

## Allergic Contact Dermatitis due to an Insect Repellent: Double Sensitization to Picaridin and Methyl Glucose Dioleate

Monica Corazza, Alessandro Borghi, Maria Rosaria Zampino and Annarosa Virgili

Department of Dermatology, University of Ferrara, Via Savonarola 9, 44100 Ferrara, Italy. E-mail: czm@unife.it

Accepted October 4, 2004.

Sir,

Picaridin, a piperidine derivate, is a promising insect repellent that has been available to the consumer since 1998 (1). Picaridin protects against arthropods in a similar fashion to diethyl toluamide (deet), which is considered the gold standard compound (2, 3). Picaridin is also better tolerated than deet (1, 4), a fact that has encouraged its use in repellent formulations. We describe here the first case of contact allergy to picaridin consequent to the application of an insect repellent aerosol for cutaneous use. Furthermore the patient was also sensitized to methyl glucose dioleate, an emulsifier of the aerosol, confirming its sensitizing potential.

### CASE REPORT

A 39-year-old man presented with a widespread persistent itching erythematous-oedematous dermatitis involving his limbs (Fig. 1). An allergic contact dermatitis was suspected and therapy with antihistamines and topical and systemic corticosteroids healed the lesions in about 10 days with transient pigmentary lesions.

The patient stated that he had used an insect repellent (Autan Family<sup>®</sup> Spray) the day before the onset of the dermatitis. He had an open test with the commercial product. After the first application an itching erythematous reaction appeared only a few hours later.

A patch test performed with the Italian standard (SIDAPA) series revealed only a weak (-D2/+D3) reaction to *Myroxylon Pereirae* 25% pet. Further patch tests were therefore carried out with all the constituents of Autan Family<sup>®</sup> Spray, kindly supplied by SC Johnson Wax s.p.a. (Table I). A strong reaction was observed to

the excipient methyl glucose dioleate 10% pet. (+++D2/+++D3) and to the active principle KBR 3023 (picaridin) 2.5% pet. (++D2/+++D3) (Fig. 2).

Table I. Patch test results using constituents of insect repellent

Constituents	D2	D3
Methyl glucose dioleate 10% pet.	+++	+++
Picaridin 2.5% pet.	++	+++
Denatured ethanol	-	-
Citric acid 1% aqua	-	-
Glycerin	-	-
Aloe vera 10% pet.	-	-
Perfume 10% pet.	-	-
Di.N.octyl ether 10% pet.	-	-
Polydimethylsiloxane 10% pet.	-	-



Fig. 1. Erythematous-oedematous dermatitis of the upper limbs.

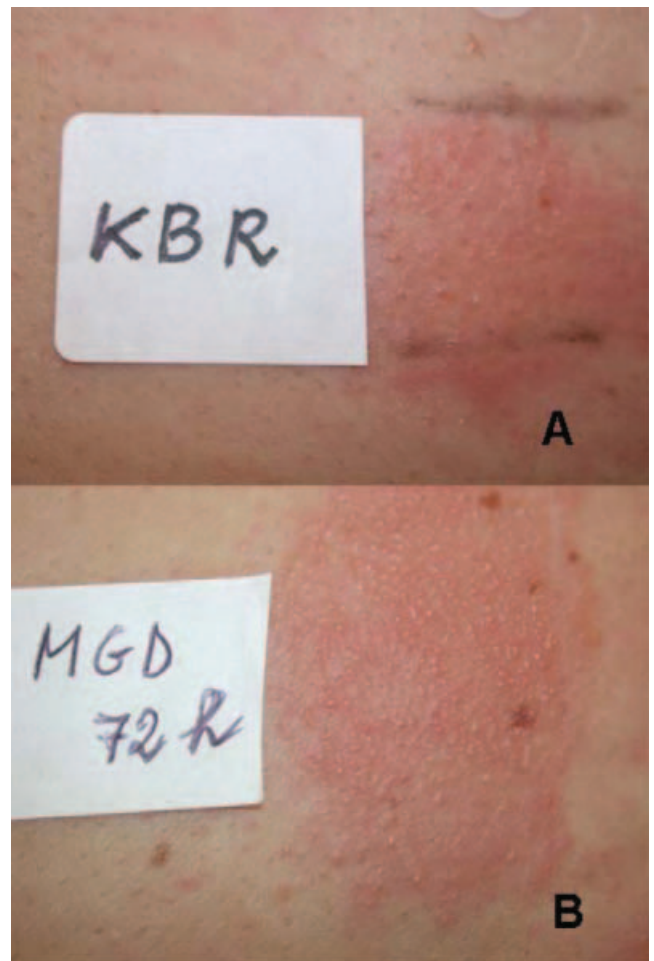


Fig. 2. Sensitization to picaridin (KBR) 2.5% pet. (A) and to methyl glucose dioleate (MGD) 10% pet. (B).

## DISCUSSION

Insect repellents represent an inexpensive and practical measure for preventing insect bites, which can cause local or systemic allergic reactions as well as, in endemic areas, a number of vector-borne diseases like typhus, scrub typhus, malaria, Lyme disease, dengue and yellow fever (4, 5). Repellents applied to the skin or clothes act by producing a coating that has an offensive smell or flavour to insects. Many compounds, both natural and synthetic, have been used against mosquitoes, biting flies, gnats, chiggers, ticks and other arthropods. They are available in several forms: liquids, foams, aerosols, sticks, creams, oils and powders. Effective agents include oil of citronella, dimethyl phtalate (dimethyl 1,2-benzenedicarboxylate), 2-ethyl-1,3-hexanediol, indalone (butyl 3,4-dihydro-2,2-dimethyl-4-oxo-2H-pyran-6-carboxylate) and permethrin. N,N-Diethyl-3-methylbenzamide, also called diethyl toluamide and commonly known as deet, is the most widely used repellent to date, representing the gold standard compound.

Deet has occasionally been related to both systemic (toxic encephalopathy, seizure, cardiovascular toxicity and child death) (6) and local side effects, which occur after cutaneous exposure. The latter mainly consist of mild skin irritation (7), scarring bullous dermatitis (8) and immunological (9) and non-immunological contact urticaria (10). Furthermore, deet irritates the eyes and mucous membranes, making facial application inadvisable.

A new compound, 1-methylpropyl 2-(2-hydroxyethyl)-1-piperidinecarboxylate, known as KBR3023 or picaridin, has recently been introduced as the active ingredient of insect repellent formulations, thus representing an alternative to deet (1). The available evidence, based on comparative evaluations, shows that picaridin provides a similar or even better protection against arthropod bites than deet, yet it appears to be less irritating (2–4). To date, adverse effects to picaridin application had never been reported, including irritant or allergic dermatitis.

Our patient used an insect repellent aerosol containing picaridin 10%, consequently developing an itching erythematous-oedematous dermatitis involving the sites of application. History and clinical features suggested an allergic contact dermatitis, which was confirmed by patch tests revealing strong sensitization to both the excipient, methylglucose dioleate 10% pet., and the active principle picaridin 2.5% pet.

Methyl glucose dioleate, the di-ester of a methyl glucoside and oleic acid, is a water-in-oil emollient and emulsifier which is used in topical and cosmetic products because of its emollient, lubricant, moisturizing and viscous properties. Although the material safety data sheet for methyl glucose dioleate admits a possibility of mild

irritancy, other cases of topical sensitization to methyl glucose dioleate have been described (11–15). Our observation seems to confirm the sensitizing potential of methyl glucose dioleate, supporting the opinion that contact allergies to this compound are not as rare as reported.

To our knowledge this is the first communication of contact sensitization to picaridin. Undoubtedly the increasingly worldwide use of picaridin as the principal ingredient of insect repellent formulations will eventually provide fuller information about its sensitizing potential.

## REFERENCES

1. Scheinfeld N. Picaridin: a new insect repellent. *J Drugs Dermatol* 2004; 3: 59–60.
2. Badolo A, Ilboudo-Sanogo E, Ouedraogo AP, Costantini C. Evaluation of sensitivity of *Aedes aegypti* and *Anopheles gambiae* complex mosquitoes to two insect repellents: DEET and KBR 3023. *Trop Med Int Health* 2004; 9: 330–334.
3. Frances SP, Van Dung N, Beebe NW, Debboun M. Field evaluation of repellent formulations against daytime and nighttime biting mosquitoes in a tropical rainforest in northern Australia. *J Med Entomol* 2002; 39: 541–544.
4. Frances SP, Cooper RD. Personal protection measures against mosquitoes. A brief history and current use of repellents by the Australian Defence Force. *ADF Health* 2002; 3: 58–63.
5. Brown M, Hebert AA. Insect repellent: an overview. *J Am Acad Dermatol* 1997; 36: 243–249.
6. Qui H, Jun HW, McCall JW. Pharmacokinetics, formulation, and safety of insect repellent *N,N*-diethyl-*m*-toluamide (deet): a review. *J Am Mosq Control Assoc* 1998; 14: 12–27.
7. Amichal B, Lazarov A, Halevy S. Contact dermatitis from diethyltoluamide. *Contact Dermatitis* 1994; 30: 188.
8. McKinlay JR, Ross EV, Barret TL. Vesiculobullous reaction to diethyltoluamide revisited. *Cutis* 1998; 62: 44.
9. Vozmediano JM, Armario JC, Gonzalez-Cabrerizo A. Immunologic contact urticaria from diethyltoluamide. *Int J Dermatol* 2000; 39: 876.
10. Wantke F, Focke M, Hemmer W, Götz M, Jarish R. Generalized urticaria induced by a diethyltoluamide-containing insect repellent in a child. *Contact Dermatitis* 1996; 35: 186–187.
11. Rossi G, Steffens W. Allergic contact dermatitis from Autan® spray: methyl glucose dioleate as sensitizing ingredient. *Contact Dermatitis* 2004; 50: 324.
12. Corazza M, Carlà E, Levratti A, Virgili A. Methyl glucose dioleate: an often-overlooked allergen? *Ann Ital Allergol Dermatol* 2002; 56: 63–66.
13. Corazza M, Levratti A, Virgili A. Allergic contact dermatitis due to methyl glucose dioleate. *Contact Dermatitis* 2001; 45: 308.
14. Schianchi S, Calista D, Landi G. Widespread contact dermatitis due to methyl glucose dioleate. *Contact Dermatitis* 1996; 35: 257–258.
15. Foti C, Vena GA, Mazzarella F, Angelini G. Contact allergy due to methyl glucose dioleate. *Contact Dermatitis* 1995; 32: 303–304.