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**Does exposure to DEET-containing insect repellents increase the risk of adverse outcomes compared when compared to children with no exposure?**

It is well-known that Long Island has a relatively high incidence of tick-borne disease, and DEET-containing insect repellents are the most effective repellent currently available on the market. Therefore, it was surprising when I came across so many families who did not use these repellents, often for safety concerns. The purpose of my CAT presentation was to determine whether or not DEET-containing insect repellents are safe for children. To conduct my literature search, I used the PubMed and Cochrane Review databases. In my PubMed search I searched “DEET” in the MeSH database, subheading “adverse effects,” limits “child: birth – 18yo” which yielded 40 studies. In Cochrane Review my search term was “DEET and children,” which yielded 3 studies. Studies I excluded were lit reviews, animal studies, case reports, foreign language, and those considered irrelevant. In addressing a question of “harm,” ideally one should choose randomized control trials (best evidence), cohort studies, or case control studies. However, after applying exclusion criteria to my already small search yield, I was left with 2 surveillance studies and 1 case series study as studies with the best evidence.

The first article, by Bell, Veltri et al, was a surveillance study which looked at DEET exposures reported to poison control centers (PCC), and at the health outcomes with different DEET concentrations. Over 17,000 children were included. The most common route of exposure for infants and children was accidental ingestion, for teens accidental ocular exposure and ingestion were equally common. Most subjects had no symptoms, with ocular exposure having the most symptoms. The most common medical outcome for all exposures was “no effect” or minor effects, and no children died in the study. For any concentration of DEET, most subjects had no symptoms or only minor ones. Limitations of this study were: passive reporting system, retrospective, selection bias, no controls, and only looking at short-term effects. Solid conclusions cannot be drawn from this surveillance data, however it suggests DEET may be relatively safe for children regardless of the concentration. Study #2 by Osimitz, Murphy et al, was also a surveillance study. Its aim was to improve upon PCC data collection with more standardization, and to evaluate the causal relationships between DEET repellents and serious neurologic and systemic events. PCC/clinicians would report exposures to the DEET Registry, who would then interview reporters for detailed information about the exposure and the patient’s medical background, and a follow-up interview was done 1 year later to assess for long-term exposure effects. The data found seizures occurred in children; counterintuitively, most seizures were associated with <10% DEET. Of note, however, the DEET concentration was unable to be determined in many cases. Of those followed up ~20% continued to have the same symptoms associated with initial exposure. Limitations included: passive reporting system, potential conflict of interest. Again, given this is a surveillance study, solid conclusions cannot be drawn, but it may suggest that children are more at-risk for seizures when exposed to DEET than adults are, and that long-term effects may exist. Article #3, by Briassoulis, Narlioglou et al, was a case analysis which reviewed 17 case reports of encephalopathy in children following exposure to DEET to correlate DEET concentration, duration of exposure, route of exposure, and demographics with medical outcome. Outcomes were: 3 Deaths, all with cutaneous exposure, and that encephalopathy was significantly more frequent with cutaneous exposure. Limitations included the small sample size, the study design, and retrospective nature. The study suggests that exposure to DEET, even in low concentrations and with brief exposure time, *may* pose a risk of encephalopathy in children.

Although one cannot draw strong conclusions from these studies because of their various limitations, they do suggest that although DEET-containing repellents may be associated with adverse outcomes, such as seizure, most children have no symptoms or relatively mild ones. As a clinician working in a region endemic for tick-borne diseases, I would recommend patients use DEET-containing repellents, as the risk of contracting the diseases of the diseases themselves is likely higher than the risk of adverse outcomes from the repellent. In regions where the risk of tick-borne disease is low, one may consider using alternative measures to protect oneself such as wearing protective clothing.

**References**:

* Bell, J.W., Veltria, J.C., et al. “Human Exposures to N,N-diethyl-m-toluamide Insect Repellents Reported to the American Association of Poison Control Centers 1993-1997.” *International Jounral of Toxicololgy*. 2002 Sep-Oct; 21(5):341-52.
* Briassoulis, G., Narlioglou, M. et al. “Toxic encephalopathy associated with use of DEET insect repellents: a case analysis of its toxicity in children.” *Journal of Human and Experimental Toxicology.* January 2001 vol. 20 no. 18-14
* Osimitz, T.G., Murphy, J.V. et al. “Adverse events associated with the use of insect repellents containing N,N-diethyl-m-toluamide (DEET).” *Journal of Regulatory Toxicology and Pharmacology.* 56 (2010) 93-99.
* Weil, W. “New information leads to changes in DEET recommendations.” *AAP News* 2001;19;52.