Informational Brochure

Dioxins

2001

Preface

Dioxins are substances not manufactured industrially. They are formed unintentionally, most often during the course of incineration. This explains why these substances are ubiquitous in the environment, although in very small in quantities.

The level of exposure to dioxins in everyday life in Japan does not lead to health effects, however, citizens still have questions and express concerns. To address these concerns, Ministries and Agencies that are members of the Ministerial Council on Dioxin Policy collaborated to produce this informational brochure.

This brochure explains in plain terms the nature of dioxins and how they are generated, and introduces concisely the actions of the Government in establishing a Council of Ministries and Agencies on Dioxin Policy and working in a unified way to promote dioxin responses.

We sincerely hope that this brochure will promote public understanding about dioxins.

Council of Ministries and Agencies on Dioxin Policy: Member Ministries and Agencies

Cabinet Office • National Police Agency • Ministry of Public Management, Home Affairs, Posts and Telecommunications • Ministry of Foreign Affairs • Ministry of Education, Culture, Sports, Science and Technology • Ministry of Health, Labor and Welfare • Ministry of Agriculture, Forestry and Fisheries • Ministry of Economy, Trade and Industry • Ministry of Land, Infrastructure and Transport • Ministry of the Environment

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I. What are dioxins?

1. The term "Dioxins" refers to PCDDs, PCDFs and co-planar PCBs.

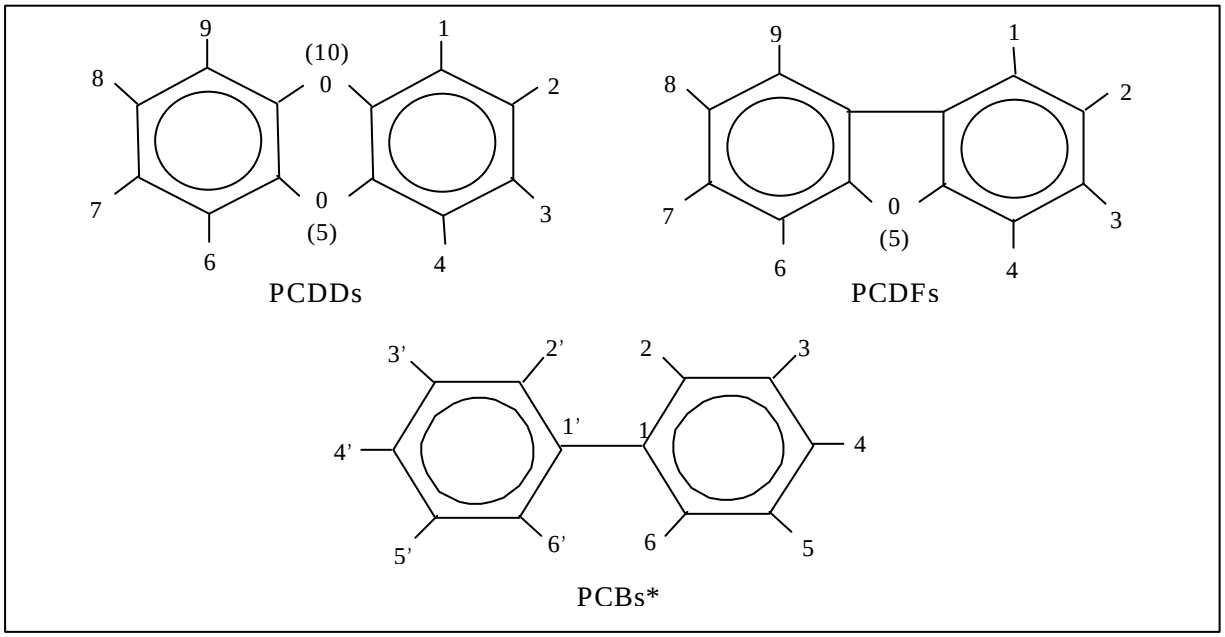
Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) are collectively called dioxins. Co-planar Polychlorinated Biphenyls (Co-planar PCBs) possess toxicity similar to that of dioxins and are called dioxin-like compounds.

"Dioxins" are defined to include PCDDs, PCDFs and co-planar PCBs in the Law Concerning Special Measures against Dioxins promulgated on July 16, 1999.

Accordingly, throughout this brochure, the term "Dioxins" will be used to refer to PCDDs, PCDFs and co-planar PCBs.

The general structure of a dioxin molecule is two rings of 6 carbon atoms (benzene rings, shown as ◎ in Fig. 1) bound by oxygen atom(s) (shown as O in Fig. 1) with chlorine or hydrogen atoms attached (the numbered positions: 1-9 and 2'-6' in Fig. 1). There are 75 kinds of PCDDs, 135 PCDFs and more than 10 co-planar PCBs, with the shape of the molecule depending on the numbers and locations of the chlorine atoms (Among dioxins, 29 isomers are thought to have some toxicities).

Figure 1 Chemical Structure of Dioxins



* PCB compounds, the two benzene rings of which are on the same plane, and thereby give the compound a fla structure, are designated as coplanar PCB. Nevertheless, some PCBs that do not have the planar structure, but possess dioxin-like toxicity, are practically classified as coplanar PCBs in current documents of the Government of Japan (See Table 1 on page 2 for details.).

2. Toxicity of dioxins overall is expressed as Toxic Equivalents (TEQs).

The degree of toxicity of dioxins varies from compound to compound. Among all dioxins, the tetrachlorinated dibenzo-p-dioxin with chlorine atoms attached in the 2, 3, 7 and 8 positions (2,3,7,8-TCDD) is known to possess the highest toxic potency.

In order to assess the toxicity of dioxins overall, a way is needed to consider their aggregate effects.

The method used here is to assign an individual Toxic Equivalency Factor (TEF) value to each dioxin compound. TEFs are estimates of the toxicity of dioxins relative to the toxicity of 2,3,7,8-TCDD, which is assigned a TEF of 1. In many studies and monitoring results, amounts or concentrations of dioxins are presented as Toxic Equivalents (TEQs), which are determined by summing the products that result from multiplying concentrations of individual dioxin compound by the corresponding TEF (Table 1). Concentration, etc. of dioxins is presented as TEQ in this brochure. In the context, however, it is presented not as pg-TEQ, etc. but simply as pg.

Table 1 Toxic Equivalency Factors (TEFs)*

	Name of Compound	TEF value
PCDD (Polychlorinated dibenzo-p-dioxin)	2,3,7,8-TCDD	1
	1,2,3,7,8-PnCDD	1
	1,2,3,4,7,8-HxCDD	0.1
	1,2,3,6,7,8-HxCDD	0.1
	1,2,3,7,8,9-HxCDD	0.1
	1,2,3,4,6,7,8-HpCDD	0.01
	OCDD	0.0001
PCDF (Polychlorinated dibenzofuran)	2,3,7,8-TCDF	0.1
	1,2,3,7,8-PnCDF	0.05
	2,3,4,7,8-PnCDF	0.5
	1,2,3,4,7,8-HxCDF	0.1
	1,2,3,6,7,8-HxCDF	0.1
	1,2,3,7,8,9-HxCDF	0.1
	2,3,4,6,7,8-HxCDF	0.1
	1,2,3,4,6,7,8-HpCDF	0.01
	1,2,3,4,7,8,9-HpCDF	0.01
	OCDF	0.0001
Co-planar PCB	3,4,4',5-TCB	0.0001
	3,3',4,4',-TCB	0.0001
	3,3',4,4',5-PnCB	0.1
	3,3',4,4',5,5'-HxCB	0.01
	2,3,3',4,4'-PnCB	0.0001
	2,3,4,4',5-PnCB	0.0005
	2,3',4,4',5-PnCB	0.0001
	2',3,4,4',5-PnCB	0.0001
	2,3,3',4,4',5-HxCB	0.0005
	2,3,3',4,4',5'-HxCB	0.0005
	2,3',4,4',5,5'-HxCB	0.00001
	2,3,3',4,4',5,5'-HpCB	0.0001

* Proposed at the WHO meeting in 1997 and published in an academic journal in 1998.

3. Dioxins have no color and very low water solubility.

Dioxins in general are colorless solids with properties of very low water solubility and low vapor pressure. On the other hand, dioxins characteristically exhibit a high degree of solubility in fats and oils. They are generally stable, not reacting easily to other chemical substances, acids and alkalis, but are thought to gradually decompose in the presence of solar ultraviolet light.

4. Dioxins are generated as unintended by-products in waste incineration and other various processes.

Dioxin is not produced intentionally, other than for research purposes, such as to prepare standard material for analysis. Dioxins are by-products generated from processes when heat is applied to substances containing carbon, oxygen, hydrogen and chlorine.

The main source of dioxins at present is waste incineration, with most being generated in combustion processes and released to the ambient air without being fully captured by waste-gas treatment equipment. Other sources exist, such as emissions from electric steel-making furnaces, cigarette smoke, and automobile exhaust. Some reports indicate that dioxins may have accumulated in sediment in the environment due to the past use of PCBs and some types of agricultural chemicals, which contained dioxins as impurities.

The behavior of dioxins in the environment is not fully known. Taking the atmospheric pathway, for example, dioxins in the air are associated with particulate matter and fall to the ground, contaminating soil and water. It is thought that over long periods of time these dioxins, together with those released into the environment via other pathways, ultimately accumulate in aquatic sediments and enter the food chain when ingested by plankton and fish, thereby starting to concentrate in organisms.

One estimate of the yearly emission of dioxins in Japan in 1999 was between approximately 2,620 and 2,820 g, excluding co-planar PCBs (See, Chapter 5 for details).

Natural sources of dioxins are thought to exist. Forest fires and volcanic activities, for example, are said to produce dioxins.

In coming years, it will be important to get a better grasp of the state of dioxin emissions, including those of co-planar PCBs whose origins are not yet clear.

II. What are the risks of dioxins to humans?

1. Exposure to dioxins in everyday life is not high enough to result in acute toxicity.

It is said that dioxins are "more toxic than cyanide and the most toxic of the man-made chemicals". The toxicity referred to, however, is the acute toxicity that occurs from very high levels of exposure, such as ingesting at one time a dose of some hundred thousand times the regular daily intake.

Since dioxins are not produced intentionally and the amount present in the environment or in food is extremely small, the regular levels of daily intake are very unlikely to lead to acute toxicity, such as would happen in the case of accidental ingestion.

2. Although the dioxin 2,3,7,8-TCDD has been recognized as carcinogenic based on accidental high-level exposures, the current level of contamination in the environment in Japan is below the cancer risks.

The International Agency for Research on Cancer (IARC) under the World Health Organization (WHO) identified 2,3,7,8-TCDD as the most toxic of all dioxin compounds, and as carcinogenic to humans based mostly on the studies involving accidental heavy exposure.

The carcinogenicity of dioxins is not caused by direct damage to genes, but rather is thought to be due to their promotional activities on the initiated cells by other possible carcinogens.

It should be noted that the present levels of dioxins in the general environment in Japan are lower than those known to cause cancer risks.

3. Relatively high doses of dioxins are known to result in congenital deformities such as cleft palate in experimental animals. However, the current contamination level in the general environment in Japan is not thought to result in the malformation of babies.

In experimental animals (rodents), high doses of dioxins during pregnancy are known to result in deformities in newborns such as cleft palate and hydronephrosis. Nevertheless, the current contamination level of dioxins in the general environment in Japan is considered

below those that cause birth defects.

4. High-level exposures to dioxins are reported to affect reproductive, thyroid and immune functions in experiments in animals. However, evidence relating to humans is not adequately available.

Dioxins are reported to cause malfunctions in thyroid glands, atrophy of gonads, reductions in the sperm production, and suppression of the immune system. Since effects on humans are not clear at present, further studies are needed of the impacts on human health.

5. Tolerable Daily Intake (TDI) is used as the indicator for evaluating safety of exposure to dioxins.

The Tolerable Daily Intake (TDI) is the amount of intake per kg of body weight per day of a chemical substance suspected of having adverse health effects, when absorbed into the body over a long period of time. The TDI is judged not to give rise to manifestations of health effects if such an amount is taken every day for an entire lifetime. The TDI of dioxins in Japan was set at 4 pg in June 1999 based on the latest available scientific information.

Safety of the total amount of dioxins ingested by humans is assessed corresponding to this value.

Brominated Dioxins

The structure of the brominated dioxin molecule is the chemical structure of dioxins with bromine atoms attached to the numbered positions (1-9, 2'-6') in Fig. 1. According to the survey conducted by an international institution, brominated dioxins are generated when burning plastic containing bromine flame retardant. However, it calls for further research on such subject as its source.

Impacts of brominated dioxins on human health or the ecosystem have not been proved in details. Therefore, the Ministry of the Environment is promoting a research on brominated dioxins by gathering and assorting information on toxicity, revealed conditions or an analysis method while conducting pilot surveys for measuring brominated dioxins in the environment.

Tolerable Daily Intake (TDI) of Dioxins

Environmental Health Committee of the Central Environment Council of the Environment Agency, and the Food Sanitation Investigation Council and Living Environment Council of the Ministry of Health and Welfare jointly discussed the TDI based on scientific grounds, and completed a report on the topic on June 21, 1999. The report was acknowledged at the meeting of Ministerial Council on Dioxin Policy on the 25th of the same month.

The main points of the report are summarized below:

The TDI of dioxins (PCDDs and PCDFs, including co-planar PCBs) is set at 4pgTEQ/kg/day (4 pg per day for each kg of body weight).

Since subtle effects have been observed in some animal tests at body burden levels below those of the evidence employed in estimation of the TDI value, it is important to promote further research.

TDI is a value calculated as an index of the effects on health when daily intake continues throughout life. A temporary slight excess of intake over the TDI does not necessarily mean damage to health.

The TDI is set based upon effects due to exposure during the fetal period that is the most sensitive period. Manifestation of effects such as carcinogenicity would occur as a result of higher exposure than the set TDI.

TDI value of 4pg is determined by extrapolating results of animal tests for humans, multiplied by a factor of 0.1 for safety.

Units for Extremely Small Quantities

Units for measuring weight

kg (kilogram)
g (gram)
mg (milligram) = 10^{-3}g (thousandth of a gram)
μg (microgram) = 10^{-6}g (millionth of a gram)
ng (nanogram) = 10^{-9}g (billionth of a gram)
pg (picogram) = 10^{-12}g (trillionth of a gram)

If water were held in a container the size of Tokyo Dome baseball stadium, it would weigh about 10^{12} g. Suppose, a lump of sugar (1 g) were dissolved in the water, the result would be 1 pg of sugar in each gram of water.

III. How large is the impact of dioxins on the environment?

1. Average concentrations in the environment in Japan are about 0.18 pg/m^3 for the ambient air, 0.24pg/l in the public waters and about 6.5 pg/g for the soil.

Surveys on air, water quality, quality of sediments, etc. are conducted in order to grasp the actual conditions of pollution caused by dioxins throughout Japan. The average dioxin concentrations in the environment in Japan revealed in a 1999 survey are 0.18 pg/m^3 for the ambient air, 0.24pg/l for the public waters and about 6.5 pg/g for the soil.

The concentrations in the ambient air decreased from 1998 (0.23 pg/m^3) to 1999. The concentrations were, except for some observation points, lower than the environmental standard value for the air (annual average: 0.6 pg/m^3).

On the other hand, though we cannot make a simple comparison due to the difference in the number of observation points, the concentrations in the public waters in 1999 became lower than that in 1998 (0.40 pg/l). In addition, the concentrations were, except for some observation points, lower than the environmental standard value for water quality (annual average: 1 pg/l).

No significant change was observed during the past 10 years in dioxin concentrations in the sediment of seas, lakes and rivers, or in tissues of animals and plants, based on surveys by the Environment Agency.

With regard to dioxins, the local governments are to monitor the conditions of the polluted air, water (including sediment on the bottom) and soil based on the Law Concerning Special Measures Against Dioxins.

2. Impacts of dioxins on wildlife are not clear. Research and surveys on the state of dioxin contamination in wildlife are now underway.

It is a difficult task to clarify the cause and effect relationship between dioxin contamination and disease or population decreases in wildlife, since wildlife is exposed to various chemicals besides dioxins, and is also affected by many different factors (such as habitat loss or impact of human activities).

Since there are studies that showed impacts of organochlorine compounds such as dioxins, PCBs, and DDT on the hatching of reptiles and birds, further studies are needed in Japan and overseas.

Surveys on the state of dioxin contamination in wildlife started in 1998 in Japan.

Errata

Page	Line	Error	Correction
7	The 6th line from the top	in a 1999 survey	in the survey
	The 7-8th line from the top	0.18 pg/m^3 for the ambient air, 0.24pg/l for the public waters and about 6.5 pg/g for the soil	0.18 pg/m^3 for the ambient air (FY 1999), 0.24pg/l for the public waters (FY 1999) and about 6.5 pg/g for the soil (FY 1998).

IV. How much dioxin do we take in everyday life?

1. We take about 2.3pg (picogram)-TEQ of dioxins a day on average through food and respiration, etc., an amount that is below the safety index (TDI).

The average dietary intake of dioxins including co-planar PCBs in Japan amounts to 100 pg a day which means 2.25 pg for each kg of body weight based on an average body weight of 50 kg, according to a 1999 survey by the Ministry of Health and Welfare (Survey on Daily Intake).

In addition to the dietary intake, with an assumed intake of about 0.05 pg from the ambient air, and about 0.0084 pg from the soil via dirt on hands, etc., the total dioxin intake of a person in Japan amounts to 2.3 pg/kg of body weight/day on average (approximately 2.1 pg in 1998) (Fig. 2). This level is below the Tolerable Daily Intake (TDI) and thereby regarded below the level to cause adverse effects on human health.

2. Since dioxins tend to accumulate in adipose tissue, dietary intake level is particularly large from seafood, meat, dairy products and eggs.

Because dioxins are lipid soluble and tend to accumulate in adipose tissue, seafood, meat, dairy products and eggs are most likely to contain them. In Japan the main source of dietary intake of dioxins is fish, while the main sources are meat and dairy products in Europe and the United States, reflecting differences in dietary habits. In any country, 70 to 90% of the dietary intake of dioxins is likely to come from the intake of seafood, meat, dairy products and eggs.

The intake of dioxins from vegetables is considered to be significantly less than that from seafood or meat.

3. Dioxins accumulate to the adipose tissue in particular. The half-life for elimination from the body is about seven years.

Once dioxins are absorbed in body, these compounds remain mostly in the adipose tissue. The rate of excretion after decomposition etc. of dioxins is very slow. It is reported to take about seven years for dioxin concentrations to be reduced one half in humans.

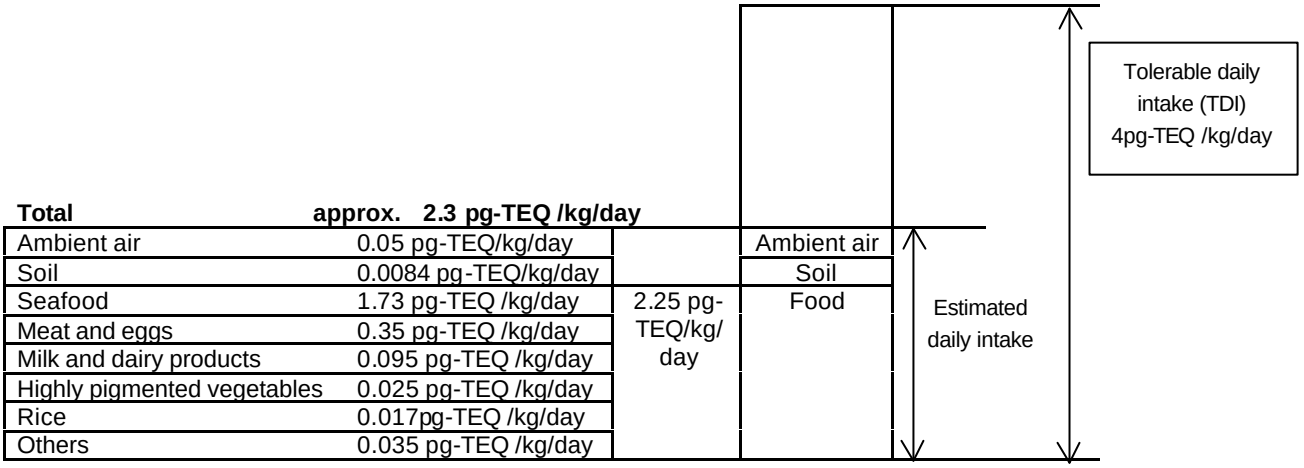
4. It is important to maintain a balanced diet over the long term not to exceed the TDI, an index for safety.

Concentrations of dioxins vary by food items and by location and seasons of production even for the same type of food. For this reason, the intake through the regular diet is thought to be lower than the TDI when averaged over a long period of time and no problem is likely to emerge even if intake on a particular day exceeds the TDI of 4pg/kg body weight/day.

According to the results of a Ministry of Health and Welfare survey on the daily intake of dioxins, the dioxin intake of a person eating the average diet (as defined in a national nutritional survey) is estimated to be below the TDI of 4pg/kg body weight/day. Since nutrients from various foodstuffs are essential for health, it is important to follow a balanced diet with an abundant variety of food items.

Figure 2 Daily Intake of Dioxins in Japan

Converted to amounts per kg of body weight

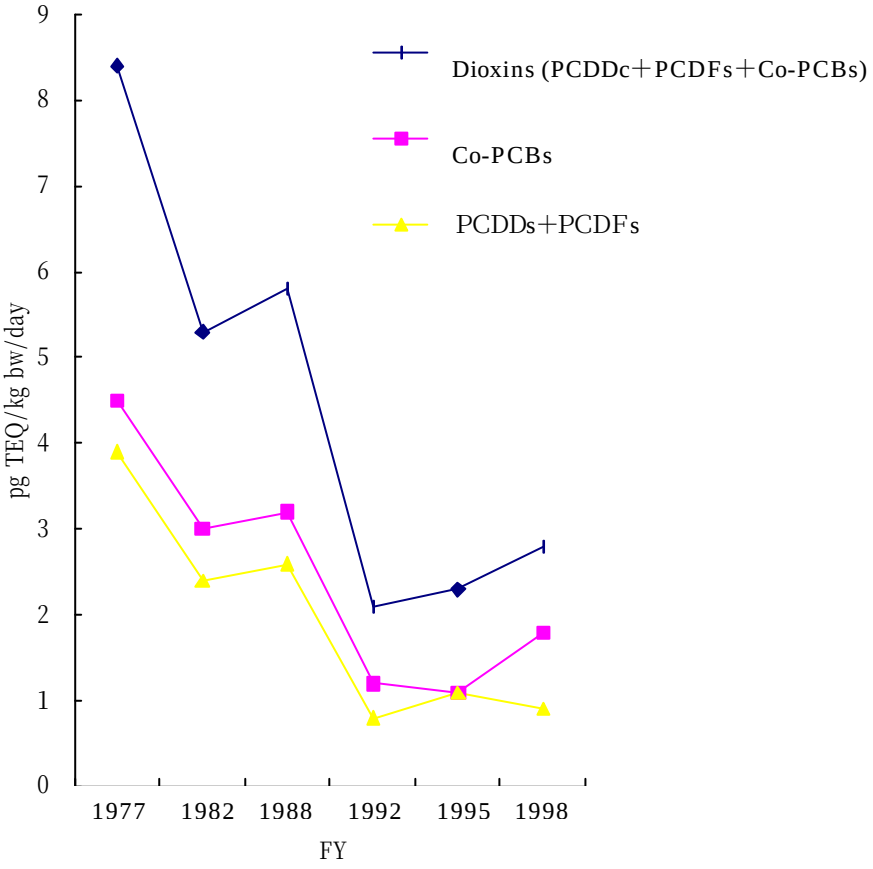


5. Intake of dioxins from food has decreased greatly since 20 years ago.

Specimens from past daily intake surveys in the Kansai region, when analyzed for dioxins, indicated that concentrations have dropped to almost one third the levels of 20 years ago (Fig. 3).

Further decreases in the concentrations are expected as a result of measures to reduce dioxin emissions.

Figure 3 Chronological Change in Daily Intake of Dioxins



Source: Health and Welfare Scientific Study Project

"Survey on the State of Food Contamination by Dioxins"

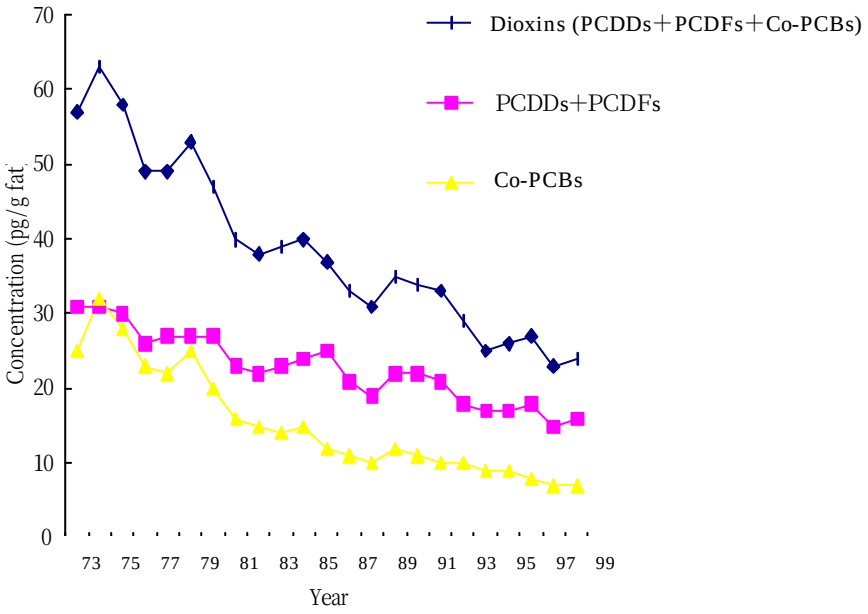
6. The concentration of dioxins in breast milk in Japan is almost the same as in other industrialized countries, and there are reports that describe the decline of dioxin concentrations to nearly half the level during the last 20 years.
Breast-feeding should continue to be encouraged, considering the beneficial effects that it has on infants.

A concentration of 22.2 pg/ 1 g of fat was found to be the average concentration of dioxin in mother's milk by 1998 nationwide survey, which analyzed breast milk from 415 mothers in 21 areas, 30 days after they gave birth. This concentration is considered similar to that of other countries. For the areas surveyed, the concentration declined compared with the previous year. No effects on resistance to infection, allergic reaction, thyroid functions or growth and development due to dioxins were observed in one-year old infants.

A study on dioxins in breast milk in 1999 showed that dioxin concentrations have declined since 1973 to approximately one-half level (Fig. 4).

Further research is planed on the effects of dioxins ingested by infants via breast milk. Meanwhile, breast-feeding should continue to be encouraged, considering its beneficial effects on infant development. The WHO (World Health Organization) Consultation concluded similarly that there should be no change in the WHO policy of promoting breast-feeding.

Figure 4　Dioxin Concentration in Breast Milk



Source: Health and Welfare Scientific Study Project
"Studies on Dioxins in Breast Milk"

V. What measures are being taken against dioxins?

1. Government ministries and agencies are working together to impose measures such as emission gas controls and improvement of waste incinerators to reduce dioxin release.

It is assumed that about 90% of the dioxin emissions, of PCDDs and PCDFs in particular, are emitted from the incineration of household or industrial waste in Japan. Accordingly, measures such as emission gas controls on waste incinerators and other sources, and improvements of incineration facilities, have been imposed since December 1997 based on the Air Pollution Control Law and Waste Management and Public Cleansing Law.

As a result of these efforts, 70% reduction of dioxin emissions from municipal waste incinerators was recorded between January 1997 and January 1998, and further reductions are expected.

Since dioxins are emitted from various sources, further surveys on emission inventories will be conducted and the other measures to reduce dioxin emissions will be promoted.

In the meeting of the Ministerial Council on Dioxin Policy held on March 30, 1999, the Basic Guidelines of Japan for the Promotion of Measures against Dioxins were established (revised on September 28) and the Ministries and Agencies concerned are now diligently promoting various unified measures aiming for a significant reduction in dioxin emissions.

In particular, based on these Basic Guidelines, the total emission of dioxins is to be reduced by approximately 90% of the 1997 level by fiscal year 2002.

Abstract of the Basic Guidelines of Japan for the Promotion of Measures against Dioxins

○ The total national release of dioxins is to be reduced to approximately 90% below 1997 level within four years.

○ Based on these Guidelines, in addition to smoothly executing the Law Concerning Special Measures against Dioxins which was enacted in July 1999, the Government will strongly promote the following activities in collaboration with local governments, business and citizens.

1. Reevaluating the Tolerable Daily Intake (TDI) and establishing standards
2. Promoting measures to reduce the release of dioxins
3. Improving inspection system relating to dioxins
4. Executing fact-finding studies into the impacts of dioxins on human health and environment

5. Promoting research and development
6. Promoting waste management and recycling
7. Providing the public with accurate information and promoting information disclosure
8. Contributing to the international community

2. In addition, based on the Law Concerning Special Measures against Dioxins which has been applied since January 2000, the Government promotes unified measures for reducing dioxins on the basis of the Basic Guidelines and a new law established in 1999.

Current measures against dioxins were implemented based on the Law Concerning Special Measures Against Dioxins which was established in July 1999 and applied since January 15, 2000. This law stipulates basic standards for the measures concerning dioxins as well as necessary regulations or measures against polluted soil in order to prevent or remove environmental pollution caused by dioxins.

Table 4 Law Concerning Special Measures Against Dioxins
[Approved on Monday, July 12, 1999 and promulgated on Friday, July 16, 1999.]

Purpose of the Law (Article 1)

Outline of the Law

1. Basic standards for formulating policies on dioxins
   1) Tolerable daily intake (TDI) (Article 6)
   2) Environmental standards for ambient air, water quality (including sediment) and soil (Article 7)
2. Regulations for emission gas and effluent relating to dioxins
   1) Specified facility (Article 2)
   2) Emission standards (Article 8)
   3) Total mass emission standards (Article 10)
   4) Notification of the establishment of specified facilities/Order for modification of plans (Articles 12-16)
   5) Restriction on emissions/Order for improvement (Articles 20-22)

3. Disposal of ash and dust relating to waste incinerators, etc.

1) Standards for ash and dust (Article 24)

2) Standards for maintenance and management of final landfill site of waste (Article 25)

4. Measures against soil contamination by dioxins (Articles 29-32)

1) Designation of the areas for the measures against soil pollution by dioxins (Article 29)

2) Plan formulation for the measures against soil pollution by dioxins (Article 32)

5. Government plan for the reduction of dioxin emissions (Article 33)

6. Obligations for monitoring and surveillance of the level of pollution caused by dioxins (Articles 26-28)

1) Regular monitoring by the local governments (Article 26)

2) Measuring the designated institutions by the persons who established it. (Article 28)

7. Date of enforcement (Supplementary provisions Article 1)

8. Review (Supplementary provisions Articles 2-3)

- Promotion of research and study of bromine-based dioxins
- Reviews based on scientific knowledge by taking into consideration the health risk and accumulation of dioxins in food
- Reviews on the state of regulations for small-scale waste incinerators

Basic Standards for the measures concerning dioxins

The Dioxin Law stipulates the tolerable daily intake (TDI) and environmental standards as basic standards for the measures.

Tolerable daily intake (TDI) ・・・4pg-TEQ/kg/day (4 pg per day for each kg of body weight).
Environmental standards

for the ambient air ・・・annual average: not more than 0.6pg-TEQ/m^3

for the water quality ・・・annual average: not more than 1pg-TEQ/l

for the soil ・・・ not more than 1,000pg-TEQ/g (index of research 250pg-TEQ/g)*

* With respect to the soil, if it exceeds the index of research, required research is conducted.

Table 2 Regulations for emission gas and effluent relating to dioxins

Regarding Dioxins, the standards for the ambient air and the water quality have been set in the Dioxin Law at the strictest values achievable at present. For specific facilities relating to the emission gas of existing facilities, the provisional standards will be set from December 2002. For specific facilities relating to effluent of existing facilities, the provisional standards are set until January 2003.

1) Specific facilities for emission gas and emission standards

(Unit: ng-TEQ/m^3 N)

Type of Specific Facilities	Scale of facilities (Capacity (C) of incineration)	Standards for new facility	Standards for existing facility	
			January, 2001~ November, 2002	December, 2002 ~
Waste incinerators (hearth area is more than 0.5m^2 or capacity of incineration is more than 50kg/h)	More than 4t/h	0.1	80	1
	2t/h – 4t/h	1		5
	Below 2t/h	5		10
Electric steel-making furnaces		0.5	20	5
Sintering facilities for steel industry		0.1	2	1
Facilities for collecting zinc		1	40	10
Facilities for manufacturing aluminum base alloy		1	20	5

Note: Regarding newly constructed waste incinerators (capacity is more than 200kg/h) and electric steel-making furnaces to which the standards for controlling designated materials in the Air Pollutions Control Law have already applied, emission standards in the above chart for a new facility are applied.

2) Specific facilities for effluent and effluent standards

(Unit: pg-TEQ/l)

Type of Specific Facilities	Standards for new facility	Standards for existing facility
• Bleaching facilities using chlorine or chlorine compounds used for manufacturing sulfate pulps (kraft pulps) or sulfite pulps. • Resolving facilities for waste PCB or PCB-processed products • Cleansing facilities for PCB contaminated matter or PCB-processed products	Flat amount for all of facilities 10	10
• Cleansing facilities for waste gas and wet dust collecting facilities relating to roasting furnaces, melting furnaces or dry kilns used for manufacturing aluminum or aluminum –base alloy • Cleansing facilities for dichloroethane used for manufacturing vinyl chloride monomer		10 (20)
• Cleansing facilities, wet dust collecting facilities, and ash storing facilities which are related to waste incinerators (capacity of incineration is more than 50kg/h) and discharge sewage or waste solution		10 (50)

• Facilities for disposing water discharged from plants or business places with facilities mentioned above • Terminal treatment facilities for sewerage relating to facilities mentioned above		10

Note 1: The numbers in () are the provisional standards applied for three years (until January 14, 2003) after the enforcement of regulations.

Note 2: The standard relating to water discharged from terminal waste disposal facilities is 10pg-TEQ/l based on instructions stipulating standards for maintenance and management based on the Wastes Disposal and Public Cleaning Law.

The Government's Plan

The Government formulated "the plan for reducing the release of dioxins generated by business activities in Japan" based on the Dioxin Law in September 2000. This plan sets the target amount of reducing dioxin release at the end of 2002 (843~891g-TEQ/year) and the target amount of reducing dioxin release of each business sector and also stipulates measures to achieve those targets. Through this plan, the policy objective contained in the Basic Guidelines of Japan for the Promotion of Measures against Dioxins that the total release of dioxins is to be reduced to approximately 90% has been positioned as the Government's Plan based on the Dioxin Law.

Table 3 Target Amount of Reduction Relating to Estimated Dioxin Release of Each Business Sector in Japan

(Using WHO-TEF (1998))

Business Sector	Target Amount of Reduction (g-TEQ/year)	(Reference) Estimated Discharge	
		Amount in 1997 (g-TEQ/year)	Amount in 1999 (g-TEQ/year)
1 Waste Disposal Sectors	576~622	6,841~7,092	2,320~2,522
(1) General Waste Incineration Facilities	310	5,000 "Water" 0.037	1,350 "Water" 0.028
(2) Industrial Waste Incineration Facilities	200	1,500 "Water" 0.51	690 "Water" 0.50
(3) Small-scale waste incinerators	66~112	340~591	279~481
2 Industrial Sectors	264	454	293
(1) Electric steel-making furnaces	130.3	228.5	141.5
(2) Steel industry Sintering process	93.2	135.0	101.3
(3) Zinc collection industry (roasting furnaces, sintering furnaces, smelting furnaces, melting furnaces and dry kilns)	13.8	42.3	18.4
(4) Aluminum base alloy manufacture industry (roasting furnaces, melting furnaces and dry kilns)	11.8	21.3	13.6
(5) Other businesses	15	26.7	18.0
3 Others	3~5	3.32~5.92 "Water" 0.093	3.42~6.12 "Water" 0.093
Total	843~891	7,300~7,550	2,620~2,820

Note 1: Target amount of reduction is the amount of discharge after reduction measures for emission gas and effluent described as annual discharge

Note 2: Total of target amount of reduction is down by 88.2 ~ 88.5% compared with the estimated amount of discharge of 1997.

Note 3: "3 Others" indicates crematoriums, smoke from cigarettes, emission gas from cars and terminal treatment facilities.

Note 4: "Water" in the table indicates discharge into water.

3. Ministries and Agencies concerned are cooperating to promote studies for further elucidation of human exposure levels, research on assessment of health effects, technological developments for proper waste management, cleaning of contaminated soil, detoxification and decomposition of contaminants and improvement of the inspection system.

The Government formulated the total plan for research and surveys, and technological developments based on the "Basic Guidelines of Japan for the Promotion of Measures against Dioxins" in March 2000. Based on this, at present, the Government is conducting research and surveys on the environmental fate of dioxins (behavior of dioxins from the environmental release to human intake), human exposure assessment (grasping the amount of dioxins taken by human via various routes), and assessment of health effects and impacts on living organisms. At the same time, the Government is working on technological developments relating to proper waste incineration, cleaning of contaminated soil, detoxification and decomposition of dioxins, precision management, and simple methods for measurement and analysis.

In addition, guidelines for which analysis authorities themselves will follow have been arranged in order to actualize eligible precision management and promote improvement of the inspection system. Guidelines which commissioned institutions and facilities will follow have been arranged so as to ensure reliability when analysis authorities commission external institutions and overseas facilities.

These research and development activities are promoted by the Ministries and Agencies concerned in a coordinated manner and their results will be fully utilized in measures for the reduction of dioxin emissions.

Measures for Workers Relating to Waste Incinerators

So as to prevent health effects imposed upon the workers at waste incineration sites and the workers who pull down waste incineration, various measures, such as education on safety and hygiene, selection of supervisors, use of proper protective equipment and measurement of dioxin concentration, have been taken. Efforts to familiarize and enforce those measures have been made.

VI. What can we do to limit dioxin release in everyday life?

1. The most important matter is that each of us becomes concerned with dioxin issues, tries to reduce waste by using products as long as possible and by avoiding the use of disposable goods, and takes part in reuse, segregated disposal and recycling.

Since dioxins are generated in combustion processes, reducing the amount of waste is an effective way to lessen dioxin release.

Accordingly, six related laws for waste/recycling such as the Basic Law for Establishing the Recycling-based Society Enacted were established in June 2000. These laws set to avoid generating waste, to reuse waste as resources, and to dispose of wastes that are impossible to reuse as resources in proper ways without causing dioxin release. From now on, it is most important for each of us to become concerned with dioxin issues, try to reduce waste by using products as long as possible and by avoiding disposable goods, and taking part in reuse, segregated disposal and recycling.

It has been reported that the incineration of waste containing chlorine, such as polyvinyl chloride, may result in higher concentrations of dioxins in some cases if the incineration is not properly controlled. However, if appropriate measures and controls are taken, the influence of polyvinyl chloride and other chlorine compounds in waste becomes a relatively smaller factor, and on the other hand, the combustion and waste-gas treatment conditions become more important factors affecting the concentrations of dioxins. Accordingly, dioxin concentrations in emissions can be limited by adopting the proper measures and controls.

2. Burning waste outside is prohibited in principle. Measures for small-scale incinerators, for which waste-gas concentrations are not yet regulated, will be also regulated. Your cooperation is strongly requested.

Since April 2001, by revision of the Waste Management and Public Cleansing Law, there is a prohibition and penalty against burning waste outside with some inevitable exceptions such as events of customs and burning for agricultural work.

So far, small-scale incinerators, for which waste-gas concentrations are not yet regulated, have needed to be ensured the adequate supply of air for combustion, prevented the release of black smoke, and prevented the scattering of incineration ash. Based on the Supplementary provisions Article 3 of the Law Concerning Special Measures Against

Dioxins, “Reviews on the state of regulations for small-scale waste incinerators,” small-scale waste incinerators will need to be able to burn at 800 degrees and higher and the structure must include a thermometer and devices for supporting combustion starting in December 2002.

At present, the Ministry of Education, Science, Sports and Culture has instructed to halt the use of incinerators at schools unless their safeties are ensured.

In view of reducing the total amounts of dioxins, the incineration of household waste using simple incinerators for home use is not appropriate. It is desirable that the waste be treated at municipal incineration facilities that meet legal standards. For the disposal of household waste, your cooperation is highly requested in efforts to dispose of waste according to the rules of the municipality such as segregated disposal.

Please address your opinions and inquiries to:

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