

Chapter 5.

**Summary of the Results of the Investigation and Survey of
Designated Chemical Substances etc.
(Fiscal Year 1998)**

Chapter 5. Summary of the Results of the Investigation and Survey of Designated Chemical Substances etc. (Fiscal Year 1998)

1. Purpose of the survey

In accordance with the amended Chemical Substances Control Law enforced in 1987, designated chemical substances are subjected to toxicity tests based on the situation of its persistence in the environment. If toxicity is observed, it is designated as a Class 2 Specified Chemical Substance. For the substance it 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 circumstance, the Environment Agency has conducted the "Investigation and Survey of the Persistence in the Environment of Designated Chemical Substances etc." since the fiscal year 1988, and later the Agency 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 the fiscal year 1990, the Study of the Exposure Route (investigation of the quantity of chemical substances humans are exposed to in daily life via multiple 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 the fiscal year 1998 are as follows.

2. Summary of the survey

(1) Surveyed substances and media

The following substances and media were chosen in consideration of the production or importation volume and physicochemical properties of Designated Chemical Substances designated by the end of March, 1998.

	(substances)	(media)
①	Trichloroethylene (note 1)	indoor air, meals
②	Tetrachloroethylene (note 1)	indoor air, meals
③	Carbon tetrachloride (note 1)	air, indoor air, meals
④	Chloroform	air, indoor air, meals
⑤	1,2-Dichloroethane	air, indoor air, meals
⑥	1,2-Dichloropropane	air, indoor air, meals
⑦	1,4-Dioxane	water, bottom sediments
⑧	4,4'-Diaminodiphenylmethane	water, bottom sediments
⑨	Tributyltin Compounds (TBT) (note 2)	water, bottom sediments
⑩	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.

- ① Survey of the Persistence in the Environment (water and bottom sediments) : 36 points (20 points in sea, 4 points in lakes and marshes and 12 points in rivers)
- ② Survey of the Persistence in the Environment (air): 33 points
- ③ Study of the Exposure Route (indoor air and meals): 3 households each in 9 points

(3) Method of Analysis

- ① GC/MS-SIM : 1,2-dichloroethane, 1,2-dichloropropane (air, indoor air and meal) , trichloroethylene, tetrachloroethylene (indoor air), carbon tetrachloride, chloroform (air, indoor air), 1,4-dioxane, 4,4'-diaminodiphenylmethane, TBT, TPT(water, bottom sediments)
- ② GC/ECD : trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform (meal)

3. Survey results

The results of the Survey of the Persistence in the Environment are indicated in Table 5-1. 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 1998 Summary of the Environmental Survey Results for Organotin Compounds.

Volume of exposure through the air and indoor air was calculated by multiplying each detected concentration by 15 m³/man/day (daily respiration volume of a man).

The results in the fiscal year 1998 are summarized below with some discussion. (The figures in parentheses are those for FY 1997 except otherwise noticed.)

(1) Trichloroethylene and Tetrachloroethylene

① Trichloroethylene is used for metal degreasing agents and solvents etc., and tetrachloro-ethylene 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 Environmental Quality Standard was established in February, 1997.

These 2 substances have been subject to the survey since the fiscal year 1988 for water, bottom sediments and air, and since the fiscal year 1989, water and bottom sediments were excluded due to their low detection frequencies and concentration levels in the fiscal year 1988 survey. Since the fiscal year 1997 air is excluded from the survey, because these substances were added to the items of Environmental Quality Standard and pollution circumstances by the substances are observed full time. Since the fiscal year 1990, the Study of the Exposure Route has also been conducted.

In the fiscal year 1998, the Study of the Exposure Route was conducted.

② (Survey results for trichloroethylene)

In the Study of the Exposure Route, the exposure range via indoor air was 3.6 to 100 μ g/man/day (1.2 to 70 μ g/man/day), and the exposure range via meals was nd to tr (nd to 0.97 μ g/man/day). Although exposure levels varied from point to point, the exposures in most of the points were those derived from the indoor air. There was no great change in the situation of exposure.

(Survey results for tetrachloroethylene)

In the Study of the Exposure Route, the exposure range via indoor air was 2.1 to 96 μ g/man/day (5.9 to 67 μ g/man/day), and the exposure range via meals was nd to 0.5 μ g/man/day (nd to 0.69 μ g/man/day). Although exposure levels varied from point to point, the exposures in most of the points were those derived from the indoor air. There was no great change in the situation of exposure.

③ Since trichloroethylene and tetrachloroethylene persist widely in the environment, it is necessary to continue surveys in order to monitor the situation of environmental pollution. However, for the Study of the Exposure Route (meals) which has showed continued low level exposure, it is considered to be possible to grasp the tendency by the study conducted at a certain interval (3 to 5 years).

(2) Carbon tetrachloride

① 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, manufacture of the substance was ceased at the end of the fiscal year 1995, based on the Montreal Protocol. Carbon tetrachloride has been subject to the survey since the fiscal year 1988 for water, bottom sediments and air, and since the 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 the fiscal year 1998, the survey for air as well as the Study of the Exposure Route was conducted.

②The detection range in air was 0.24 to 2.1 $\mu\text{g}/\text{m}^3$ (0.012 to 2.4 $\mu\text{g}/\text{m}^3$), the detection frequency was 130/130 (128/128), and the geometric mean was 0.68 $\mu\text{g}/\text{m}^3$ (0.62 $\mu\text{g}/\text{m}^3$). In terms of point, it was detected in 33 out of 33 points (34 out of 34 points). In the Study of the Exposure Route, the exposure range via general or indoor air was 6.3 to 26 $\mu\text{g}/\text{man}/\text{day}$ (3.3 to 31 $\mu\text{g}/\text{man}/\text{day}$) and the exposure range via meals was nd to tr (nd to 0.58 $\mu\text{g}/\text{man}/\text{day}$). Although the exposure levels varied from point to point, the exposures in most of the points were those derived from the general or indoor air. There was no apparent difference in indoor and general air.

In comparison with the past survey results, there was no apparent difference in the situation of pollution and exposure.

③Since 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. However, for the Study of the Exposure Route (meals) which has showed continued low level exposure, it is considered to be possible to grasp the tendency by the study conducted at a certain interval (3 to 5 years).

(3) Chloroform

①Chloroform 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 designated as the items for monitoring water pollution.

Chloroform has been subject to the survey since the fiscal year 1988 for water, bottom sediments and air, and in the fiscal year 1989, water and bottom sediments were excluded due to its low detection frequencies and concentration levels in the fiscal year 1988 survey, and only air has been surveyed. Since the fiscal year 1991, the Study of the Exposure Route has also been conducted.

In the fiscal year 1998, the survey for air as well as the Study of the Exposure Route was conducted.

② The detection range via air was 0.046 to 11 $\mu\text{g}/\text{m}^3$ (nd to 5 $\mu\text{g}/\text{m}^3$), the detection

frequency was 126/126 (122/134), and the geometric mean was $0.31 \mu\text{g}/\text{m}^3$ ($0.54 \mu\text{g}/\text{m}^3$). In terms of point, it was detected in 33 out of 33 points (33 out of 34 points).

In the Study of the Exposure Route, the exposure range via general or indoor air was 1.9 to $110 \mu\text{g}/\text{man}/\text{day}$ (2.8 to $62 \mu\text{g}/\text{man}/\text{day}$) and the exposure range via meals was 3.4 to $14 \mu\text{g}/\text{man}/\text{day}$ (3.6 to $23 \mu\text{g}/\text{man}/\text{day}$). Although the exposure levels varied from point to point, the exposures in most of the points were those derived from the media, general air, indoor air and meals. There was no apparent difference in indoor and general air.

In comparison with the past survey results, there was no apparent difference in the situation of pollution and exposure.

③ 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

① 1,2-Dichloroethane is used as raw material for vinylchloride monomer.

1,2-Dichloroethane was designated as Designated Chemical Substances in July, 1987. In March, 1993, 1,2-dichloroethane was added to the items of the Environmental Quality Standard for water pollution.

1,2-dichloroethane has been subject to the survey for water, bottom sediments and air since the fiscal year 1989. Water and bottom sediments were excluded from the survey 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 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 the fiscal year 1991. The substance has been subject to the Study of the Exposure Route since the fiscal year 1994 due to the tendency of high detection frequency in air.

In the fiscal year 1998, survey for air as well as the Study of the Exposure Route was conducted.

② Survey results for 1,2-dichloroethane

The detection range in air was 0.0048 to $1.2 \mu\text{g}/\text{m}^3$ (tr to $2.7 \mu\text{g}/\text{m}^3$), the detection frequency was 102/102 (96/97) and the geometric mean was $0.084 \mu\text{g}/\text{m}^3$ ($0.075 \mu\text{g}/\text{m}^3$). In terms of point, it was detected in 32 out of 32 areas (31 out of 32 areas).

In the Study of the Exposure Route, the exposure range via general or indoor air was 0.38 to $8.8 \mu\text{g}/\text{man}/\text{day}$ (tr to $13 \mu\text{g}/\text{man}/\text{day}$), and the exposure range via meals was nd to $\text{tr} \mu\text{g}/\text{man}/\text{day}$ (nd to $1.8 \mu\text{g}/\text{man}/\text{day}$). Although the exposure levels varied from point to point, the exposures in most of the points were those derived from general or indoor air. There was no apparent difference in indoor and general air.

In comparison with the past survey results, there was no apparent difference in the

situation of pollution and exposure.

③ Since 1,2-dichloroethane persists widely with a comparatively high concentration level in the environment, it is necessary to continue surveys in the environment. However, for the Study of the Exposure Route (meals) which has showed continued low level exposure, it is considered to be possible to grasp the tendency by the study conducted at a certain interval (3 to 5 years).

(5) 1,2-Dichloropropane

① 1,2-Dichloropropane is used as solvent for fat and asphalt.

1,2-Dichloropropane was designated as Designated Chemical Substances in March, 1988. In March, 1993, 1,2-dichloropropane was added to the items of the Environmental Quality Standard for water pollution.

1,2-dichloropropane has been subject to the survey for water, bottom sediments and air since the fiscal year 1989. Water and bottom sediments were excluded from the survey, because it was detected with low frequencies and concentration levels in the fiscal year 1990 survey. Since the fiscal year 1991, only air has been surveyed. The substance has been subject to the Study of the Exposure Route since the fiscal year 1994 due to the tendency of high detection frequency in air.

In the fiscal year 1998, survey for air as well as the Study of the Exposure Route was conducted.

② Survey results for 1,2-dichloropropane

The detection range in air was tr to $0.72 \mu\text{g}/\text{m}^3$ (nd to $1.9 \mu\text{g}/\text{m}^3$), the detection frequency was 82/86 (93/97), and the geometric mean was $0.02 \mu\text{g}/\text{m}^3$ ($0.033 \mu\text{g}/\text{m}^3$). In terms of point, it was detected in 29 out of 30 points (31 out of 32).

In the Study of the Exposure Route, the exposure range via general or indoor air was 0.13 to $7 \mu\text{g}/\text{man}/\text{day}$ (0.052 to $6.8 \mu\text{g}/\text{man}/\text{day}$), and the exposure via meals was not detected consecutively since the fiscal year 1995.

Although the exposure levels varied from point to point, the exposures in most of the points were those derived from general or indoor air. There was no apparent difference in indoor and general air.

In comparison with the past survey results, there was no apparent difference in the situation of pollution and exposure.

③ Since 1,2-dichloroethane persists widely with a comparatively high concentration level in the environment, it is necessary to continue surveys in the environment. However, for the Study of the Exposure Route (meals) which has showed continued low level exposure, it is considered to be possible to grasp the tendency by the study conducted at a certain interval (3 to 5 years).

(6) 1,4-Dioxane

① 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 the fiscal year 1989, and water and bottom sediments has been surveyed.

In the fiscal year 1998, water and bottom sediments were surveyed.

② The detection range in water was nd to 5.3 ng/ml (nd to 42.8 ng/ml), the detection frequency was 63/103 (70/102) and the geometric mean was 0.18 ng/ml (0.28 ng/ml). In terms of point, it was detected in 24 out of 35 points (24 out of 34 points).

The detection range in bottom sediments was nd to 0.051 μ g/g-dry (nd to 0.041 μ g/g-dry), the detection frequency was 5/108 (4/105) and the geometric mean was 0.0019 μ g/g-dry (0.0017 μ g/g-dry). In terms of point, it was detected in 2 out of 36 points (1 out of 35 points).

In comparison with past survey results for water and bottom sediments, there was no apparent difference in the situation of pollution.

③ 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.

(7) 4,4'-Diaminodiphenylmethane

① 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 the fiscal year 1989, but it was detected in very small quantities in both media.

In fiscal year 1998, survey was conducted for water and bottom sediments.

② The substance was not detected in water. And the detection range for bottom sediments was nd to 2.1 μ g/g-dry (nd to 0.88 μ g/g-dry*), the detection frequency was 31/97 (14/69) and the geometric mean was 0.015 μ g/g-dry (0.012 μ g/g-dry*). In terms of points, it was detected in 15 out of 33 points (6 out of 23 points*).

③ 4,4'-diaminodiphenylmethane was not detected in water alike the previous survey result (FY 1995).

The detection frequency for bottom sediments was higher in this survey than in the previous one. This is due to the lowered unified detection limit in the survey of the fiscal year 1998.

The level of concentration detected does not suggest any problem at present. But since the detection frequency is rising, it is considered to be suitable to conduct a survey after a certain period of time, in consideration of the situation of production or importation volume etc..

(* : results of FY1995 survey)

**Fig. 5-1 Locations of Investigation and Survey of Designated Chemical Substances etc.
(Fiscal Year 1998)**

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 designated Chemical Substances in Fiscal Year 1998
(The Survey of the Persistence in the Environment)**

(Water & Bottom sediments)

(concentration unit : water: μ g/l, bottom sediments: μ g/g-dry)

	Detection range	Geometric mean	Detected frequency	Detected spot
1,4-Dioxane	nd~5.3	0.18	63/103	24/35
	nd~0.051	0.0019	5/108	2/36
4,4'-Diaminodiphenylmethane	nd~tr(0.024)	0.098	0/108	0/36
	nd~2.1	0.015	31/97	15/33

(Note) 1. The each of upper and lower column means the survey results for water and bottom sediments, respectively.

2. The geometric mean is calculated on condition that the nd is the half of the detection limit.

(Air)

	Detection range	Geometric mean	Detected frequency	Detected spot
Carbon tetrachloride	0.24 ~2.1	0.68	130/130	33/33
Chloroform	0.046 ~11	0.31	126/126	33/33
1,2-Dichloroethane	0.0048~1.2	0.084	102/102	32/32
1,2-Dichloropropane	tr(0.00063)~0.72	0.02	82/86	29/30

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

(Unit: $\mu\text{g}/\text{man}\cdot\text{day}$)

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	'98	—	3.6	nd	—	16	nd	8	10	nd	12	18	8.6
	'97	—	8.1	nd	—	67	nd	11	20	nd	12	39	4.5
	'96	1.5	10	nd	13	40	nd	15	8.4	nd	8.7	14	4.6
	'95	1.4	2.3	nd	8.4	17	nd	9.2	5.4	nd	8.4	8.5	8.5
	'94	8.4	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	—	—	—
	'98	—	3.6	tr	—	15	tr	10	11	nd	6.2	11	14
'97	—	1.2	nd	—	14	0.39	4.2	3.3	nd	5.4	14	8.4	
'96	6.1	4.9	nd	8.9	3.6	nd	4.7	3.4	nd	13	5.5	12	
'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	'98	—	100	nd	—	88	nd	8.4	6.3	nd	110	68	5.1
	'97	—	55	nd	—	25	0.69	8.4	7.8	nd	62	40	3.6
	'96	5.4	100	tr	19	63	nd	5.2	8.3	nd	160	270	tr
	'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	—	—	—
	'98	—	6.5	nd	—	13	nd	8.8	11	nd	5.3	13	3.4
'97	—	7.0	nd	—	43	tr	8.2	8.2	0.58	2.8	11	4.3	
'96	not surveyed	nd	nd	not surveyed	2.4	tr	nd	nd	tr	nd	nd	tr	
'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	'98	—	15	nd	—	5.6	tr	12	13	nd	6.8	8.6	3.5
	'97	—	14	nd	—	12	0.45	9.7	8.9	nd	5.5	7.4	6.6
	'96	8.8	11	nd	6.5	8.5	nd	11	11	nd	4.0	6.3	1.4
	'95	5.4	5.1	nd	10	2.5	nd	10	90	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	—	—	—
	'98	—	48	tr	—	28	tr	8.8	7.9	nd	8.1	10	10
'97	—	50	0.97	—	12	tr	8.9	7.6	nd	10	22	23	
'96	2.1	76	tr	11	34	tr	4.4	9.4	tr	11	18	18	
'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	2.4	56	0.96	20	19	0.46	10	10	tr	6.4	20	1.4	
'91	56	96	nd	35	436	2.3	6.2	9.3	0.87	5.9	12	13	
'90	2.4	53	tr	20	107	2.4	10	12	nd	—	—	—	
In Kobe City	'98	—	27	tr	—	96	0.5	14	26	tr	5.8	72	4.6
	'97	—	15	nd	—	33	nd	14	31	nd	7.7	22	6.9
	'96	4.3	9.4	nd	9.9	21	nd	0.19	tr	nd	14	14	5.5
	'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	—	—	—
	'98	—	4.8	tr	—	4.8	nd	11	11	nd	6.9	13	5.1
'97	—	13	nd	—	6.4	nd	8.7	9.5	nd	7.0	16	6.3	
'96	3.2	6.8	nd	4.5	7.3	nd	9.3	9.1	nd	5.0	18	5.3	
'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	'98	—	10	nd	—	2.1	nd	8.1	10	nd	1.9	25	11
	'97	—	49	nd	—	5.9	nd	16	19	nd	4.5	21	14
	'96	3.4	4.1	nd	9.3	2.0	tr	5.3	3.6	nd	2.8	4.8	5.6
	'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	9.4	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	5.4	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	'98	(—)	(13)	(tr)	(—)	(15)	(tr)	(9.9)	(11)	(tr)	(8.3)	(19)
'97		(—)	(25)	(tr)	(—)	(30)	(tr)	(9.9)	(12)	(tr)	(19)	(27)	(7.3)
'96		(—)	(18)	(tr)	(—)	(18)	(tr)	(9.3)	(11)	(tr)	(8.1)	(19)	(7.2)
'95		(6.8)	(10)	(tr)	(9.5)	(10)	(tr)	(2.8)	(3.9)	(tr)	(6.1)	(8.7)	(6.1)
'94		(13)	(25)	(tr)	(10)	(20)	(tr)	(6.1)	(6.1)	(tr)	(25)	(39)	(7.7)
'93		(6.3)	(10)	(nd)	(8.3)	(13)	(tr)	(6.8)	(9.3)	(tr)	(6.4)	(15)	(3.8)
'92		(16)	(20)	(nd)	(12)	(24)	(tr)	(8.1)	(14)	(tr)	(12)	(21)	(8.8)
'91		(6.6)	(16)	(tr)	(9.9)	(13)	(0.30)	(7.6)	(7.6)	(tr)	(5.1)	(10)	(5.1)
'90		(1.4)	(42)	(tr)	(1.4)	(20)	(0.51)	(9.1)	(8.2)	(tr)	(7.3)	(12)	(8.0)
'93		(6.8)	(11)	(tr)	(13)	(30)	(0.52)	(6.7)	(10)	(tr)	(7.6)	(16)	(6.3)
'92	(1.1)	(22)	(tr)	(13)	(55)	(0.79)	(8.0)	(12)	(tr)	(8.9)	(20)	(9.2)	
'91	(8.5)	(19)	(tr)	(20)	(19)	(0.37)	(8.1)	(11)	(tr)	(3.5)	(11)	(6.2)	
'90	(16)	(30)	(tr)	(37)	(25)	(0.48)	(9.3)	(11)	(tr)	(5.9)	(17)	(8.3)	
'91	(14)	(17)	(tr)	(31)	(46)	(0.96)	(9.2)	(9.8)	(tr)	(8.9)	(14)	(7.2)	
'90	(21)	(29)	(tr)	(44)	(103)	(1.3)	(10)	(10)	(tr)	(12)	(18)	(9.7)	
'90	(8.2)	(10)	(tr)	(21)	(19)	(0.84)	(7.7)	(7.6)	(tr)	—	—	—	
'90	(20)	(31)	(tr)	(38)	(39)	(1.1)	(9.0)	(8.9)	(tr)	—	—	—	

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

(Unit: μ g/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	'98	0.60	0.42	nd	0.29	0.41	nd
	'97	0.63	0.50	nd	0.45	0.61	nd
	'96	0.43	0.20	nd	0.33	0.20	nd
	'95	0.52	0.20	nd	0.42	0.17	nd
	'94	4.50	0.16	nd	0.36	0.16	nd
In Sendai City	'98	8.8	1.7	nd	2.1	1.4	nd
	'97	nd	0.04	1.8	0.052	0.13	nd
	'96	0.79	0.94	nd	0.99	1.8	nd
	'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	'98	2.1	1.6	nd	7.0	6.6	nd
	'97	2.8	2.2	nd	6.8	3.7	nd
	'96	tr	0.52	3.3	0.96	1.7	nd
	'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	'98	1.7	1.7	nd	0.72	0.38	nd
	'97	2.0	1.5	nd	0.33	0.55	nd
	'96	0.80	1.6	nd	0.24	0.98	nd
	'95	1.7	2.0	nd	1.1	1.5	nd
	'94	1.3	1.3	nd	0.15	1.0	nd
In Nagano City	'98	1.8	2.2	nd	0.89	1.3	nd
	'97	0.4	0.35	nd	0.17	0.25	nd
	'96	0.31	0.39	nd	0.32	0.47	nd
	'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	'98	1.8	3.1	nd	0.3	1.4	nd
	'97	3.4	3.1	nd	1.7	2.5	nd
	'96	not surveyed	2.3	nd	0.74	1.6	nd
	'95	17	18	nd	nd	0.48	nd
	'94	not surveyed	not surveyed	nd	not surveyed	not surveyed	nd
In Kobe City	'98	2.7	3.8	tr	not surveyed	not surveyed	nd
	'97	1.7	9.4	nd	3.1	3.1	nd
	'96	4.7	1.7	nd	not surveyed	nd	nd
	'95	4.4	3.0	nd	not surveyed	not surveyed	nd
	'94	2.8	5.3	nd	0.075	not surveyed	nd
In Takamatsu City	'98	0.38	0.66	nd	0.13	0.24	nd
	'97	4.4	3.5	nd	0.14	0.1	nd
	'96	0.60	1.3	nd	0.30	0.42	nd
	'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	'98	2.1	1.5	nd	not surveyed	not surveyed	nd
	'97	13	7.6	tr	1.8	2.4	nd
	'96	0.48	1.1	nd	0.13	0.24	nd
	'95	0.88	0.49	tr	0.28	0.25	nd
	'94	0.43	0.98	nd	0.42	1.9	nd
Geometric mean	'98	1.7 (2.4)	1.5 (1.8)	tr (tr)	0.73 (1.63)	0.94 (1.7)	nd (nd)
	'97	2.2 (3.2)	1.4 (3.1)	tr (tr)	0.61 (1.6)	0.74 (1.5)	nd (nd)
	'96	0.51 (1.0)	0.89 (1.1)	tr (tr)	0.40 (0.50)	0.53 (0.84)	nd (nd)
	'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 (1.8)	nd (nd)

Calculation conditions

- ① Measured values of each point are arithmetic means of individual data which were treated by conduct of the unified detection limit
- ② 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.
- ③ The value of the geometric mean are the geometric mean of the arithmetic means of each household. As reference the arithmetic values of all data are indicated in parentheses. In that case nd is calculated as half of the detection limit.
- ④ 15 m³/man·day was used for inhalation volumes per person a day. Exposures in general air and indoor air were calculated by multiplying each concentration and inhalation volume together.
- ⑤ Measurements of general air were performed in the neighborhood areas of measuring points of indoor air, but not identical
- ⑤ Exposures in meals were actual measured values (including values via drinking water.)