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A FIVE-YEAR IMMUNOLOGICAL FOLLOW-UP STUDY OF THE INSTITUTIONALIZED HANDICAPPED CHILDREN VACCINATED WITH LIVE VARICELLA VACCINE OR INFECTED WITH NATURAL VARICELLA

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Twenty-two institutionalized handicapped children who were susceptible to varicella were vaccinated with live varicella vaccine of the Oka strain and their immune status was followed for 5 years under conditions without exposure to natural varicella. Simultaneously, 7 children infected with natural varicella were followed.

Of the 22 vaccinees, 16 showed sero-positive conversion by the fluorescent antibody to membrane antigen (FAMA) test, the other 6 remaining seronegative during 5 years of observation period. All the 16 cases showing seroconversion had detectable antibody for 5 years after vaccination, and 14 of them gave a positive reaction in the varicella skin test. All the 7 cases after natural varicella gave positive reactions in both the FAMA and skin test. These results suggest that immunity conferred by the vaccination would persist long even in the absence of exposure to natural varicella, though further follow-up studies are needed.

INTRODUCTION

Between January and March 1975, a varicella epidemic occurred in one of the three wards of an institution for handicapped children in Fukuoka city, and susceptible children were

vaccinated with live varicella vaccine. As we reported previously, live varicella vaccine of the Oka strain was effective in preventing the spread of varicella among susceptible children, and there was no contact infection from vaccinees to susceptible children (Ueda et al., 1977). Because there was no subsequent outbreak of varicella in the institution, a five-

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year follow-up study was made on the vaccinees and the children who had been infected with natural varicella.

MATERIALS AND METHODS

The Institution for Handicapped Children in the Minami-Fukuoka National Chest Hospital has 3 wards (I, II, III), each accomodating 40 children of

2 to 19 years old. There were 12 cases of varicella in Ward II in January and February 1975 and 51 children without a history of clinical varicella were then vaccinated with live varicella vaccine in March and November 1975 (Ueda et al., 1977). The live varicella vaccine used was the Oka strain (Takahashi et al., 1974, 1975), which contained approximately $10^{2.0}$ TCID₅₀/0.1 ml. Twenty-two vaccinees and 7 children after natural varicella were followed up for 5 years.

TABLE 1. *Five-year follow-up of institutionalized handicapped children vaccinated with live varicella vaccine of the Oka strain or infected with natural varicella*

Group	Case No.	Fluorescent antibody titer to membrane antigen (FAMA)							Varicella skin test reaction
		0	1/2 yr	1 yr	2 yr	3 yr	4 yr	5 yr	5 yr
Vaccine recipients	1	<4	32	16	16	8	4	8	+
	2	<4	32					8	+
	3	<4	16					8	+
	4	<4	32		8	8			+
	5	<4	8	4	4	4		8	+
	6	<4	4	8	4	4	8	8	+
	7	<4	64			128			+
	8	<4	16	8	8	8	4	4	+
	9	<4	16		8	8	4	4	+
	10	<4	16					8	+
	11	<4	16			8		4	+
	12	<4	16		8	4	4	8	+
	13	<4	8	8	4	4	4	4	+
	14	<4	16		8		4	8	+
	15	<4	16	8	8		8	8	—
	16	<4	16		8			8	—
	17	<4	<4	<4	<4	<4	<4	<4	+
	18	<4	<4	<4	<4	<4	<4	<4	—
	19	<4	<4	<4	<4	<4	<4	<4	—
	20	<4	<4	<4	<4	<4	<4	<4	—
	21	<4	<4	<4	<4	<4	<4	<4	—
	22	<4	<4	<4	<4	<4	<4	<4	—
Children with natural varicella	1	<4	16	8	8	8	8	16	+
	2	<4	32			16	16	32	+
	3	<4	16	8	8	16	16	32	+
	4	<4	8	8	8	8	8		+
	5	<4	8	8				8	+
	6	<4	8			8	8	8	+
	7	<4	8			8	8	16	+

Serum specimens were obtained from all these 29 children before vaccination or infection with natural varicella and also 1-6 times in the period from 1975 to 1980 for tests on the antibody against varicella by the fluorescent antibody to membrane antigen (FAMA) test. A skin test was also performed on all these children with varicella skin test antigen (Kamiya et al., 1977; Asano et al., 1981). Reactions were evaluated according to the criteria of Kamiya et al. (1977). The FAMA test was performed at the Research Institute for Microbial Diseases, Osaka University following the method of Baba et al. (1984).

RESULTS

The serum antibody titers of individual children for varicella by the FAMA and varicella skin tests are shown in Table 1. Among the 22 vaccinees followed for 5 years, 16 showed seropositive conversion of the FAMA antibody titer. ($>1:4$) and the other 6 cases remained seronegative ($<1:4$). All the 16 showing seroconversion had detectable FAMA antibody during the 5 year-follow period. The 6 children who showed no seroconversion remained negative throughout the follow-up period. All the 7 children with natural varicella infection showed seroconversion and remained seropositive during the follow-up period.

Of the 16 cases with persistent antibody, 14 gave a positive reaction in the varicella skin test done 5 years after vaccination. All 7 children with natural varicella infection gave positive skin test reaction.

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DISCUSSION

The persistence of immunity after vaccination with live varicella vaccine of the Oka strain should be pursued for its practical use. Asano et al. (1983) reported that healthy children immunized with varicella vaccine of the Oka strain were fully protected against natural infection for at least 5 years, and that both with and without known exposure to natural varicella afterwards the antibody levels of these vaccinated children were well maintained. In the present study, all the 16 cases showing seroconversion by the FAMA test after vaccination were found to have substantial antibody 5 years after vaccination in the absence of immune-booster by known exposure to natural varicella.

Initially, 6 of the 22 vaccinees failed in seroconversion after the vaccination. This might be due to insufficient viral dose of the liquid vaccine which is extremely heat-labile, or depressed immunity of the handicapped vaccinated subjects. These 6 cases remained seronegative during observation period of 5 years which suggests that no natural infection including subclinical infection occurred in the institution during that period.

The results of this five-year follow-up study support the finding of Asano et al. (1983) on the long lasting immunity by the vaccination. However, negative skin test was found in 2 of the 16 vaccinees who showed persistence of FAMA antibody, which suggest the need for further follow-up studies on the vaccinees.

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