6. Comparison of the Fiscal 1998 and Fiscal 1999 Surveys

In A and B regions of the Nose Town area in Osaka Prefecture and in A1 and B regions of the Saitama Prefecture areas, measurements of blood, air, and so on were carried out on the same study subjects and the same locations in fiscal 1999 as in fiscal 1998. This allows the two surveys to be compared.

Analysis and Evaluation

(a) Blood

For this survey, a total of 45 subjects who had also participated in the fiscal 1998 survey had the concentration of dioxins in their blood measured again.

In the Nose Town area in Osaka Prefecture, the concentration of PCDD+PCDF+Co-PCB in fiscal 1999 had declined since fiscal 1998. However, the difference observed was not significant. In the Saitama Prefecture areas, the values for both fiscal 1998 and 1999 were similar.

(b) Air

For this survey, the concentrations of dioxins in the air were measured again at a total of twenty locations used previously in fiscal 1998.

In the Nose Town area of Osaka Prefecture, there was virtually no change in the concentrations of PCDD+PCDF+Co-PCB.

In the Saitama Prefecture areas, on the other hand, the concentrations of PCDD+PCDF+Co-PCB in the A regions had declined in fiscal 1999 while those in B regions had increased. The difference was not significant in any regions.

(c) Indoor Air

For this survey, the concentrations of dioxins in indoor air were measured again at a total of twenty locations used previously in fiscal 1998.

In the Nose Town area of Osaka Prefecture, the concentration of PCDD+PCDF+Co-PCB had become conspicuously higher in fiscal 1999. However, this was thought to be affeted by an outlier.

In the Saitama Prefecture areas, on the other hand, this concentration displayed the same trend as the concentrations in air.

(d) Soil

For this survey, the concentrations of dioxins in the soil were measured again at a total of twenty locations used previously in fiscal 1998.

In the Nose Town area of Osaka Prefecture, the concentration of PCDD+PCDF+Co-PCB had decreased in fiscal 1999 in the A region, while it had increased in the B region there and in the A regions in the Saitama Prefecture areas. The difference was not significant in any of these regions.

(e) Ground Surface Sampling

For this survey, the concentrations of dioxins were measured again by ground surface sampling at a total of twenty locations used previously in fiscal 1998.

The concentrations of PCDD+PCDF+Co-PCB in the B region of the Nose Town area of Osaka Prefecture had decreased conspicuously in fiscal 1999, while it had increased in the A regions in the Saitama Prefecture areas. The difference was not significant in any of these regions.

(f) Food

For this survey, the concentrations of dioxins in food were measured again for a total of 42 subjects who had also cooperated in the fiscal 1998 survey.

The concentrations of PCDD+PCDF+Co-PCB had decreased in all regions in fiscal 1999, but the difference was not significant.

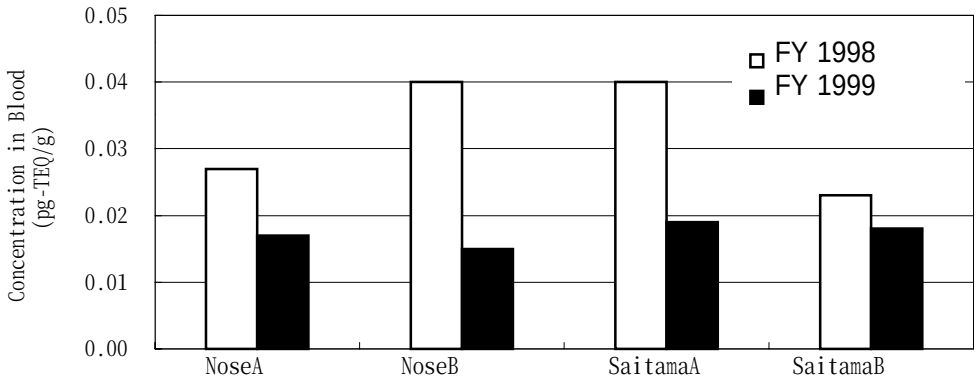
Summary

Comparison of the findings from the fiscal 1999 survey and the fiscal 1998 survey showed that there were no regions displaying significant differences under any survey items. However, it is necessary to remember that the surveys are based on a limited number of specimens.

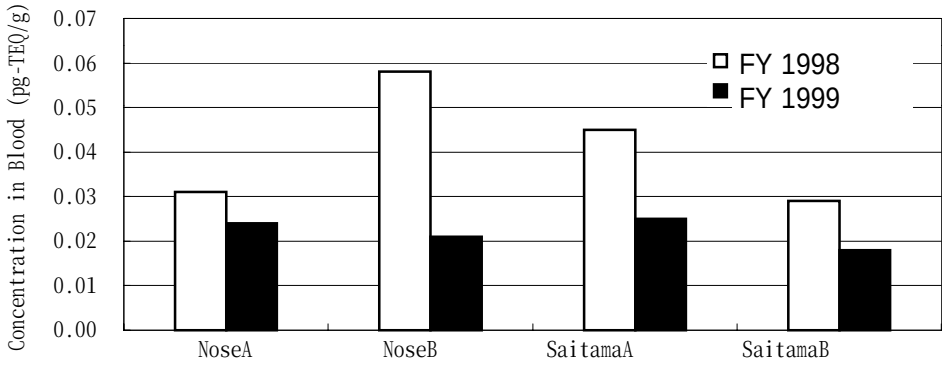
Table 6-1. Concerning the Difference in Mean Concentrations of Dioxins between Fiscal Years Surveyed

Item		Osaka Prefecture Nose Town				Saitama Prefecture			
		A region		B region		A region		B region	
		FY 1998	FY 1999	FY 1998	FY 1999	FY 1998	FY 1999	FY 1998	FY 1999
Blood	No. of samples	12	12	11	11	12	12	10	10
	Mean	40	31	37	32	26	27	26	25
	S.D.	29	21	17	16	13	12	12	7.7
Air	No. of samples	4	4	5	5	7	7	4	4
	Mean	0.10	0.062	0.069	0.064	0.67	0.37	0.59	0.74
	S.D.	0.080	0.010	0.0059	0.0088	0.11	0.37	0.13	0.025
Indoor air	No. of samples	6	6	6	6	7	7	4	4
	Mean	0.11	0.10	0.065	0.74	0.27	0.19	0.28	0.38
	S.D.	0.043	0.064	0.038	1.7	0.074	0.16	0.096	0.074
Soil	No. of samples	4	4	6	6	6	6	4	4
	Mean	12	6.0	11	26	31	45	6.8	8.8
	S.D.	13	6.0	18	42	19	36	3.3	10
Surface sampling	No. of samples	4	4	5	5	6	6	4	4
	Mean	15	14	180	1.4	25	39	8.6	6.6
	S.D.	25	25	390	2.2	17	39	8.1	5.8
Food	No. of samples	11	11	9	9	12	12	10	10
	Mean	0.058	0.040	0.097	0.036	0.083	0.045	0.052	0.035
	S.D.	0.024	0.027	0.050	0.013	0.081	0.033	0.021	0.011

PCDDs+PCDFs



Co-PCBs



PCDDs+PCDFs+Co-PCBs

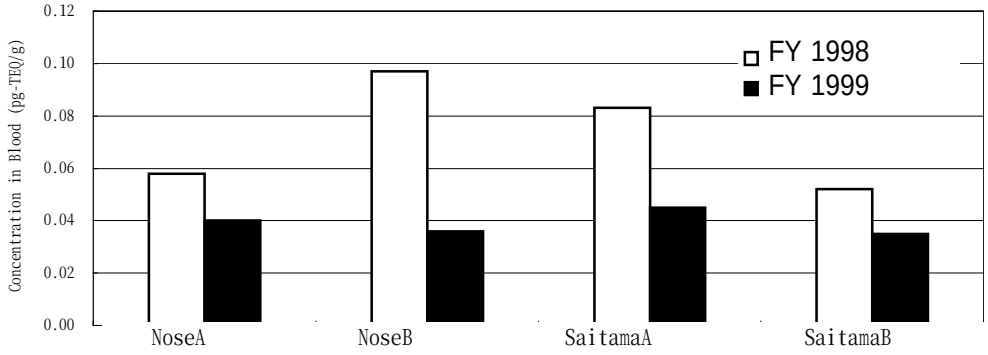


Figure 6-1. Comparison by Area of Concentrations of Dioxins in Blood (Toxic Equivalent)

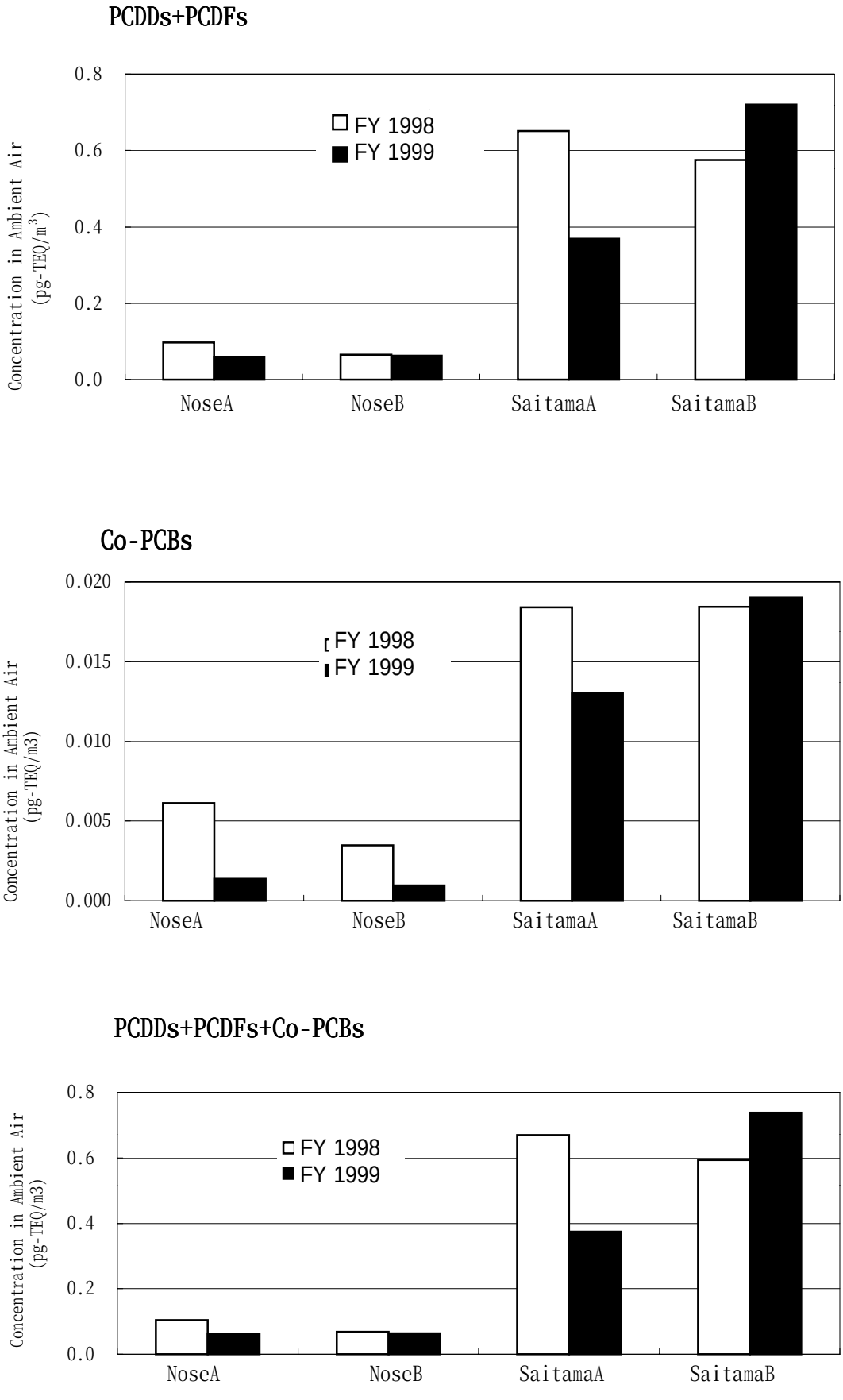


Figure 6-2. Average Concentration of Dioxins in Ambient Air by Area and Fiscal Year

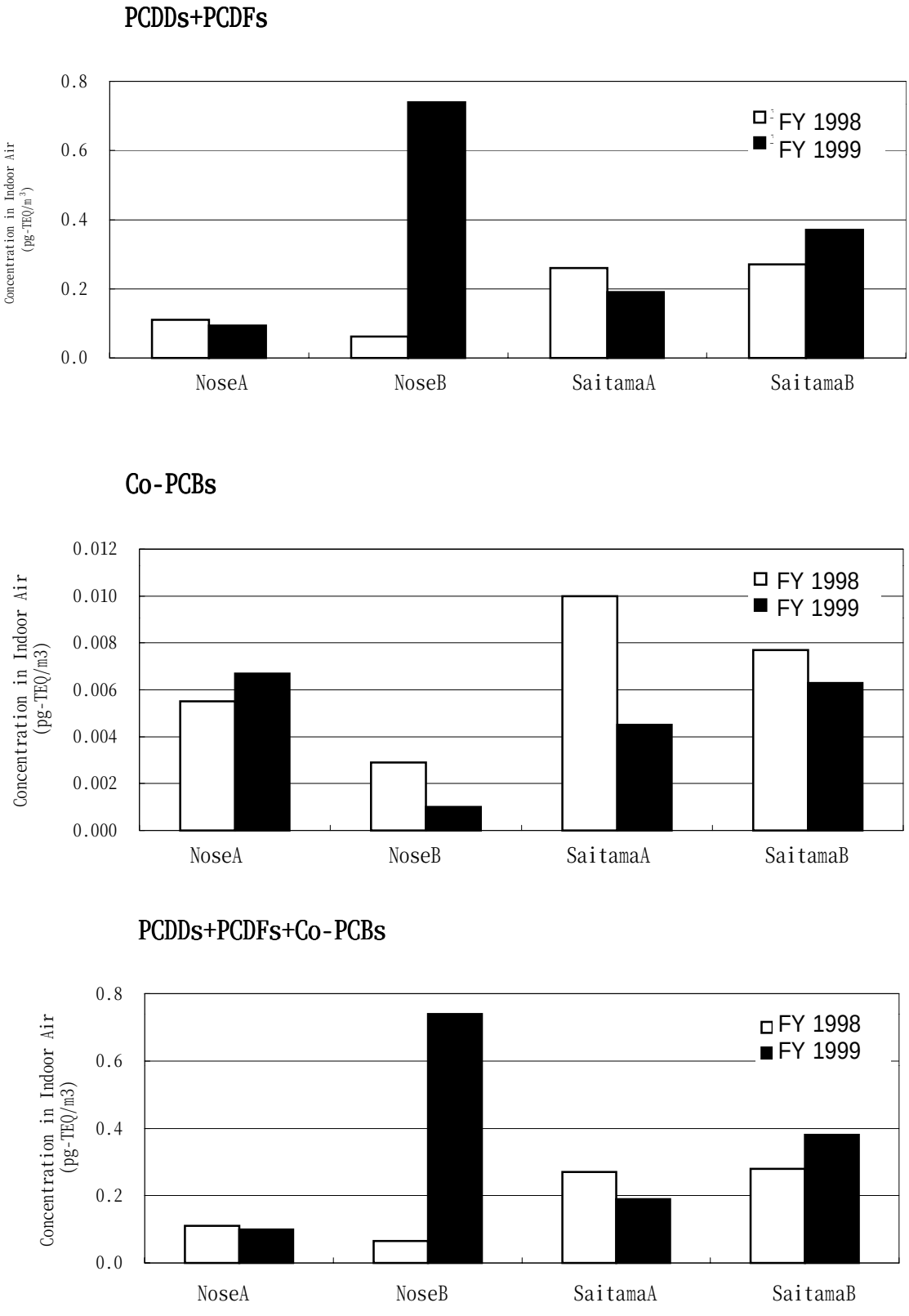


Figure 6-3. Average Concentration of Dioxins in Indoor Air by Area and Fiscal Year

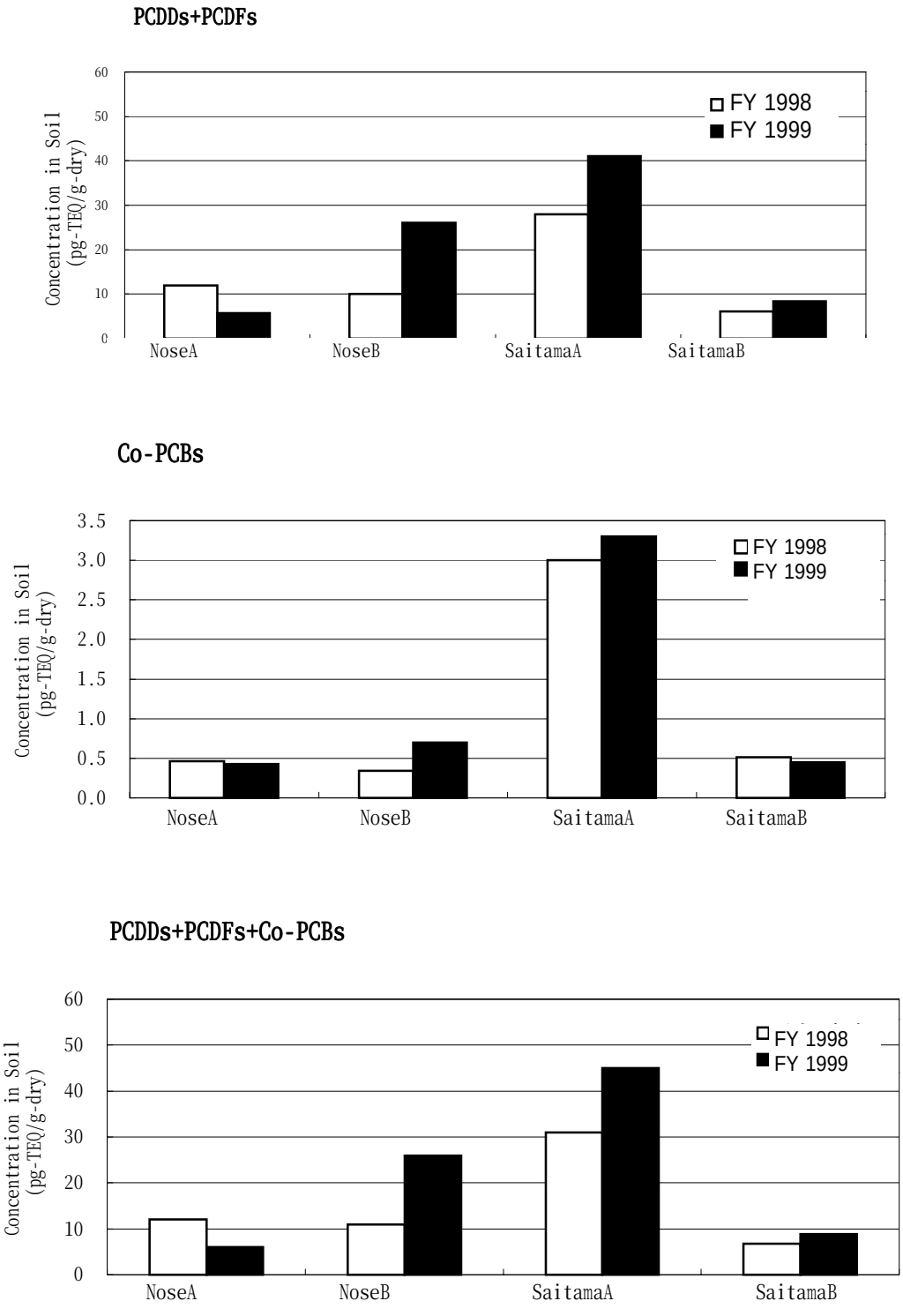


Figure 6-4. Average Concentration of Dioxins in Soil by Area and Fiscal Year

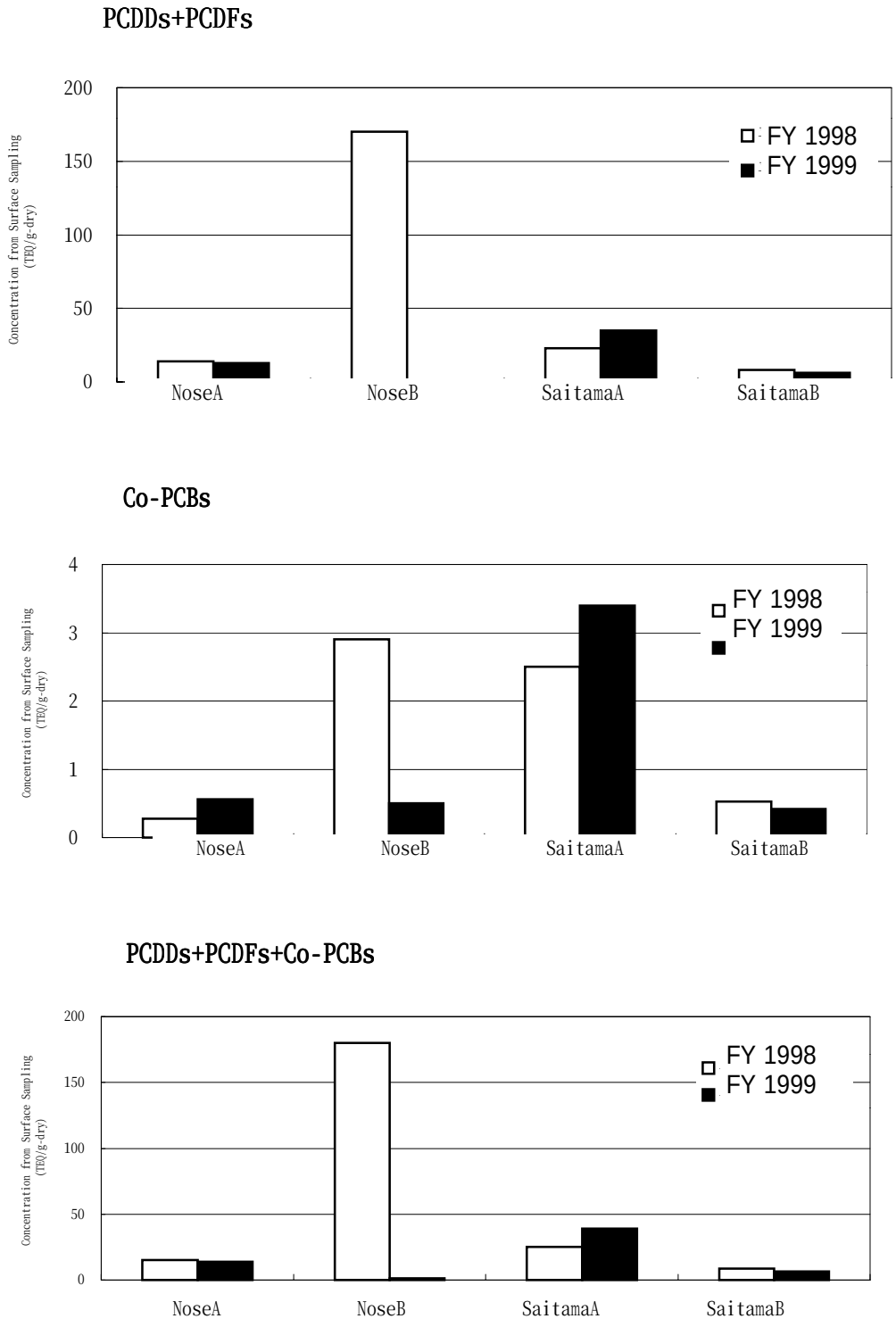


Figure 6-5. Average Concentration of Dioxins from Surface Sampling by Area and Fiscal Year

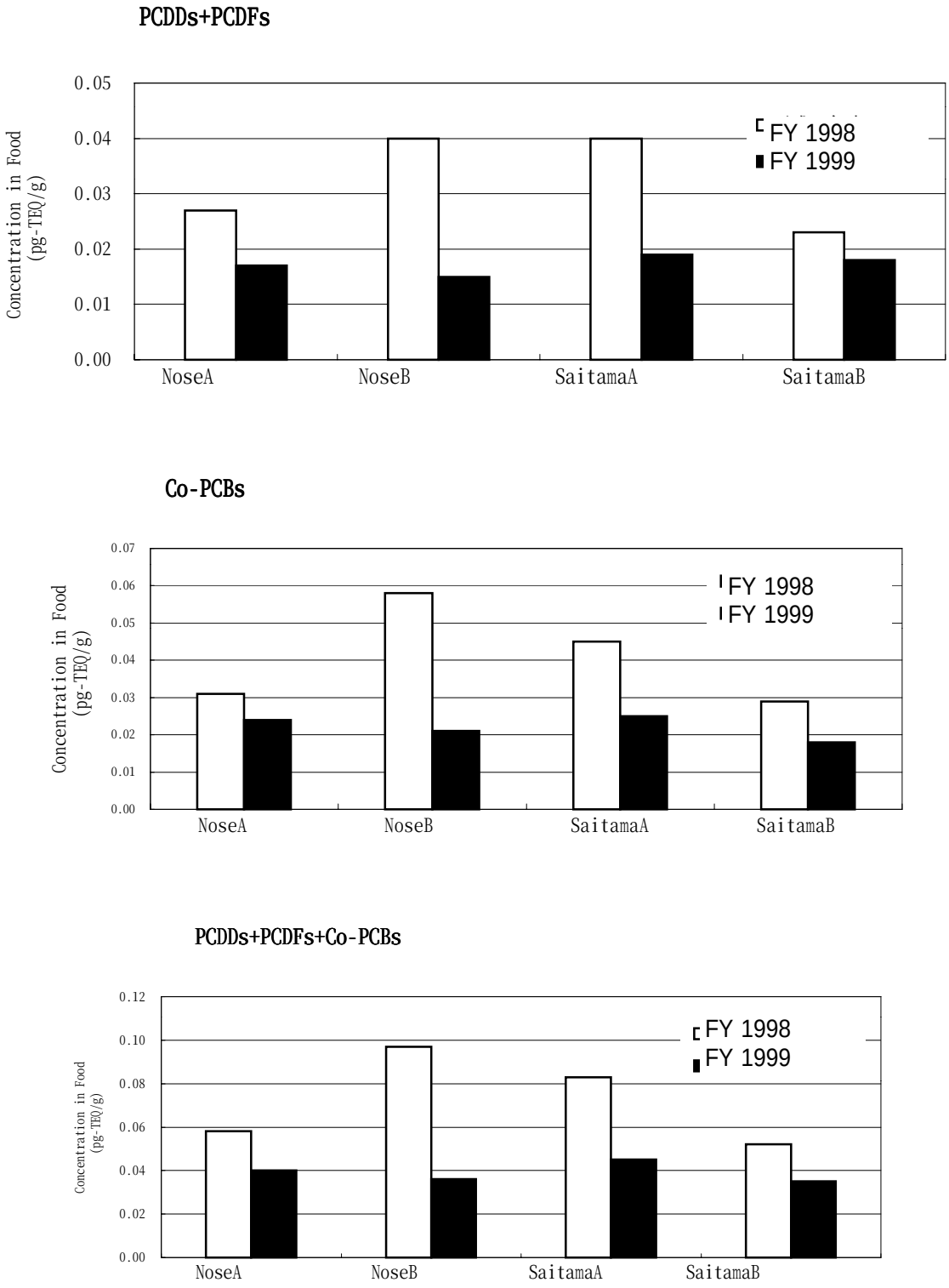


Figure 6-6. Average of Individual Measurements of Concentration of Dioxins in Food by Area and Fiscal Year

IV. Quality Control

The measurement of PCDD+PCDF and Co-PCB requires sophisticated technology, and quality control of the data is extremely important. Quality control for this survey was based on the quality control for measurement dioxin concentrations in environmental media for the Fiscal 1997 Comprehensive Pilot Survey of Dioxins. Specifically, as a means of internal quality control, written plans for quality control of data at each step were drawn up by the survey implementing organizations, including sample collection, pre-treatment, and analysis. Measurements were made according to these plans. Further, as a means of external quality control, experts made inspections at the implementing organizations, and also conducted detailed checks of measurement results.

In addition, examinations were made in advance of the blood measurement techniques, including the use of blank tests, pre-treatment and measurement techniques. The survey implementing organizations themselves conducted repeated measurements of dioxins in blood samples to confirm their reproducibility. They also made measurements of standard samples from the National Institute for Environmental Studies in order to confirm that they were able to make accurate measurements. Only after taking these steps did they conduct measurements of the blood from the subjects of the present survey. Furthermore, some of the samples were measured twice, and the results showed good reproducibility.

V. Summary

The findings of the Fiscal 1999 Detailed Study of Dioxin Exposure (in blood, air, soil, food, and so on) were summarized comprehensively in this report.

This study included surveys of blood to determine dioxin accumulation in human subjects as well as surveys of the environment and food to estimate dioxin exposure levels over time for different exposure routes. The results do not show any clear difference between test and control regions in the dioxin accumulation in human subjects, or in the estimated total exposure through the exposure routes studied.

Attachment 1 Method for Estimating Individual Exposure through Different Routes

Individual exposure amounts were estimated from the food, air, indoor air, and soil measurement results. The methods used to estimate exposure from each route are as shown below.

The results of calculation do not take absorption rates into consideration.

(a) Exposure through Food

This was calculated by multiplying the concentration of dioxins in food by the daily amount of food ingested, then dividing by the body weight of the individual subject.

Exposure from food (pg-TEQ/kg/day)	=	Concentration of dioxins in food (pg-TEQ/g)	×	Daily amount of food ingested (g/day)	÷	Individual body weight (kg)

Notes:

1 Adjustment was made for individuals from whom part of the food ingested during the three-day period could not be collected (see main text).

2 Analysis of alcoholic drinks and juices detected virtually no dioxins. As a rule, therefore, alcoholic drinks and juices were not included in survey samples. When collected food samples included some portion of these items, however, that portion was included in the analysis.

(b) Exposure through Air (Ambient and Indoor Air)

Exposure through air was calculated on the assumption of a daily respiration volume of 15 m^3 and a body weight of 50 kg. The following three cases were postulated for the length of time spent indoors and outdoors:

Case 1: The logs of everyday activity were used to determine the length of time each survey subject spent indoors and outdoors.

Case 2: Time spent outdoors was set as 4 hours, and time indoors as 20 hours.

Case 3: Time spent outdoors was set as 24 hours.

$$\text{Exposure through air (pg-TEQ/kg/day)} = \frac{\text{Concentration of dioxins in air (pg-TEQ/m}^3\text{)} \times \text{Daily respiration volume (m}^3\text{/day)} \times \frac{\text{Time spent outdoors}}{24} + \text{Concentration of dioxins in indoor air (pg-TEQ/ m}^3\text{)} \times \text{Daily respiration volume (m}^3\text{/day)} \times \frac{\text{Time spent indoors}}{24}}{\text{Body weight (kg)}}$$

c) Exposure through Soil

Exposure through soil was calculated on the assumption of a body weight of 50 kg and a daily ingestion of soil of either 100 mg (Case 1) or 50 mg (Case 2).

Exposure through soil (pg-TEQ/kg/day)	=	Concentration of dioxins in soil (pg-TEQ/g)	×	Daily ingestion of soil (g/day)	÷	Body weight (kg)