Deet (OFF!) – Summary of Adverse Health Effects in Children and Adults

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Deet (N--diethyltoluamide, (OFF!) was first developed as a skin lotion for use by the military in the field, most recently by impregnation in military uniforms[1], and as an ingredient in camouflage face paint[2]. Deet is the most widely used insect repellent in the U.S. Estimates are that it is used on 23-29% of children annually[3].

Deet is neurotoxic and can adversely affect the brain and nervous system. Children are more susceptible than adults. A poison control study of deet related calls found that the greatest number of reported exposures involved infants and children[4].

Deet Poisoning in Children

Signs and symptoms of mild poisoning include headache, restlessness, irritability, crying spells and other changes in behavior. In more severe poisoning there can be slurring of speech, tremor (shakiness), seizures (convulsions), and coma. Deet has caused death in children from absorption through the skin when it was either applied repeatedly or in a high concentration.

A one year old child died after development of seizures and coma one hour after accidental ingestion of a large amount of concentrated deet[5].

A five year old girl, sprayed with deet nightly for three months, developed headaches and slurred speech, progressing to staggering gait, shaking, screaming, and seizures, and episodes of stiffening into sitting position, extending extremities, flexing fingers and dorsiflexing toes. She died 24 days later. At autopsy the brain showed generalized edema with intense congestion of the meninges. The same author reported another case in an 18 month old who ingested an unknown amount of liquid deet. She displayed extreme irritability and bizarre movements, but her condition improved steadily[6].

A review of 17 cases of toxic encephalopathy in children (56% girls) found it occurred not only after ingestion or repeated and extensive application, but also from brief exposure to a product containing 45% deet. Of the skin application cases, 33% were in a product containing less than 20%. The review also described a case in an 18-month-old boy following brief exposure to 17.6% deet[7].

A case is reported of seizures and coma developing in a child two hours after accidental ingestion of a low dose of deet. (80 mg/kg). He recovered without sequelae[8].

Seizures and acute behavior change developed in an 8-year-old girl following exposure to deet, with recovery in three days after treatment for the seizures[9].

A case was reported of a four year old boy with mental retardation, impaired sensorimotor coordination, and craniofacial dysmorphology, whose mother applied deet daily throughout her pregnancy, in addition to taking the anti-malaria drug chloroquine prophylactically[10].

A Reye-like syndrome was reported in a 6 year old girl with extensive exposure to deet who was deficient in ornithine carbamoyl transferase (OCT). This deficiency delayed metabolism of deet in the liver and removal from the body, increasing its toxic effect. The author suggest that other cases of deet related toxic encephalopathy might also have suffered from OCT deficiency[11].

Four healthy boys, three to seven years old, who had never had a seizure or neurologic problem, developed seizures eight to 48 hours after three or less applications of deet at a summer camp. One boy who had a rash before his seizure developed a rash to the dilantin medication used to control the seizures. All recovered[12].

A 5-year-old boy with mild developmental delay , experienced a major motor seizure at day camp after skin application of deet that morning and again later in the day. His seizures continued in the emergency room and were eventually brought under control with diazepam[13].

Generalized urticaria (skin rash) has also been reported[14].

Adverse Effects in Adults

A severe anaphylactic reaction occurred in a 42 year old woman with no prior history of allergy, who touched a companion who had just applied 52% deet. Rapid generalized pruritus progressed to angioedema, nausea, hypotension, and unconsciousness; she recovered with appropriate treatment[117]. This type of severe allergic reaction, which can be fatal, is similar to the immune effects that occur from bee stings and peanuts in sensitive individuals.

Military personnel in south Vietnam who applied 50% deet while sleeping in the field, developed a burning sensation, erythema (redness), blisters, and a bullous eruption in the antecubital fosse (bend of the arm) which led to ulceration and scarring in some cases. Blisters remained for one to three days, with severe disabling purulent necrotic skin lesions lasting two to three weeks; most patients could not extend their arms because of pain. Deet was felt to be too effective to remove, and was recommended to be used with caution and not be applied to the antecubital and popilteal fossa (behind the knee) because of occlusion and sweating[15, 16].

Skin rash has been reported after topical application[17,18,19,20], a vesicobullous reaction from occupational exposure[21,22], and allergic dermatitis[23,24]. There is a case report of cardiovascular toxicity in an adult[25].

Applications of one to two milliliters of a 50% concentration for five days to the skin of volunteers produced paresthesia, blisters and local skin effects[26]

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