

Patch testing with zinc dibenzylthiocarbamate. A multicentre study of the Information Network of Departments of Dermatology* and the German Contact Dermatitis Research Group

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While a list of allergens in protective rubber gloves was being compiled (1), a representative of a large European glove manufacturer indicated that the 2 dithiocarbamates currently tested in standard series and in rubber series, i.e. zinc diethyldithiocarbamate (ZDEC) and zinc dibutylthiocarbamate (ZDBC), did not represent the full spectrum of dithiocarbamates currently used in glove production. Zinc dibenzylthiocarbamate (ZBEC, CAS-No. 14726-36-4, Fig. 1) was said to be used as a vulcanizing agent even more frequently than ZDEC or ZDBC. Based on this information, ZBEC was patch tested in unselected, consecutive patients in addition to the standard series in 16 departments of dermatology, all members of the Information Network of Departments of Dermatology (IVDK; <http://www.ivdk.org>) and the German Contact Dermatitis Research Group (DKG).

The objective of this study was to determine the frequency of sensitization to ZBEC and to investigate cross-reactions to other dithiocarbamates.

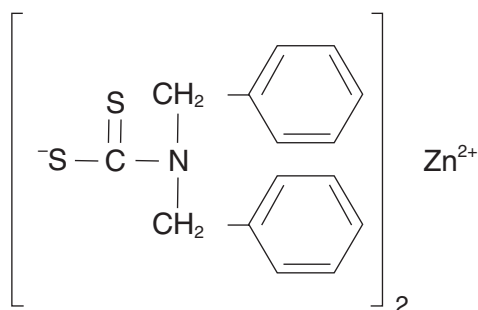
Patients and Methods

The investigation was carried out from February to August 2002. Patch tests were performed according to internationally accepted guidelines and readings were documented following the recommendations of the DKG (2, 3). In total, 1385 patients were tested with ZBEC 1% petrolatum (pet.) The description of the test population according to the MOAHLFA index was: male 38.1%, occupational dermatitis 7.8%, atopic dermatitis 15.8%, hand dermatitis 20.9%, leg dermatitis 13.0%, face dermatitis 13.6% and age 40 years or more 68.9%. Patch test exposure time was 2 days in 1036 patients (74.8%) and 1 day in 349 patients (25.2%). Patch test substances were obtained from Hermal (Reinbek, Germany). The purity of ZBEC used for patch testing was $\geq 99\%$.

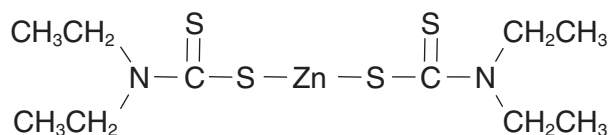
Results

Patch test results on D3 are summarized in Table 1. No positive reactions to ZBEC occurred, 2 irritant reactions were seen and all the doubtful reactions were also interpreted as irritant. In the same test population, 2.1% (29 of 1370 tested patients) reacted positively to thiuram mix and 0.9% reacted to ZDEC (12 of 1371 patients). Zinc dibutylthiocarbamate was tested in 330

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Zinc dibenzylthiocarbamate (ZBEC, CAS-No. 14726-36-4)



Zinc diethyldithiocarbamate (ZDEC, CAS-No.14324-55-1)

Fig. 1. Chemical structures of zinc dibenzylthiocarbamate (ZBEC) and zinc diethyldithiocarbamate (ZDEC).

patients, and no positive reactions were noted. Except for 1 patient showing a few follicular papules to both, there were no cross-reactions whatsoever between ZBEC and ZDEC. All patients with a positive or erythematous reaction to ZDEC were ZBEC negative, and all patients with an erythematous or irritant reaction to ZBEC were negative to ZDEC.

Table 1. Patch test results on D3 with zinc dibenzylthiocarbamate 1% petrolatum (pet.)

Reaction	No. of patients	%
Negative	1379	99.6
Erythema only	3	0.2
A few follicular papules	1	0.1
Irritant reaction	2	0.1
Total	1385	100.0

Comment

To our knowledge, this is the 1st report on patch tests with ZBEC in a large number of patients. The complete lack of unequivocally allergic reactions to ZBEC may have 3 possible reasons:

(1) Inadequate patch test preparation. According to published recommendation (4), we chose the same test concentration as that used for patch testing ZDEC and ZDBC. However, the molecular weight of ZBEC (610) is consider-

ably higher than that of ZDEC (362). Thus, the molar concentration of ZBEC in a patch test preparation with 1% pet. is only 60% of the molar concentration of ZDEC 1% pet. Hence, one could argue that a higher test concentration might be necessary for ZBEC.

- (2) No widespread exposure to ZBEC. Although ZBEC is used in the production of several glove brands of the above-mentioned manufacturer, ZBEC might not be used in rubber glove production as frequently as other dithiocarbamates. After the data analysis, we asked 3 other big European glove-manufacturing companies whether they used ZBEC, and they reported that none of them did so. However, 2 of them reported that they had been experimenting with this substance. Additionally, it may be that ZBEC is not released from the glove to the same extent as ZDEC, thus restricting exposure.
- (3) Low allergenic potential of ZBEC. In the local lymph node assay (LLNA), ZDBC had a low sensitization potential compared to zinc dimethyldithiocarbamate and ZDEC (5, 6). Thus, dithiocarbamates with a longer (bulky) chain might be less potent sensitizers. For ZBEC, such a situation is provided by the 2 aromatic rings in the side chains. The results of the LLNA are in accordance with the lower frequency of reactions to ZDBC than to ZDEC. To our knowledge, no animal tests with ZBEC have been published.

Our data suggest that, at present, patch testing with ZBEC 1% pet. will gain no further information in patients with suspected rubber allergy.

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