

JAPANESE DIOXIN INCIDENTS AND THE GOVERNMENT MEASURES

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Abstract

After TCDD was first detected in fly ash from a municipal waste incinerator by Japanese researcher in 1983, Japanese government has come up with various measures for the reduction of dioxins. In July 1999, The Special Measures Law on Dioxin Control, stipulating environmental standards and release limits was enacted and went into force in January 2000. Public concerns on dioxin issues as seen in the mass media coverage peaked in 1998 and 1999 and declined to nearly one tenth of the peak level in 2006. Marked declines over the same period were also observed in the number of published scientific papers on dioxins or the amount of grants for dioxin researches in Japan. Here I summarize the major Japanese measures on dioxins along the time course and their consequences as observed in the media coverage.

Introduction

In February 1999, a popular news program on TV Asahi reported that considerable level of dioxins (up to 3.8 pg/g) had been detected in green vegetables produced in Saitama Prefecture near Tokyo, evoking serious public concern over the safety of agricultural products and the risks of living near incinerators. The surprisingly high level shown on the TV was later revealed to be of the green tea product, the local specialty. The high proportion of dioxins in the tea leaf was due to the loss of water during the drying process of the product and of no wonder. Leaf vegetables of the area were not polluted more than in other areas. 1.7 % of Dioxins in leaf at the most is found to come out into the prepared tea and will mount to 0.2 % of daily intake after daily five teas. However, the area's agriculture had to suffer a large loss in sales. Meanwhile, a joint dioxin risk assessment committee under the Ministry of Health, Labour and Welfare (MHLW) and the Ministry of the Environment (MOE) established the tolerable daily intake (TDI) of 4 pg-TEQ/kg-bw/day in June 1999.

The Special Measures Law on Dioxin Control, stipulating environmental standards and release limits derived from this TDI value, was enacted in July and went into force in January 2000. The law was passed with strong support from the Diet and was remarkable for its quick enactment, in response to grass-roots campaigns. The law requires municipal governments to conduct constant environmental monitoring and sets strict emissions limits for incinerators and furnaces, which will impose heavy costs on both governments and the private sector. Although the environmental levels of dioxins especially that in the ambient air dropped significantly after the Special Measures Law enforcement, in the trend of rapid decline in the media coverage after 1999, criticism on the severe dioxin measures became vocalized often. One of such efforts appeared as a science book for general readers titled "Dioxins--the End of Myth" published in 2003.

Materials and Methods

Legislations and Dioxin Related Events

Information on Japanese dioxin legislations was obtained from government reports and articles on the Ministry's web pages. The chronologic list of events were compiled using chronological environmental table system on the web site of the Environmental Information and Communication (EIC) Network.

Research Numbers

(1) **Scientific papers:** Japanese research papers on dioxins and PCBs were searched in JST7580 and JST plus files of the JDream II database. The search criteria was "dioxins" and "dioxins or PCBs" in Keywords. World research papers were searched in MEDLINE (PubMed). The search criteria was "dioxin" and "dioxin or PCB" in any area.

(2) **Scientific Programs:** Japanese research programs on dioxins sponsored by the MHLW were searched using MHLW Grants System database.

Article Numbers

(1) **News Paper Articles:** Articles were searched using news paper and magazine articles cross-searching system provided as a commercial service. The nation-wide major news papers "Asahi (since 1985)" and "Yomiuri (since 1987)" were searched. The search criteria were "dioxin" for both news papers with the addition of "dioxin or PCB" for Asahi.

(2) **TV News:** NHK (Japan Broadcasting Corporation) TV news (since 1986) were also searched for "dioxin" using the same commercial database service.

Results and Discussion**Dioxin Measures in Japan**

(1) **The First Detection and the Emission Guideline:** The first detection of dioxins from Japanese medium was in 1979 from the fly ash of a municipal waste incinerator. The first detection of dioxins by a Japanese researcher took place in 1983 and was also from the fly ash. In 1984, an expert committee on the dioxins and other issues concerning waste incineration organized by the MHLW (then the Ministry of Health and Welfare) concluded that the 2,3,7,8-TCDD level for the incinerator workers and the residents around the incinerators are below the level of any health concern. In 1990, the MHLW announced to local governments of the dioxin prevention guideline stating that newly build continuous kilns preferably emitted dioxins less than 0.5 ng TEQ/Nm³.

(2) **Tolerable Daily Intakes:** In 1984, the expert committee under the MHLW come up with the dioxin assessment guidance value of 100 pg-TEQ/kg/day.

In 1997, the MHLW established the tolerable intake of 10 pg I-TEQ/kg-bw/day for dioxins, extrapolating from the administered dose that produced cancer and hyperplasia in the liver of rats. In the same year, the MOE established the health risk guideline value of 5 pg I-TEQ/kg-bw/day, based on the dose that caused endometriosis in rhesus monkeys.

In 1998, the World Health Organization (WHO) recommended the TDI value be reduced to 1–4 pg-TEQ/kg-bw/day from the previous 10 pg I-TEQ/kg-bw/day and used the new TEF system that includes the toxicity of co-PCBs¹. Taking this into account, the joint dioxin risk assessment committee under Japan's MHLW and MOE established the TDI of 4 pg-TEQ/kg-bw/day in June 1999². The value was calculated from the body-burden of 86 ng/kg in rats derived from the effects on the reproductive system of female offspring as the endpoint. Although the value of 4 pg-TEQ/kg-bw/day is at the high end of WHO's recommendation, it is a substantial reduction from the former values, even from the MOE's guideline level of 5 pg I-TEQ/kg-bw/day, because the intake level may well double when calculated using the WHO TEF system.

In 2001, new dioxin health assessment results were reported by the European Commission's Scientific Committee on Food (SCF)^{3,4}, the Joint FAO/WHO Expert Committee on Food Additives (JECFA)⁵, and the U.K. Food Standard Agency⁶, recommending lower tolerable intake levels (Table 1). Working groups under the MHLW and MOE studied these reports and concluded that the TDI of 4 pg-TEQ/kg-bw/day should be maintained, while they emphasized the need for continued investigation on key topics, including the kinetics of isomers and trans-generational effects at low doses.

Table 1. Tolerable intake levels for dioxins and dioxin-like PCBs

	Daily (pg-TEQ/kg/day)	Weekly (pg-TEQ/kg/week)	Monthly (pg-TEQ/kg/month)
WHO (1998)	1–4		
Japan (1999)	4	28 ^{a)}	120 ^{a)}
EC SCF (May, 2001)		14 ^{b)}	
JECFA (June, 2001)			70 ^{b)}
U.K. FSA (Oct., 2001)	2		

^{a)} Numbers shown only for comparison (they are not official).

^{b)} Tolerable intake levels are expressed on a weekly or monthly basis, taking into account the long half-lives (e.g., 7.5 years for TCDD) of the compounds in the human body. Higher intake on any particular day may not significantly alter the body burden.

It should be noted that *tolerable* intake values are not the same as government-stipulated *permissible* limits. The former are estimates of doses that are thought to cause no health effects in humans despite life-time exposure. The WHO stated clearly that the ultimate goal is to reduce exposure to less than 1 pg-TEQ/kg-bw/day.

(3) Present Standards and Limits: Japan's Special Measures Law on Dioxin Control (Law 0150, 1999) was enacted in December 1999, and entered into force in January 2000. The law establishes the TDI value as 4 pg-TEQ/kg-bw/day on the basis of dioxin-related measures, and lays down environmental standards for air, water, sediment and soil. It also prescribes regular monitoring of dioxins in the environment (air, water, sediment and soil) by municipal governments and requires specified facilities to comply with emission limits. Table 2 summarizes the standards and limits established or amended based upon this law. Although the phased approach was employed for some limits over the first three years, all limits are were at their ultimate values by January 2002.

Table 2. Standards and limits under the Special Measures Law on Dioxin Control

Environmental Standard:		
Ambient air		0.6 pg-TEQ/m ³ (max. annual average)
Water		1 pg-TEQ/L (max. annual average)
Sediment		150 pg-TEQ/g (max.)
Soil		1,000 pg-TEQ/g (max.) (Action level: 250 pg-TEQ/g)
Emissions to air:		
		(Units: ng-TEQ/m ³ N)
Waste incinerators	New facilities	0.1- 5 (specified by capacity)
	Existing facilities	1-10 (specified by capacity)
Furnaces and industrial processes	New facilities	0.1- 1 (specified by type)
	Existing facilities	1-10 (specified by type)
Emissions to water:		
		10 pg-TEQ/L (max.)
Discharge from Specified facilities: bleaching facilities that use chlorine, ethylene dichloride cleansing facilities for the production of vinyl chloride monomers, waste PCB resolving facilities, emissions gas scrubbing and wet dust collecting facilities of incinerators, and the waste water disposal facilities of above.		

Dioxin Studies in Japan

As seen in the number of published scientific papers on dioxins in Japan (Fig. 1), the number of studies started to grow rapidly in 1997, peaked in 2000 and came down quickly to the previous level. In contrast, dioxin related papers in MEDLINE show somewhat stable increase over the past thirty years.

Somewhat similar pattern of the rise and decline is observed in the number of dioxin study programs granted by the MHLW.

Dioxin Media Coverage in Japan

A surprising resemblance was observed in the trend of article numbers appeared in mass media during this time period, however, the timing and the rate of the rise and decline seems quicker for the media coverage numbers compared with the study or grant numbers (Fig. 2).

Future Prospect

Due to the extensive measures, dioxin environmental levels especially that of the ambient air are successfully reduced. However, soil and sediment dioxins pollution will not improve too soon and meanwhile keep spelling contamination risks on agriculture and fishery products. Although the MHLW and MAFF (Agriculture, Forestry and Fisheries Ministry) sponsor food monitoring studies every year and the results indicate dioxin intake less than TDI for general public, there is no system in Japan to detect and eliminate dioxin contaminated food from the market like the European Union had installed. The recent trend of less concerns over dioxin issues slowed down government's efforts and reduced budget and thereby decreased the amount of grants. These trends may become a danger if lead by shallow thoughts from the human nature of no perseverance and not based on the sound science.

References

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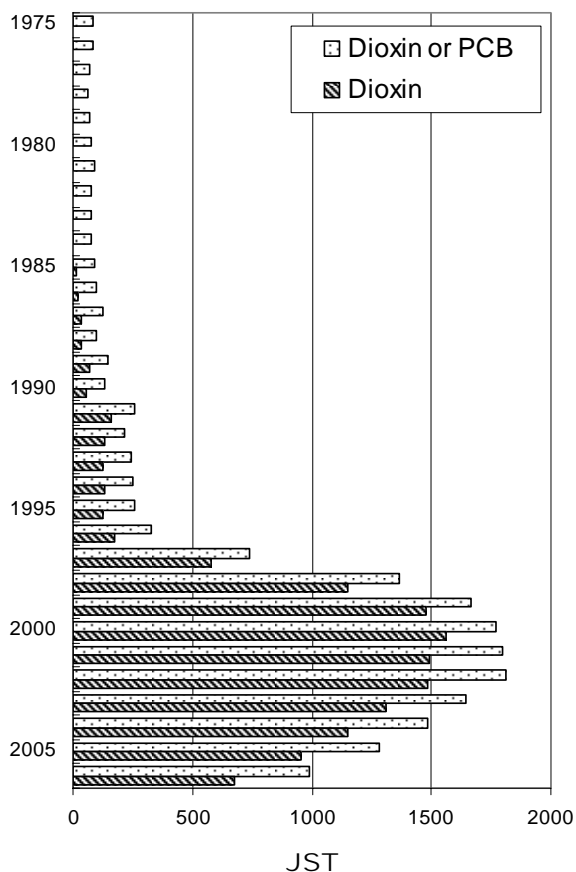


Fig. 1 Number of Japanese Dioxin Scientific Papers

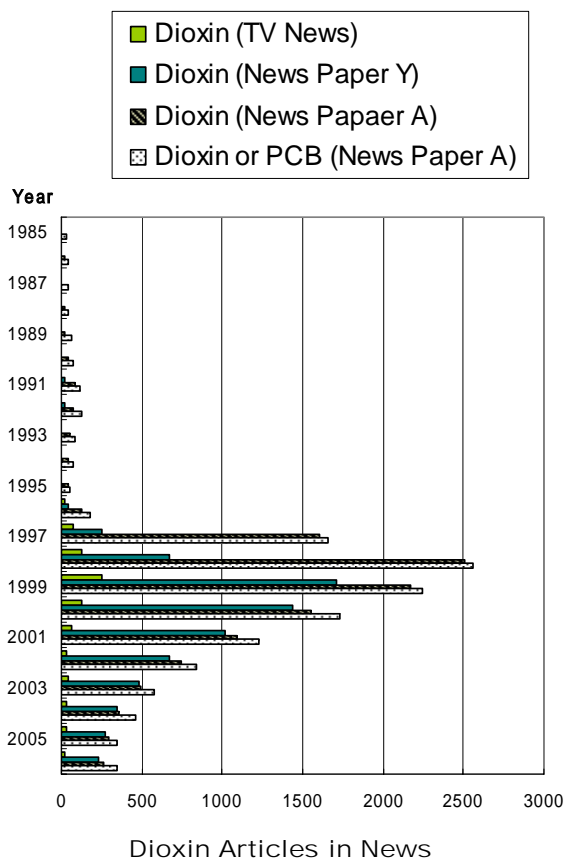


Fig. 2 Number of Articles in Mass Media