

Title	Protective Effect of Immediate Inoculation of a Live Varicella Vaccine in Household Contacts in Relation to the Viral Dose and Interval between Exposure and Vaccination
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### PROTECTIVE EFFECT OF IMMEDIATE INOCULATION OF A LIVE VARICELLA VACCINE IN HOUSEHOLD CONTACTS IN RELATION TO THE VIRAL DOSE AND INTERVAL BETWEEN EXPOSURE AND VACCINATION

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The protective effect on 45 household contacts of immediate inoculation of a live varicella vaccine was examined in relation to the viral dose and days after exposure to varicella. The viral doses used were 300 PFU to 15,000 PFU, and the intervals between exposure and vaccination were 0 to 5 days. All 30 contacts given viral doses of 800 to 15,000 PFU within 3 days after exposure were protected from clinical varicella. With lower viral doses of 300 to 600 PFU within 3 days after exposure, 6 of 10 contacts developed rashes 13 to 25 days after vaccination, but all showed mild symptoms. When vaccine was given 5 days after exposure, even with a dose of 1,500 to 4,000 PFU, typical varicella symptoms appeared 6 to 9 days after vaccination. These results suggest that vaccination of household contacts with viral doses of over 500-800 PFU within 3 days after exposure is effective in preventing manifestation of clinical varicella and that clinical symptoms may be modified to a mild form by vaccination with even a lower viral dose when given within 3 days after exposure.

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Live varicella vaccine of the Oka strain

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(Takahashi et al., 1974) has been safely and effectively used for hospitalized children with various underlying diseases, and spread of varicella in a ward was prevented by vaccination of susceptible children within a few days

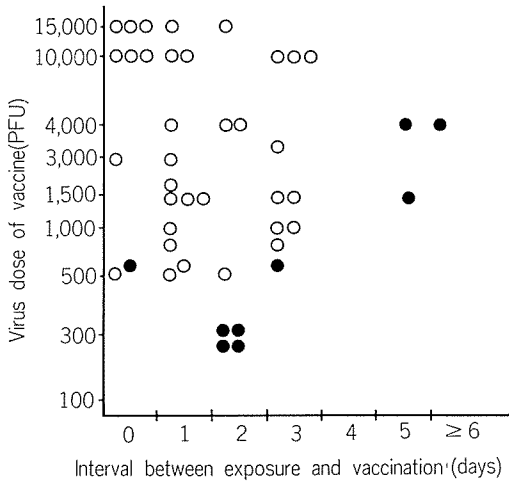


FIGURE 1 Protective effect of immediate varicella vaccination to household contacts in relation to viral dose, interval between exposure and vaccination. symbols: ○ no varicella symptom; ● with varicella symptom.

after exposure. Its effectiveness has also been demonstrated on household contacts of varicella when it is given promptly (Asano et al., 1977). The present paper reports more detailed studies of its effect on household contacts when given at different doses, and at different days after contact.

The virus doses of the vaccine used were

300 to 15,000 PFU. When a child with varicella came to the pediatric out-patient clinic of Kariya Toyota Hospital near Nagoya, susceptible siblings were given the vaccine at various viral dose. Vaccination was carried out with informed consent of the parents and clinical observations were performed by the mothers at home. Sera were obtained before and one month after vaccination, and examined by the neutralization test. The vaccinated subjects ranged in age from 6 months to 7 years, most being between 2 and 4 years old.

Results on the protective effect in relation to the viral dose and the interval between exposure and vaccination are shown in Fig. 1. Eleven of the 45 children exhibited symptoms of varicella 3 to 25 days after vaccination, and data on these children are given in Table 1. Results on two children (case Nos. 10 and 11) who showed typical varicella symptoms were omitted from Fig. 1, because these children developed symptoms as soon as 5 to 6 days after the index case; they had probably been exposed to the same sources to which the index cases were exposed. Six children (case No. 1-6) showed mild symptoms of varicella with a somewhat prolonged incubation period. Three children (case No. 7-9) vaccinated 5 to

TABLE 1. Cases that developed varicella symptoms after prompt inoculation of varicella vaccine

Case	Age (yr)	Sex	Vaccine (PFU/dose)	Days between exposure and inoculation	Days between inoculation and onset of varicella	Clinical symptoms	
						Rash (number of rash)	Fever
1	5	F	300	1	17	Vesicles (10)	-
2	2	F	300	1	25	Vesicles (7-8)	-
3	1	M	300	1	16	Vesicles (5-6)	-
4	1	F	300	1	13	Vesicles (7)	-
5	5	M	600	3	13	Erythema (10)	-
6	2	F	600	0	15	Erythema (6-7)	-
7	3	M	1500	5	8	Vesicles (Countable)	-
8	4	F	4000	5	9	Vesicles (Numerous)	+
9	9	F	4000	6	6	Vesicles (Numerous)	+
10	3	F	4000	0	6	Vesicles (Numerous)	+
11	1	F	4000	2	3	Vesicles (Numerous)	+

6 days after exposure exhibited typical varicella symptoms, though they received vaccine with a high viral dose. The other 34 children who received the vaccine within 3 days after exposure were free from varicella symptoms. The minimum viral dose required to prevent the disease in household contacts was 500 to 800 PFU.

The following hypothesis may explain why immediate vaccination was effective in the prevention of natural infection. In natural infection, a long period, probably 5 to 7 days, may be required for a wild virus to propagate

in the respiratory tract before dissemination in the body. In contrast, the vaccinated virus may elicit humoral and cellular immunity in a shorter period. Cellular immunity was detected by the skin test as early as 5 days after vaccination (Baba et al., 1978) and neutralizing antibody was detected 7 days after vaccination (Kamiya et al., 1977). These earlier inductions of humoral and cellular immunity by vaccination would lead to prevention of propagation and dissemination of wild virus, which otherwise would cause clinical manifestations.

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