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Environmental Health Aspects of Organochlorine Insecticides Residued in Okinawa. Preliminary Report: Comparison of Epidemiological Background in Okinawa vs. Japan

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Introduction

As the result of nation-wide epidemiological surveys made by the Ministry of Health and Welfare, strict administrative and legal actions were taken to prohibit production and utilization of the residual organochlorine insecticides in 1971 in Japan. Thereafter remarkable decrease of residual levels has been reported.¹⁾ Based on the findings of the surveys, it was concluded that the contamination of human milk, beef and cow's milk with organochlorine insecticides especially with BHC was mainly due to the food chain, in short, tremendous amount of crude manufactured BHC, of which only gamma isomer has toxicity, was used for rice field and cows and cattles were fed with these rice straw BHC contaminated, and then BHC had moved to milk and tissues which were finally taken by man.²⁾

Under the United States Administration from 1945 through May 1972, Okinawa had been executed similar regulations on agricultural chemicals to Japan. The Government of the Ryukyu Islands had, therefore, made a partial amendment of the Agricultural Chemical Regulation Law concerning organochlorine insecticides in 1971 as well as in Japan without carrying out any area-wide surveys on actual residual levels of the insecticides. Since then it has been left unknown up to present.

From the facts, however, that great quantities of organochlorine insecticides had been used for about twenty five years from 1945 through 1970 for agricultural and public health purposes, environmental pollution with the insecticides can be foreseen in great certainty in Okinawa too.

As the actual levels of the insecticides residued in the environment of Okinawa will be reported in a seperate article, comparison of epidemiological background of the problems with Japan has made in this report.

Method and materials

Comparison has made on three main epidemiological factors; structure of agriculture, usage of organochlorine insecticides for agricultural and public health purposes, and structure of food consumption.

Materials and sources referred were as follows; Annual Statistical Report of Okinawa Prefecture, Statistics of Japan, History of Plant Quarantine Administration in the Ryukyus, Annual Report of Health Statistics, Reports on National Dietary Surveys (1969-1970), Yearly Foreign Trade Statistics Tables, Government of the Ryukyu Islands (1966-1970), etc.

Results and discussion

I. Structure of agriculture

Composition of cultivated areas by crops³⁾ is shown in Fig. 1. In Japan, as rice is the most important agricultural products, rice field stands first, 47.4 percent of total cultivated areas, followed by 15.0 percent of feed and fertilizer and 11.0 percent of vegetables. On the contrary, in Okinawa industrialized crops represented by sugar cane account for 62.8 percent, followed by 13.7 percent of fruits representzd by pineapple. Rice is comparatively less important in Okinawa. In a word, agriculture of Okinawa is characterized by monoculture composed of sugar cane and pineapple.

II. Usage of organochlorine insecticides for agricultural purpose

Concerning the relationship between structure of agriculture and usage of organochlorine insecticides, DDT and BHC were used for rice and vegetables, great quantities of BHC

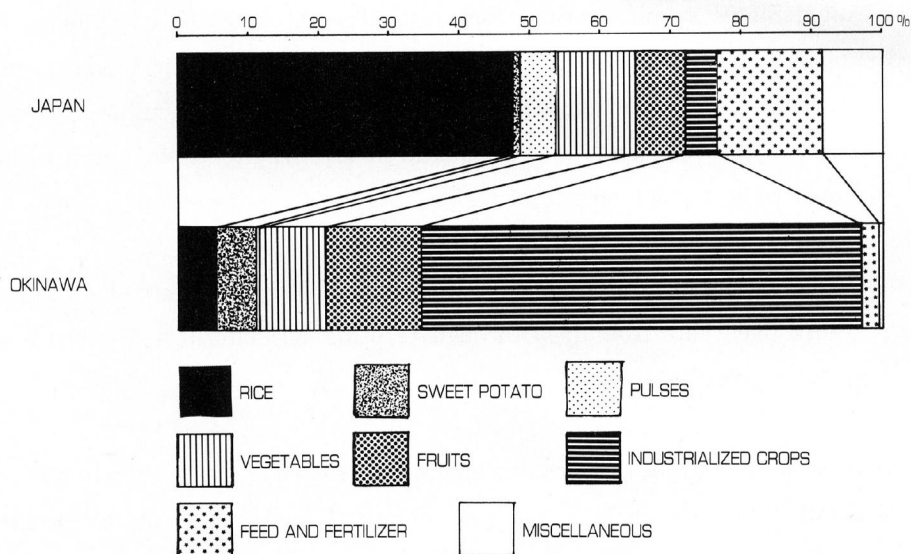


Fig. 1. Composition of cultivated areas by crops (1974)

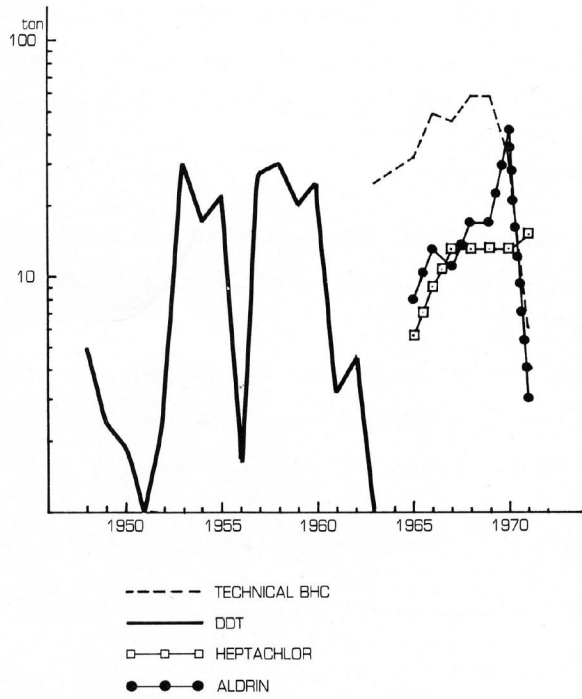


Fig. 2. Usage of organochlorine insecticides in Okinawa (1948-1971)

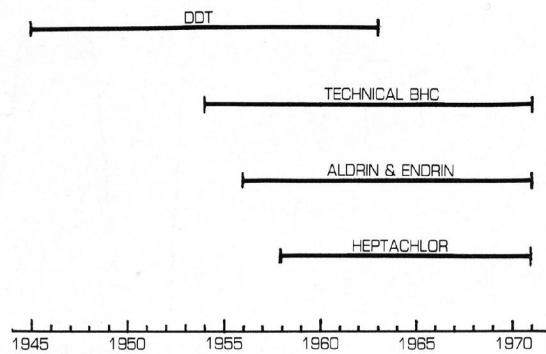


Fig. 3. Application period of organochlorine insecticides in Okinawa

including alpha, beta, gamma and delta isomers had been used for insects control of rice.^{4,5)} Utilization of these cost-cut production of technical BHC led to high concentration in meat, cow's milk and human milk in Japan.⁶⁾

In Okinawa, on the other hand, rice stands for only 5.3 percent of all cultivated areas and it has less significance in the process of environmental pollution with BHC. Nematocides such as aldrin, dieldrin and heptachlor are rather significant than BHC in view of environmental health in Okinawa, because of their utilization of great quantities and long periods for control nematodes of sugar cane, pineapple and sweet potato.

II-1. For public health purpose

Great quantities of organochlorine insecticides had been used in Okinawa to eradicate the mosquito born diseases such as malaria, filariasis and Japanese B. encephalities until legal action was taken in 1971.

As malaria had been endemic in Yaeyama and Miyako Islands since 19th century and been obstruction for health of inhabitants and community development, DDT had been used for the malaria eradication program from 1945 to 1962. As be shown in Fig. 4,

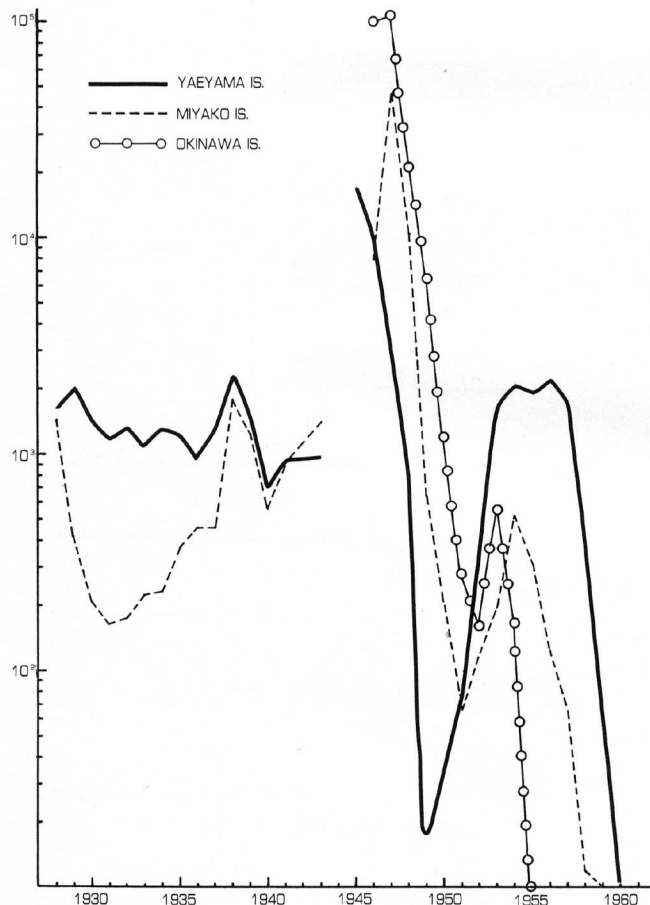


Fig. 4. Number of malaria cases in Ryukyu Islands (1928-1961)

epidemic malaria outbreak occurred at war time and immediately after the World War II in all over the Islands. Prevalence of malaria in Yaeyama had reached a level of 538.2 per 1,000 inhabitants and mortality rate was 117.1 per 1,000 in 1945. In Miyako and Okinawa Islands, it had reached levels of 708.8 and 314.2 respectively in 1946. In Okinawa Island, however, DDT was introduced by United States troops when they had landed to the Island April 1945 and intensive mosquito control measures were initiated consisting of airplane spraying of DDT for malaria control.^{10, 11)} These early countermeasures had resulted great success with complete termination of transmission in 1955.

In Yaeyama and Miyako Islands, however, no successful antimalaria works had been done until the introduction of DDT in 1948. From 1948 to 1956, it had placed great emphasis on larval control. On the basis of epidemiological assessment in 1956, the Government of the Ryukyu Islands had established new antimalaria program which need house-to-house spraying of DDT.^{12, 13)} As the result of the most advanced operation of malaria eradication program at that time, malaria had disappeared from Miyako Island in 1959 and from Yaeyama in 1962.

III. Structure of food consumption

Meat and meat products are consumed twice in Okinawa as much as in Japan as be shown in Table 1. Out of meat and meat products, pork is the most favorite by both

Table 1 Consumption of meat (gram/man/day), 1970

	Okinawa*(a)	Japan(b)**	a/b x 100(%)
Beef	8.2	6.78	120.9
Pork	32.5	15.11	215.1
Poultry	5.5	9.15	60.1
Other Meat	1.2	2.83	42.4
Ham and Sausage	23.8	7.63	311.9
Canned Meat	7.8	1.03	757.3
Total Intake	79.0	42.52	185.8

* Okinawan Diet Survey (1970), Department of Health and Welfare, Government of the Ryukyu Islands

** National Diet Survey (1970), Ministry of Health and Welfare, Government of Japan

people, but intake of it is 32.5 g per man per day in Okinawa and contrary to 15.1 g in Japan.^{14, 15)} Followed by ham and sausage of 23.8 g in Okinawa and only 7.6 g in Japan. Beef is consumed as much as in Japan. Canned meat is consumed 7.6 times in Okinawa compared with that in Japan. Poultry is, however, consumed one half of Japan in Okinawa.

Table 2. shows the order of preference of meat and meat products in Okinawa and her self-supporting rate.¹⁶⁾ In consequence of low self-supporting rate, large portions of beef, manufactured meat and poultry are dependent upon importation from foreign countries.¹⁷⁻²¹⁾

Table 2 Self-Supporting Rate of Meat in Okinawa (1970)

Pork	107.8%
Meat Prepared	8.0
Poultry	62.4
Beef	7.9
Edible Offals	96.7

Source: Okinawa Development Agency

Table 3 Meat Imported to Japan and its Share of Okinawa (1975)

	All Japan(a)	Okinawa(b)	b/a x 100 (%)
Beef	44,923	6,230	13.9%
Pork	124,513	1,655	1.3
Poultry	20,630	2,814	13.6
Mutton	130,770	6	0.005
Ham	737	481	65.3
Bacon	1,389	1,189	85.6
Sausage	1,116	542	48.6
Canned Beef	1,104	943	85.4
Cornebbef d	363	151	41.6
Luncheon meat	5,064	4,429	87.5

Source: Okinawa Development Agency

Ninety two percent of beef consumed in Okinawa depends upon importation of which 85.9 percent is from Australia and 9.8 percent is from the United States. On importation of meat products such as ham, bacon, sausage and canned meat, 62.3 percent is from Denmark, 11.0 percent is from Japan mainland and 6.8 percent is from the United States. Poultry is imported 96.0 percent from the United States and 3.3 percent is from Japan mainland.

The trend of meat consumption in Okinawa has never changed even after the reversion of her administrating authority from the United States to Japan May of 1972. Different trend of meat consumption is also revealed from the share of meat and meat products imported to Japan including Okinawa since 1972.²²⁾ In 1975, for instance, Okinawa shares

87.5 percent of pork products representing luncheon meat imported, 85.6 percent of ham and bacon, and 85.4 percent of canned beef respectively. Importation of these pork products and canned beef is mainly from Denmark.

Summary

Different structure of agriculture led to the different application of insecticides. Great quantities of not refined technical BHC had been used for insects control of rice in Japan and nematocides representing aldrin had been used for sugar cane and pineapple in Okinawa to the contrary. DDT had also been used to eradicate epidemic malaria for about twenty years in Okinawa.

Although beef had played a very important role in residual levels of organochlorine insecticides in Japan, the pattern of consumption of meat differs in Okinawa from that of Japan. Pork is supplied locally in sufficient, but beef, pork products prepared and poultry depend upon importation from Australia, the United States and Denmark.

Based on these facts the author have obtained suggestions that the levels and patterns of organochlorine insecticides residued in the environment of Okinawa are subject to the influence of those in the United States, Australia and Denmark, and are different from those in other parts of Japan.

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