

BRIEF COMMUNICATION

Effect of bee envenomation on local tissue response in varicella

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A case of chickenpox is presented, occurring in a 9-year-old boy in whom the skin of the left forearm had been injured by bee stings one week prior to varicella vesiculation. The alteration in the response to the disease in the area of prior injury is discussed, and some of the factors involved in this response are presented.

The appearance, course, and distribution of the vesicular lesions of chickenpox are familiar and generally predictable. The most common variation is probably in the number of lesions from patient to patient. The dermatologic complications are also usually recognizable when they do occur. The disease has been observed to appear in conjunction with scarlet fever (personal observation) or measles or^{1, 2} to be secondarily infected with staphylococci and other bacteria. Artenstein and Weinstein¹ reported 5 cases in which measles preceded chickenpox. Their cases were relatively severe but without modification of the vesicular distribution. Knight² reported on a patient in whom measles *followed* chickenpox where the measles rash "failed to involve concentric zones of skin around healing chickenpox lesions". Among possible causes they suggested the possible presence of interferon in the locality of the healing vesicles.

Hemorrhagic phenomena are not infrequent. Rivers and Tillett³ have reported that the lesions may be more profuse in areas of nonspecific skin irritation, in acne eruptions, and beneath adhesive bandages. They concluded that the localization of the virus of varicella in the skin is influenced by irritation and is increased where blood flow to skin is increased, offering this as indirect evidence that the virus is in the blood.

Robinson⁴ reported the case of an 8-year-old boy in whom a Zoster distribution of vesicles appeared in the right cervical area 6 days after the onset of the disease. He noted the occurrence of Zoster associated with disease or injury of

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the spine, x-ray therapy, or lumbar puncture and suggested Zoster is caused by activation of latent chickenpox virus, possibly in ganglia. In the case he reported, he stated there was no evidence to indicate the stimulus which led to reactivation.

Generally, however, marked variation in the distribution of the lesions of varicella is rare. This report concerns a patient in whom tissue injury occurred from a bee sting during the incubation period of chickenpox. Although residual visual evidence of tissue damage from the bee venom had disappeared prior to manifestations of chickenpox, changes that occurred in the skin did influence its response to virus penetration. The following is a report of the case and a discussion of the possible tissue reaction involved.

Case report

T. A., a 9-year-old Caucasian boy, was stung 3 times on the left forearm by a bumble bee, *Hymenoptera bombus*, on September 9, 1967. He had no systemic reaction, and the resultant swelling and erythema was completely absent one week later when, on September 16, he began to erupt with chickenpox. His illness was relatively mild, but he was brought to the office on September 19 because of the number of lesions on his left forearm. Examination showed approximately 150 vesicles in the general area where he had been stung (Fig. 1). In contrast, there were 7 vesicles on the right forearm. The vesicles did not otherwise appear unusual, and their course and resolution were essentially the same as those on the rest of his body. Recovery was uneventful.



Fig. 1

Note cluster of vesicles in envenomed area. The discoloration is due to application of calamine lotion.

DISCUSSION

Although some smaller viruses may be free in the blood, according to Mims,⁵ the chickenpox virus belongs to a larger group that appears to be carried by leukocytes. In this manner the cell-borne viruses apparently penetrate capillary walls and invade the surrounding tissue where they may enter dermal and epidermal cells, proliferate, and infect additional nearby cells. The familiar vesicular lesion is the result.⁶

Variations in the usual epidermal response to infection with other virus diseases have also been observed. The eruptions of measles have been noted to be numerous in the area about a positive Mantoux test.⁷ The response to smallpox vaccination may be more severe in a patient with leprosy, and the leprosy lesions themselves may exacerbate during the reaction to the vaccine.⁸ The production of skin lesions can be altered by injected drugs such as has been done experimentally with pox virus by hyaluronidase.^{5, 10} Small inert particles, such as colloidal mercuric sulfide injected intravenously, can be seen to cluster about the site in the animal's skin where it has been injected with histamine or serotonin.⁹

The constituents of bee venom bear an interesting relation to these observations.

Venom contains¹¹: (1) histamine, 5 hydroxytryptamine, acetylcholine; (2) enzymes, as hyaluronidase, phospholipidase, proteinases, and oxidases; and (3) proteinlike compounds of high toxicity.

Factors to consider in this case appear to include:

1. Hyaluronidase and other substances in the venom decrease the viscosity of the ground substance, facilitating movement of inflammatory cells through it. In this case the large number of skin lesions reflects the ease with which the cell-borne virus passed from capillary through the ground substance and into the dermis.
2. The number of skin lesions is related to the number of leukocytes carrying virus into the tissue, the ease with which these cells leave the capillaries, the rapidity of movement through the ground substance, and the number of dermal and epidermal cells invaded.

The biologically active substances present in bee venom greatly influence the number of lesions about the envenomed site. The sequence of events following the sting may be somewhat as follows: Tissues react with mast cell degranulation and release of heparin which appears to prevent widespread dissemination of the venom by strengthening the ground substance.¹² Within the envenomed area, however, the venom's hyaluronidases increases the permeability of the ground substance. Capillary dilatation caused by the histamine in the venom increases local blood flow. The effect of the venom's strong cellular toxins and the accompanying increased capillary permeability resulting from histamine combine to deliver a large number of leukocytes to a site where ground substance passage has been facilitated. In this case the patient had viremia, and the leukocytes, responding normally, carried their passengers, the varicella virus, with them into the site of the bee sting.

This case of varicella was felt to be of interest because of the clustering of vesicles in the area injured by bee venom one week prior to the eruption. It is also hoped that the observation of this relationship between prior injury and virus invasion may add something to the understanding of the mechanism of virus migration in tissues and to the tissue response to injury via envenomation.

We would like to express appreciation to Dr. R. D. Higgenbotham, University of Louisville School of Medicine, for assistance in preparation of this article.

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