

## Treatment of Scabies with Disulfiram and Benzyl Benzoate Emulsion: A Controlled Study

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Received September 25, 1978

**Abstract.** In a double-blind study, 38 adults with scabies were treated with the scabicide Tenutex® (a proprietary aqueous emulsion containing 0.5% DDT, 2% disulfiram and 22.5% benzyl benzoate) and 42 patients were treated with a similar emulsion lacking DDT. The treatment consisted of a single whole-body (except for the head) application which was washed off after 24 hours. When examined 3 weeks later, both groups were completely cured. Thereafter, a further 35 patients took part in an open trial with the DDT-free Tenutex emulsion and all patients were cured, irrespective of whether the treatments were administered by skilled personnel or by themselves at home. It is concluded that for the treatment of scabies in Sweden, the most commonly used preparation, Tenutex®, can be replaced, without risk of loss of efficacy, by an emulsion containing 2% disulfiram and 22.5% benzyl benzoate, i.e. Tenutex® without DDT.

**Key words:** Treatment of scabies; DDT; Disulfiram; Benzyl benzoate

Scabies has increased in frequency since 1960 and now accounts for about 2–4% of all patients consulting dermatologists, both in the United States (8) and in Sweden (4). Highly effective scabicides are therefore necessary. The choice of drug, obviously influenced by local traditions must, in addition to its efficacy as a scabicide, depend on any potential toxicity. Data on both percutaneous absorption (2, 4) and toxicity (9) are available for gamma benzene hexachloride (Hexicide), the scabicide most extensively used in the United States and in Western Europe. This has prompted American dermatologists to recommend that this substance should not be used on infants and young children or on pregnant women (7, 9).

The situation for Swedish dermatologists is somewhat different. Since 1947, when Flodén (3) published his article, the proprietary preparation Tenutex® (an aqueous emulsion containing 0.5% chlorophenothane (DDT), 2% disulfiram [*Bis-diethylthiocarbamoyl*]disulfide] and 22.5% benzyl

benzoate) has been used almost exclusively, for the treatment both of scabies and of pediculosis. It has been judged to be of the greatest practical advantage to have only one main preparation in Sweden for the treatment of these common infestations. Experience with this preparation, which can be obtained without a prescription, has also been excellent and, when properly applied for 24 hours, failures in scabies treatment have seldom been reported.

We have recently shown (5) that when Tenutex® is applied there is sufficient percutaneous absorption to give rise to measurably increased plasma concentrations of DDT. This was especially evident in children and after repeated applications. Due to these findings and because there has been only limited interest in comparative, controlled efficacy trials of scabicides, we decided to compare the effects on scabies of ordinary Tenutex® emulsion and an emulsion not containing DDT.

### MATERIAL AND METHODS

Eighty, mostly adult, patients with verified scabies infections took part in a double-blind trial. Eighteen men and 20 women were treated with ordinary Tenutex®. Twenty men and 22 women were treated with a similar emulsion lacking DDT. Both DDT-free Tenutex and ordinary Tenutex® were supplied by the manufacturer in coded blind tubes. The code was only broken after completion of the trial. The treatment was given as a 24-hour whole-body application including the neck—but not the head, after which the body was washed. The usual method of washing bed clothes and articles of clothing in contact with the skin was recommended. Treatment was administered to the first 23 and 25 patients in the two respective groups by experienced staff at the skin department, whereas the rest were allowed to treat themselves at home.

After the completion of the double-blind study, two further open trials with the DDT-free Tenutex® emulsion were performed. The treatment of Group A (20 patients, mainly infants and young children) was given by the staff at the department, whereas group B (15 older children and adults) treated themselves at home.

The patients were examined clinically 3 weeks later and any persistent signs of scabies, pruritus, nodules, excoriations or eczematous reactions were noted.

### RESULTS

The outcome of the double-blind study is shown in Table I. About 21% of the patients treated with the DDT-containing ordinary Tenutex® emulsion did not attend the follow-up, as compared with a 7%

dropout in the other group. However, as none of these patients has subsequently been heard of, we have reason to believe that both treatments were effective. In all the patients who were followed-up, the results of the treatment were satisfactory, both in the group treated at the department and in those who treated themselves at home. The results from these sub-groups have therefore been presented together (Table I).

In the subsequent open trial with the DDT-free Tenutex® emulsion, nearly all patients were followed up. As can be seen in Table II, there was no failure of treatment, either when the emulsion was applied by skilled staff or when the patients treated themselves at home.

## DISCUSSION

This controlled study verified the well documented beneficial effect of Tenutex® on scabies. Flodén (3) pointed out long ago that DDT alone had only a moderate effect on scabies and virtually no miticidal effect. We have now shown that scabies can be successfully treated even with an emulsion lacking DDT (Table I, II). Each of the two remaining components, disulfiram and benzyl benzoate, has an antiscabies effect. However, when used singly, they are apparently needed in a higher concentration than when combined and repeated and longer treatment schedules are recommended to ensure an adequate effect (3, 6).

It thus seems as if the success of the 24-hour single treatment with DDT-free Tenutex® can be ascribed to the combination of the effects of disulfiram and benzyl benzoate. It is of great practical advantage that both ordinary Tenutex® and the DDT-free preparation can be used with success by

Table I. A double-blind study on the effect on scabies of Tenutex® and of disulfiram and benzyl benzoate emulsion (i.e. Tenutex® without DDT)

	Tenutex®	Tenutex® without DDT
Number of pats.	38	42
Age, range (years)	15-47	4-46
Age, mean (years)	25	27
Not attended follow-up	8	3
Cured at follow-up	30	39
Treatment failure	0	0

Table II. Open trial of disulfiram and benzyl benzoate emulsion (i.e. Tenutex® without DDT) in scabies

Group A: treatment given at the department; Group B: treatment self-administered at home

	Group A	Group B
Number	20	15
Age, range (years)	1/2-12	9-56
Failed to come to follow-up	1	2
Cured at follow-up	19	13
Treatment failure	0	0

the patients at home, provided proper instructions are given.

It is fairly common, in both Sweden and other countries, that patients, unaware of the clinical picture of scabies, overtreat themselves with scabicides. Non-toxic scabicides are therefore preferable. We would prefer, in agreement with Orkin & Maibach (7), until appropriate pediatric toxicologic data are available, to recommend that gamma benzene hexachloride (which will soon be available in Sweden) should not be used on infants, young children or on pregnant women. As mentioned above, significant percutaneous absorption of DDT can occur after repeated application of Tenutex® (5).

Despite the fact that toxic effects in man following percutaneous absorption of DDT have not been reported, it would seem wiser from an ecological point of view not to use ineffective DDT unnecessarily for the treatment of scabies. What then is the possible toxicity of the other constituents in the emulsion tested? Even if appreciable absorption occurs, the toxicity of benzyl benzoate is negligible (1) and disulfiram has been given by mouth for long periods in alcoholics without any alarming side effects. Patients, allergic to disulfiram (Thiuram-mix), may, however, contract an eczematoid dermatitis.

As an alternative to other scabicides, such as malathion, gamma benzene hexachloride, crotamiton (Eurax®), sulphur, mercury preparations etc., the emulsion tested here which contained 2% disulfiram and 22.5% benzyl benzoate seems to us a very attractive preparation, since a well administered 24-hour whole-body application is effective and the emulsion is both essentially non-irritant and cosmetically acceptable for the patients. Further controlled studies are desirable to eluci-

data the optimal treatment schedule for various scabicides, to compare their relative efficacy and also to estimate the extent of absorption.

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## Percutaneous Absorption of DDT from a Parasiticide Used for Treatment of Scabies

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Received September 25, 1978

**Abstract.** Moderately to markedly increased plasma concentrations of DDT and its major metabolite DDE were found in 3 boys 4, 7 and 9 years of age and also in a 50-year-old woman who, because of suspected or proven scabies infection, had all repeatedly received between 7

and 200 applications of Tenutex® (a DDT-containing scabicide) during recent years. Normal values were found in 4 untreated children and in 2 children who had been treated with Tenutex four and three times respectively. In 9 adults there was no significant increase in the plasma concentrations of DDT and DDE after a single 24-hour treatment with Tenutex. These results indicate that DDT, a known constituent of the scabicide Tenutex®, can be percutaneously absorbed and lead to measurably increased plasma concentrations after repeated application, especially in children.

**Key words:** Percutaneous absorption; DDT; Scabies

Since 1947 (2), dermatologists in Sweden have used Tenutex® emulsion almost exclusively for the treatment of scabies. Tenutex (registered trade name) which is a combined scabicide and pediculocide contains 0.5% chlorophenothane (DDT, Dichlorodiphenyltrichloroethane), 2% disulfiram [*Bis*(diethylthiocarbamoyl) disulphide] and 22.5% benzyl benzoate. Excellent results have been obtained with this preparation. When properly used for 24 hours, no failures to cure scabies have been reported. Although DDT alone has only a moderate effect on scabies and virtually no miticidal effect (2, 8), it seemed of great practical advantage to use only one main preparation for the treatment of both scabies and pediculosis. It may be noted that the current World Health Organization (WHO) recommendation for the treatment of scabies is an emulsion concentrate containing 68% benzyl benzoate, 6% DDT, 12% benzocaine and 14% polysorbate 80, which requires dilution 1: 5–15 with water before application (8).

As regards the potential hazard of percutaneous absorption for the scabicides commonly used, data are only available for gamma benzene hexachloride (Hexicide), the scabicide used most extensively in the United States and in Western Europe (1, 3). This lack of information is due to the fact that the majority of scabicides were developed and brought into use well before the risk of penetration through the skin was appreciated.

In people occupationally and intensively exposed to DDT there are many reports of high concentrations of DDT and DDE (dichlorodiphenylethylene) in plasma and fatty tissue (6). DDE is the main metabolite of DDT in man. However, no toxic effects in man have been reported as being due to uptake by percutaneous absorption or inhalation of DDT powder. From an ecological point of view, the danger of DDT has been stressed repeatedly. This