

Chapter 5.

Summary of the Results of the Investigation and Survey of Designated Chemical Substances etc. (Fiscal Year 1995)

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1. Purpose of the survey

In accordance with the amended Chemical Substances Control Law enforced in 1987, designated chemical substance is ordered to conduct of the toxicity test based on the situation of its persistence in the environment. If toxicity is observed, it is designated as a Class 2 Specified Chemical Substance. The substance is required to submit prior notification of the scheduled production or importation volume, and the production or importation volume are restricted when necessary. In this surrounding, the Environment Agency has conducted the “Investigation and Survey of the Persistence in the Environment of Designated Chemical Substances etc.” since fiscal year 1988, and later has been increasing points for survey and improving precision of measurement, for the purpose of grasping the situation of persistence of Designated Chemical Substances and Class 2 Specified Chemical Substances in the general environment. Since fiscal year 1990, the Study of the Exposure Route (investigation of the quantity of chemical substances humans are exposed to in daily life via multi-media) has been conducted, and the name of the survey was revised to the “Investigation and Survey of Designated Chemical Substances etc.”. The survey results in fiscal year 1995 are as follows.

2. Summary of the survey

(1) Surveyed substances and media

The following substances and media were chosen considering the production or importation volume and physicochemical properties of Designated Chemical Substances designated by the end of March, 1995.

(substances)	(media)
Trichloroethylene (note 1)	air, indoor air, meals
Tetrachloroethylene (note 1)	air, indoor air, meals
Carbon tetrachloride (note 1)	air, indoor air, meals
Chloroform	air, indoor air, meals
1,2-Dichloroethane	air, indoor air, meals
1,2-Dichloropropane	air, indoor air, meals
1,4-Dioxane	water, bottom sediments
3,3'-Dichlorobenzidine	water, bottom sediments
4,4'-Diaminodiphenylmethane	water, bottom sediments
4,4'-Diamino-3,3'-dichlorodiphenylmethane	water, bottom sediments

- | | |
|---------------------------------------|-------------------------|
| Tributyltin compounds (TBT) (note 2) | water, bottom sediments |
| Triphenyltin compounds (TPT) (note 3) | water, bottom sediments |
- (note 1) Designated as a Class 2 Specified Chemical Substance from Designated Chemical Substances in April, 1989.
- (note 2) TBTO was designated as a Class 1 Specified Chemical Substance from Designated Chemical Substances in January, 1990 and TBT compounds except for TBTO were designated as a Class 2 Specified Chemical Substances from Designated Chemical Substances in September, 1990.
- (note 3) Designated as a Class 2 Specified Chemical Substances from Designated Chemical Substances in January, 1990.

(2) Surveyed points (See Figure 5-1)

In the Survey of the Persistence in the Environment, in order to grasp the situation of the persistence of Designated Chemical Substances etc. in the general environment, points for the survey were chosen so that they would not be directly affected by a specific source. The households for the study of the exposure route survey were chosen so that they would be as similar as possible to the air condition of the air survey. Survey points for surveyed media are as follows.

- Survey of the Persistence in the Environment (water and bottom sediments) : 35 points (20 points in sea, 4 points in lakes and marshes and 11 points in rivers)
- Survey of the Persistence in the Environment (air): 29 points
- Study of the Exposure Route : 3 households in 9 points

(3) Method of Analysis

- GC/MS-SIM : 1,2-dichloroethane, 1,2-dichloropropane, 1,4-dioxane, 3,3'-dichlorobenzidine, 4,4'-diaminodiphenylmethane, 4,4'-diamino-3,3'-dichlorodiphenylmethane
- GC/ECD : trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform
- GC/FPD : TBT, TPT

3. Survey results

The results of the Survey of the Persistence in the Environment are indicated in Table5-1. The results of the Study of the Exposure Route are indicated in Table 5-2. Concerning survey results for TBT and TPT, refer to the fiscal year 1995 Summary of the Environmental Survey Results for Organotin Compounds. (ppb indicates ng/ml in water and ng/g·dry in bottom sediments. $\mu\text{g}/\text{m}^3$ in air indicates in terms of 1 atm and 20 .)

(1) Trichloroethylene and Tetrachloroethylene

Trichloroethylene is used for metal degreasing agents and solvents etc., and tetrachloroethylene is used for dry cleaning solvents and metal degreasing agents etc.. These 2 substances were designated as Designated Chemical Substances in May, 1987, and were later designated as Class 2 Specified Chemical Substances in April, 1989. As of October 1989, the 2 substances have been subject to waste water regulation and ground water regulation based on the Water Pollution Control Law, and in March, 1993, they were added to the items of the environmental quality standards for water pollution. Concerning air, the Guidelines on Environmental Atmosphere (provisional figure) was established in April, 1993, and the Provisional Measures Guidelines were prepared. These 2 substances have been subject to the survey since fiscal year 1988 in water, bottom sediments and air, and since fiscal year 1989, water and bottom sediments were excluded due to their low detected frequencies and concentration levels in the fiscal year 1988 survey, and only air has been surveyed. Since fiscal year 1990, the Study of the Exposure Route has also been conducted. In fiscal year 1995, surveys were conducted for air as well as the Study of the Exposure Route.

(Survey results for trichloroethylene)

The detection range of trichloroethylene in the air was nd (indicating that it was not detected, hereinafter the same) -7.4 $\mu\text{g}/\text{m}^3$ (nd-8.3 $\mu\text{g}/\text{m}^3$, hereinafter values in parentheses indicate the results in fiscal year 1994, unless necessary.), the detected frequency (detected samples/ total number of samples, hereinafter the same) was 91/108 (88/110), and the geometric mean (the value of the geometric mean obtained from among the arithmetical mean of a certain point, hereinafter the same) was 0.37 $\mu\text{g}/\text{m}^3$ (0.39 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 25 out of 28 points (25 out of 28 points). In the Study of the Exposure Route, the exposure range in general or indoor air was 1.4-67 $\mu\text{g}/\text{man}\cdot\text{day}$ (0.84-143 $\mu\text{g}/\text{man}\cdot\text{day}$), and the exposure range in meals was nd (nd-1.1 $\mu\text{g}/\text{man}\cdot\text{day}$). Although exposure levels varied from point to point, those were derived from the exposure in general and indoor air in all points. There was no apparent difference between indoor and general air. In comparison with past survey results, there was no great change in the situation of pollution or exposure.

(Survey results for tetrachloroethylene)

The detection range in the air was nd-4.1 $\mu\text{g}/\text{m}^3$ (nd-5.8 $\mu\text{g}/\text{m}^3$), the detected frequency was 110/111 (109/114) and the geometric mean was 0.33 $\mu\text{g}/\text{m}^3$ (0.36 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 29 out of 29 points (28 out of 29 points). In the Study of the Exposure Route, the exposure range in general or indoor air was 1.4-85 $\mu\text{g}/\text{man}\cdot\text{day}$ (1.5-76 $\mu\text{g}/\text{man}\cdot\text{day}$), and the exposure range in meals was nd-0.99 $\mu\text{g}/\text{man}\cdot\text{day}$ (nd-2.1 $\mu\text{g}/$

man·day). Although exposure levels varied from point to point, those were almost derived from the exposure in general and indoor air in all points. There was no apparent difference in indoor and general air. In comparison with past survey results, there was no apparent change in the situation of pollution or exposure.

Since trichloroethylene and tetrachloroethylene persist widely in the environment, it is necessary to continue surveys in order to monitor the situation of environmental pollution.

(2) Carbon tetrachloride

Carbon tetrachloride is used for raw material etc. in the chemical industry. It was designated as a Designated Chemical Substance in July, 1987, and was later designated as a Class 2 Specified Chemical Substance in April, 1989. It was added to the items of the environmental quality standard for water pollution in March, 1993. In Japan, it has been basically prohibited at the end of fiscal year 1995, based on the Montreal Protocol. Carbon tetrachloride has been subject to the survey since fiscal year 1988 in water, bottom sediments and air, and since fiscal year 1989, water and bottom sediments were excluded due to its low detected frequencies and concentration levels in the fiscal year 1988 survey, and only the air has been surveyed. Since fiscal year 1990, the Study of the Exposure Route has also been conducted. In fiscal year 1995, the survey was conducted in air as well as the Study of the Exposure Route.

The detection range in air was 0.037-1.48 $\mu\text{g}/\text{m}^3$ (0.042-1.4 $\mu\text{g}/\text{m}^3$), the detected frequency was 111/111 (111/111), and the geometric mean was 0.45 $\mu\text{g}/\text{m}^3$ (0.59 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 29 out of 29 points (28 out of 28 points). In the Study of the Exposure Route, the exposure range in general or indoor air was 1.4-60 $\mu\text{g}/\text{manday}$ (1.2-14 $\mu\text{g}/\text{man}\cdot\text{day}$) and the exposure range in meals was nd-0.62 $\mu\text{g}/\text{man}\cdot\text{day}$ (nd-0.25 $\mu\text{g}/\text{manday}$). Although exposure levels varied from point to point, those were almost derived from the exposure in general and indoor air in all points. There was no apparent difference in indoor and general air. In comparison with past survey results, there was no apparent difference in the situation of pollution or exposure.

Since carbon tetrachloride persists widely with a comparatively high concentration level in the environment, it is necessary to continue surveys in order to monitor carefully the situation of environmental pollution.

(3) Chloroform

Chloroform is used for raw materials for synthetic resin and solvents etc.. It was designated as a Designated Chemical Substance in July, 1987. In March, 1993, it was desig-

nated in the items for monitoring water pollution. Chloroform has been subject to the survey since fiscal year 1988 in water, bottom sediments and air, and in fiscal year 1989, water and bottom sediments were excluded due to its low detected frequencies and concentration levels in the fiscal year 1988 survey, and only air has been surveyed. Since fiscal year 1991, the Study of the Exposure Route has also been conducted. In fiscal year 1995, the survey was conducted in air as well as the Study of the Exposure Route.

The detection range in air was nd-7.7 $\mu\text{g}/\text{m}^3$ (nd-2.8 $\mu\text{g}/\text{m}^3$), the detected frequency was 98/113 (104/113), and the geometric mean was 0.24 $\mu\text{g}/\text{m}^3$ (0.28 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 27 out of 29 points (28 out of 29 points). In the Study of the Exposure Route, the exposure range in general or indoor air was 1.7-75 $\mu\text{g}/\text{man}\cdot\text{day}$ (nd-34 $\mu\text{g}/\text{man}\cdot\text{day}$) and the exposure range in meals was nd-25 $\mu\text{g}/\text{man}\cdot\text{day}$ (tr (indicating that it was detected below the unified detection limit)-23 $\mu\text{g}/\text{man}\cdot\text{day}$). Although exposure levels varied from point to point, those were derived from the exposure in general and indoor air and meals in all points. There was no apparent difference in indoor and general air. In comparison with past survey results, there was no apparent difference in the situation of pollution and exposure.

Since chloroform persists widely with a comparatively high concentration level in the environment, it is necessary to continue surveys in the environment.

(4) 1,2-Dichloroethane and 1,2-Dichloropropane

1,2-Dichloroethane is used as raw material for vinylchloride and synthetic resin. 1,2-dichloropropane is used for solvents for fats and oils, asphalt and degreasing agents for metal etc.. 1,2-Dichloroethane and 1,2-dichloropropane were designated as Designated Chemical Substances in July, 1987, and March, 1988, respectively. In March, 1993, 1,2-dichloroethane was added to the items of the environmental quality standard for water pollution, and 1,2-dichloropropane was designated in the item of monitoring for water pollution. These 2 substances has been subject to the survey in water, bottom sediments and air since fiscal year 1989. Water and bottom sediments were excluded in the survey for 1,2-dichloroethane for 2 reasons: first, because it was added to the item of the environmental quality standard for water pollution and the situation of water pollution was to be constantly monitored, and second, since it was detected with low frequencies and concentration levels in the fiscal year 1992 survey. Since fiscal year 1993, only air has also been surveyed. For 1,2-dichloropropane, water and bottom sediments were excluded due to its low frequencies and concentration levels in the fiscal year 1990 survey. Only air has been surveyed since fiscal year 1991. Both substances have been subject to the Study of the Exposure Route since fiscal year 1994 due to their tendencies of high detected fre-

quencies in air. In fiscal year 1995, surveys were conducted for air as well as the Study of the Exposure Route.

(Survey results for 1,2-dichloroethane)

The detection range in air was nd-1.8 $\mu\text{g}/\text{m}^3$ (nd-1.1 $\mu\text{g}/\text{m}^3$), the detected frequency was 66/79 (73/80) and the geometric mean was 0.05 $\mu\text{g}/\text{m}^3$ (0.06 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 24 out of 28 areas (25 out of 26 areas). In the Study of the Exposure Route, the exposure range in general or indoor air was 0.2-18 $\mu\text{g}/\text{man}\cdot\text{day}$ (0.16-5.3 $\mu\text{g}/\text{man}\cdot\text{day}$), and the exposure in meals was not detected as well as in fiscal year 1994. Although exposure levels varied from point to point, those were derived from the exposure in general and indoor air in all points. There was no apparent difference in indoor and general air. In comparison with past surveys results, there was no apparent difference in the situation of pollution and exposure.

(Survey results for 1,2-dichloropropane)

The detection range in air was nd-0.93 $\mu\text{g}/\text{m}^3$ (nd-0.79 $\mu\text{g}/\text{m}^3$), the detected frequency was 59/77 (57/77), and the geometric mean was 0.016 $\mu\text{g}/\text{m}^3$ (0.02 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 22 out of 28 areas (21 out of 25 areas). In the Study of the Exposure Route, the exposure range in general or indoor air was 0.17-3.4 $\mu\text{g}/\text{man}\cdot\text{day}$ (0.075-8.5 $\mu\text{g}/\text{man}\cdot\text{day}$), and the exposure in meals was not detected as well as in fiscal year 1994. Although exposure levels varied from point to point, those were derived from the exposure in general and indoor air in all points. There was no apparent difference in indoor and general air. In comparison with past surveys results, there was no apparent difference in the situation of pollution and exposure.

Since 1,2-dichloroethane and 1,2-dichloropropane persist widely in the environment, it is necessary to continue surveys in order to monitor the situation of pollution in the environment.

(5) 1,4-Dioxane

1,4-dioxane is used for a variety of industrial solvents. It was designated as a Designated Chemical Substance in October, 1987. It has been subject to the survey since fiscal year 1989, and water and bottom sediments has been surveyed. In fiscal year 1995, water and bottom sediments were surveyed.

The detection range in water was nd-7.6 ppb (nd-15 ppb), the detected frequency was 64/105 (60/96) and the geometric mean was 0.24 ppb (0.31 ppb). In terms of point, it was detected in 22 out of 35 points (22 out of 32 points). The detection range in bottom sediments was nd-74 ppb (nd-7.6 ppb), the detected frequency was 9/102 (13/90) and the

geometric mean was 1.6 ppb (1.37 ppb). In terms of point, it was detected in 4 out of 34 points (7 out of 30 points). In comparison with past survey results for water and bottom sediments, there was no apparent difference in the situation of pollution.

Since 1,4-dioxane persists widely in the environment, it is necessary to continue surveys in order to monitor the situation of pollution in the environment.

(6) 3,3'-Dichlorobenzidine

3,3-Dichlorobenzidine is used as an intermediate for organic yellow pigments. It was designated as a Designated Chemical Substance in October, 1987. It was subject to the survey in water and bottom sediments for the first time in fiscal year 1989, but they were detected in very small quantities in both media. In fiscal year 1995, surveys were conducted for water and bottom sediments for the first time since fiscal year 1989.

The detected frequencies in water and bottom sediments were both 0/69 (in fiscal year 1989, the detected frequencies for both media were 2/78, but this cannot be simply compared with the results of this survey, since the method of data processing was different, hereinafter the same in this part.), and was not detected.

Since 3,3-dichlorobenzidine was not detected in both water and bottom sediments, survey should be considered to be conducted after a certain period of time, by considering the situation of production or importation volume etc. after this survey.

(7) 4,4'-Diaminodiphenylmethane

4,4'-Diaminodiphenylmethane is used as synthetic raw material for diphenylmethane diisocyanate (MDI), and as a hardening agent for epoxy resins and a copolymer of polyurethanes. It was designated as a Designated Chemical Substance in March, 1989. The survey was conducted for the first time in water and bottom sediments in fiscal year 1989, but was detected in very small quantities in both media. In fiscal year 1995, surveys were conducted for water and bottom sediments for the first time since fiscal year 1989.

The detected frequency in water was 0/69 (2/72 in fiscal year 1989). In bottom sediments, the detected frequencies were 14/69 (1/72 in fiscal year 1989), the detection range was nd-880 ppb (nd-0.2 ppb in fiscal year 1989), the geometric mean was 12 ppb, and it was detected in 6 out of 23 points in terms of point.

Although 4,4'-diaminodiphenylmethane was not detected in water at present, the detected frequencies in bottom sediments have increased compared to the fiscal year 1989 survey. This is estimated to be due to the lower detection limit in the fiscal year 1995 survey, compared to that in fiscal year 1989. It does not seem to suggest any problems concerning

the detected concentration levels. But since the detected frequencies have increased, survey should be considered to be conducted after a certain period of time, by considering the situation of production or importation volume etc. after this survey.

(8) 4,4'-Diamino-3,3'-dichlorodiphenylmethane

4,4'-Diamino-3,3'-dichlorodiphenylmethane is used as a hardening agent for polyurethane elastomers, and a hardening agent for epoxy resins and epoxy urethane resins. This substance was designated as a Designated Chemical Substance in October, 1987. The survey was conducted for the first time in water and bottom sediments in fiscal year 1989, but it was not detected in both media. In fiscal year 1995, surveys were conducted for water and bottom sediments for the first time since fiscal year 1989.

The detected frequency in water was 0/69. In bottom sediments, the detected frequencies were 2/69, the detection limit was nd-110 ppb, the geometric mean was 7.2 ppb, and it was detected in 1 out of 23 points in terms of point.

Although 4,4'-diamino-3,3'-dichlorodiphenylmethane was not detected in water at present, it was detected in bottom sediments in contrast to the fiscal year 1989 survey in which it was not detected. This is estimated to be due to the lower detection limit in the fiscal year 1995 survey, compared to that in fiscal year 1989. It does not seem to suggest any problems concerning the detected concentration levels. But since it was detected for the first time in this survey, survey should be considered to be conducted after a certain period of time, by considering the situation of production or importation volume etc. after this survey.

Fig. 5-1 Locations of Investigation and Survey of Designated Chemical Substances etc. (Fiscal Year 1995)

Note: 1. A, B and C means sea, lakes and marshes and rivers, respectively
 2. — and □ means survey area of air and exposure route, respectively



Table 5-1 The Results of the Investigation and Survey of Designated Chemical Substances, etc. (The Survey of the Persistence in the Environment)

(Water・Bottom sediments)

(concentration unit : ppb)

	Detection range	Geometric mean	Detected frequency	Detected spot
1,4-Dioxane	nd ~ 7.6	0.24	64 / 105	22 / 35
	nd ~ 74	1.6	9 / 102	4 / 34
3,3'-Dichlorobenzidine	nd	–	0 / 69	0 / 23
	nd ~ tr	–	0 / 69	0 / 23
4,4'-Diaminodiphenylmethane	nd	–	0 / 69	0 / 23
	nd ~ 880	12	14 / 69	6 / 23
4,4'-Diamino-3,3'-dichlorodiphenylmethane	nd	–	0 / 69	0 / 23
	nd ~ 110	7.2	2 / 69	1 / 23

The each of upper and lower column means the survey results for water and bottom sediments, respectively.

(Air)

(concentration unit : $\mu\text{g}/\text{m}^3$)

	Detection range	Geometric mean	Detected frequency	Detected spot
Trichloroethylene	nd ~ 7.4	0.37	91 / 108	25 / 28
Tetrachloroethylene	nd ~ 4.1	0.33	110 / 111	29 / 29
Carbon tetrachloride	0.037 ~ 1.48	0.45	111 / 111	29 / 29
Chloroform	nd ~ 7.7	0.24	98 / 113	27 / 29
1,2-Dichloroethane	nd ~ 1.8	0.05	66 / 79	24 / 28
1,2-Dichloropropane	nd ~ 0.93	0.016	59 / 77	22 / 28

Table 5-2 Survey Results of Exposure Route (No.1)

(Unit: mg/man·day)

Sampling point	Fiscal year	Trichloroethylene			Tetrachloroethylene			Carbon tetrachloride			Chloroform		
		General air	Indoor air	Meals	General air	Indoor air	Meals	General air	Indoor air	Meals	General air	Indoor air	Meals
In Sapporo City	'95	1.4	2.3	nd	8.4	17	nd	9.2	5.4	nd	8.4	8.5	8.5
	'94	0.84	2.5	1.1	11	14	2.1	7.7	4.5	nd	8.1	10	17
	'93	2.3	3.6	tr	17	16	2.6	2.6	4.7	tr	7.3	5.2	9.6
	'92	2.4	2.5	tr	17	30	1.2	2.2	9.9	nd	1.6	1.9	11
	'91	2.9	3.0	0.94	51	25	1.9	5.8	6.7	tr	5.2	6.2	13
'90	1.1	tr	nd	32	6.9	1.8	2.5	3.4	nd				
In Sendai City	'95	6.1	8.2	nd	3.7	43	tr	1.4	3.4	nd	2.3	4.6	12
	'94	4.5	4.7	nd	7.4	15	0.47	5.8	4.3	nd	5.2	13	23
	'93	1.5	2.5	nd	27	19	0.75	2.2	6.9	nd	9.3	41	22
	'92	6.6	46	tr	165	12	0.79	10	9.5	nd	5.9	21	21
	'91	not surveyed	18	nd	109	31	3.4	5.6	8.9	tr	4.0	22	29
'90	3.9	13	nd	79	19	tr	10	9.9	nd				
In Tokyo-to	'95	67	65	nd	44	85	0.80	9.0	9.3	nd	58	75	9.6
	'94	56	143	tr	37	76	0.97	12	14	nd	10	34	8.3
	'93	26	72	tr	16	72	1.2	3.4	8	nd	not surveyed	32	6.3
	'92	77	56	tr	73	86	0.86	13	12	nd	15	31	4.1
	'91	45	60	tr	94	110	0.65	12	12	nd	45	55	2.1
'90	101	138	tr	124	126	0.83	16	16	nd				
In Kanazawa City	'95	not surveyed	9.3	nd	1.4	19	tr	5.5	7.3	nd	2.3	10	4.1
	'94	3.7	121	nd	1.5	6.8	0.34	10	4.3	nd	4.9	6.4	2.9
	'93	4.4	9.3	nd	4.7	226	0.83	11	8	nd	5.3	12	4.7
	'92	3.3	6.8	nd	7.1	16	nd	12	15	tr	2.8	8.8	tr
	'91	18	28	nd	14	46	0.54	11	21	nd	4.9	15	3.9
'90													
In Nagano City	'95	5.4	5.1	nd	10	2.5	nd	10	60	nd	4.1	17	6.8
	'94	11	20	nd	16	5.7	nd	11	11	nd	5.8	8.3	3.1
	'93	21	34	nd	9.8	12	nd	11	13	nd	3.8	14	4.8
	'92	13	17	nd	9.3	10	tr	10	11	nd	3.6	4.7	tr
	'91	7.4	13	nd	13	8.2	1.1	11	11	nd	5.1	6.8	8.6
'90	7.0	26	nd	14	32	1.9	11	13	nd				
In Nagoya City	'95	36	51	nd	19	31	0.99	8.8	14	0.62	13	26	25
	'94	29	53	nd	25	33	nd	1.2	8.9	0.25	2.1	13	9.1
	'93	28	53	tr	20	20	0.50	9	13	tr	6.9	12	15
	'92	24	56	0.96	20	19	0.46	10	10	tr	6.4	20	14
	'91	56	96	nd	35	436	2.3	6.2	9.3	0.87	5.9	12	13
'90	24	53	tr	20	107	2.4	10	12	nd				
In Kobe City	'95	2.8	2.2	nd	10	4.1	nd	15	8.5	nd	8.2	14	nd
	'94	2.7	4.4	nd	18	12	nd	14	9.1	nd	19	9.0	tr
	'93	13	12	nd	17	24	tr	9.9	10	1.7	13	17	0.45
	'92	9.9	49	nd	22	29	0.31	10	12	2.7	14	44	3.7
	'91	13	35	tr	21	34	0.58	7.7	9.7	tr	14	20	8.9
'90	7.1	6.0	nd	18	11	0.53	8.7	3.7	nd				
In Takamatsu City	'95	3.3	7.3	nd	7.0	9.0	nd	10	11	nd	10	14	8.8
	'94	5.4	3.7	nd	8.4	7.9	nd	11	10	nd	10	7.1	3.7
	'93	2.6	3.3	tr	4.8	7.1	nd	11	13	nd	4.2	11	5.1
	'92	8.2	6.2	nd	16	10	nd	13	11	nd	4.1	17	5.8
	'91	5.6	6.7	nd	7.3	9.0	tr	9.7	8.2	nd	14	9.3	5.6
'90	3.3	1.8	nd	14	8.3	tr	11	9.2	nd				
In Kitakyushu City	'95	2.5	27	nd	7.7	2.6	tr	3.5	5.7	nd	1.7	19	4.1
	'94	not surveyed	26	nd	3.2	5.1	nd	not surveyed	7.3	nd	nd	5.9	4.2
	'93	3.9	7.4	nd	16	94	0.48	12	31	tr	21	32	15
	'92	2.4	31	nd	6.4	9.3	nd	3.3	8.3	nd	0.16	2.8	11
	'91	19	4.6	nd	54	228	0.65	23	6.5	tr	14	13	2.7
'90	12	7.8	nd	1.4	2.7	0.54	3.0	3.8	tr				
Geometric mean	'95	6.3 (16)	10 (20)	nd (nd)	8.3 (12)	13 (24)	tr (tr)	6.8 (8.1)	9.3 (14)	tr (tr)	6.4 (12)	15 (21)	3.8 (8.8)
	'94	6.6 (14)	16 (42)	tr (tr)	9.9 (14)	13 (20)	0.30 (0.51)	7.6 (9.1)	7.6 (8.2)	tr (tr)	5.1 (7.3)	10 (12)	5.1 (8.0)
	'93	6.8 (11)	11 (22)	tr (tr)	13 (15)	30 (55)	0.52 (0.79)	6.7 (8.0)	10 (12)	tr (tr)	7.6 (8.9)	16 (20)	6.3 (9.2)
	'92	8.5 (16)	19 (30)	tr (tr)	20 (37)	19 (25)	0.37 (0.48)	8.1 (9.3)	11 (11)	tr (tr)	3.5 (5.9)	11 (17)	6.2 (8.3)
	'91	14 (21)	17 (29)	tr (tr)	31 (44)	46 (103)	0.96 (1.3)	9.2 (10)	9.8 (10)	tr (tr)	8.9 (12)	14 (18)	7.2 (9.7)
	'90	8.2 (20)	10 (31)	tr (tr)	21 (38)	19 (39)	0.84 (1.1)	7.7 (9.0)	7.6 (8.9)	tr (tr)			

Table 5-2 Survey Results of Exposure Route (No.2)

(Unit: mg/man·day)

Sampling point	Fiscal year	1, 2-Dichloroethane			1, 2-Dichloropropane		
		General air	Indoor air	Meals	General air	Indoor air	Meals
In Sapporo City	'95	0.52	0.2	nd	0.42	0.17	nd
	'94	4.5	0.16	nd	0.36	0.16	nd
In Sendai City	'95	0.71	0.53	nd	0.32	0.4	nd
	'94	1.4	0.76	nd	0.23	0.4	nd
In Tokyo-to	'95	not surveyed	not surveyed	nd	1.1	3.4	nd
	'94	1.8	5.3	nd	6.3	8.5	nd
In Kanazawa City	'95	1.7	2	nd	1.1	1.5	nd
	'94	1.3	1.3	nd	0.15	1	nd
In Nagano City	'95	0.27	0.23	nd	0.34	0.21	nd
	'94	0.51	0.58	nd	0.48	0.36	nd
In Nagoya City	'95	17	18	nd	nd	0.48	nd
	'94	not surveyed	not surveyed	nd	not surveyed	not surveyed	nd
In Kobe City	'95	4.4	3	nd	not surveyed	not surveyed	nd
	'94	2.8	5.3	nd	0.075	not surveyed	nd
In Takamatsu City	'95	2.2	1.8	nd	0.28	0.21	nd
	'94	0.75	1.1	nd	0.42	0.34	nd
In Kitakyushu City	'95	0.88	0.49	tr	0.28	0.25	nd
	'94	0.43	0.98	nd	0.42	1.9	nd
Geometric mean	'95	1.5 (3.5)	1.1 (3.2)	tr (tr)	0.33 (0.48)	0.46 (0.83)	nd (nd)
	'94	1.28 (1.69)	1.13 (1.92)	nd (nd)	0.39 (1.06)	0.75 (1.5)	nd (nd)

Calculation conditions

Measured values of each point are arithmetic means of individual data which were treated by conduct of the unified detection limit. nd means that all data are below the detection limit, and tr means that the mean of detected concentrations are below the unified detection limit.

The value of the geometric mean are the geometric mean of the arithmetic means of each household. As reference the arithmetic value of all data are indicated in parentheses. In that case nd is calculated as half of the detection limit.

15 m³/man · day was used for inhalation volumes per person. Exposures in general air and indoor air were calculated by multiplying each concentration and inhalation volume together.

Measurements of general air were performed in the neighborhood areas of measuring points of indoor air, but not identical.

Exposure in meals were actual measured values (including values via drinking water.).