

Duration of Virus Excretion in the Throat of Asymptomatic Household Contacts of Smallpox Patients

J.K. Sarkar*, A.C. Mitra† and M.K. Mukherjee‡

Department of Virology, School of Tropical Medicine, Calcutta and Regional Smallpox Reference Centre, Government of India.

Received for publication, January 19, 1974.

Serial examination of throat swabs of household contacts of smallpox patients were made to find out the duration of variola virus excretion, if any, in their throat. Of the 51 contacts, five were found to excrete virus. One of the virus-positive contacts was not available for prolonged study. Three excreted virus till the 21st day, and the fourth till 6th day of illness of their index cases. The log titre of virus ranged from 1.54 to 3.30 per swab.

Introduction

In tracing out the source of infection of a smallpox case it is customary to search for another patient from whom the new case might have imbibed the virus. While considering the source of infection, the household contacts of smallpox cases are not usually taken into account. In a recent communication (Sarkar et al., 1973a), it has been shown that variola virus could be isolated from the throat of about 10 per cent of household contacts, very few of whom subsequently developed the diseases. The findings were based on single examination of the throat swabs and therefore the period of infectivity of the throat could not be ascertained. The purpose of the present work was to find out the duration of excretion of the virus in the throat of the virus positive contacts.

Material and Methods

The smallpox patients whose contacts were studied have been designated as 'index' cases. The latter included the hospitalised patients as well as those encountered during the visit to the infected localities. The word 'contact' in this work has been used to denote a person belonging to the family of a virologically proved smallpox case, living in intimate contact with the case, and on many occasions, sleeping in the same room with the patient.

*Professor of Virology.

†Research Officer, W.H.O. Research Project on Smallpox.

‡Demonstrator.

Presence of vaccination scar was taken as the evidence of primary vaccination history of re-vaccination or its timing was not recorded, because the disease occurred generally in people of very low socio-economic status and the statement of the family members on this point was not dependable. However, all the contacts, unvaccinated or vaccinated long ago were given vaccination after the first specimen from them were collected. Day of contact was calculated from the day of onset of fever of the index cases.

Throat swabs were collected on alternate days for about two weeks and the visits were continued for another week to find out if any of the contacts developed smallpox. But because many of the latter were daily wage earners, some of them were not available on all the days of the visits. Before swabbing the throat, the cotton swabs were soaked in Hank's Basal Salt Solution (BSS) containing 0.5 per cent bovine serum albumen and antibiotics (penicillin and streptomycin). The specimens were immediately placed in ice containers and brought to the laboratory. The swabs were dipped and squeezed in one ml. of Hank's BSS and the fluid was preserved at -20°C . till inoculation. Inoculation of eggs and pock counts were made in the standard manner followed previously (Sarkar and Mitra, 1967). The identification of variola virus was made on the characteristics of growth on the chorioallantoic membrane (CAM).

Results

Out of 51 contacts examined, throat swabs of five were positive for variola virus. The results of studies on these five are shown in the Table. One of the five (Serial No. 4) left Calcutta for his native home 3 days after his first specimen was collected, was reported to have developed smallpox at his home. The other four did not develop the disease. Of these, Serial Nos. 1-3 live in the same room with the index case, whereas Serial No. 4 lived in the room opposite to that of the patient. Throat swabs of seven other contacts of index Case No. 1 and eight of the index Case No. 2 did not show presence of variola virus. All the five virus positive contacts had old marks of primary vaccination.

Discussion

In the present work, 5 out of 51 contacts examined demonstrated presence of virus in their throat. Serial Nos. 1-3 were found to excrete virus till the 21st day after the onset of fever of their index case whereas Serial No. 5 did not excrete virus after the 6th day of illness of her index case. As the contacts were examined only after the hospitalisation (on 10th day for index Case No. 1 and 4th day for index Case No. 2) of the index cases, the total period of virus excretion by the contacts cannot be stated.

The potentiality of the household contacts with presence of virus in the throat to spread smallpox cannot be denied. This is more so because, unlike the smallpox patients, the movement of the family members of the patients is never restricted. Even if any outsider visits the house of a smallpox patient he is likely to come closer to other family members than to the patient. The quantum of virus excreted in the throat has definitely a bearing on the infectivity. Log titre of virus per swab varied from 1.54

Virus Excretion in Smallpox contacts

Table I. Log titre of virus excreted in the throat of contacts on different days after the onset of fever of the index cases.

Sl. No. of household contacts	Age in years and sex	Sl. No. of case and clinical type	Days																							
			5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
1	23 Male	Discrete	..	..	..	..	..	..	..	..	1.87	..	1.85	..	1.84	..	1.70	..	1.54	..	0	..	0	..	0
2	22 "	—do—	..	..	..	..	..	..	..	..	2.95	..	2.93	..	2.93	..	1.90	..	1.55	..	0	..	0	..	0
3	24 "	—do—	..	..	..	..	..	..	..	..	..	..	3.30	..	2.90	..	2.00	..	2.00	..	0	..	0	..	0
4*	45 "	—do—	..	..	..	..	..	..	..	..	1.70	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	28 Female	Haemorrhagic	..	1.81	..	..	..	..	0	0	..	0	..	..	..	..	..	..	..	..	..	..	..	..	..

*Left Calcutta on the 15th day and was reported to have developed smallpox on the 19th day of onset of fever of the index case.

to 3·30. The concentrations of virus in the throat are not very high but it should be remembered that similar concentrations were found in the throat of a few of the smallpox patients (Sarkar et al., 1973b). Furthermore, presence of live virus in the throat, even in low titre always carries the risk of transmission of infection, however, small that risk may be.

Regarding vaccination status all the positive contacts had primary vaccination marks, but dependable history about revaccination was not available. It was shown before (Sarkar et al., 1973a) that both the vaccinated and unvaccinated contacts of smallpox cases could excrete virus in the throat although the percentage of the former was much less than that of the latter. As the Contact No. 4 developed smallpox subsequently it may be presumed that he had been vaccinated many years ago, may be in his childhood. The statement of Contact No. 5 a private nurse by profession, that she had been re-vaccinated almost every year, may be relied on, and this fact might have bearing on the transient nature of her carrier state.

It is needless to add that the possibility of the symptomless household contacts spreading the infection, as a result of virus excretion in their throat for a number of days will complicate issues like tracing the source of infection of a smallpox case or determining the incubation period of cases infected by these contacts, but the possibility if kept in mind will help solving occasional problems arising on these issues.

Acknowledgment

We are grateful to Dr. D.A. Henderson and Dr. I. Arita of Smallpox Eradication Unit, Geneva for their help and advice and to the staff of the Infectious Diseases Hospital, Calcutta for their co-operation. The work was supported by a grant from the Smallpox Eradication Unit of the WHO, Geneva.

References

- Sarkar, J.K., Mitra, A.C., Mukherjee, M.K. and De, S.K. 1973a. Virus excretion in the throat of household contacts of smallpox patients. **Bull WHO** (In press).
- Sarkar, J.K. and Mitra, A.C. 1967. Virulence of variola virus isolated from smallpox cases of varying severity. **Indian J Med Res** **55**, 13-20.
- Sarkar, J.K., Mitra, A.C., Mukherjee, M.K., De, S.N. and Mazumdar, D. 1973b. Virus excretion in the throat, urine and conjunctive of smallpox cases. **Bull WHO** (In press).