



# Compensation for Occupational Cancer

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The legal scope and criteria for occupational cancer in Korea was out of date. The aim of this study was to review the current criteria for occupational cancer and amend the existent criteria on the basis of recent scientific evidence. The scientific evidence and the legal list of occupational cancer were analyzed to identify the causes of occupational cancer on a global scale. The relationship between compensated occupational cancer cases and carcinogen exposure in Korea was examined. The factors associated with specific causes and target cancers were determined to produce additional criteria. Five-hundred and nineteen cases of 2,468 were awarded compensation for occupational cancer including lung, malignant mesothelioma, lymphohematopoietic, and liver cancers from January 2000 to October 2012. Between 1996 and 2005, benzene accounted for 84.4% of cases, and between 1999 and 2005, asbestos was associated with 62.3% of cases. Fourteen novel causative agents and 12 additional target cancers were identified and the final guidelines were amended to include 23 causative agents and 21 target cancers. This amendment of the criteria for occupational cancer represents the widest change in Korean history and is expected to improve the understanding of occupational cancer by providing an up-to-date and accurate reference guide.

**Keywords:** Occupational Cancer; Compensation; Korea

## INTRODUCTION

The Korean public is highly concerned about the risk of occupation cancer as a result of exposure to carcinogens in the workplace. An increase in the incidence of occupational cancer among workers based in industries manufacturing goods such as asbestos textiles, semiconductors, and tires, as well as those working in the refinery/petrochemical sector has raised public concern (1-4). Cancer is the most common cause of death in the Korean population and because of the costs incurred and the impact it has on the loss of workforce, it is of major concern for employers or policymakers (5). This situation makes the compensation criteria for occupational cancer an important agenda for policymakers.

Occupational cancer is defined as cancer resulting from occupational exposure to carcinogens or an increased risk of cancer incidence during the performance of a specific task (6). Usually, the evidence indicating if a worker was occupationally exposed to a carcinogen or not is insufficient and the measurement of the past carcinogen exposure level or the cumulative exposure level is very difficult. The general ambiguity regarding past exposure makes the decision for the work-relatedness a controversial subject (7).

Article 34 on the Enforcement Decree of the Industrial Accident Compensation Insurance (IACI) Act defines the criteria

for the recognition of work-related disease. The first criterion is to identify the history of hazard exposure. The second is to determine the cumulative exposure level and latent period, which is the period between the first exposure to causative agent and the diagnosis of cancer. The third is a consideration of medically recognized causal relationships (8). Occupational lung cancer is covered by 2 acts under Korean law. According to the Ordinance of the Ministry of Employment and Labor, workers dealing with soil, rocks, or minerals who are exposed to dust that might cause pneumoconiosis and who have confirmed pneumoconiosis by chest radiography (profusion of 1/0 or greater according to the International Labor Organization [ILO] classification) can be compensated according to the Act on The Prevention of Pneumoconiosis and Protection, Etc., of Pneumoconiosis Workers (PPPW) (9). Other lung cancers are compensated for according to the IACI Act.

The Occupational Safety and Health Research Institute of the Korean Occupational Safety and Health Agency and the Occupational Lung Disease Institute of the Workers' Compensation and Welfare Service (COMWEL) investigate individual cancer cases to make a scientific decision on the work-relatedness. This process involves thorough occupational history taking, a work environment survey, and a review of epidemiologic literature and medical records. The COMWEL usually request this epidemiologic investigation for the majority of claims.

The criteria determining whether or not an employee is entitled to compensation as a result of occupational cancer are a major issue because the criteria is the only legal standard adapted all processes of compensation for occupational disease from COMWEL to the Administrative Court. Workers' compensation and approval rates of individual countries are very closely related to social contexts such as social recognition for the occupational disease, the health insurance system, or the social security system (10).

Owing to the increase in public concern in Korea, the opinion that the criteria for occupational cancer should be reviewed and amended on the basis of up-to-date scientific evidence was presented. The aim of this study was to review the history of compensated occupational cancer in Korea and to clarify and update the criteria for awarding occupational cancer compensation in Korea. This paper will assist clinicians in understanding the issue of occupational cancer for a more informed decision regarding whether compensation should be awarded or not.

## MATERIALS AND METHODS

A review of the published literature was undertaken to determine the strength of the causal association between cancer risks and the workplace environment. Literature included data published by the International Agency for Research on Cancer (IARC) (11-18) and related peer-reviewed articles. The occupational cancer lists of international organizations such as the ILO (19) and the European Union (EU) and their member countries were also investigated (20). An analysis of each individual occupational cancer case awarded compensation in Korea between 1992 and 2012 was conducted to decide the validity of including specific causative agents and types of cancer to the criteria list. Based on these results, we suggested the list of the carcinogens and its target cancers to include recent amendments of the scope and criteria.

**Table 1.** Occupational cancers identified by OSHRI from 1992 to 2000 in Korea

Year	Claimed	Compensated cases (n)				
		Total	Lung*	Lymphohe-matopoietic	Malignant mesothelioma	Others
1992	2	0	0	0	0	0
1993	4	1	0	0	1	0
1994	4	0	0	0	0	0
1995	4	0	0	0	0	0
1996	5	0	0	0	0	0
1997	7	3	0	1	2	0
1998	12	7	2	2	1	2
1999	32	11	6	2	2	1
2000	38	13	6	5	0	2

\*Except for lung cancer with pneumoconiosis; †Reprinted from Kang et al. (2000). OSHRI, Occupational Safety and Health Research Institute.

## RESULTS

### A review of the recognition of occupational cancer in Korea between 2000 and 2012

The first officially reported case of occupational cancer in Korea was a case of mesothelioma at an asbestos thread factory in 1993. A 56-yr-old non-smoking woman employed at the factory for 18 yr was officially approved by the COMWEL and was compensated by the IACI (21). After the first reported compensation case, between 1992 and 1999, out of 379 claims for occupational cancer, only 22 cases were confirmed as occupational disease by the Occupational Safety and Health Research Institute (Table 1) (22). The 31 lung cancer cases associated with pneumoconiosis reported until 1999 that were compensated according to the PPPW Act are not included in Table 1, which only included cases to be conduct professional and specific examination for the work-relatedness by occupational physician and occupational hygienist of OSHRI. However, Table 2 included all cases to be decided based on PPPW Act, the result of special examination for the work-relatedness, or the self process of COMWEL.

From 2000 to 2009, out of 1933 claims, the COMWEL approved 253 cases as occupational cancer (23). Sixty-one of these were compensated according to the PPPW Act. From January 2010 to October 2012, out of 544 claims, the COMWEL approved 266 cases as occupational cancer (Table 2). After 2000, the number of claims increased rapidly. Especially after 2010, the number of compensated cancers also increased because the social awareness for occupational cancers or carcinogens such as asbestos or benzene improved and the claims from various high risk jobs such as miners, masons, construction workers, painters, welders, and so on, which would be influenced by social issue for the occupational cancer in semiconductor industry or

**Table 2.** Occupational cancers compensated by COMWEL from January 2000 to October 2012 in Korea

Year	Claimed cases	Target organs of compensated cancers					
		Total	Respira-tory	Lymphohe-matopoietic	Malignant mesothelioma	Diges-tive	Others
2000	109	11	107	35	28	74	8
2001	99	13					
2002	254	33					
2003	236	43					
2004	250	32					
2005	244	30					
2006	210	21					
2007	217	20					
2008	176	30					
2009	138	20					
2010	213	94	84	4	5	1	0
2011	182	100	85	0	8	0	3
Oct-12	149	72	57	1	6	1	2

\*Updated from Lee et al. (2011) and analyses COMWEL data. COMWEL, Workers' Compensation and Welfare Service.

communal claims by metal union. Respiratory cancers, especially lung cancer, were the most common cancers compensated for by the IACI. Between 2000 and 2009, occupational cancer types included respiratory (n = 107), lymphohematopoietic (LHP) (n = 35), malignant mesothelioma (n = 28), and digestive tract cancer (n = 74) (23). Between January 2010 and October 2012, occupational cancer types included respiratory (n = 226), LHP (n = 5), malignant mesothelioma (n = 19), and digestive tract cancer (n = 2). Cancers originating from digestive tract cancer abruptly decreased after the late 2000s, because hepatocellular carcinoma related to workload or stress in healthy hepatitis B virus carriers were rejected in court, and the specific criteria for recognition of liver disease was amended in 2003 (24).

Between 1999 and 2005, lung cancer related to asbestos exposure (62.3%, 33 out of 53 cases) and LHP cancer related to benzene (84.4%, 43 out of 50 cases) was the most common cause of occupational cancers (5, 25, 26). Between 2000 and 2009, construction (n = 15) was most common industry among compensated cancers, followed by shipbuilding (n = 11), and other metal product manufacturing (n = 10). The most common occupation among compensated cancers was metal molders, welders, and related trades workers (n = 16), followed by miners, shot firers, stone cutters, and carvers (n = 14) (Table 3) (23).

After the early 1990s, the number of claims and compensations has increased, but the origin of cancers awarded compensation is still limited to 2 organs, namely the lung and LHP system. The major carcinogens are asbestos and benzene. Among compensated lung cancer cases, the most probable carcinogens were asbestos (45%), hexavalent chromium (30%), and crystalline silica (19%) (27). In case of LHP malignancies, the most probable carcinogens were pure benzene (27.5%), impurity of benzene in a mixture (56.9%), and ionizing radiation (8.0%) (26). With these data in mind, the existing criteria and

scope for occupational cancer required amendment with respect to the causative carcinogens and the target cancer type.

### The main focus of recognition criteria amendments

The prior Korean criteria included only 10 agents and were very outdated compared with the ILO occupational disease list or the IARC list of Group 1 carcinogens. Skin cancer was the first cancer included in ILO Convention No. 42 in 1934. Mesothelioma due to asbestos was included in the occupational disease list in Convention 121 in 1980. On Recommendation No. 194 in 2002, the ILO added 15 carcinogens to the list including asbestos; benzidine and its salts; bis-chloromethyl ether; chromium VI; coal tars and coal tar pitches; beta-naphthylamine; vinyl chloride; benzene; toxic nitro and amino derivatives of benzene or its homolog; ionizing radiation; tar, pitch, bitumen, mineral oil, anthracene, or related compounds; coke oven emissions; nickel; wood dust; and other carcinogens. At this time, an association between specific occupational cancers caused by specific carcinogens was not included. In 2010, arsenic, beryllium, cadmium, erionite, ethylene oxide, and hepatitis B and C viruses were included on the ILO occupational cancer list (8).

The IARC reviewed the entire Group I carcinogenic agents list between 2006 and 2010, and 113 agents were included as Group I carcinogens. Since these agents cover both occupational and environmental exposure, Siemiatycki et al. (28) proposed 28 agents and 12 occupations or industries as definite occupational risk factors and we listed other additional occupational carcinogens updated after the review of IARC.

In the European occupational cancer lists including those of Austria, Belgium, Denmark, Germany, Finland, France, Italy, Luxemburg, Portugal, Spain, Swiss, and the EU. Finland included the fewest agents (n = 17) and Germany, Denmark, and Luxemburg included > 40 agents. Lung cancer due to chromate, asbestos, or nickel and malignant mesothelioma due to asbestos were included in the list of occupational cancers in all countries.

The prior criteria for recognition of occupational cancer according to the Enforcement Decree of the IACI Act included only 11 agents, for example soot, tar, pitch, asphalt, mineral oil, paraffin, vinyl chloride, chrome or its compounds, benzene, asbestos, and hepatitis virus. Except for hepatocellular carcinoma due to occupational exposure to hepatitis B or C virus, which was included in the criteria in 2003, other carcinogens and their target cancers have not ever been amended after since the 1980s. Table 4 shows the presented agents on the occupational cancer lists of the ILO, and European countries, those suggested by Siemiatycki et al. or us based on the IARC list, and the Korean criteria of occupational carcinogens before 2013.

Table 5 shows the prior criteria and considerations of carcinogen exposure in Korea. Originally, cancer caused by soot, tar, pitch, asphalt, mineral oil, or paraffin was incorrectly identified

**Table 3.** Frequency of occupational cancer in Korea from 2000 to 2009 according to industry and occupation

Type of industry and occupation	Total cases	Approved cases (%)
<b>Industry</b>		
Metal casts	21	9 (42.9)
Building construction	52	15 (28.8)
Other	33	8 (24.2)
Interurban rail transportation	25	6 (24.0)
General purpose machinery	39	8 (20.5)
Ships and boats	58	11 (19.0)
Rubber products	23	4 (17.4)
Other metal products and metal working service activities	58	10 (17.2)
Motor vehicles and engines for motor vehicles	33	5 (15.2)
Road freight transport	20	3 (15.0)
<b>Occupation</b>		
Miners, shot firers, stone cutters, and carvers	36	14 (38.9)
Metal molders, welders, and related trade workers	45	16 (35.6)
Mining and construction laborers	21	5 (23.8)
Engineers	21	3 (14.3)

\*Reprinted from Lee et al. (2011).

**Table 4.** The carcinogenic agents presented in the occupational disease list of the ILO or European countries and the IARC

ILO*	12 European (countries)	IARC†	Korean criteria before 2013
Asbestos	All	Included	Included
Benzidine and its salts	11	Included	None
Bis-chloromethyl ether	7	Included	None
Chromium VI compounds	All	Included	Included
Coal tars and coal tar pitches	9	Included	Included
Beta-naphthylamine	11	Included	None
Vinyl chloride	11	Included	Included
Benzene	11	Included	Included
Toxic nitro and amino derivatives of benzene or its homolog	-	-	None
Ionizing radiation	All	Included	None
Tar, pitch, bitumen, mineral oil, anthracene, or related compounds	11	Included	Included
Coke oven emissions	-	-	None
Nickel compounds	All	Included	None
Wood dust	11	Included	None
Arsenic and its compounds	11	Included	None
Beryllium and its compounds	11	Included	None
Cadmium and its compounds	9	Included	None
Erionite	-	Included	None
Ethylene oxide	-	Included	None
Hepatitis B and C virus	8	-	Included

Occupational carcinogens included in only the IARC list: Solar radiation, crystalline silica, talc containing asbestiform fibers, 4-aminobiphenyl, 2,3,7,8-tetrachlorodibenzo-p-dioxin, passive smoking, mustard gas, strong inorganic-acid mists, aflatoxin, diesel engine exhaust, formaldehyde, leather dust, polyaromatic hydrocarbons, shale oil, trichloroethylene, ortho-toluidine, anti-cancer drugs or immunosuppressants. \*List of occupational diseases (revised 2010) from the International Labor Organization; †International Agency for Cancer Research: Occupational carcinogen list from Siemiatycki et al. (2004) or authors based on the Group 1 carcinogens classified by the IARC.

**Table 5.** The prior specific criteria for the recognition of occupational diseases according to the Enforcement Decree of the Industrial Accident Compensation Insurance Act (before July 2013)

Agents	Target cancer	Exposure consideration
Tar	Lung	Tenure over 10 yr
Chrome or its compounds	Lung Nasal cavity, paranasal sinus, or larynx	Tenure over 2 yr
Asbestos	Lung Malignant mesothelioma	· With asbestosis · With pleural thickening, plaque, calcification, asbestos body, or fiber · Exposure duration over 10 yr
Benzene	Leukemia Myelodysplastic syndrome Multiple myeloma	Cumulative exposure over 10 ppm-year
Hepatitis virus	Liver	-
Vinyl chloride	Hemangiosarcoma	Tenure over 4 yr
Soot, tar, pitch, asphalt, mineral oil, or paraffin	Primary epithelial cancer	-

as epithelial cancer, but needed to be amended as skin cancer. In addition, myelodysplastic syndrome is not cancer, but is a hematologic malignancy, and the epidemiologic evidence for larynx cancer caused by chrome exposure was insufficient. Vinyl chloride exposure as a cause of human hepatocellular carcinoma had sufficient evidence. In case of ionizing radiation, as a definite cause of cancer was not included in prior criteria, which only included acute radiation injury-related diseases. Therefore, the previous list had 3 main problems. First, the number of covered agents was smaller than those of the international lists. Second, the target cancer or the name of the agent was not clear. Third, a reconsideration of exposure duration or cumulative exposure level was needed; however, this was not included in the current amendment because this would require a na-

tional consensus across professional review boards considering various situations of exposure in Korea.

The main points of this amendment were as follows: First, the type and number of carcinogens should match those of international levels, considering the lists of the ILO, EU, and IARC, with the occupational cancer list of the ILO taking first priority. Second, the priority order of the list should be decided by the carcinogen exposure possibility in Korea. Third, the criteria should include matches between specific carcinogens and target cancers, as evidenced by clinical data from the IARC.

#### **An overview of the recent amendments to the scope and criteria of compensation for occupational cancer**

We, who suggested the list of carcinogens and its target cancers

for recent amendment and directly participated in the policy making process of amendments to the scope and criteria, selected 28 agents and 11 industries to extend the criteria of occupational cancer according to the results the previously described review of the occupational cancer list of the ILO, the EU, and the IARC classification, and the exposure possibility in Korea to identified risk factors. Aflatoxins, 4-aminobiphenyl, arsenics, ultraviolet-emitting tanning devices, benzidine, beryllium, beta-naphthylamine, 1,3-butadiene, cadmium, crystalline silica, diesel engine exhaust, erionite, ethylene oxide, formaldehyde, leather dust, nickel compounds, passive smoking, polycyclic aromatic hydrocarbons (PAHs), radon, shale oil, solar radiation, strong inorganic acid, 2,3,7,8-tetrachlorodibenzo-para-dioxin, trichloroethylene, ortho-toluidine, wood dust, anti-cancer drugs or immunosuppressants, and sulfur mustard were included in reviewed list of agents. Occupations or industries included the rubber industry, painting magenta production, coal gasification, aluminum production, auramine production, isopropyl alcohol manufacture using strong acids, underground hematite mining, iron and steel founding, coke production, and coal-tar distillation.

Coal gasification, coke production, and coal-tar distillation were reviewed with respect to PAHs. These industries could be matched to causative agents in a Korean-based exposure situation. Occupational cancer risk of the rubber industry could be explained by exposure to aromatic amines or solvents. The magenta, aluminum, auramine, isopropyl alcohol, or hematite production industries are rare in Korea. PAHs, crystalline silica, and strong inorganic acid could explain the occupational cancer risks of the iron and steel founding industry. As a result, painter was the only occupation/industry added to the amended criteria.

It was not possible to determine the exposure to passive smoking, solar radiation, ultraviolet-emitting tanning device, and solar radiation between environmental exposure and occupational exposure. In Korea, exposure to aflatoxins, sulfur mustard, erionite, shale oil, and 2,3,7,8-tetrachlorodibenzo-para-dioxin is unlikely and was classified as low risk. Measuring the exposure level of leather dust, strong inorganic acid mist, PAHs, 4-aminobiphenyl, and ortho-toluidine was very difficult. Diesel engine exhaust and trichloroethylene were recently upgraded by the IARC and information concerning exposure measurements, epidemiological evidence, or cases in Korea was limited. Anti-cancer drugs and immunosuppressant exposure are usually important to patients. In total, 13 agents and 1 occupation among 39 considerable agents and industries were assigned as priority add-ons to the amended scope and criteria specific for Korea.

We also suggest classifying the system of occupational cancer into an agent- and organ-oriented systems according to the specific criteria for the recognition of occupational diseases according to the Enforcement Decree of Labor Standard Act (LSA) and

the Enforcement Decree of IACI Act. Therefore, on the basis of the scope of occupational cancers of the LSA, on which all the agents were listed without target cancer, agents were listed with target cancers based on organ oriented system named cancer on the specific criteria of the IACI Act. Especially, regarding some agents such as benzene, asbestos, or chrome, the considerations related with exposure duration or level persisted unless there were definite evidences.

As a result, 14 agents and occupation matched with 12 target cancers were added to the list including X-rays or  $\gamma$ -rays; arsenic and its inorganic compounds; nickel compounds; cadmium and its compounds; beryllium and its compounds; wood dust; benzidine; beta-naphthylamine; crystalline silica; formaldehyde; 1,3-butadiene; radon-222 and its decay; spray painting; ethylene oxide. Asphalt and paraffin were removed because of the ambiguity of chemical characteristics that could be masked by other agents. The descriptions for some agents were revised to enhance the clarity of the characteristics of the agent; tar was revised to coal tar, pitch was revised to coal tar pitch, chrome was revised to hexavalent chrome, mineral oil was revised to untreated mineral oil, and hepatitis virus was revised to hepatitis B and C virus.

Target cancers, especially those related with ionizing radiation, such as cancers of the salivary glands, esophagus, stomach, colon, bone, breast, kidney, thyroid, ovary, nasopharynx, and bladder were incorporated. Table 6 presents the scope of occupational cancers according to the Enforcement Decree of the LSA, July 2013 and the specific criteria for the recognition of occupational diseases according to the Enforcement Decree of the IACI Act, July 2013.

## DISCUSSION

Occupational cancer underwent the widest changes in a recent amendment for tables of the Enforcement of Decree of the LSA and the IACI Act. As a result of a review of the published literature including international occupational cancer lists, alongside an analysis of the carcinogen exposure situation in Korea, and a review of cases compensated in Korea, the carcinogen agents included in legal tables increased from 11 to 23 and the target cancers increased from 9 to 21. Various stakeholders such as representative organizations of employers, workers, insurers, and policymakers participated in this amendment process.

As previously stated, it was not possible to further define the work-relatedness between agents and target cancers as a function of exposure level and duration or cumulative exposure. Further investigation and discussion between researchers to form a social consensus among various stakeholders will be necessary to resolve criteria for rapid compensation for occupational cancer based on estimates of past exposure level and individual susceptibility. A difference in social security systems



**Table 6.** The scope of occupational cancers according to the Enforcement Decree of Labor Standard Act and the specific criteria for the recognition of occupational diseases according to the Enforcement Decree of Industrial Accident Compensation Insurance Act (enforcement date: July 1, 2013)

Enforcement Decree of Labor Standard Act
E. Occupational cancer Cancer caused by carcinogenic agents such as soot, coal tar, coal tar pitch, untreated mineral oil, hexavalent chromium or its compounds, vinyl chloride, benzene, asbestos, hepatitis B or C virus, ionizing radiation such as X-rays or gamma rays, inorganic arsenic or its compounds, nickel compounds, cadmium or its compounds, beryllium or its compounds, wood dust, benzidine, beta-naphthylamine, crystalline silica, formaldehyde, 1,3-butadiene, radon-222 or its decay products, ethylene oxide, and spray painting.
Enforcement Decree of Industrial Accident Compensation Insurance Act
10. Occupational cancers
A. Lung cancer, malignant mesothelioma, laryngeal cancer, or ovarian cancer due to asbestos (exposure for 10 yr or longer)
B. Lung cancer or nasal cavity or paranasal sinus cancer due to hexavalent chromium or its compounds and nickel compounds (exposure for 2 yr or longer)
C. Lung cancer due to coal tar pitch (exposure for 10 yr or longer), Radon-222 or its decay products, cadmium or its compounds, beryllium or its compounds and crystalline silica
D. Lung cancer or skin cancer due to soot
E. Skin cancer due to coal tar (exposure for 10 yr or longer) and unrefined mineral oil
F. Lung cancer, bladder cancer, or skin cancer due to arsenic and its inorganic compounds
G. Lung cancer or bladder cancer occurring in spray coating workers
H. Bladder cancer due to benzidine and beta-naphthylamine
I. Nasopharyngeal cancer or nasal cavity or paranasal sinus cancer due to wood dust
J. Leukemia or multiple myeloma due to benzene (cumulative exposure level more than 10 ppm-year or 1 ppm-year at present exposure level)
K. Leukemia or nasopharyngeal cancer due to formaldehyde
L. Leukemia due to 1,3-butadiene
M. Lymphoid leukemia due to ethylene oxide
N. Hemangioma (exposure for 4 yr or longer) or hepatocellular carcinoma due to vinyl chloride
O. Hepatocellular carcinoma due to hepatitis B or C
P. Salivary gland tumor, esophageal cancer, gastric cancer, colon cancer, lung cancer, bone tumor, basal cell carcinoma of skin, breast cancer, renal cell carcinoma, bladder cancer, brain tumor, central nervous system tumor, thyroid cancer, acute lymphoid leukemia, or (acute or chronic) myeloid leukemia due to ionizing radiations

between countries is one of the main issues to consider, especially an understanding of the compensation criteria or scope of occupational cancer, because cancer usually develops post-exposure (5). The determination of past exposure history or the level of carcinogens in the work environment is very difficult, because of environmental changes over time and the closure of workplaces deemed unfit in the past (7).

Cancer is a chronic disease with a significant financial and health burden at both an individual and national level (29). The financial difference between compensation coverage and wage compensation benefit for absenteeism from the workplace between the National Health Insurance and the IACI system can aggravate the burden of disease for the individual worker, and the outcome of whether a worker is compensated by IACI or not is a major issue for them and their families. The policy makers, professionals, and various stakeholders should carefully consider the fundamental issue in the Korean welfare system by introducing sickness absence benefit for workers during the treatment and rehabilitation of occupational cancer.

The continuous modification of compensation coverage by the IACI according to new evidence presented in the scientific literature and according to general consensus is essential until sickness absence benefit for workers is introduced by the National Health Insurance system. A continuous review system of the evidence of causal association is necessary to modify and update the criteria of occupational cancer to formulate guidelines to decide work-relatedness. Many countries, such as the UK, Germany, France, Canada, or Japan, operate this kind of

regular review system with medical professionals based on legal background, which is not the case in Korea.

Expanding the criteria and scope of occupational cancers is unlikely to lead to an increase in claims for the compensation for occupational cancers, because cancer is a rare disease and the added carcinogens and target cancers in this time have been compensated by decision of professional through out of list system. However, this amendment of the scope and criteria of occupational cancer could increase the public concerns for the compensation for occupational cancer. This situation could improve the very low frequency of claims due to lack of understanding on occupational cancers.

## DISCLOSURE

The authors have no conflicts of interest to disclose.

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