Epidemiologic Notes and Reports Seizures Temporally Associated with Use of DEET Insect Repellent -- New York and Connecticut

In August 1989, epidemiologists from the New York State Department of Health (NYSDH) investigated five reports of generalized seizures temporally associated with topical use of N,N-diethyl-m-toluamide (DEET). Three of the case-patients, one from New York and two from Connecticut, were reported by a pediatric neurologist who practices in both states. One case was reported initially to an entomologist in New York, and one was reported directly to the NYSDH. The cases occurred in June through August 1989.

The patients, four boys aged 3-7 years and one 29-year-old man, had few prodromal symptoms and recovered quickly. All five had unremarkable medical histories, and none had had a previous seizure or neurologic event. All had normal nonfocal neurologic examinations after their seizures, and four had normal complete laboratory examinations and normal computerized tomography and/or magnetic resonance imaging examinations. Each had had topical cutaneous exposure to varying concentrations of DEET; four had had fewer than three applications. The interval between last use of DEET and onset of seizures ranged from 8 to 48 hours. One patient developed urticaria before his seizure; he was one of two patients who developed an urticarial reaction to phenytoin administered to control seizures.

While reinforcing the importance of DEET in preventing Lyme disease (LD (Lyme borreliosis)), health officials in New York, Connecticut, and New Jersey issued a health alert on August 22 advising caution in the use of DEET-containing repellents. The NYSDH is planning to conduct epidemiologic studies to evaluate the association between DEET and neurologic events. Reported by: S Oransky, MD, Hudson Valley Poison Control Center, Nyack; B Roseman, MD, Pediatric Neurologic Associates, White Plains; D Fish, PhD, Medical Entomology Laboratory, New York Medical College, Valhalla; T Gentile, MS, Center for Environmental Health, J Melius, MD, State Environmental Epidemiologist, New York State Dept of Health. ML Cartter, MD, JL Hadler, MD, State Epidemiologist, Connecticut State Dept of Health Svcs. Div of Environmental Hazards and Health Effects, Center for Environmental Health and Injury Control; Div of Vector-Borne Infectious Diseases, Center for Infectious Diseases; Div of Field Svcs, Epidemiology Program Office, CDC.

Editorial Note

Editorial Note: For health officials in New York and Connecticut, two of the states where LD is of growing concern, inquiries about the potential adverse effects of insect repellents have increased. Recent anecdotal reports of seizures temporally associated with the use of DEET have heightened
public awareness of DEET's potential adverse effects.

DEET has been marketed in the United States since 1956 and is used by an estimated 50-100 million persons each year. Since 1961, at least six cases of toxic systemic reactions from repeated cutaneous exposure to DEET have been reported (1-6). Six girls, ranging in age from 17 months to 8 years, developed behavioral changes, ataxia, encephalopathy, seizures, and/or coma after repeated cutaneous exposure to DEET; three died. Another six systemic toxic reactions have been reported following ingestion of DEET (7). Additionally, episodes of confusion, irritability, and insomnia have been reported by Everglades National Park employees following repeated and prolonged use of DEET (8).

DEET is partially absorbed through the skin and has been used to enhance dermal delivery of other drugs (9). Adverse reactions include allergic responses, direct neurotoxicity, and dermatitis. One of the girls who died after dermal exposure was partially deficient in the enzyme ornithine carbamoyltransferase (3); DEET may interfere with the urea cycle metabolic pathway (10).

Anecdotal reports of seizures are difficult to interpret. None of the recent cases in New York and Connecticut have been clearly established as DEET toxicity. In contrast to cases described in the medical literature, the New York and Connecticut patients were all male, DEET exposure was less intense, few prodromal symptoms or encephalopathy were seen, and recovery was more rapid and complete. With the dramatic increase in the prevalence of DEET use in areas with endemic LD, the reported cases of seizures temporally related to DEET use may be coincidental. However, these cases may represent a different, previously unreported spectrum of toxic reactions. Careful toxicologic and epidemiologic studies must be conducted, including adequate documentation of DEET levels in affected and unaffected persons.

Clinicians evaluating patients with unexplained seizures should consider the possibility of exposure to DEET. However, since the exact circumstances under which DEET-related neurotoxicity may occur are unclear, DEET should not be accepted as the cause of a seizure until appropriate evaluation has reliably excluded other possible etiologies.

The optimal concentration of DEET for prevention of tick bites is unknown. However, repellents containing 20%-30% DEET applied to clothing are approximately 90% effective in preventing tick attachment (11). To minimize the possibility of adverse reactions to DEET, the following precautions are suggested: --Apply repellent sparingly only to exposed skin or clothing. --Avoid applying high-concentration products to the skin, particularly of children. --Do not inhale or ingest repellents or get them into the eyes. --Wear long sleeves and long pants, when possible, and apply repellent to clothing to reduce exposure to DEET. --Avoid applying repellents to portions of children's hands that are likely to have contact with eyes or mouth. --Never use repellents on wounds or irritated skin. --Use repellent sparingly; one application will last 4-8 hours. Saturation does not increase efficacy. --Wash repellent-treated skin after coming indoors. --If a suspected reaction to insect repellents occurs, wash treated skin, and call a physician.
information about the active ingredients in insect repellents is available from the National Pesticide Telecommunications Network, telephone (800) 858-7378.

**References**


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