PAPULAR URTICARIA*

ITS RESPONSE TO TREATMENT WITH DDT AND THE ROLE OF INSECT BITES IN ITS ETIOLOGY

BERTRAM SHAFFER, M.D., MALCOLM C. SPENCER, M.D., AND HARVEY BLANK, M.D.

Although many methods of treatment for papular urticaria have been advocated, the results have been variable and often equivocal (1–10). Because this disease is known to occur chiefly in children of poor social and economic status, and because it is prevalent especially in the spring, summer, and fall seasons, one of us (B. S.) suspected that insects, particularly fleas and/or bedbugs, might be important in its etiology. This idea had been advanced previously by other investigators, particularly by Continental and English writers, and recently by Lumsford (3, 4, 6, 11, 12, 13, 14, 15, 16).

Proceeding upon the above hypothesis, we have successfully treated papular urticaria with DDT in a lotion or dusting powder, and as a household spray.

CLINICAL DATA

During the warm weather seasons of 1946 and 1947, 69 patients suffering from papular urticaria were examined. All except 5 of these individuals were children between the ages of 2 months and 13 years. The incidence of the disease in this group (Table I) indicates that except for sporadic cases it begins in March, reaches its peak in June, July and August, and disappears by October.

Because it was suspected that fleas and bedbugs were the etiologic agents of the disease, the parents of 66 of these patients were questioned about the presence in their homes of cats, dogs, collections of sand, and other sources of fleas and bedbugs. It was found that 55 patients had been exposed to sources of these insects. Dogs were in direct or indirect contact with the patients in 27 cases, cats in 33 cases, and collections of sand in 6 cases. The actual presence of fleas was observed in 21 cases, while bedbugs were reported in 3 instances.

These data show that an overwhelming majority of the patients were exposed to sources of these pests.

Forty-one of the patients were treated as follows:

DDT powder in calamine lotion, in talc, or in an aqueous emulsion of triethanolamine, was prescribed, to be applied three times a day to the general cutaneous surface. In addition, the parents of each child were given the following instructions:

* From the Department of Dermatology and Syphilology, Hospital of the University of Pennsylvania (Dr. Donald M. Pillsbury, Director).

Received for publication July 9, 1948.

1 The common cat and dog flea—Ctenocephalides felis and C. canis. The human flea—*Pulex irritans.*

2 Cimex lectularius.

3 Dichlorodiphenyltrichloroethane.
Your child has a condition which at times results from insect bites. These insects include dog, cat, house, sand, and human fleas, as well as bedbugs.

It is necessary, therefore, for you to remove all sources of these insects.

This may be done in the following manner:

A spray consisting of 5 per cent DDT in Flit is to be used daily in your household. Certain portions of your household should receive careful and more intensive treatment. They are (1) the baseboards, (2) the cellar, (3) the bed frame, and (4) upholstered furniture.

Collections of sand should be removed. All contact with dogs and cats should be avoided.

**TABLE I**

*Seasonal incidence of 69 cases of papular urticaria*

<table>
<thead>
<tr>
<th>Month</th>
<th>No. of Cases</th>
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<tbody>
<tr>
<td>Jan.</td>
<td>5</td>
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<tr>
<td>Feb.</td>
<td>10</td>
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<td>Mar.</td>
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<td>Apr.</td>
<td>20</td>
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<td>May</td>
<td>25</td>
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<td>June</td>
<td>10</td>
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<td>July</td>
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<td>Aug.</td>
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<td>Sept.</td>
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<td>Oct.</td>
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<td>Nov.</td>
<td>5</td>
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<td>Dec.</td>
<td>10</td>
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**TABLE II**

*Results of treatment with DDT lotion and DDT household spray*

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<thead>
<tr>
<th></th>
<th>Total Cases Examed</th>
<th>Cured</th>
<th>Improved</th>
<th>Not Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>30</td>
<td>10</td>
<td>15</td>
<td>5</td>
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<tr>
<td>2 weeks</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>0</td>
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<td>1 mo. or more</td>
<td>10</td>
<td>5</td>
<td>5</td>
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In 33 of the 41 cases so treated, a follow-up observation was made one week or more after the institution of treatment (Table II). Twenty-six patients were examined one week after treatment began. Seventeen showed complete response to treatment in that no new lesions were apparent and that the original lesions
TABLE III
Results of treatment of 121 consecutive cases of papular urticaria demonstrating seasonal incidence and period of treatment

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<th>Jan</th>
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<th>Apr</th>
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<td>88 cases treated with modalities other than DDT</td>
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<td>Not Improved</td>
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<th>Jan</th>
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<tbody>
<tr>
<td>33 cases treated with DDT</td>
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showed definite evidence of involution. In all these cases, pruritus was completely relieved. Seven patients showed improvement, as indicated by diminution in the incidence of new lesions, partial relief of itching, and a variable response in the old lesions. In two instances no improvement was apparent.

Sixteen patients were seen two weeks after initiation of treatment. Of this group, 13 were classified as cured, 2 as improved, and 1 as not improved.

One patient (R. B.) who had shown no improvement after an examination at one week, was found by a social worker to have been living alternately in two households where there was unavoidable contact with cats and dogs, and where the treatment routine was not adequately carried out. The second patient (M. A.) who had failed to respond to treatment after one week was found to be cured after three weeks.

Fifteen patients were examined one month or more after the beginning of treatment. All were classified as cured.

The final results of treatment in patients followed one week or more (Table III) indicated that all but two were eventually cured. These two could be followed only one and two weeks respectively, but showed improvement at the time of observation.

The records of 88 consecutive cases of papular urticaria treated by other methods during the years 1939 to 1945 inclusive were reviewed as controls. These data are shown in Table III, which presents the period of treatment and seasonal occurrence of each case reviewed (both controls as well as experimental cases).

In the experimental group, 31 of 33 patients treated were cured. The average period of time for cure was 2.3 weeks. By contrast, only 19 of the 88 control cases were classified as cured. The period of time for cure in the control group averaged 10.9 weeks.

**SKIN TESTS**

In order to demonstrate the etiologic mechanism of this disease suggested by the therapeutic results, a number of patients were tested to flea and bedbug antigens. In these tests, 0.1 cc. of the antigen was injected intradermally. The results were read 48 hours later.

Originally, flea antigen was prepared by us according to the technique of Cherney (17 and 18). Later, it was supplied by Eli Lilly and Company as a stock antigen. Bedbug antigen was prepared in accordance with Peck's technique (19).

Preliminary testing of normal individuals with these antigens indicated that a 1:50 dilution of the flea antigen as prepared by us, the full-strength flea antigen as prepared by Lilly, or the 1:50 bedbug antigen prepared by us were not likely to give a positive reaction (indicated by the development of a papule 7 or more mm. in diameter).

Using the above preparations and a 1:10,000 tricresol solution as a control, we tested 17 normal children in the manner previously described. Two children showed a positive reaction to flea antigen, none to bedbug antigen. It may be

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4 Eli Lilly and Company, Indianapolis, Indiana.
significant that the two subjects showing positive reactions to flea antigen gave a history of having been bitten by fleas many times in the past. All tricresol control tests were negative. Eleven adults were tested to flea antigen alone. In all these tests the results were negative.

On the other hand, when 16 patients with papular urticaria were tested to flea antigen, the readings were positive in 12 cases. When 10 of these 16 patients were tested to bedbug antigen, 3 had positive reactions. One of these 3 had also shown a positive reaction to flea antigen. Therefore, 14 of the original group of 16 patients showed skin sensitivity to either or both of these antigens, as demonstrated by skin testing. Additional tests for appraising the general non-specific reactivity of the skin of these patients were performed on 8 of the above 16 cases. An injection of 0.02 cc. of stock silk antigen and Coca's solution was given intradermally. After 15 minutes these control tests were negative.

DISCUSSION

Dietrich (13) studied the reactions of patients with papular urticaria to the placement of the insects directly on the individual's skin. By this method, he demonstrated that in a group of 77 patients with papular urticaria, 19 cases were due to bedbug bites, 51 to flea bites, and 7 cases to the bites of both the flea and the bedbug. Hamburger (12, 14) agrees with these findings, and believes with Dietrich that papular urticaria is the result of an idiosyncrasy to the bites of fleas and bedbugs which develops at an early age but disappears later in life.

In an attempt to correlate the seasonal incidence of papular urticaria with variations in the incidence and activity of fleas and bedbugs, personal communications were obtained from several recognized authorities (20, 21, 22, 23). All indicated that there was a definite seasonal variation in the abundance of human, cat, and dog fleas, the three species which attack human beings in the Eastern United States. These pests are most troublesome during the months of July, August, and September. It was the opinion of one authority (22) that these species of fleas are almost wholly absent during the period from December 1 to May 1. In general, no true seasonal incidence has been observed for bedbugs. It is well recognized, however, that in unheated buildings these insects survive the winter in states of considerably reduced activity (20, 23). Those of our cases of papular urticaria which we believed to be of bedbug etiology did come from under-privileged neighborhoods with heatless homes.

A small group of individuals was tested to the antigens of these insects. The high incidence of reactivity (14 out of 16 patients with papular urticaria) as compared to a control group of normal individuals (2 positive in 28 cases) seems to indicate that patients with papular urticaria are abnormally reactive to the antigens of these pests.

It is not impossible that papular urticaria may be a cutaneous syndrome or a pattern reaction to which a number of etiologic agents contribute. Our own experience, however, leads us to believe that all, or most, of our cases resulted from flea and/or bedbug bites. We feel that in our own clinic population, at least, insect bites were the chief cause of papular urticaria.
CONCLUSIONS

(1) A majority of cases of papular urticaria may be cured within a period of several weeks by the use of DDT (dichlorodiphenyltrichloroethane) locally and as a household spray.

(2) The incidence of sensitivity to flea and/or bedbug bites, as shown by skin tests is higher in patients with papular urticaria than in normal individuals.

(3) The seasonal incidence of papular urticaria parallels the seasonal activity of fleas and bedbugs.

(4) The above circumstantial evidence leads us to believe that sensitivity to flea and bedbug bites is a frequent cause of papular urticaria.

REFERENCES

20. Wright, W. H., Chief, Division of Tropical Diseases, National Institute of Health—personal communication.
21. Stewart, M. A., Professor of Parasitology, University of California College of Agriculture—personal communication.