Technical Data

Factors Used for the Estimation of Radioactive Nuclide Intake through Foodstuffs by Inhabitants in Coastal Area of Ibaraki Prefecture (VII)

—The Consumption of Leaf Vegetables and Milk by Infants in Tokai Village—

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Survey on the consumption of leaf vegetables and milk by infants was carried out in Tokai village, which was one of the parameters used for the estimation of thyroid dose caused by iodine-131 released from stacks of nuclear facilities into the air. It was observed that unweaned babies had no leaf vegetables and were fed on milk only. The daily intake was estimated roughly as 1.1 liters. After weaning leaf vegetables consumption by infants increased with the age. On the contrary, milk consumption decreased with the age. The consumption of leaf vegetables and milk by each age group was as follows; 20 g/d/p and 600 ml/d/p for 0.5 to 1.5 years, 25 g/d/p and 300 ml/d/p for 1.5 to 3 years, 35 g/d/p and 300 ml/d/p for 3 to 5 years, and 50 g/d/p and 300 ml/d/p for 5 to less than 6 years old, respectively.

KEY WORDS: dietary survey, consumption of leaf vegetables, milk, by infants, iodine-131, parameter.

I INTRODUCTION

Iodine-131 is one of the noticeable gaseous radioactive nuclides released from stacks of nuclear facilities because of its biomedical characteristics lying in the fact that iodine is selectively taken up and concentrated by thyroid gland. The nuclide is transferred to human body through skin, inhalation and food.^{1,2)} Among them it is supposed that the path through foods, but notably the milk and leaf vegetables, must be most suspicious, as shown in a previous paper.³⁾ In general, however, Japanese take milk much less than Westerners and therefore it is considered that the leaf vegetables must be critical. So the first survey³⁾ was done

on the harvest around the nuclear site in Tokai village and on the consumption by inhabitants over school age. On the other hand, it has been pointed out that a special attention must be paid to the radiation caused by iodine-131 to thyroid gland of infants because they have small thyroid gland and the consequent high radiation dose. This survey, therefore, was designed to provide needed information on the consumption of leaf vegetables and milk by infants.

II METHOD

The survey was done seasonally from autumn of 1974 to summer of 1975 in Tokai village where several nuclear facilities were situated. An investigator made a house-to-house visit to ask for keeping note on leaf vegetables and milk consumptions for two successive weeks a season. about forty infants were surveyed in a season, but the recovery of the note fluctuated somewhat with the seasons. The intake of breast milk was estimated

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from the number of nursing times and the suckling volume a nursing time.⁴⁾ The consumption of powdered milk was presented as the volume of reduced milk.

III RESULTS AND DISCUSSION

In the previous report,³⁾ the consumption of leaf vegetables was surveyed on three kinds of families, that is, fisherman's, farmer's including side-work farmer's and the office worker's families whose constituents were employed by Japan Atomic Energy Research Institute. It was expected that the farmer's families should have much of leaf vegetables because they could take their domestic products at any time they wanted. Unexpectedly, the office worker's families showed the highest consumption. This survey was done on the infants of those families. Table 1 shows the seasonal variations of average daily intake of leaf vegetables by each age group. Unweaned babies

take no leaf vegetables. After weaning the consumption rises with the age. It is observed that the leaf vegetables consumption is low in summer and high from autumn to winter. Such seasonal variation is obviously recognized for the infants over 1.5 years old. On the contrary, those of less than 1.5 years old show a constant intake. This suggests that the infants up to 1.5 years old are carefully fed by their mothers. Table 2 shows the average daily intake of each leaf vegetables. Three kinds of leaf vegetables, chinese cabbage, spinach and cabbage, are taken well through a year, followed by lettuce. It is also observed that leaf beet is preferably consumed in summer though not shown in Table 2. Table 3 shows the consumption of milk by each age group. Unweaned babies are fed on milk only. Though the consumption rises gradually with the months after birth, the daily intake of milk is estimated roughly as 1.1 liters. Coming to the weaning period babies

Table 1 Seasonal variations of average daily intake of leaf vegetables by infants in Tokai village.

Age of infants	Average daily intake (g/d/p)				
	Spring	Summer	Autumn	Winter	Annual ave.
0 ~ <0.5	0	—	0	0	0
0.5 ~ <1.5	20	20	20	15	20*
1.5 ~ <3	25	15	30	30	25
3 ~ <5	25	15	40	50	35*
5 ~ <6	45	30	60	50	50*

* Represented in approximate figures.

Table 2 Average daily intake of each leaf vegetable by infants.

Age of infants	Average daily intake (g/d/p)				
	Chinese cabbage	Spinach	Cabbage	Lettuce	Others
0.5 ~ <1.5	3	5	6	0	6
1.5 ~ <3	5	5	7	1	7
3 ~ <5	8	6	8	4	7
5 ~ <6	8	6	15	4	13

Table 3 Average daily intake of milk by infants in Tokai village.

Age of infants	Average daily intake (ml/d/p)				
	Spring	Summer	Autumn	Winter	Annual ave.
0 ~ <0.5	1100	—	1200	1000	1100
0.5 ~ <1.5	600	650	550	650	600*
1.5 ~ <3	350	350	300	250	300*
3 ~ <5	200	350	250	300	300*
5 ~ <6	200	300	350	300	300*

* Represented in round numbers.

Table 4 Composition of milk intake by babies.

Composition	Number of babies	
	0~0.5	0.5~1.5
Breast milk only	2	0
Breast milk and powdered milk	2	1
Breast milk and market milk	0	1
Powdered milk only	1	3
Powdered milk and market milk	0	6
Market milk only	0	16

begin to have their meal, but they still depend upon milk. In general, the consumption of milk decreases with increasing amount of meal. The daily intake of milk by babies from 6 months to 1.5 years old can be made an estimate as about 600 ml. Over 1.5 years old the infants show almost constant milk intake of about 300 ml/d/p, though there is more or less an individual difference. There are three kinds of milk those infants take, that is, breast milk, powdered milk and market milk. **Table 4** shows the consumption of

milk intake by infants. Unweaned babies are mostly fed on breast milk and partially on powdered milk. After weaning they are fed on powdered milk and gradually shifted to market milk. Over 1.5 years old they take mainly market milk. **Table 5** represents the composite consumption of leaf vegetables and milk by each age group, which is useful for the estimation of the ingestion of iodine-131 released from stacks of nuclear facilities into the air. Because of a short half-life of the nuclide, however, the intake through powdered milk is negligible. There are a few farms for producing cow's milk near the nuclear sites in Tokai village. All of them are of small scale. Besides the raw milk produced there is transported to a milk plant and mixed there with that produced in the other districts. So it is considered that the ingestion of iodine-131 through market milk is also actually negligible. Special attention, however, must be paid to the private consumption by the farmer's family. The result of the survey shows that the children of the farm's took about 600 ml of fresh milk every day.

Table 5 Composite consumption of estimated critical food by infants.

Age of infants	Average daily intake of		Remarks
	Leaf vegetables (g/d/p)	Milk (ml/d/p)	
0 ~ <0.5	0	1100	Mainly breast milk
0.5 ~ <1.5	20	600	Powdered milk to market milk
1.5 ~ <3	25	300	Mainly market milk
3 ~ <5	35	300	Market milk
5 ~ <6	50	300	Market milk

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