Insect Repellents and Contact Urticaria: Differential Response to DEET and Picaridin

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Practice Points

- Topical insect repellents containing picaridin may be well-tolerated alternatives in patients who develop contact urticaria in response to products containing N,N-diethyl-meta-toluamide (DEET).
- Open patch testing can be a helpful diagnostic tool in treating contact urticaria secondary to exposure to topical insect repellents.

Topical insect repellent is commonly used throughout the world. Active ingredients typically include N,N-diethyl-meta-toluamide (DEET) or picaridin. Reactions to topical repellents have ranged from contact dermatitis to urticaria. Exposure to DEET can produce contact urticaria; however, it is unknown if patients with a sensitivity to DEET can tolerate picaridin. We report the case of a 22-year-old man who presented for evaluation of contact urticaria that had developed immediately after the application of insect repellent and contact with individuals who had used DEET-containing repellents. No systemic manifestations were noted. Commercially available products containing DEET or picaridin were used for open patch testing. The patient showed immediate urticarial responses to 7% DEET and 7% DEET in ethanol, but patch tests for 5% picaridin and 5% picaridin in ethanol were negative. Based on these results, we conclude that insect repellents containing picaridin may be acceptable alternatives in patients who demonstrate sensitivity to products containing DEET.

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The most widely used active ingredient in topical insect repellents is N,N-diethyl-meta-toluamide (DEET).[1] Cutaneous adverse events have been described with the use of DEET. One study reported that 35% of 242 participants developed hives, rashes, itching, redness, and swelling from exposure to DEET.[2] Instances of DEET-induced urticaria and anaphylaxis also have been reported.[3-6] Additionally, cutaneous exposure to DEET has resulted in systemic side effects such as encephalopathy, cardiotoxicity, and childhood death.[7]

Picaridin is a more recent alternative to DEET (available in the United States since 2005) that is available in 5% to 20% concentrations. According to a PubMed search of articles indexed for MEDLINE using the terms *contact urticaria and picaridin*, *hypersensitivity and picaridin*, and *picaridin and*

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dermatitis, there have been no reports of contact urticaria from direct exposure to picaridin and only one case describing a type IV hypersensitivity reaction to a picaridin-containing repellent.[8] Picaridin is said to have comparable efficacy to DEET as an insect repellent but with less irritation.[9]

Evidence shows that the scents of these chemicals are strongly disliked by biting insects such as mosquitos.[10] Insect repellents represent a pragmatic approach to the prevention of allergic reactions or vector-borne diseases such as typhus, malaria, Lyme disease, dengue fever, yellow fever, and West Nile virus that could potentially accompany an insect bite.[11,12]

It currently is not known if patients sensitized to DEET may alternatively tolerate repellents containing picaridin.

Case Report

A 22-year-old man with no notable medical history presented for evaluation of contact urticaria that had developed immediately after the application of insect repellent. At the time of presentation, skin examination revealed no evidence of a wheal-and-flare response. The patient noted that he consistently avoided using DEET-containing products because of prior instances of the development of large pruritic welts within minutes of contact with them. Recently, he had developed hives after contact with individuals who had used DEET-containing repellents. No systemic manifestations were noted, and the hives responded to treatment with antihistamines.

Open patch testing was conducted using 7% DEET, 7% DEET in ethanol, 5% picaridin, and 5% picaridin in ethanol. A small amount of each product was applied to test areas on the patient's back, each measuring 1 cm in diameter. Following application of the products, he was observed for 15 minutes for any signs of reaction. Any signs of wheal and flare were noted, with a wheal 3 mm larger than a saline control (1 cm in diameter) indicating a positive result. The patient showed a large wheal-and-flare response (>4 cm) in the 7% DEET and 7% DEET in ethanol test areas. There was no reaction noted in the 5% picaridin or 5% picaridin in ethanol test areas. Histamine was applied to another test area as an intended positive control but produced no wheal; saline also was applied as a negative control and did not produce a cutaneous reaction.

Subsequently, the patient was advised to continue his avoidance of DEET-containing insect repellents. Products containing picaridin were noted as practical alternatives. The patient also was counseled on other methods for preventing future bites including avoidance of infected habitats and utilization of protective clothing. He also was instructed to use antihistamines, when necessary, following contact with DEET-containing products.

Comment

Contact urticaria, which refers to a wheal-and-flare reaction to external contact with an irritant substance, usually appears less than 30 minutes following contact with the offending agent and resolves in a matter of hours with no residual signs of the reaction.[13] Immunologic contact urticaria is a type I hypersensitivity reaction that is mediated by antigen-specific IgE in individuals who previously have been sensitized. Unlike nonimmunologic contact urticaria, immunologic contact urticaria responds to treatment with antihistamine agents.[14] It has previously been shown that contact urticaria due to DEET exposure is an IgE-mediated response and that mast cell and basophil degranulation occurs where CD63 expression is increased.[15]

In an open patch test, our patient demonstrated a sensitivity to DEET but not picaridin, 2 common active ingredients in insect repellents. The results of this case reveal that patients who develop contact urticaria in response to DEET exposure may tolerate other insect repellents; products containing picaridin are reasonable alternatives. Open patch testing can be a helpful diagnostic tool to aid in the treatment of contact urticaria resulting from exposure to insect repellents.

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