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Historical developments of administrative measures for occupational diseases in Japan

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Abstract

Between Japan's Meiji Restoration (1868) and the end of the Second World War (1945), the health implications of poor working conditions included pulmonary tuberculosis in the textile industry and silicosis among miners. There was a gradual move to protect workers, culminating in the 1947 establishment of the Ministry of Labour – now the Ministry of Health, Labour and Welfare) and the enactment of the Labour Standards Law. From the mid-1950s to the mid-1970s, high economic growth was achieved, but the number of occupational diseases (such as pneumoconiosis and chemical intoxication) increased. The Ministry of Labour established the Industrial Safety and Health Law (ISHL, still in effect today) in 1972, laying the legal foundation to specifically focus on occupational health and address occupational diseases. The ISHL designated countermeasures for pneumoconiosis, including the Health Management Diary System, to provide government-paid health examinations for retired workers with medical complaints. It thus ushered in a significant revision of the Pneumoconiosis Law (1960). Due to their long latency periods, occupational cancer cases surged many years after (but as a consequence of) exposure to hazardous substances (for example, benzidine, beta-naphthyl amine and asbestos) during the high growth era. Karoshi, or death from overwork, typifies the occupational mental health issues that are characteristic of modern-day Japan. Historically, administrative measures for occupational diseases have been retroactively responsive to public concern triggered by media reports. Today, however, there are promising signs of administrative measures shifting towards more preventive stances and actions.

I. Overview of historical developments

1.1. The dawning era of modernization and occupational diseases

Japan's Meiji Government, which was established in 1868, adopted a policy of "encouraging new industry (*Shokusan Kogyo*)" by applying world-class production methods.¹ The Industrial Revolution of Japan began around 1886–89, when the cotton spinning, railway and mining industries rose to eminence, and lasted until around 1907. World-class technologies were applied to the shipping, machinery and steel production industries, and mechanization progressed in the textile industry.¹ In terms of occupational health, this period was notable for silicosis among mining workers, heat stroke among mining pit labourers exposed to hot ambient temperatures, for example, in the Takashima Coal Mine (Nagasaki Prefecture),² and tuberculosis among textile workers.

In 1882, there were about 61,000 workers in private sector factories; of them, more than half were women and 14 per cent were juveniles less than 16 years of age.¹ Within the textile industry, the reeling/spinning sector had the largest number of workers and factories. Many of the workers were teenage girls from agricultural areas. The working conditions were both harsh and unjust, as workers were simply sent home once they contracted tuberculosis.^{3, 4} Infectious diseases such as plague and cholera were also rampant in the textile industry.^{2, 4}

In 1875, the first match factory was built in Tokyo^{2, 4} and similar businesses soon spread to Hyogo and Osaka prefectures, giving rise to yellow (white, hereafter) phosphorus poisoning (intoxication, hereafter). Additional health hazards for workers in the nineteenth century included beriberi and eye injuries.²

The mining industry was first regulated by the Mining Regulations (Law) of 1890, which limited the daily work of miners to 12 hours or less, restricted the scope of work for female factory workers, and prescribed the work content and hours for juveniles aged 14 years or less.^{2, 4} In 1905, the Mining Regulations were replaced by the Mining Law, which included six articles on the protection of mining workers.² Around the time the Factory Law was enforced in 1916 (see below), new Regulations on Aid to Mining Workers were established.^{2, 4}

1.2. The establishment of the Factory Law

The Japanese Government had long been concerned about tuberculosis affecting female workers in the textile industry, fearing that loss of human power would hinder the policy of "encouraging new industry (*Shokusan Kogyo*)". As part of governmental efforts to draft a factory law in 1882,⁴ opinions were sought from the textile associations.⁵ In 1891, regional boards of trade were consulted regarding the scope, degree and methods of regulation in the textile industry. However, of the eight boards that responded, seven were opposed to the establishment of a factory law.⁵ Because of this debate, the drafts for the Factory Workers Law of 1897 and the Factory Law of 1899 could not be submitted to the Imperial Diet. In fact, the draft Factory Law was first submitted to the Imperial Diet in 1909, but it was withdrawn in the face of opinions that the prohibition of night work was premature. The draft was revised in 1911, and the Imperial Diet finally enacted the Factory Law (table 1).⁵ Meanwhile, the Government assigned a task force to survey the conditions of occupational hygiene in various regions. The task force's findings, published as the "*Shokko Jijo*" (Conditions of Factory Workers) in 1903, became a valuable basis for

drafting the Factory Law.⁴ Finally, the Factory Law was enforced in September 1916, five years after its enactment.

Table 1. Outline of the Factory Law^{4,6}

Item	Content (prescription)	Notes
Scope of application	(1) Factories that consistently employ 15 or more workers. (2) Factories in which the work may be dangerous or hazardous.	Under government ordinance, some industries were exempted; dangerous or hazardous work was specified.
Minimum age	Work by those under 12 years of age was prohibited.	There were some exceptions for those 10 years old and older.
Maximum working hours, night work	For those under 15 years of age and women, maximum was set at 12 hours per day and work from 10 p.m. to 4 a.m. was prohibited. However, implementation of the prohibition of night work was suspended for 15 years.	There were some exceptions for specific jobs.
Holidays and recess	Days off were provided twice or more per month for those under 15 years of age and women. When work exceeded six hours, break was provided for 30 minutes or more. When work exceeded ten hours, break was provided for one hour or more.	For specified night work, days off were provided 4 times or more per month.
Dangerous or hazardous work	Those under 15 years of age and women were prohibited.	Jobs which apply were designated by ministerial notification.
Aid for damage	Provided for injuries, diseases and deaths if there was no serious fault by the worker (specified by government ordinance).	Designated seven types of occupational diseases by administrative ruling (1916). ⁴

1.3. Protection of workers between the two world wars (First World War and Second World War)

The period between the First World War and the Second World War was characterized by dramatic developments in the textile, coal and copper industries, which assumed important roles as their production increased in a country with scarce natural resources.¹ Industrial development was also seen in other private sectors, such as the machinery, shipbuilding, railway vehicle manufacture, and steel production industries, driven by the army and navy arsenals.¹

In terms of occupational health, a critical event was the 1919 founding of the Ohara Institute for Social Research by Mr Magosaburo Ohara, a member of the *Zaibatsu* (industrial and financial business conglomerates).^{4, 7} This Institute later became the Institute for Science of Labour (Kanagawa Prefecture), which remains a going concern today and has turned out many outstanding researchers of their respective times, including Gito Teruoka, Shinji Katsuki and Shigetaka Kubota.

When the International Labour Organization (ILO) was established after the First World War in 1919, Japan was given a permanent seat on the Governing Body and encouraged to prepare labour protection laws.⁴ In 1921, the Law to Prohibit White Phosphorus Matches was enacted amid incidents of intoxication by white phosphorus.⁴ A re-examination of the Factory Law and the Mining Law resulted in their respective amendments in 1926,^{4,5} in response to the Conventions and Recommendations adopted by the First Session of the International Labour Conference in 1919.

In 1929, rules for preventing damage in factories and encouraging hygiene (36 articles) were established as a ministerial ordinance of the Factory Law. They specified measures to prevent exposure to harmful substances and on the use of personal protective equipment (PPE). The revision of 1938 stipulated the duties of the safety manager (including hygiene management), the appointment of a factory doctor, and the implementation of annual health examinations by the factory doctor.⁴

At that time it was rare to provide aid for occupational diseases, even in developed countries. In Japan, by contrast, the Mining Law of 1905 required employers to provide aid for occupational diseases, and the Factory Law of 1911 followed suit.⁴ When the Factory Law was enforced in 1916, the actual scope of the occupational diseases covered was defined in an official notice (administration document), including intoxication by certain hazardous substances, musculoskeletal disorders due to heavy physical labour, and certain infectious diseases.^{4, 8} Silicosis among miners was not designated as an occupational disease until 1930, when it was included by official notice.⁴ The official notice of 1936 repealed the prior notice and added new items, for a total of 26 designated occupational diseases.^{4, 8}

Neither the Factory Law nor the Mining Law stipulated the provision of aid for damage sustained by day labourers. To address this situation, the Law to Aid Workers' Damage and the Insurance Law on Responsibility to Aid Workers' Damage were established in 1931; together the various provisions finally covered a large portion of the accidents and diseases experienced by workers.⁸

1.4. The new era of workers' protection following the Second World War

Following Japan's Second World War defeat in 1945, urban land was desolated, industry slumped, and there were desperate shortages of food and jobs. The Constitution of Japan, founded on basic principles such as respect for fundamental human rights and pacifism, was promulgated in 1946 after debate in the Imperial Diet and under guidance from the General Headquarters/Supreme Commander for the Allied Powers (GHQ/SCAP). It was enforced the following year.

The Labour Standards Law (121 articles) and the Industrial Accident Compensation Insurance Act (54 articles) were legislated in 1947 in accordance with article 27, paragraph 2 of the Constitution, which states that: "Standards for wages, hours, rest and other working conditions shall be fixed by law." The two laws replaced the earlier Factory Law, Mining Law, Law on Prohibition of White Phosphorus Matches, Law to Aid Workers' Damage and Insurance Law on Responsibility to Aid Workers' Damage.⁶ The Ministry of Labour (which merged with the Ministry of Health in 2001 to become the Ministry of Health, Labour and Welfare) was established the same year to administer workers' protection. The Ministry of Labour was (the Ministry of Health, Labour and Welfare now is) the sole administrative body of occupational health in Japan.⁹ Its local arms included the Labour Standards Bureau in each prefecture and the Labour Standards Inspection Offices as their subsidiaries.¹⁰ The Ordinance for Enforcement of the Labour Standards Law designated 38 diseases as compensable occupational diseases⁸ according to the law; any of these diseases caused by an occupation became eligible for compensation.

Between 1947 and the mid-1950s, silicosis in the mining industry was considered the most important health issue among workers. As the mining industry was believed to be the main engine driving the overall resurrection of industry, various administrative measures were taken to protect miners.¹¹ Other problems included various intoxications in fertilizer-producing chemical plants, where production was accelerated to overcome food shortages, and carbon disulfide intoxication in the spun-rayon-producing textile industry.¹¹ With the

aim of restarting the oil-refining industry, the Ordinance on the Prevention of Tetraalkyl Lead Hazards was established in 1951.¹¹

1.5. Occupational diseases during the high growth era

The period from 1955 to October 1973 (when the first oil shock hit Japan) is generally referred to as the “era of high economic growth” or the “high growth era”. The economy boomed during this period, recording an average annual growth rate of 9.8 per cent,¹ and a White Paper on Economics published in July 1956 declared the end of the post-war period. Indeed, at this point the national production level exceeded the pre-Second World War level.¹² In December 1956, Japan rejoined the international community, becoming a member of the United Nations.

Fatal and injury-inflicting industrial accidents increased drastically during the early part of the high growth era, peaking in 1961 when 481,686 fatal and injury-inflicting accidents were recorded, including 6,712 deaths. Occupational diseases increased until 1959, declined for a brief period, and then increased again after 1966, recording their historical peak in 1972 with 30,869 incident cases.^{13, 14}

From 1953 to 1954, just before the start of the high growth era, the dye production industry faced a growing demand for exports and suffered many cases of intoxication by benzidine and beta-naphthyl amine¹¹ and a number of cases of urinary tract tumours.¹⁵ Beginning in about 1955, the shoulder–arm–neck syndrome emerged and increased among key-punching clerical workers. Some of them committed suicide, making this syndrome a social issue. Consequently, in 1964 the Administration issued a notification for administrative guidance in an effort to prevent shoulder–arm–neck syndrome.¹¹

From 1956 to 1966, there were outbreaks of benzene intoxication among micro-enterprise employees and homemaker side-job workers engaged in the assembly of “Hepburn sandals”. This also developed into a social issue.¹¹ Intoxication by nitro-glycol in dynamite production was recognized in the period 1959–60, and by tetraalkyl lead in the 1950s, and countermeasures were taken accordingly.^{11, 12, 14, 16} Lead and its compounds have been used since antiquity but their application and usage volume expanded with industrial development, bringing new intoxication problems. The Administration responded by enacting the Ordinance on the Prevention of Lead Poisoning in 1967.¹⁴

Health impairments caused by vibrating tools increased from the mid-1950s with the expanded use of chainsaws among forest industry workers, and also became a social issue that has relapsed many times since. Under the piece-rate wage system characteristic of the forest industry,¹⁷ it was difficult to limit working hours for fear of reducing output and wages, even though such regulation was considered necessary to prevent health problems. Consequently, notifications for administrative guidance had to be issued repeatedly.

The Ordinance on Prevention of Ionizing Radiation Hazards was established in 1959 in response to the spreading use of X-ray equipment and radioactive substances in medical facilities and the steel industry.^{11, 14} The Ordinance on Prevention of Health Hazards due to Compressed Air was established in 1961 to deal with work performed under high pressure during underwater construction, and the occurrence of decompression sickness and divers’ disease caused by diving work.¹⁴ The Ordinance on Prevention of Hazards Due to Specified Chemical Substances was established in 1971 to prevent industrial intoxication by chemicals other than organic solvents, lead and tetraalkyl lead.¹⁴ The Ordinance on Prevention of Anoxia was established in 1971 in response to the frequent occurrences of anoxia at sites of public engineering work, beginning around 1961.¹⁸

As industry developed and business structures diversified, it became increasingly difficult to secure safety and health by regulations based on the Labour Standards Law, because the minimal standards proved insufficient to prevent industrial accidents. Accordingly, the Industrial Safety and Health Law (122 articles) was legislated in 1972. In the same year, related Cabinet orders, ministerial ordinances and public notices were also prepared.^{5,19}

1.6. Occupational diseases after the enactment of the Industrial Safety and Health Law

After the first oil shock (1973–74), the rationalization of industry was promoted, the economy entered an era of slow growth, and the number of occupational diseases took a downturn.¹⁴ However, this era followed the era of high economic growth, which was characterized by little or no awareness of protecting workers' health, and prioritization of production over preventive measures. As a consequence of this earlier era, various occupational cancers began to surface in 1975 after a long latency period (i.e. the period from the start of an exposure to the occurrence of disease).

A typical example was hexavalent chromium: many cases of cancer of the lung and upper respiratory tract occurred among chromate production factory workers in Tokyo and Hokkaido, creating a serious social issue by 1975. In the same year, a worker engaged in forming polymers from vinyl chloride monomers became the first to develop occupation-induced angiosarcoma of the liver. In addition, lung cancer was seen among workers who had been exposed to bis (-chloromethyl) ether, benzo-trichloride, asbestos, coke-oven work in steel production, and arsenic-containing copper smelting.^{11, 14}

Between 1975 and 1978, therefore, occupational diseases (especially occupational cancers) became a central theme in workers' health protection and the Administration took various countermeasures.

The Pneumoconiosis Law was substantially revised in 1977 to reflect the state of medical knowledge at the time. Because pneumoconiosis and its complications can develop or progress long after individuals cease performing dusty work, their incidence peaked in 1979 at 2,491 cases, as a result of dust exposure during the era of high economic growth.²⁰ The Ordinance on Prevention of Hazards Due to Dust was established in the same year (1979), strengthening the measures aimed at preventing dust exposure.

Partly due to the 1977 revision of compensation criteria (official notice), health impairment caused by vibration peaked in 1978, recording 2,595 cases.²¹ Workers who suffered cerebrovascular disease or ischemic heart disease after labouring under excessive workloads were already covered under the workers' compensation scheme. The compensation criteria (official notice) of 1961 were revised in 1987. However, criticism arose as the revision failed to promote compensation. This developed into "the social issue of *karoshi* (death due to overwork)".²² Although the debate originally centred on compensation, various preventive measures were later introduced.

In 1984, a design engineer's depression became the first psychiatric condition to be compensated. This prompted administrative responses,²³ including the inception of training on mental health care (1985 onwards), the formulation of compensation criteria (official notice) for psychiatric disease (2000), the establishment of mental health support centres (2008), and the initiation of preventive measures, such as the opening of a portal site called the "Ear of the Mind" (2009).²⁴

II. Pneumoconiosis

2.1. Silicosis before the Second World War

In the wake of the first oil shock, gold, silver, copper and coal mines that had been operating since the Meiji Restoration began to close one after another.²⁵ Historically, miners had short lifespans during the seventeenth to nineteenth centuries²⁶ and industrial accidents involving cave-ins and gas explosions were rampant.^{2, 4} The largest industrial accident to ever occur in Japan was the gas explosion at the Hojo Coal Mine (Fukuoka Prefecture) in December 1914, when 671 were killed and many others were intoxicated by carbon monoxide.⁷

In 1930, silicosis among miners was first designated as a compensable occupational disease. This was most likely influenced by the First International Conference on Silicosis (now called the International Conference of Occupational Respiratory Diseases), which was held around the same time in Johannesburg, South Africa.²⁷

2.2. Pneumoconiosis since the Second World War

In June 1946, town meeting participants in the home town of the Ashio Copper Mine (Tochigi Prefecture) issued a declaration on the need to eliminate silicosis. The event was widely publicized across the country, and countermeasures against silicosis became a central theme for the administration overseeing occupational health and compensation for industrial accidents.¹¹ Silicosis was discussed by academicians of occupational health in national committees and in the Council to Restore Metal Mines (a conference of business organizations). Furthermore, the Ministry of Labour convened the National Council on Silicosis Measures (established in January 1948) to discuss related issues and embark on circuiting health examinations. The latter were administered to more than 70,000 workers in the mining, foundry and quarrying industries until 1955.^{14, 28-30}

The Outline on Silicosis Measures was deliberated by the Silicosis Inquiry Commission (established in 1949, with members representing public interest, workers and employers) and issued as an official notice in August 1949.¹⁴ Regarding compensation, “pneumoconiosis and pulmonary tuberculosis caused by work at places where dust is dispersed in ambient air” were listed among the occupational diseases in the Enforcement Regulations of the Labour Standards Law.²⁹

The creation of an independent law on silicosis was initially proposed in 1948 by the Council to Restore Metal Mines, but discussions continued until the end of 1951 because there were dissenting opinions from the employers’ group. In 1955, the “Special Protection Law on Silicosis and External Injuries to the Spinal Cord” (hereafter called the “Special Protection Law”) was established, designating: (i) the provision of health examinations for silicosis; and (ii) the payment of special benefits (effective for two years) for medical treatment and work absences for patients with silicosis and external injuries to the spinal cord.²⁸ As the two-year benefit provision under the Special Protection Law would terminate in 1958, the “Temporary Expedient Law on Silicosis and External Injury to the Spinal Cord” (hereafter called the “Temporary Expedient Law”) was established in May 1958, designating measures to temporarily continue benefit payments.²⁸

Beginning in 1958, preparations began to legislate a new law that considered the discussions of the Silicosis Inquiry Commission, the findings from health examinations for silicosis, and a survey of related systems in foreign countries. The Silicosis Inquiry Commission reported back the respective positions of employers and workers, whose representatives failed to reach an agreement; the report was thus inconclusive. A further

consultation with the Inquiry Commission on the Industrial Accident Compensation Insurance Act was similarly inconclusive. Each report was submitted to the Minister of Labour. Due to the inconclusiveness of the two inquiry commissions, the Ministry of Labour, in compliance with the provisions of the Temporary Expedient Law (with a deadline set at the end of 1958), presented the Diet with the draft Pneumoconiosis Law and the draft Law to Amend the Industrial Accident Compensation Insurance Act (IACIA). The two draft laws were deliberated in the Diet, enacted on 31 March (which was the final effective date of the Temporary Expedient Law) and enforced the following day.²⁸

These two laws were controversial in many ways, as outlined in table 2.²⁸

Table 2. Main points of the Pneumoconiosis Law and the Law to Amend the IACIA

The Pneumoconiosis Law	<ul style="list-style-type: none"> (1) The diseases subject to the Law were expanded to include cases of silicosis, other pneumoconiosis caused by mineral dust, and pneumoconiosis complicated by pulmonary tuberculosis. (2) Employers were required to implement three different types of pneumoconiosis health examination: upon employment, periodical exams, and exams administered on an ad hoc basis. The categories designated for health management were defined as administrative levels (AL) 1, 2, 3 and 4, and were determined by a combination of findings from chest radiogram, cardiopulmonary function and the presence/absence of pulmonary tuberculosis. (3) The final decision on health management (in terms of AL) was to be made by the Director of the Prefectural Labour Office. Appeals to the decision could be made to the Minister of Labour. (4) Certain procedures were to be followed for transfer of work, with monetary benefits provided by the employer.
The Law to Amend the Industrial Accident Compensation Insurance Act (IACIA)	<ul style="list-style-type: none"> (1) Long-term injury and disease compensation was to be paid for as long as necessary for all injuries and diseases that have not been cured after three years of receiving medical treatment. (2) For individuals whose symptoms have stabilized after three years of receiving medical treatment and who are seriously disabled with a disability grade of 3 or higher (on a scale of 1–14), long-term injury and disease compensation benefits should be paid (partial pension scheme) instead of the conventional lump-sum benefit.

2.3. Amendment of the Pneumoconiosis Law

The enactment of the Industrial Safety and Health Law in 1972 was a defining event in the context of countermeasures for occupational diseases in Japan. Under this law, the Health Management Diary System was introduced to provide government-paid health examinations for retired workers with medical findings for pneumoconiosis.

Industrial development during the high growth era brought increasing numbers of dust-related issues and pneumoconiosis patients, medical progress in managing pneumoconiosis and growing sentiment that the Pneumoconiosis Law should be amended.¹⁴ From 1974 onwards the Pneumoconiosis Inquiry Commission deliberated requests to make specific amendments advanced by Commission members representing the workers' group. The Labour Ministry convened an expert meeting to discuss the health management of pneumoconiosis, and produced an interim report in March 1977. The Pneumoconiosis Inquiry Commission, deliberating the issue from December 1976 onwards, produced a unanimous final report in March 1977. The draft law was submitted to the Diet and enacted in June 1977.²⁸ Since then, amendments have been made to the ministerial ordinance (such as the addition of certain types of dust-related jobs and complications of pneumoconiosis), but the basic framework of the amended law remains unchanged.

2.4. Enactment of the Ordinance of Prevention of Hazards due to Dust (OPHD)

Demands arose to strengthen measures aimed at improving the working environment in order to prevent pneumoconiosis. This reflected the opinions of various parties regarding the post-1974 amendment of the Pneumoconiosis Law and its deliberation in the Diet. The demands were based on the premise that little progress had been made on measures to combat pneumoconiosis, stipulated in only three abstract articles (one being the stipulation in the Industrial Safety and Health Regulations to install local exhaust systems).³¹

In response, the Ministry of Labour implemented surveys to ascertain the actual situation in various dust-emitting industrial processes, measured dust in the work environment, monitored personal exposure and assessed the status of dust emission prevention. It also commissioned research and convened expert meetings to legislate the Ordinance of Prevention of Hazards due to Dust (OPHD). After an inquiry was made to the Central Labour Standards Council and Pneumoconiosis Inquiry Commission and their reports were received, the OPHD was issued as a ministerial ordinance based on the Industrial Safety and Health Law, and enforced in October 1979.³¹

III. Infectious diseases

The policy of encouraging new industry (*Shokusan Kogyo*) adopted by the Meiji Government emphasized the role of the textile industry in leading exports. Female labourers from across the country worked at the Tomioka Spinning Factory. After gaining skills and experience, some of these workers eventually returned home and took jobs at similar plants in their original regions, thereby contributing to the nationwide diffusion of technology.² However, many of the teenage female workers in the spinning factories faced harsh conditions, being housed in shabby dormitories and working as long as 12 hours per day, sometimes on night shifts. Their treatment was often unjust, and they would be sent back home if they contracted such diseases as tuberculosis.^{2,3} A report entitled “Pathetic Life of Mill Girls” (*Jokou Aishi*) was published in 1925 by Mr Wakizo Hosoi, who himself worked in harsh conditions as a mechanic in the textile industry when he was young. This book is widely known in Japan.³ Plague broke out in the textile industry in 1899, and spinning mills were hit by epidemics in 1901–03, 1905, 1916 and 1920.²

With a view to regulating infectious diseases, the Ordinance for the Enforcement of the Factory Law (1916) prohibited sick persons from working, and the revised Ordinance on the Prevention of Damage in Factories and on Hygiene (1938) mandated the appointment of a factory doctor and the implementation of health examinations.⁴ In addition, the Labour Standards Law (1947) required the provision of health examinations, and the Industrial Safety and Health Law (1972) mandated the implementation of general health examinations at the time of employment and periodically thereafter (twice annually for those engaged in hazardous work). Health examinations for tuberculosis were also mandatory for some time but this was discontinued in 2009.

After the first oil shock in 1973, Japanese companies, as part of their rationalization policy, set up overseas factories and employed local workers for lower wages. When high-tech equipment and machinery were exported, Japanese engineers were sent overseas to instruct the buyers on instalment and operation. Since 1990, this globalization has progressed and the number of expatriate Japanese workers has increased. Some have contracted infectious diseases, with more than ten such workers being compensated annually.³² In 1989, as part of the general health examination system, employers were required to provide health examinations (before departure and after return) for workers who were sent overseas for six months or more.

IV. Industrial intoxication

4.1. White phosphorus matches

In Japan, the production of white phosphorus matches began in 1875. The factories were mostly micro-scale, and a considerable number of juvenile workers (aged approximately 8–15 years) engaged in factory work. There are records of children having been intoxicated by phosphorus.^{2,4}

When the Factory Law was enforced in 1916, a survey revealed the many health hazards associated with white phosphorus, prompting its prohibition. Japan became a signatory of the Minimum Age (Industry) Convention, 1919 (No. 5), which was among several Conventions adopted by the First Session of the International Labour Conference in 1919 (Japan ratified it in 1926). Subsequently, the Law to Prohibit White Phosphorus Matches was established in 1921.⁴ This law was largely succeeded by the Labour Standards Law of 1947, and finally by the Industrial Safety and Health Law of 1972, which remains in force today.

4.2. Industrial intoxication up to the Second World War

When the Factory Law was enforced in 1916, a range of compensable occupational diseases was defined by official notice. Industrial intoxication was defined as (i) intoxication by arsenic, mercury, phosphorus, lead and their compounds, hydrocyanic acid, and other hazardous substances; and (ii) erosion or ulcer due to acids, alkaline, chloride, fluorine and related compounds, tar and other erosive and irritating chemical substances.⁴ The official notice of 1936 defined 26 occupational diseases, 14 of which (more than half) were related to industrial intoxication.⁴ Moreover, the list of substances known to cause industrial intoxication has continued to grow with industrial development.

Mercury and lead intoxications were frequent. The former increased from 1920 onwards (imports stopped during the First World War) due to the use of mercury in the production of thermometers (clinical and ambient) and other devices. The latter was caused by the common use of lead among printers, painters and lead battery makers.⁷ Chromium intoxication occurred during the production of chromates, chromium steel, bleaches, glass colouring products, batteries and chromium pigments (for paints and dyes), particularly during the 1910s (demand grew during the First World War). Chromium intoxication manifested as chromium ulcers, nasal septum perforation, oral mucosal ulcers and respiratory diseases. Chromium plating began in the 1920s²⁷ and also increased chromium intoxication. Intoxication due to carbon disulfide increased at this time in the artificial silk and staple fibre industries, and measures were taken to combat it.²⁷

4.3. Industrial intoxication between 1947 and 1972

The List of Occupational Diseases annexed to the Ordinance for the Enforcement of the Labour Standards Law comprised 38 types of diseases, 18 of which were industrial intoxications. For example, benzene intoxication among manufacturers of “Hepburn sandals” developed into a serious social issue beginning around 1956. Vinyl sandals, which gained popularity because they were worn by the actress Audrey Hepburn, were produced in micro-enterprises or by homemakers performing side jobs in home factories. Rubber cements containing high levels of benzene were used to fuse the vinyl parts, usually in small workrooms with no preventive measures such as ventilation, leading to high concentrations of benzene vapour and subsequent intoxication among workers.¹¹

In an effort to prevent such problems, notifications for administrative guidance were issued repeatedly beginning in 1958. In November 1959, the production, sale, import and storage for the purpose of sale of rubber cement containing 5 per cent or more benzene were prohibited.^{11, 14} In 1960, the Ordinance on the Prevention of Organic Solvent Poisoning was established to regulate a range of organic solvents. It designated 12 types of related work and 50 types of organic solvents.^{11, 14} Finally, homemakers performing side jobs were not covered by the Labour Standards Law (the definition of “worker” in the Law did not cover homemakers), meaning that their cases of intoxication were not covered. The Household Labour Law was established in 1970 to protect this group of workers.¹¹

Another industrial intoxication-related issue that arose around 1960 was caused by nitro-glycol, which replaced nitro-glycerol as an ingredient for manufacturing dynamite. The number of intoxication cases increased as the scale of production and the concentration of the mixture grew. This type of intoxication is unique in that it manifests as angina-like attacks that are sometimes fatal and often occur on the day following a holiday, such as on Mondays.^{11, 14}

Carbon monoxide intoxication occurs in various industries, but it is particularly noteworthy in coal mines. The gas explosion of November 1963 at the Mitsui Miike Coal Mine (Fukuoka Prefecture) left 458 dead and 839 intoxicated by carbon monoxide, making it the worst industrial accident in Japan since the Second World War.^{11, 14, 18} The gas explosion at the Yamano Coal Mine (Fukuoka Prefecture) in 1965 killed 237.¹¹ In response to these repeated major accidents, the Act on Special Measures for Carbon Monoxide Intoxication due to Coal Mine Accidents was established in 1967.^{11, 14} As coal mines were already declining during this period, rationalization was prioritized over measures to prevent industrial accidents.¹¹

Lead intoxication became rampant as the scope and volume of its industrial use grew during the high growth era (table 3). The Ordinance on the Prevention of Lead Poisoning was thus established in 1967.

Table 3. Incidence of lead intoxication since 1959 (excludes tetraalkyl lead)³³

Year	Cases (persons)	Year	Cases (persons)	Year	Cases (persons)	Year	Cases (persons)
1959	42	1967	8	1975	18	1983	16
1960	17	1968	9	1976	9	1984	1
1961	8	1969	7	1977	13	1985	3
1962	37	1970	22	1978	14	1986	1
1963	14	1971	53	1979	4	1987	0
1964	25	1972	54	1980	2	1988	0
1965	51	1973	27	1981	10	1989 to 2011	25
1966	21	1974	24	1982	0		

Because tetraalkyl lead causes serious acute intoxication, the Ordinance on the Prevention of Tetraethyl Lead Hazards was established in 1951. This is the oldest ordinance specific to occupational health that is still in effect today. Many fatalities and intoxications accompanied the serious industrial accidents (table 4), prompting the revision of the relevant laws and regulations. The above ordinance was revised to become the Ordinance on the Prevention of Tetraethyl Lead Hazards, Etc., in 1961, and finally the Ordinance on the Prevention of Tetraalkyl Lead Poisoning in 1968.¹⁴

Table 4. Major incidents of tetraalkyl intoxication

Incident	Date	Summary
Intoxication among storage tank cleaning workers at a US armed forces base ¹²	July to September 1958	Twenty-one workers who engaged in cleaning storage tanks at the US armed forces base in Koshiba, Yokohama City, were intoxicated; eight of them died.
Tetraalkyl lead intoxication of stevedoring workers ³³	June 1959	Workers who engaged in stevedoring of drum cans on a ship anchored in Kobe Port were exposed to tetraalkyl lead that leaked; of the exposed workers, 21 were intoxicated.
The "Boston" Incident ¹⁴	October 1967	Twenty workers who engaged in cleaning a tetraalkyl lead-contaminated hold of a ship (the "Boston") were intoxicated; eight of them died.

Other types of industrial intoxication also increased during this period, necessitating measures to regulate chemical substances other than those named in the three ministerial ordinances discussed above. This led to the establishment of the Ordinance on the Prevention of Hazards due to Specified Chemical Substances in 1971. ¹⁴

4.4. Industrial intoxication since 1972

In 1972, the year the Industrial Safety and Health Law was enacted, Japan saw its highest incidence of occupational diseases recorded to that point – 30,869 cases, of which 1,084 were industrial intoxications. ³³ As a measure for compensation, the list of occupational diseases designated by the Enforcement Ordinance of the Labour Standards Law of 1947 was reviewed for the first time. Up to this point, the new types of occupational diseases that emerged during the high growth era had been interpreted as falling under the last item of the ordinance, i.e. "other illnesses which clearly result from operations." This interpretation continued to be applied for some time, but obscured the general public's understanding of what constituted a compensable disease. The amendment of March 1978, based on a public notice of the Labour Minister via a Delegation Provision of the Enforcement Ordinance of the Labour Standards Law, defined industrial intoxication by listing 127 chemical substances or groups of chemicals, and the symptoms caused by intoxication. Most recently, additional chemical substances and groups of chemicals were added in a 1996 revision of the notice, which currently comprises 151 items. ³⁴

V. Occupational cancers

5.1. Occupational cancers before the Second World War

Yawata Steel began operations in Fukuoka Prefecture as a state-owned plant in 1901 and was later privatized in 1934. Around the time of privatization, factory physicians Shizuka Kuroda and Koretoki Kawahata began to suspect a relationship between tar and lung cancer. In 1935, they identified three lung cancer cases, which was a rare form of cancer at the time, among workers exposed to gas-emitting ovens during steel production. They later added another nine similar cases by inspecting previous health examination records for age at onset, exposure duration and the job content of the suspected work. By comparing these data to those of labourers doing other work, they deduced that the observed lung cancer had been caused by the occupational exposure to hot tar ingredients of the gases emitted from the ovens. Their report was published in a German journal in 1936. ^{27, 35}

The use of oven-produced gas was discontinued by 1953 and replaced by coke. However, coke oven work also incurred heavy exposure to tar, and the causal relationship between tar and lung cancer was ultimately proven by analytical epidemiological studies conducted in Japan and other countries.³⁵ Under the Labour Standards Law and IACIA of 1947, 250 such lung cancer cases were compensated between 1947 and 2011.^{36,37}

5.2. Occupational cancers since the Second World War

Tumours of the urinary tract (for example bladder cancer) among dye factory workers are caused by exposure to dye ingredients, such as benzidine and beta-naphthyl amine. Compensation had begun as early as the 1950s,³⁸ and a total of 613 cases had been compensated by the administrative year of 2011.^{36,37} The Industrial Safety and Health Law of 1972 prohibited the production, import, sale, provision and use of benzidine, beta-naphthyl amine and white phosphorus matches. Due to the long latency period of such diseases, however, several new patients are still seen each year, even today.³⁷

In 1972, a hospital physician in Hokkaido came to suspect that three lung cancer cases among workers engaged in chromate production had been caused by chromium exposure. He consulted researchers at the University of Hokkaido, and the issue came to the attention of the Ministry of Labour. Researchers at the University of Hokkaido conducted an epidemiological investigation and confirmed a causal relationship. This led to official compensation for the three individuals.³⁹ Three years later, in August 1975, the media reported a cluster of lung cancer and nasal septum perforations among chromate production workers in Tokyo. This developed into a social issue known as the “hexavalent chromium issue”. Upon official recognition of a causal relationship, cancers of the upper respiratory tract also became eligible for compensation.^{14,38}

Liver angiosarcoma, a very rare cancer in the general population, was identified in 1974 in three United States chemical workers who had been exposed to vinyl chloride monomers during the polymerization process of vinyl chloride. In October 1975, amid heightened concerns about the high risk implicated by the study (and not long after the hexavalent chromium issue came to light), the media reported similar incidences of liver angiosarcoma in Japan.^{14,38} Nine such cases had been officially compensated up to the administrative year of 2011.³⁷

The ILO adopted the Convention concerning prevention and control of occupational hazards caused by carcinogenic substances and agents (the Occupational Cancer Convention, 1974 (No. 139)) in June 1974, which Japan ratified in July 1977.^{14,38,40} Given the potential risk of developing cancers after retirement from work (for example pneumoconiosis), the Industrial Safety and Health Law of 1972 mandated the issuance of health management diaries to workers who engage in the production or handling of benzidine and beta-naphthyl amine for three months or more.

During the high growth era, many workers were exposed to carcinogens without being provided with adequate preventive measures and/or medical information on carcinogenicity. Some of them developed cancer after the long latency period, leading to the emergence of a range of occupational cancers in the 1970s. As mentioned above, the incidence of occupational diseases peaked in 1972. Consequently, as from 1975 the prevention of occupational diseases (particularly occupational cancers) became the central theme for the protection of workers. The Ministry of Labour thus took corresponding administrative measures.

The September 1975 revisions to the Ordinance on Prevention of Hazards Due to Specified Chemical Substances strengthened the regulations on occupational cancer. In addition, the amendment of the Industrial Safety and Health Law in 1977 distinguished “new chemical substances” from “existing chemical substances (i.e. chemicals officially disclosed to the public until June 1979, chemicals produced naturally, and other specified chemicals)”. Under the amended law, it became mandatory for each business operator who manufactured or imported the “new chemical substances” to conduct a hazard assessment and submit the findings to the Ministry of Labour.

From the 1960s onwards, skin cancer of the fingers and leukaemia among workers in medical facilities were recognized as being caused by ionizing radiation, likely due to procedural methods and inadequate protection.¹¹ During the same period, cancers were also recognized as developing due to X-ray exposure during non-destructive inspection work. In total, at least six individuals with occupational radiation-induced cancer were officially compensated during the administrative years of 1946–76,³⁶ and since then 13 individuals have been compensated up to the administrative year of 2012.³⁷

In the context of nuclear power plants, a periodic inspection worker was the first to be officially compensated for leukaemia in December 1991. Up to the 2011 administrative year, six leukaemia cases, two multiple myeloma cases and two malignant lymphoma cases had been officially compensated.⁴¹ When the 2011 Great East Japan Earthquake triggered the severe nuclear accident at the Fukushima Daiichi Nuclear Power Plant (NPP) of TEPCO Inc., 20,000 people engaged in emergency work. Among them, six workers exceeded the exposure level of 250 mSv.⁴² The operation will continue until the ultimate shut-down of the NPP, and the future occurrence of cancer among these workers is a concern. As of 2012, however, there has been no reported health damage due to ionizing radiation among these workers.

Cancer caused by asbestos was officially compensated as early as 1973.⁴³ Around 1986–87, media reports repeatedly addressed the public fear of asbestos exposure, as asbestos had been used widely in buildings and other applications. However, the regulations were not strengthened at the time. In 1986, the ILO adopted the Asbestos Convention (Asbestos Convention, 1986 (No. 162)), which includes an article prohibiting crocidolite and its products. In April 1995, Japan added crocidolite, amosite and any product containing them to the list of prohibited manufacturing items. Japan ratified the Asbestos Convention in 2005.³⁸ Asbestos and asbestos-containing products were “prohibited in principle” (i.e. prohibited items were designated by a negative list) in 2004 and “banned” (i.e. exempted items were designated by a positive list) in 2006. Items on the positive list were progressively removed, and the positive list was completely deleted (that is asbestos was banned without exception) in March 2012.⁴⁴

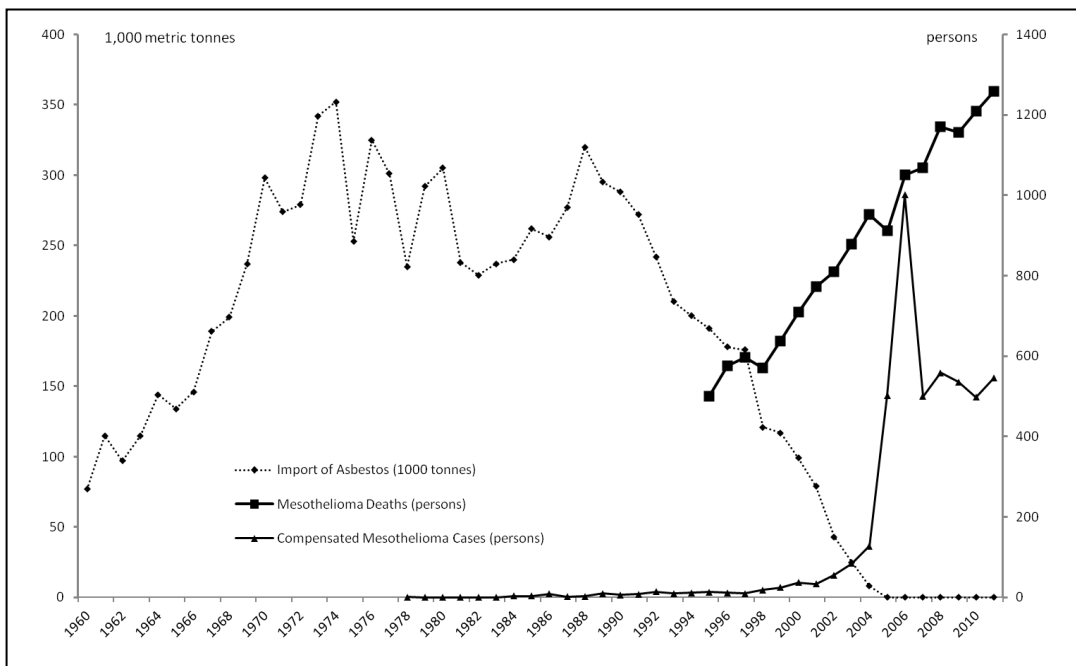
Up to February 2005, asbestos had been regulated by the Ordinance on the Prevention of Hazards Due to Specified Chemical Substances. However, faced with a prevailing trend towards prohibition, regulations premised on the manufacture and handling of asbestos became less relevant. These circumstances led to the enforcement of a new law, the Ordinance on the Prevention of Asbestos Hazards, in July 2005.^{38, 44}

In June 2005, Kubota Inc. disclosed that a number of mesothelioma cases had developed among former employees and neighbourhood residents of an abolished factory in Hyogo Prefecture. This was the beginning of the “asbestos issue”, which developed into a huge social issue.⁴⁵ The use of asbestos was so ubiquitous that the Government mounted a wide-ranging response that included a historical examination of administrative measures taken by a number of ministries and agencies in addition to the Ministry of Health, Labour and Welfare.⁴³ The “Law to Relieve Asbestos Health Damage” (or the Asbestos Relief Law) was established in February 2006 to relieve health damage to local residents and others who were not covered under the conventional scheme of industrial accident

compensation insurance. Since 2006, around 1,000 people are being compensated every year under the IACIA for developing mesothelioma and lung cancer due to asbestos exposure, substantially exceeding the previous annual number of compensated occupational cancers.³⁷

Historically, asbestos was extracted from domestic mines. However, extraction was entirely replaced by importation to meet domestic demands. The importation of asbestos increased drastically in the 1960s and exceeded 200,000 metric tons per year until the 1990s. The number of deaths caused by mesothelioma in Japan became statistically available since 1995 and has been increasing rapidly.^{46,47} The latency period of mesothelioma ranges from ten to 70 years, with an average of 40 years.⁴⁸ As shown in the figure, the number of mesothelioma deaths started to increase 40 years after the 1960s, when asbestos importation began to take off. Because there is a good correlation between the use of asbestos and subsequent rates of asbestos-related diseases at the national level,^{49,50} it can be speculated that mesothelioma will continue to increase in line with the trend of asbestos imports.⁵¹ Although asbestos and asbestos-containing products (ACPs) have been totally banned, the ACPs that are already present in buildings and facilities (asbestos in situ) are still allowed. Thus, it is an important policy goal to prevent asbestos exposure during demolition and removal, which are expected to increase due to the ageing of buildings and facilities.⁵¹

Figure. Time trend of asbestos import and mesothelioma



In May 2012, the media reported that a cluster of employees and former employees of an offset colour proof printing factory in Osaka City (Osaka Prefecture) had developed cholangiocarcinoma, that is intrahepatic or extrahepatic bile duct cancer (five cases with four deaths). It was revealed that these workers had sustained high-level exposure to organic solvents, specifically dichloromethane (DCM) and 1,2-dichloropropane (1,2-DCP), which were used as detergents.^{52, 53} This is a new type of occupational cancer unprecedented in any other country. As of late February 2013, 64 workers at similar printing plants had filed compensation claims. As of March 2013, 16 individuals had been officially approved for compensation based on the high likelihood that exposure to 1,2-DCP and/or DCM caused their cancers. This suggests that the existing preventive measures need to be revised further, and the necessary research and strengthening of regulations are under way.⁵⁴

VI. Karoshi (cerebrovascular diseases and ischemic heart diseases), depression and other psychiatric diseases

6.1. Karoshi (cerebrovascular diseases and ischemic heart diseases)

The Administration has long considered the issue of cerebrovascular diseases and ischemic heart diseases occurring as a consequence of excessive workloads, but only in the context of compensation. An official notice on the enforcement of the Factory Law of 1916 and the Ordinance for the Enforcement of the Labour Standards Law of 1947 included the item “other illnesses which clearly result from operations” in the annexed List of Occupational Diseases. In 1948, this item was used to compensate a worker for a case of overwork.⁸

In 1956, Iichiro Hasegawa, a physician at the Ministry of Posts and Telecommunications, wrote the “Study of Accident Compensation Act”,⁵⁵ which was initially used to guide compensation for karoshi, and later utilized in 1961 to formulate the compensation criteria for karoshi (official notice). A process to revise the compensation criteria was initiated in 1982 and finalized in 1987. However, the resulting criteria were overly strict, hindered the approval of compensation, and received significant criticism. This debate, which became known as “the social issue of karoshi”, caught the interest of the international community.⁵⁶ The compensation criteria were subsequently revised in 1995 and 1996. Further, the Supreme Court ruling (July 2000) on the administrative case litigation prompted a further revision in 2001. This is the latest version valid as of today, and is generally accepted by society at large.

The List of Occupational Diseases annexed to the Ordinance for the Enforcement of the Labour Standards Law was revised in 2010 to include karoshi. In legal terms, karoshi became the subject of compensation, being defined as: “brain haemorrhage, subarachnoid haemorrhage, cerebral infarction, hypertensive encephalopathy, myocardial infarction, angina, cardiac arrest including cardiac sudden death, dissecting aortic aneurysm or their annexed disease due to long-term prolonged job or others which significantly aggravate vascular and other lesions”.

The number of compensated cases increased from around 30 per year up to 1994, to about 80 per year beginning in 1995, and jumped to around 300 in 2002 and beyond.⁵⁷ Based on this trend, the Administration deemed it necessary to take preventive measures. Accordingly, the Industrial Safety and Health Law underwent a series of revisions to meet the following goals: to promote a comfortable work environment (1992); to enact measures to follow up health examinations and set conditions for appointing occupational physicians (1996); to introduce a system that offers voluntary health examinations to night workers and submits the reports to their employers (1999); and to introduce consultation by interview (2005). In addition, the IACIA was revised in 2001 to initiate a system for the follow-up medical examination benefits.

6.2. Measures relating to mental health

Until the early 1980s, there were only a few systematic measures relating to occupational mental health, and occupational physicians had to deal with cases of workplace maladaptation on an individual basis in their respective settings.

In February 1982, a Japan Airlines passenger jet crashed into the sea just before landing at Haneda Airport, killing 24 of the 174 passengers and crew. The crash was caused by the captain's abnormal behaviour; although schizophrenic, he was allowed to fly because the diagnostic report stated "psychosomatic illness". This problem heightened concern about administrative measures relating to mental health.⁵⁸ In February 1984, a design engineer suffering from depression committed suicide at the Ueno underground station of the bullet train. Official compensation was awarded, drawing widespread press coverage. This was the first compensation approved for a mental disorder case,⁵⁹ and prompted the Ministry of Labour to implement preventive measures that included the organization of mental health care training. The 1988 revision of the Industrial Safety and Health Law obliged employers to make efforts to implement Total Health Promotion (THP), and issued an official guideline for training counsellors who would be responsible for mental health at worksites.²⁴

District courts ruled in favour of the plaintiffs regarding the Dentsu Incident (a damage claim) of March 1996 and the Incident of the Kakogawa Labour Standards Inspection Office (a rescission claim on the decision not to approve benefit payments under the Industrial Accident Compensation Insurance Act) of April 1996. These rulings supported the causal relationship between work and mental disorders. Due to widespread media coverage, compensation claims for similar situations increased. The Ministry of Labour decided to establish compensation criteria in an official notice issued in September 1999, following discussions by an expert committee.²⁴ These compensation criteria were revised in December 2011, and this latest version is currently in effect.

The List of Occupational Diseases annexed to the revised Ordinance for the Enforcement of the Labour Standards Law of 2010 included mental disorders due to work. In legal terms, mental disorders became the subject of compensation under the item, "Mental or behavioural disorders or their annexed diseases due to jobs associated with life-threatening accidents or incidents which psychologically impose excessive loads." A notification for administrative guidance regarding mental health measures was issued in August 2000; it stipulated that four levels of mental health care should be delivered at worksites: (i) self-care; (ii) care by the line; (iii) care by occupational health staff; and (iv) care by resources external to the worksite.²⁴

Since the turn of the century, an increasing number of workers have developed depression, received treatment and returned to work. To aid occupational physicians faced with the need to facilitate a smooth return to work, the "Guidebook to Assist the Return to Work of Workers after Absence due to Mental Problems" was published in 2004.²⁴ Furthermore, the 2005 revision of the Industrial Safety and Health Law stipulated that face-to-face guidance be implemented as a mental health measure.

In 2008, mental health support centres were established in each prefecture to provide consultations in areas including mental health planning and implementation.⁶⁰ In 2009, an Internet portal site called the "Ear of the Mind" was opened to disseminate information relevant to mental health and provide routine updates to this information.⁶⁰

VII. Conclusion

The Ministry of Health, Labour and Welfare (formerly the Ministry of Labour), which continues to be the sole administrative body responsible for occupational health in Japan, has implemented various measures to tackle occupational diseases, while interacting with the parties concerned – the workers, the employers, the legislative body (the Diet), academia, the media and the general public. Implementation has been effected through such measures as drafting and revising the relevant laws, developing regulations and

establishing compensation criteria, issuing official notices and notifications for administrative guidance, and convening expert meetings.

Historically, administrative measures targeting occupational diseases, most typically intoxication and occupational cancers, have been responsive retroactively to public concern triggered by media reports. Today, however, there are promising signs that administrative measures are shifting towards more preventive stances and actions. This is evident in the recent systematic and proactive administrative measures taken to deal with occupational mental health issues. Novel occupational diseases that are unprecedented in other countries, such as karoshi (death due to overwork) and dichloromethane/1,2-dichloropropane-induced cholangiocarcinoma, require primary prevention and attest to the need for all countries to be flexible and prepared for the unexpected.

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