

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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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

Table 1. Plasma concentrations of DDE and DDT in controls, patients treated repeatedly with Tenutex, and the DDE and DDT values found in three different adult populations in Sweden

The concentration of DDE and DDT are expressed as nanogram per ml

Patient number	Sex	Age (years)	Diagnosis	Number of treatments	DDE	DDT	Sum of DDE and DDT
1-4	Boys	2-6	Atopic dermatitis (3), anetoderma (1)	0	14	4	18
5	Boy	4	Scabies	10	17	36	53
6	Boy	7	Scabies	7	9	33	42
7	Girl	5	Scabies	4	6	<3	6
8	Boy	10	Scabies	3	8	<3	8
9	Female	50	Acarophobia	200?	30	46	76
10	Boy	9	Son to no. 9	100?	68	72	140
Adult Swedish clerks, Stockholm (n=11)					21±12*	6± 3*	27
Fishermen, Isle of Gotland (n=31)					88±43*	34±12*	122
Fishermen, Swedish West Coast (n=23)					19±13*	7± 4*	26

* Mean ± S.D.

has led to its prohibition as a pesticide in agriculture and forestry in many countries. The discussion on the ecological dangers of DDT prompted us to investigate whether sufficient DDT could be absorbed through the skin to give measurably increased plasma concentrations in adults and in children following treatment with the scabicide Tenutex®.

MATERIAL AND METHODS

DDT and DDE concentrations in human plasma were estimated by a sensitive quantitative gas chromatographic method (9). The sensitivity of this method was 3 ng/ml for DDT and 1 ng/ml for DDE. We investigated 4 children who, during the past year had been treated 3-10 times with Tenutex® for proven or suspected scabies infection. Four untreated children served as controls. A 50-year-old woman with acarophobia (delusions of parasitosis) and her 9-year-old son were also studied. For the last 5 years the woman had treated herself and her son with Tenutex® once or twice a week. Plasma samples were taken for analysis at least 24 hours after the last treatment. In order to evaluate any possible absorption of DDT during a single treatment, plasma samples from 9 adults with scabies were analysed before, 12-14 hours after and one week after a 24-hour whole-body treatment with Tenutex emulsion.

RESULTS AND DISCUSSION

The case histories and the plasma concentrations of DDE and DDT both for the children and the woman with acarophobia, are given in Table I together with the control results. The main source of the DDT and DDE commonly present in human tissue today

is food, contaminated due to the widespread use of DDT as a pesticide. Apart from those occupationally exposed, the highest plasma concentrations of DDT have been reported in those consuming large amounts of fish caught in "freshwater lakes". For the sake of comparison, previously published data (3) on the DDT and DDE plasma concentrations in three Swedish populations with different fish consumption habits are also included in Table I. As seen, the highest plasma concentrations were found in fishermen from the Isle of Gotland. Pilot investigations have shown that fish in the Baltic Sea may still contain high concentrations of DDT (7).

The 2 boys, treated seven and ten times respectively with Tenutex®, as well as the mother with acarophobia and her son, had markedly increased concentrations, especially of DDT (Table I). They all had normal food habits and denied consuming abnormally large amounts of fish. Thus we feel it

Table II. The plasma concentrations of DDE and DDT in adults before, 12-14 hours and one week after a single 24-hour treatment with Tenutex®

The concentrations of DDE and DDT are given as nanogram per ml (mean ± S.D.)

	Before treatment	12-14 hours	One week after treatment
DDE	7.0±2.8	7.5±2.8	7.0±3.2
DDT	2.4±1.0	2.7±1.1	2.3±1.0
Sum of DDE+DDT	9.4±3.8	10.2±3.7	9.3±4.1
n	9	9	8

justified to conclude that the repeated whole-body treatment with the DDT-containing Tenutex® emulsion is the cause of the increased DDE-DDT concentrations and, consequently, when locally applied to the skin, DDT can be percutaneously absorbed, yielding measurably increased plasma concentrations. This is especially so in the case of repeated applications in children, who are known to have a lower skin resistance to penetration. As can be seen in Table II, there was no significant percutaneous uptake following a single 24-hour treatment in adult patients. The lack of agreement between the plasma concentrations in treated children shown in Table I can be explained by the varying degrees of excoriation and there are also great interindividual variations as regards the ability to absorb chemicals through the skin (1).

When Tenutex® was first introduced, Flodén (2) pointed out even then that DDT alone had only a moderate effect on scabies. We have performed a double-blind study (5) and shown that in treating a scabies infection, an emulsion of 2% disulfiram and 22.5% benzyl benzoate (i.e. Tenutex® without DDT) is just as effective as ordinary Tenutex®.

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Erythromycin and Lyme cycline Treatment in Chlamydia-positive and Chlamydia-negative Non-gonococcal Urethritis—A Partner-controlled Study

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Abstract. A group of 213 men with non-gonococcal urethritis and their sexual partners were treated either with erythromycin stearate 500 mg×2 for 15 days or with lymecycline 300 mg×2 for 10 or 20 days. *Chlamydia trachomatis* was isolated from 40% of the men, from 26% of their female partners and from 56% of the partners of men with chlamydia-positive urethritis. One hundred and eighty-one men were available for evaluation of therapy. There were no significant differences between the treatment schedules. The cure rate was 86–90% in men with chlamydia-positive and 89–100% in men with chlamydia-negative urethritis. Four of the 17 chlamydia-positive females treated with erythromycin and 2 of the 20 chlamydia-positive females treated with lymecycline for 10 days still had chlamydia at re-examination.

Key words: *Chlamydia trachomatis*; Non-gonococcal urethritis; Treatment of

One of the major reasons why non-gonococcal urethritis (NGU) has gained a reputation as being difficult to treat is obviously that it generally is not treated as a venereal disease. Failure to treat female partners and to carry out essential epidemiological examinations of sexual contacts results in reinfections in a number of cases. Any therapeutic trial of NGU should therefore include treatment of partners of patients in parallel.

Convincing evidence that *Chlamydia trachomatis* is the cause of 30–50% of cases of NGU has been produced by many groups. There is general agreement that up to 70% of sexual consorts of men with chlamydial urethritis have chlamydial infection of the cervix. Unfortunately the treatment of NGU has remained difficult, despite the recent extension of our understanding of its etiology, and the clinical use of many different antimicrobial agents.