Informational Brochure

Dioxins

1999

Published by
Ministries and Agencies that are members of the Ministerial Council on Dioxin Policy
Japan

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 Ministerial Council 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.

Ministerial Council on Dioxin Policy: Member Ministries and Agencies

Cabinet Secretariat / Environment Agency • Ministry of Health and Welfare / Ministry of Foreign Affairs • Ministry of Education, Science, Sports and Culture • Ministry of Agriculture, Forestry and Fisheries • Ministry of International Trade and Industry • Ministry of Transport • Ministry of Posts and Telecommunications • Ministry of Labor • Ministry of Construction • Ministry of Home Affairs • National Police Agency • Hokkaido Development Agency • Economic Planning Agency • Science and Technology Agency • Okinawa Development Agency • National Land Agency

Contents

I. What are dioxins?

II. What are the risks of dioxins to humans?

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

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

V. What measures are being taken against dioxins?

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

I. What are dioxins?

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

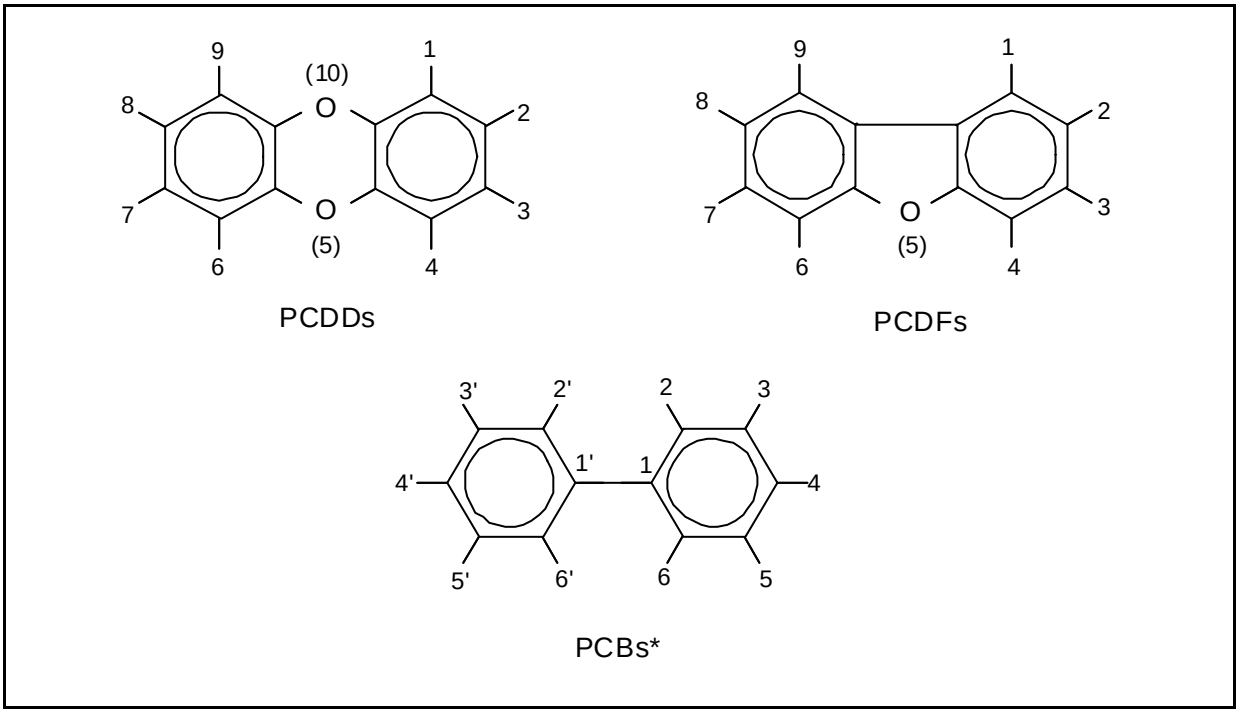
Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) are collectively called dioxins. Co-planar Polychlorinated Biphenyls (Co-planar PCBs) possess toxicity similar to that of dioxins and are called dioxin-like compounds.

"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 hexagons in Fig. 1) bound by oxygen atom(s) (shown as O in Fig. 1) with chlorine or hydrogen atoms attached (the numbered positions 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).

Fig. 1 Chemical Structure of Dioxins



* PCB compounds, the two benzene rings of which are on the same plane, and thereby give the compound flat 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).

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 steelmaking 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 1998 was between approximately 2,900 and 2,940 g, excluding co-planar PCBs (Table 2).

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.

Table 2. Dioxin Emissions from Various Sources in Japan (Excluding co-planar PCBs)

SOURCE	EMISSION AMOUNT	
	1997	1998
Municipal waste incinerators	4,320	1,340
	(water) 0.016*	(water) 0.016
Industrial waste incinerators	1,300	960
	(water) 0.065*	(water) 0.065
Unregulated small-scale waste incinerators	325-345*	325-345
(establishments)		
Crematoriums	1.8-3.8	1.8-3.8*
INDUSTRIAL SOURCES		
Electric steelmaking furnaces	187	114.7
Steel industry: sintering processes	118.8	100.2
Zinc recovery industries	34.0	16.4
Aluminium alloy production	15.7	14.3
Other industries	approx. 26*	approx. 26
Cigarette smoke	0.075-13.2	0.079-13.9
Automobile exhaust	2.14	2.14*
Final waste disposal sites	(water) 0.078*	(water) 0.078
TOTAL	**6,330 - 6,370**	**2,900 - 2,940**

Note 1: Emission unit is g-TEQ/year.
Note 2: "water" indicates emissions to aquatic environment.
Note 3: "*" indicates the emissions are assumed to be the same as a year in which actual estimates were made (1997 or 1998).

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.

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. If 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 0.23 pg/m^3 for the ambient air and about 6.5 pg/g for the soil.

The average dioxin concentrations in the environment in Japan revealed in a 1998 survey are about 0.23 pg/m^3 (about 0.55 pg/m^3 on average, excluding co-planar PCBs in a 1997 survey) for the ambient air and about 6.5 pg/g for the soil (about 22 pg on average in a 1997 survey). Although the concentrations in the ambient air decreased from 1997 to 1998, the overall concentration of dioxins in Japan is high compared with those in other countries.

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.

Since dioxins are detected everywhere in the environment, investigations are to be continued.

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 gather evidence that associates dioxins to 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.

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

1. We take about 2.1pg (picogram) 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 2.0 pg for each kg of body weight based on an average body weight of 50 kg, according to a 1998 survey by the Ministry of Health and Welfare (Survey on Daily Intake).

In addition to the dietary intake, with an assumed intake of about 0.07 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 2.1 pg/kg of body weight/day on average (approximately 2.6 pg in 1997)(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.

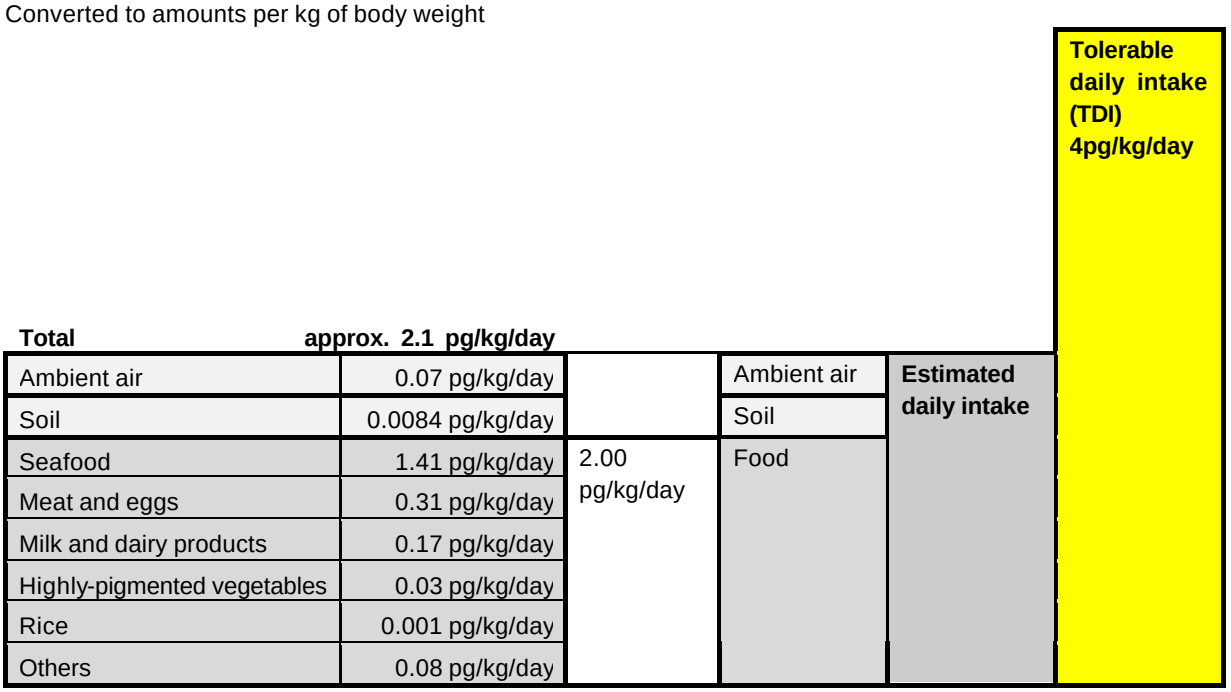
4. It is important to maintain a balanced diet over the long term not to exceed the TDI, an index for safety.

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

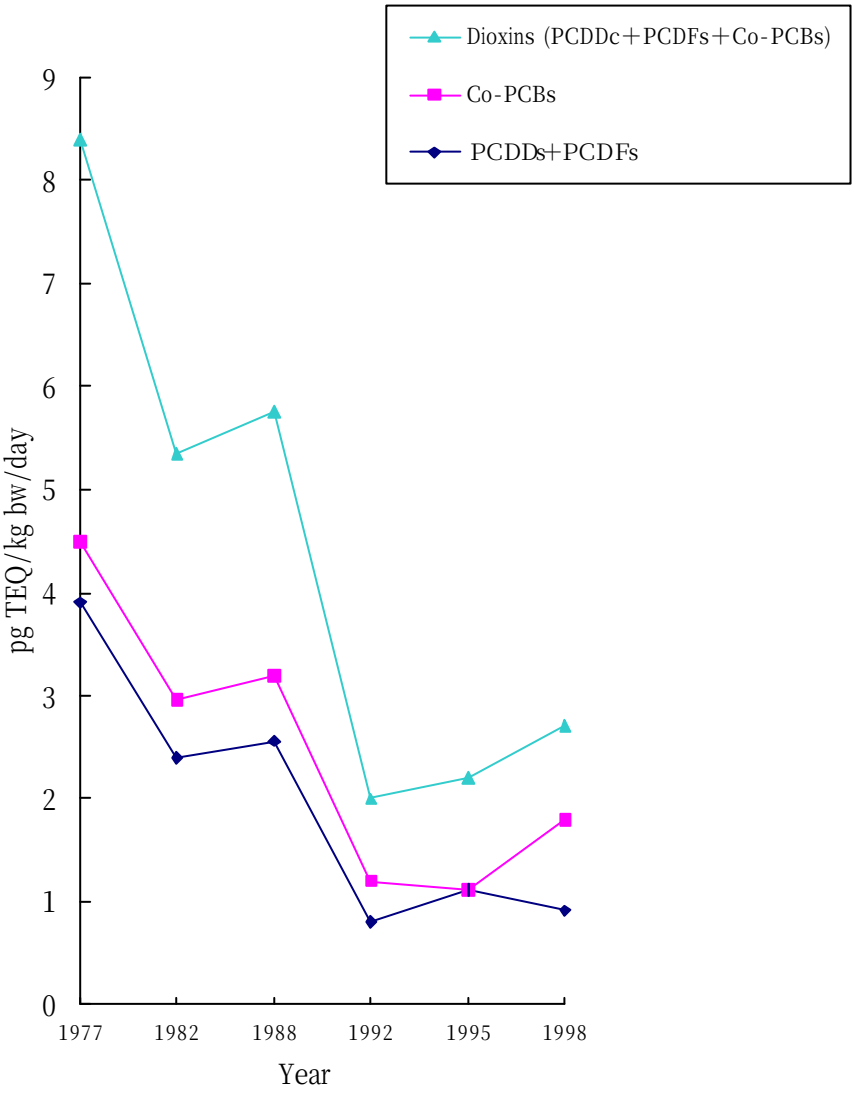


5. Intake of dioxins from food has decreased greatly since 20 years ago.

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.

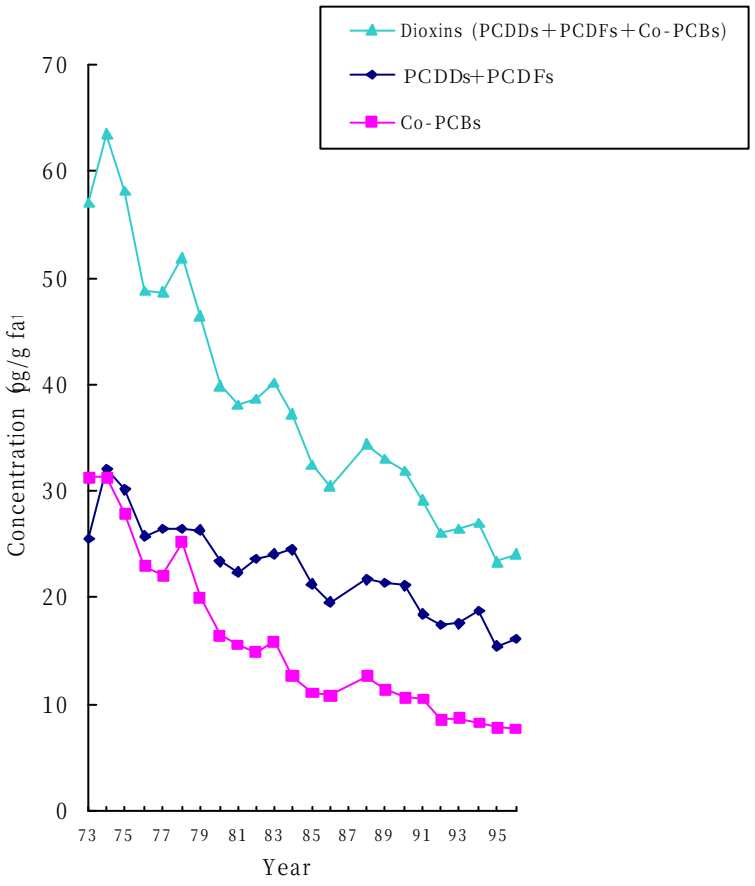
A concentration of 22.2 pg/ 1 g of fat was found to be the average concentration of dioxin in mother's milk by 1998 nationwide survey, which analyzed breast milk from 415 mothers in 21 areas, 30 days after they gave birth. This concentration is considered similar to that of other countries. For the areas 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 1997 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. Measures such as emission gas controls and improvement of waste incinerators are already being imposed 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 results 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.

Emission Controls

Through the amendments of the cabinet orders of the Air Pollution Control Law and Waste Management and Public Cleansing Law in August 1997, the standard has been set at the strictest values achievable at present (enforced since December 1997). For existing facilities, the standard will be stricter in 5 years (from December 2002).

(ng-TEQ/m^3N)

	Incineration chamber	New facility	Existing facility		
	Capacity (C) Through-put		year 1	Year 2-5	Year 5-
Waste incinerators	C≧4t/h	0.1	no standard applied	80	1
	2t/h≦C<4t/h	1	no standard applied	80	5
	200kg/h≦C<2t/h	5	no standard applied	80	10
Electric steelmaking furnaces	Transformer 1000kVA and over	0.5	no standard applied	80	5

Note: Year 1: from Dec. 1, 1997 to Nov. 30, 1998
Year 2-5: from Dec. 1, 1998 to Nov. 30, 2002
Year 5-: from Dec. 1, 2002 onwards

2. The Government promotes unified measures for reduction of dioxins on the basis of Basic Guidelines and a new law established in 1999.

In the meeting of 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 (Table 3).

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

In addition, the Law Concerning Special Measures Against Dioxins was approved on July 12, 1999 and promulgated on the 16th of the same month (goes into effect within 6 months)(Table 4).

Table 3 Basic Guidelines of Japan for the Promotion of Measures against Dioxins

Basic Approaches

I. The issue of dioxins requires the entire Cabinet to strengthen efforts in order to protect human health and conserve the environment now and into the future.

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

III. Research on dioxins conducted by the Government has confirmed the safety of vegetables and tea, particularly in the area of Tokorozawa City in Saitama Prefecture. However, it is necessary to alleviate concerns of the public, through close cooperation between the Ministries and Agencies concerned, improved and strengthened measures, and the release of accurate information about dioxins, from the perspective of making stronger preventative efforts to avoid impacts on health and the environment.

IV. With this awareness, the Government established concrete Guidelines for comprehensive and systematic measures to deal with dioxins. 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, businesses and citizens.

1. Reevaluating the Tolerable Daily Intake (TDI) and establishing standards
2. Promoting measures to reduce the release of dioxins
3. Improving inspection systems 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

V. Progress in implementing measures based on these Guidelines will be reviewed within one year, and revisions will be made if necessary.

VI. Japan will contribute to the international community through transferring overseas the experiences and technologies acquired through the efforts noted above, relating to measures to deal with dioxins and waste.

VII. Furthermore, besides all-out efforts to deal with waste, the entire Government will work together for the realization of a society based on sound material cycles.

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 (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)

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)

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

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, and detoxification and decomposition of contaminants.

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.

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.

Enforcing General Inspections and Supervision of Waste incinerators for the Protection of Workers' Health

In view of preventing health effects imposed upon the workers at waste incineration and other facilities, "Measures against Dioxins at Waste incinerators" were drawn up in July 1998. According to these measures, general inspections and supervisions are being enforced, which require monitoring and evaluation of concentration levels at work places, measures to limit ash and dust or to prevent scattering them, keeping work clothes clean, and wearing respiratory protection while working inside incinerators, etc.

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, 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. Measures for small-scale incinerators, for which waste-gas concentrations are not yet regulated, are now being studied. Your cooperation is highly requested.

Information currently available is not yet sufficient regarding the placement and operational conditions of small-scale incinerators, for which waste-gas concentrations are not yet regulated. Efforts to assess the actual situation are now being made and the reinforcement of regulations and other measures to reduce emissions are going to be considered. Even though small-scale incinerators are not yet restricted, it is important that they must be operated properly, including ensuring the adequate supply of air for combustion, preventing the release of black smoke, and preventing the scattering of incineration ash.

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:

Environment Agency of Japan
Office of Environmental Risk Assessment,
Environmental Health and Safety Division,
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