company. On this part, the compensation policy, first aid and health care services in case of injury and illness were examined. After obtaining the information on the current issues concerning occupational health, current health issues and the work-site wellness program were studied.

In February 1997, the research protocol was approved by the director of Department of Health Service (DHS) in the company. Information collection and clarifications were continued until January 1998. Data collection was done in three phases. First, introductory documents on the companies and their TOCs were obtained in March and April 1997. Information on overall organization and staffing were obtained from brochures of the company and the TOC. Second, after reviewing this information, questions on the occupational health policies were prepared in July 1997. Then, discussion was made with the director of DHS and industrial hygiene staffs at DCSC during an onsite visit in August 1997. Next, based on the responses, further discussion and refinement were continued by personal interview until January 1998. When further clarifications of responses and supplementary information were needed, telephone or mail correspondence were done. To increase the accuracy of responses, final evaluations were performed by the director of DHS, the Corporate Industrial Hygienest(CIH) at DCSC. To gain better understanding on the national occupational health policies, discussions were held with a professor of occupational health policy at the Emory University,

Rollins School of Public Health in Atlanta.

Results

I. Overall Organization and Staffs

The overall organization and staffs in D company are presented in figure 1. At D company, occupational safety and health services are administered by two different departments and a private health care center: the DHS, the Department of Corporate Safety and Compliance (DCSC), and the Cigna Health Center. The roles of DHS are supervising the Health Benefit Plan, random drug and alcohol testing, health education, and medical surveillance progra-

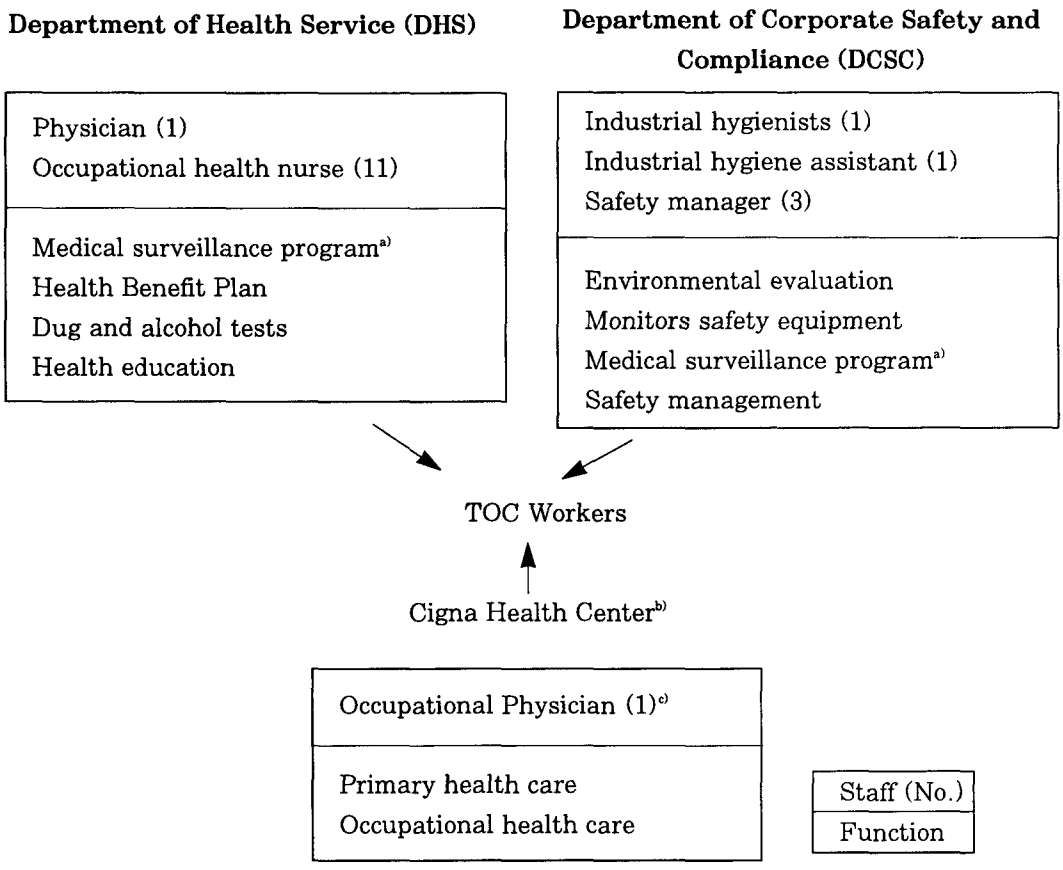

Figure 1. Overall organization and staffing for TOC workers in D company.

a): Industrial hygiene staffs (Occupational Safety Group) at DCSC conducts medical surveillance programs. DHS supervise the programs.

b): A private health center that makes a contracted with D company for the health care services of employees.

c): A specialist of occupational medicine. In the Cigna Health Center, there are more numbers of physicians, nurses, and other medical personnel.

ms. In compliance with the OSHA regulation for general industry, DHS supervises the medical surveillance programs for TOC employees who work where exposure levels of toxic substances at workplaces exceed the OSHA action levels. DHS performs a random drug testing and reports the results to the Federal Department of Transportation. To prevent workplace alcohol use, DHS also performs breath alcohol testing randomly. Contracted with the company, the Cigna Health Center provides comprehensive health care services (e.g. the Health Benefit Plan) to all employees. DHS supervises the services of the Cigna Health Center. Occupational health nurses perform health counseling, random drug and alcohol testing, audiometric test, and provide first aid services.

The DCSC performs broad functions including waste product management, quality assurance, flight safety, and occupational safety services for all of the company. Oversight of occupational safety and health of TOC workers is the responsibility of the Occupational Safety group. This group performs air sampling, monitors performance of safety equipment such as local exhaust ventilators, and audits workplace conditions. Safety managers at DCSC deal with OSHA compliance issues and attempt to eliminate the hazards from the machines, materials, or facility structure.

To provide occupational safety and health services to approximately 5,000 TOC workers, D company has a staff of seventeen including a physician (the director of DHS), eleven occupational health nurses (DHS), one industrial hygienist (DCSC), one industrial hygiene ass-istant (DCSC), and three safety managers (DCSC). In addition, including a specialist in occupational medicine, there are many physicians and other health care personnel at the Cigna Health Center.

Compared with general organization and staffs in a general business company in Korea, D company seems to have more occupational health nurses and their roles are more diverse. The reason would be that nurses perform active onsite health education and random drug and alcohol testing for all TOC employees. The company has the Industrial Hygiene Awareness program in place, which support the activities of industrial hygiene staffs. For example, educated employees at this program perform personal air samplings by themselves during the job. However, considering the large number of TOC employees, one certified industrial hygienest seems to be insufficient in number.

II. Medical Examination System

The medical examination systems for TOC workers are presented in table 1. Medical examination services for TOC employees are provided by medical surveillance programs and the Health Benefit Plan. OSHA standards for general industry regulate the identification and control of toxic substances in the US industry. Currently, thirty-three OSHA standards, including standards for carcinogen (29 CFR 1910.1003-

Table 1. Medical examination systems for TOC workers in D company

Medical Surveillance Program		Health Benefit Plan
Organization	Department of Health Service	Cigna Health Center
Subject	Employees exposed to above the OSHA action level	All employees and their family members
Items	Audiometric test Urinary and blood cadmium Questionnaires for respirator use Random drug and alcohol test	Screening and immunization[a)]
Frequency	Drug and alcohol testing: randomly, others: 1/year	Every 1-3 year
Basis	OSHA standard for general industry Hearing conservation: 29 CFR 1910.95 Respiratory Protection: 29 CFR 1910.134 Cadmium: 29 CFR 1910.102	Self-funding system

a): Items of services are different from age and sex.

1016: 13 carcinogens), respirator (29 CFR 1910.134), and hearing conservation programs (29 CFR 1910.95), contain mandated medical service provisions (Straif & Silverstein, 1997). Medical surveillance programs are provided to the employees who work where exposures reach or exceed the action levels of these thirtythree standards. In compliance with these OSHA regulations, DCSC provides medical surveillance programs to TOC employees. At present, about 150 employees are included in the cadmium surveillance program, about 3,000 employees in audiometric testing program, and about 3,000 employees in the respirator user medical screening (questionnaires) program. In addition, the Federal Aviation Associationrequired drug and breathing alcohol testing are conducted post job offer randomly by occupational health nurses. For the analysis of drug testing, urine samples are sent to a certified laboratory that makes a contract with D company.

The Health Benefit Plan is a comprehensive health care program provided to all employees of company and their family members. As it is operated by the self-funding system, the company hires and makes a contract with the Cigna Health Center. Therefore, instead of paying premium to a health insurance company, the company pays for all health care costs directly to the Cigna Health Care based on the amount of provided services. Besides primary health care services, the Health Benefit Plan provides additional preventive services: screening, immunization,and counseling.

Screening service is provided to all employees every one to three years. The items of service are provided according to age, sex, and other risk factors of illness (e.g rubella antibody test for a pregnant woman etc). According to the schedule, immunization services are provided to the employees and their family members (e.g. every 10 years tetanus-diphtheria booster, and annual influenza vaccine etc.)

As discussed above, the medical examination services for TOC employees are well organized. However, companies in Korea provide more the items of medical examination services according to ISHAct. In compliance with the ISH-Act, the employers uniformly to provide special medical services to the employees who are exposed to 118 kinds of toxic substances or physical hazards (e.g. audiometric test, urinary cadmium level, etc.) as well as general medical examinations twice a year (e.g.physical examination, chest X-ray, GOT, GPT, total cholesterol, fasting blood glucose, blood pressure, etc) (Industrial Safety Research Committee, 1996). One reason might be related to expensive health care costs in the US. Recently, as the health care costs in the US increase, the employers have shifted the costs to the employees (Clakin *et al*, 1995). However, D company provides comprehensive and preventive medical services emphasizing the well-being of the employees and their family members. The inclusion of family members might have raised the morale of employees. However, for occupational exposures, it is recommended that D company should provide more medical examination services to the employees who are exposed to a variety of solvents and heavy metals (e.g. toluene, trichloro-ethylene, nickel, and chromium). Fortunately, at present, D company is tentatively planing to implement a non-OSHA medical surveillance program for about 30 employees in the plasma shop, who are potentially exposed to a variety of metals including cobalt, nickel, chromium, and zirconium. Like this, it is hoped that D company provide more medical examination services in the future.

III. Injury and Illness Management

The injury/illness management systems are presented in table 2. The company operates two First Aid Stations for emergency injury management (e.g. one at TOC, the other at Atlanta airport). The TOC First Aid Station is operated 24 hours a day. Occupational health nurses at DHS provide first-aid services in case of occupational injury. Injured mechanics at TOC may be referred to the nearby Cigna Health Center for further treatment and evaluation.

In case occupational disease is suspected, the employee is referred to the specialist of occupational medicine in the Cigna Health Center. When evaluating the employee, the Material Safety Data Sheets (MSDS) of suspected materials are reviewed with his previous health records to assess an occupational illness.

Table 2. Injury and illness management system for TOC workers

Item	Content
Health Care Services	
First Aid Service	TOC First Aid Station
Primary Health Care	Cigna Health Center(a contracted private health center)
Compensation for Occupational Injury/Illness	
Provider	D company
Eligibility	Workers who have occupational injury/illness
Exception	Drug-related injury/illness
Compensation	Full costs related to medical care Full salary for 13 weeks followed by 70% salary for additional 15 weeks
Compensation for Non-Occupational Injury/Illness	
Provider	D company
Eligibility	Workers who have non-occupational injury/illness
Compensation	Full salary for 11 weeks followed by 70% salary for additional 15 weeks

For effective evaluation, D company operates a computerized management system, called the Occupational Health Module (OHM). The OHM contains comprehensive information on each employee including previous records of health examinations, substances of workplace exposures, results of environmental evaluation. For occupational disease, the sick worker is treated at the Cigna Health Center and is reported to OSHA. For non-occuational disease, the sick worker is covered by private health care benefits.

The workers' compensation is a form of employerprovided life health and disability insurance for work-related injury, illness, and death. Currently, all states in the US have their own compensation laws, but the frame works of basic regulations (e.g. eligibility, benefit) are similar. According to the Georgia workers' compensation law, those who have work-related injury or disease are provided with twothirds of salary and full costs related to medical care. For commercially purchased or state administered plans, the employer pays premiums into an insurance fund, which pays worker claims. However, as D company operates a self-funded system for the workers' compensation, the company pays a claim for injury or disease directly to the sick Also, the company provides better compensation than the state's law. D companycontinues to provide full salary for 13 weeks followed by 70% of salary until the recovery. Even if the sick worker had

non-occupational disease or injury, the company continues to provide full salary for 11 weeks followed by 70% of salary, and it can be extended for additional 15 weeks. Because of a 'exclusive remedy', the injured or diseased worker can not sue the employer. But, drug related injury or disease can not be covered by the workers' compensation law.

As discussed above, D company compensates more conditions of injury and illnesses than Korea Indusrial Disaster Compensation and Insurance Act (IDCIAct). Which was created in 1963 to cover work-related injury or disease. According to the Act, those who hav. work-related injuries or diseases are provided with two-thirds of their average salary and full costs related to medical care. The medical compensation may not be enough to treat the injury or illness, because the amount of compensation is determined by the degree of disability: 1,474 days of average salary is provided to the grade 1 patient and 55 days for the grade 14 patient. The Act does not cover the injury or disease that can be cured with three days of rest or medical care. Furthermore, all the conditions of occupational diseases are not covered by the IDCIAct because of stringent compensation rules (Industrial Safety Research Committee, 1996). For example, the formula applied for the compensation of noise induced hearing loss (NIHL) is stricter than that for the diagnosis[1]. Therefore, all the cases of NIHL are not compensated by the IDCIAct. At the ISHAct, there is no regulation like the 'exclusive remedy'. Thus, there is always a possibility of lawsuits between the employer and the injured or the diseased. In Korea, it might take long time to expand workers' compensation plans, because it is related to the national economic status and wellness. However, in the aspect of occupational safety and health, the expansion of workers' compensation is strongly recommended to Korea.

IV. Current Issues on Occupational Health and Work-Site Wellness Programs

The current issues on occupational health and work-site wellness programs are summarized in Table 3. D company shows the greatest concern about ergonomic issues such as cumulative trauma disorders and occupational injuries during the job. Statistics demonstrates that musculo-skeletal injuries (e.g. strains, sprains, and repetitive traumas) are the leading cause of injury in TOC, accounting for 33% of all injuries. The leading causes of TOC injuries are struck against/bumped into (14%), pulling /pushing (12%), caught in/between and

[1]: The formula applied for the compensation of NIHL is '(A+2B+ 2C+D)/6', while the formula for the diagnosis of NIHL is '(A+B+C)/3. (A: hearing threshold at 500 Hz, B: hearing threshold at 1,000 Hz, C: hearing threshold at 2,000 Hz and D: hearing threshold at 4,000 Hz).

Table 3. Current health issues and work-site wellness programs for TOC workers

Item	Content
Worksite-wellness program	
Provider	Cigna Health Center
Subjects	All employees and their family members
Program	Health Risk Assessment Annual mailed questionnaire survey for life-style analysis and health risk factors finding. Health counseling for workers who have risky lifestyles. Wellness classes for smoking cessation and weight reduction
	Health Benefit Plan Screening tests, health counseling and immunization services for every 1 to 3 years.
Current Health Issue	Ergonomics related musculo-skeletal disorder

lifting/carrying (10%).

Cigna Health Center plays an important role in the well-being of employees and their family members. As a part of the Health Benefit Plan, Cigna provides systematic health counseling on diet and exercise, substance use (e.g. smoking cessation), sexual practices (e.g. condom use, etc.), injuries prevention (e.g. safety belt, etc.), dental care, and other primary preventive measures (e.g. glaucoma testing for old people, etc.). Cigna Health Center also provides the Health Risk Assessment (HRA) program for the well-being of employees and their family members. Cigna administers annual mailed questionnaire survey to the employee and their family members. After evaluating the information on health risk behaviors, Cigna sends a personal health assessment report by mail. Those who have problematic behaviors are encouraged to receive health counseling and to participate into the intervention program such as smoking cessation class. Also, occupational health nurses provide onsite health counseling in order to prevent work-related illnesses and promote health status of TOC employees.

As discussed above, the work-site wellness program of D company seems to be very well organized. However, to attend the work-site wellness classes, the interested workers have to go to the Cigna Health Center in person Thus, to maximize the effectiveness of the program, it is hoped that the Cigna

Health Center present work-site wellness classes (e.g. smoking cessation or weight reduction classes etc.) at TOC in place. In Korea, according to the ISHAct almost employees in workplaces are already provided with periodic clinical laboratory examinations. However, efforts to modify risky lifestyles such as heavy alcoholic consumption and cigarette smoking seems to be less than the US. Furthermore, according to the 1993 National Survey on People's Health, the rates of tobacco use in Korean adults was 68.8% for men and 5.3% for women. The rates of alcohol consumption in adults were estimated to be 71.4% for men and 19.8% for women (Korea Ministry of Health and Welfare, 1996). Although there is no statistics regarding those rates in workplaces, the rates among the employees might not be significantly different from the statistics of the 1993 National Survey. Therefore, it hoped that the periodic health examination systems should be improved emphasizing health behavior modification and health education in the future.

Discussion

The occupational safety and health services in D company are performed by DHS, DCSC and the Cigna Health Center. For the health services of TOC employees, the roles of physicians are divided into the supervision of occupational health services (DHS) and the primary health care (Cigna Health Center). With large numbers of employees, the system of D company might be efficient to conduct occupational health services. Also, the computerized data management system such as the OHM would help improve effectiveness and efficiency of occupational health services. However, the results strongly suggest that DCSC hire more certified industrial hygienists. Although the comapny has one industrial hygiene assistant and operates the Industrial Hygiene Awareness program, one industrial hygienist seems to be insufficient in number. According to the ISHAct, the company that has more than 2,000 employees hire more than two industrial hygienists (Industrial Sagety Research Committee, 1996). According to Robin (1990), a sound occupational health program depends on an excellent professional relationship between the industrial hygienist and the occupational physician. He emphasized that the two professionals must have an understanding of each role's in the process. Also, they have to realize the capabilities and limitations of each professional's role.

DHS nurses seems to provide diverse and active roles to the employees. They are responsible for conducting hearing conservation programs, firstaid services, and record keeping concerning work-related illnesses and injuries. Besides these, they perform drug and alcohol testing including onsite health counseling. In the US, the roles of occupational health nurses have expanded greatly since the passage of the OSHAct in 1970. With the passage of the OSHAct, the nurses were expected to know more

about the industrial work environment and workplace factors causing occupational diseases and injuries. From firstaid provider in the past to informed health professional at present, the nurses have met challenges of the specialty practice of occupational health nursing (Zenz, 1988). In Korea, since the legislation of the ISHAct, the roles of occupational health nurses have also increased. However, it is hoped that they perform more active roles in workplaces. For example, besides providing just the explanation of the results of periodic health examination, the nurses in support of occupational physician should perform more active health education with a continuous assessment in place. If the nurses play an effective role in providing systematic health services, the quality and effectiveness of services might improve greatly.

D company performs random drug and alcohol testing. In Korea, there is still no report on drug use in workplaces. In the US, substance abuse is estimated to be the actual cause of about 120,000 death per year with 100,000 attributed to alcohol and 20,000 to other drugs. A 1992 survey of employers with 50 or more employees found that 88% had drug policies. The most common policy was drug-free and alcohol-free workplaces. More than one-third of the work-sites offers information and 40% offer employee assistant program place. Substance abuse in the workplace may be highly associated with occupational injury, violence and diseases (e.g. HIV, hepatitis B, etc.) (Us Department of Health and Human Service, 1995). There has been pro and cons on the drug testing in the workplace which is still surrounded by controversy on violation of personal privacy. However, from the aspects of occupational safety and health, the random drug and alcohol testing policy seems to have contributed to make a healthy working environment at the company.

According to Schilling (1986), achieving the objectives of medical examinations depends on selecting appropriate tests that are acceptable to workers. He also suggested that occupational health professionals should review health surveillance program periodically as a whole, and modify or abandon them as necessary in the light of improved working conditions. Silverstein (1997) pointed out that OSHA lacks consistency and coherence. For example, most of the 21 standards include a requirement for physical examination, but the coke oven standard requires no physical examination other than a skin test and the cotton dust standard requires no physical examination at all. In Korea, the items for medical examination have not been changed since the legislation of the ISHAct. Currently, new chemicals that could introduce unexpected health hazards are continuously synthesized and used in two countries. In this regard, we recommend the occupational health professionals in two countries should try to modify and develop the items of medical examinations. According to

Conway et al (1993a), the likelihood that the company will have a medical surveillance program increases directly with the business size. Among companies with fewer than 20 employees, only 4% have medical surveillance programs, whereas 56% of companies that employs 250 or more employees have such programs. The majority of employees in the manufacturing division (59%) have a medical surveillance program, whereas 24% of employees in non-manufacturing and 17% of employees in construction do so. Among the 18 million employees in companies which conduct periodic testing, approximately one third or 6 millions employees actually received such tests during 1989. The survey identified 334,380 employees with adverse health effects reported during 1989. Of the total, 300,016 cases were found in companies with periodic medical surveillance testing. The health effects most commonly identified by the medical surveillance programs are cumulative trauma (8%), hearing loss (7%), and skin disorders (5%) (Conway *et al*, 1993b). According to a statistics of the Korean Labor Ministry, there are approximately 7.9 million workers in 1995. Among them, approximately 3.5 million workers were received periodic health examinations for occupational or non-occupational diseases. In the same year, approximately 0.7 million workers who were exposed to industrial toxic substances. Thus, most of them received periodic health examinations including biological monitoring. Among them, 3,166 employees were identified to have occupational diseases such as noise induced hearing loss (60.5%), or pneumoconiosis (37.1%) (Korean Ministry of Labor, 1994).

Development of medical technology and health care industry in the US led to increase in the quality of health service, but also escalated health care costs. As the health care costs increase, the employer shifted the costs to the employees. In 1991, approximately 13.8% (37 millions) of Americans are uninsured, and 13.5% of all employed individuals were uninsured in 1991, and the percentage continues to increase (Clakins, 1995). Halperin *et al* (1986) suggested that the cost of screening in industry should not weighted against health care expenditure in the community. Wilson and Junger (1986) suggested that screening tests must be simple and readily applicable both to meet cost constrains and to match the level of skill of the practitioner who will administer them. Based on these recommendations, D company should try to provide more effective and costefficient medical examination services to the employees. The health care costs per capita are continuously increasing in Korea: $101 in 1985, $248 in 1989, and $362 in 1992 (Preventive Medicine Research Committee, 1995). In this regard, we suggest Korean occupational health professionals should make a plan to provide more cost-efficient medical examinations in the future.

According to Silverstein (1997), to be a successful medical examination system,

health care providers should work as an integrated interdisciplinary team with others who have skills related to environmental assessment and control such as industrial hygienists, toxicologists, safety managers, and union representatives. It should be emphasized that occupational disorders can not be detected effectively with only the medical examination itself. Millar (1986) reported that medical screening and biological monitoring are important tools of prevention. However, he emphasized that screening and monitoring are tools for prevention, not ends in themselves. Other factors important to assess occupational disorders might include the ability of performing a good occupational history, the broad knowledge about occupational health related areas (e.g. toxicology, occupational epidemiology, etc.), and good clinical skills. Therefore, Korea should develop such areas more apart from the medical examination system.

Through a self-funding system, D company provides better compensation plans than the state workers' compensation law. Before the workers' compensation law, the only legal remedy available to workers who had work-related injuries was based on English Common Law theories of "tort" or "breach of contract". The three main reasons that deterred the injured from filing suits for damages were the fellow servant rule, assumption of risk doctrine, and the contributory negligence defense (Yorker, 1994). However, at present, the workers' compensation law in the US covers injury, disease, and death on the jobs without regard to who is at fault. Also, this law generally prohibit the employee from suing the employer. However, the workers' compensation law does not cover drug related injury (Rosenstock & Cullen, 1994). Worker's compensation is reported to affect safety and fatality of workers. There is an economic incentive to the employers as the insurance company determines the premiums by the safety rating of the company. Also, as the worker's compensation is determined by 600 classes, and the insurance cost are different from classes (e.g. construction versus office work), the employers have incentives to substitute capital for the relatively higher labor cost and thus move employment away from the more risky occupations (Durbin & Richard, 1997). With the self-funding system, D company provides good workers' compensation program for the employees. This compensation system might well have contributed to the rapid recovery and rehabilitation for the injured or the diseased.

The Korean IDCIAct was created to provide financial support for the injured or the diseased in workplaces. However, all occupational diseases and injuries are not compensated. It does not cover injuries in some types of business (e.g. logging business with less than 800 m^2 of carrying capacity, the company with less than five employees except logging business, etc.). Also, it does not compensate work-related injury or disease that can be

cured with a medical care for three days (Industrial Sagety Research Committee, 1996). This regulation might be a barrier in the active practice of occupational health in Korea. If all occupational diseases could be compensated regardless of the recovery duration, the awareness of occupational disorders by workers increases. In addition, the occupational health practitioners would make more efforts to clarify the causal association between workplace exposure and occupational disease. According to Lee *et al* (1993), the follow-up management for occupational disease is worse in efficiency for smaller businesses. The provision of comprehensive compensation plans combined with periodic health examination would greatly contribute to effective follow-up management. Therefore, for example, if all NIHL are compensated regardless of the grade of impairment, no employer would let the disease continue to develop for fear of more premiums, and other workers would try to keep the safe rules to protect their hearing. Therefore, it is strongly recommended that Korea should expand workers' compensation plan for workers' health in the future.

In the US, cumulative trauma disorders are a major disease identified during the medical surveillance program. Korea currently ranks ergonomics very low among occupational health problems. However, it is possible that ergonomics is already a current health issue in Korea which is not being perceived as such. Likewise, the different profiles in two countries on cumulative trauma disorders might be due to weak background on occupational health in Korea. As the levels of occupational health improve, the future concern of occupational health in Korea may be cumulative trauma disorders or other diseases caused by chronic longterm exposure. In this regard, it is suggested that Korean occupational health practitioners should try to study more about ergonomics related health problems.

Recently in the US, the workplace is regarded as a priority target for disease prevention and health promotion, since most adults spend their daily activities in workplaces. About 70% of cancers are reported to be associated with lifestyle and environmental exposure. They could be preventable by changing behavioral pattern related to diet, smoking, and physical activity (Sorensen *et al*, 1996). Comprehensive work-site wellness programs are reported to help reduce health risks and promote lifestyles of workers (Pelietier, 1991). Work-site wellness programs have focused on improvements in measures such as blood pressure, serum cholesterol, weight reduction, and smoking cessation have been conducted (Harris, 1986; Wood *et al*, 1989; Wilson *et al*, 1992). According to a simulation study by Warner *et al* (1996), work-site smoking cessation program is reported to be particularly profitable when long-term benefits are calculated. In the 1993 National Household Survey on Drug Abuse (NHSDA), the rates reporting past month use of cigarettes is

estimated to be 32.2% for men and 27.3% for women in the US (US Department of Health and Human Service, 1996). Compared with the rates in the US, those rates among the industrial workers in Korea are expected to be higher. Thus, it is recommended that Korean occupational health professionals perform more intensive smoking cessation program. The initiation of work-site smoking cessation program is expected to improve the company's productivity eventually.

Cigna Health Center includes the employees' family members in the Health Risk Assessment program and the Health Benefit Plan. According to the social cognitive theory, an individual's environment such as family members and peers at work is regarded as an important factor in changing health behavior (Glanz *et al*, 1997). At the smoking cessation class in the Cigna Health Center, a smoker is encouraged to invite his/her spouse to the class. Thus, the inclusion of employee's family members in the program might have greatly contributed to the health promotion of employees as well as their family member's health.

Until now, we presented the occupational safety and health system in D company. Through the study, we realized the importance of occupational health policies of the country as well as the company. Also, we strongly realized that the objectives of occupational health can not be achieved without the team approaches of occupational health professionals. We could not administer a questionnaire survey to obtain practical data (e.g. lifestyles, and opinions to the current system, etc.). In evaluating the effectiveness of the system, these may act as the limits of the study. However, as we intended to understand the importance of occupational health practices with the review of system, we hope the results will be used as a basic data in developing better occupational health strategies in D company as well as in Korea. Therefore, we hope further study will be made more specifically in the future.

Conclusion

At D company, occupational safety and health services are conducted at DHS, DCSC and the Cigna Health Center. The results suggest that the company should hire more industrial hygienists for better assessment of TOC hazards. The number of items of medical examination services are fewer than those of periodic health examination services in Korea. However, D company provides comprehensive and preventive health care services (e.g. the HRA program and the Health Benefit Plan) by including all family members of employees. Ergonomic issues are great concern at D company The compensation policy of the company seems to be superior to that of Korea The Cigna Health Center provides comprehensive work-site wellness programs to the employees and even their family members As the lifestyles risk factors might be great concern in Korea, occupational health professionals should implement more

systemic work-site wellness program by increasing the roles of occupational health nurses. Despite the differences of cultural backgrounds and occupational health policies, the occupational safety and health issues are still of great concerns in the US as well as Korea. Therefore, I suggest that occupational health professionals in two countries should try to improve the effectiveness of occupational health services by studying more about their systems.

References

Ashford NA, Caldart CC: *Technology, law and the working environment.* Washington DC, Island press. 1996, pp 28-29.

Cho KS: *Occupational health.* Seoul, Sumunsa. 1991, pp 20-24 for history of occupational health, pp 450-468 for Korean standards for toxic substance

Clakins D, Fernandopulle RJ, Marino BS: *Health care policy.* Cambridge, Blackwell Science, 1995, pp 173-189.

Conway H, Simmons J, Talbert T: Effects of occupational medical surveillance programs as perceived by resp-ondents to the Occupational Safety and Health Administration's 1990-1991 *J Occup Med* 1993a;35(7):687-697.

Conway H, Simmons J, Talbert T: The Occupational Safety and Health Administration's 1990-1991 survey of occupational medicine surveillance prevalence and type of current practice. *J Occup Med* 1993b;35(7):659-669

Durbin D, Richard JB: Deaths in the workplace, looking beyond the number *New York Times* 1997;26 Jan:F17.

Glanz K, Lewis FM, Rimer BK: *Health behavior and health education; theory, research, and practice.* 2nd ed. San Francisco, Jossey-Bass Publisher, 1997, pp 153-159.

Halperin WE, Ratcliffe J, Frazier TM, Wilson L, Becker SP, Schutle PA: Medical screening in the workplace, proposed principles. *J Occup Med* 1986; 28(8):547-557.

Harris J: Northern Telecomm, a million dollar medically based program in a rapidly changing high tech environment. *Am J Health Promotion* 1986;1:50-66.

Industrial Safety Research Committee: *Industrial Safety and Health Laws.* Seoul, Crown press. 1996, 1-272 for Industrial Safety and Health Act, 647-723 for Industrial Disaster Compensation and Insurance Act.

Korean Ministry of Health and Welfare: *The 1993 National Survey on People's Health.* Seoul, 1996.

Korean Ministry of Labor. *The year book of the Labor of Korean Ministry.* Seoul, 1994, pp 228-410.

Lee WJ, Kim DS, Baek DM: A follow up survey of workers with occupational diseases detected in the periodic health examination. *Kor J Occup Med* 1993;5(2): 283-294.

Millar JD: Screening and monitoring, tools for prevention. *J Occup Med* 1986; 28(8):544-546.

Pelietier K: A review and analysis of the health and cost-effective outcome studies of comprehensive health promotion and disease programs. *Am J Health Promotion* 1991;5:311-315.

Preventive Medicine Research Committee. *Preventive medicine and public health* Seoul, KeiChuk press. 1995, pp 775-779.

Robin ST: Role of industrial hygiene in medical surveillance. *Occup Med State Art Rev* 1990:5(3):469-478.

Rosenstock L, Cullen MR: *Textbook of clinical occupational and environmental medicine.* Philadelphia, W.B. Saunders Company, 1994, pp 77-83.

Schilling RSF: The role of medical examination in protecting workers health. *J Occup Med* 1986:28(8):553-557.

Schwartz BS, Ford DP, Yodaiken RY: Analysis of OSHA inspection data with exposure monitoring and medical surveillance violations. *J Occup Med* 1992 ;34(2):272-278.

Silverstein M: Analysis of medical screening and surveillance in 21 Occupational Safety and Health Administration standards: support for a generic medical surveillance standard. *Am J Ind Med* 1997; 26: 283-295.

Sorensen G, Thomson B, Glanz K, Feng Z, Susan K, DiClemente C: Worksite-based cancer prevention: Primary results from the working well trial. *Am J Pub Health* 1996:86(7):939-947.

Straif K, Silverstein M: Comparison of U.S. OSHA standards and German Berufsgenossenschaften guidelines for preventive occupational health examinations. *Am J Ind Med* 1997:31:371-380.

US Department of Health and Human Services, Public Health Service: *Healthy people 2000: Midcourse review and 1995 revisions.* Washington DC, Government Printing Office, 1995, pp 42-51 for substance abuse, pp 74-77 for occupational safety and abuse.

US Department of Health and Human Services, Public Health Services: *National household survey on drug abuse and national drug and alcoholism treatment unit survey.* Substance Abuse and Mental Health Services Administration, Office of Applied Studies. 1996, 74.

Warner KE, Richard JS, Smith DG, Fries BE: Health and economics implication of a work-site smoking cessation program: A simulation analysis. *Occup Environ Med* 1996:39(10):981-992.

Webster BS, Snook SH: The cost of compensable upper extremity cumulative trauma disorders. *J Occup Med* 1994; 36(7):713-717.

William JMG, Junger G: Principles and practices of screening for disease. *Public Health Papers*, Geneva, World Health Organization, 1986, No. 34.

Wilson MG, Edmunson J, DeJoy DM: Cost effectiveness of work-site cholesterol screening and intervention programs. *J Occup Med* 1992:34(6):624-649.

Wood E , Olmstead G, Craig J: An evaluation of lifestyle risk factors and absenteeism after two years in a work-site health promotion programs. *Am J Health Promotion* 1989:4:128-133.

Yorker B: Workers' compensation law, an overview. *Am Ass Occup Health Nurse J* 1994; 42(9):420-424.

Zenz C: *Occupational medicine,Principles and practical applications.* 2nd ed. Chicago, Yearbook of Medical Publisher, 1988, pp 1061-1066.