

How to advise parents on insect repellents in era of Zika, chikungunya

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Due to the upsurge in insect-borne infections such as chikungunya and Zika, it is of critical importance for pediatricians to be aware of and counsel their patients on the safe and effective use of insect repellents.

Both viruses are transmitted by the *Aedes* mosquito vector, some species of which — *aegypti* and *albopictus* — are present in large parts of the southern and southeastern United States. Since effective and approved vaccines do not exist for these viruses, prevention of bites by wearing appropriate clothing and using insect repellents as well as controlling the mosquito vector are especially important in affected geographic areas.

The risk of mosquito bites can be reduced by eliminating areas where mosquitoes breed (e.g., standing water), limiting outdoor activities in areas and times of high mosquitoes, wearing clothing that covers the skin, and using barriers to protect the skin (e.g., mosquito netting, screens for strollers). People also should use insect repellents to protect themselves and their children.



The Centers for Disease Control and Prevention and the Food and Drug Administration recommend the use of products containing active ingredients registered by the Environmental Protection Agency (EPA). In the 1990s, the EPA evaluated unregistered products such as citronella oil, cedar oil, geranium oil, peppermint and peppermint oil, and soybean oil for safety and determined that they posed minimum risk. The products, however, were not evaluated for effectiveness. All EPA-approved products should bear an EPA registration number, while those deemed safe but are unregistered appear on the EPA minimum risk pesticide webpage, <https://www.epa.gov/minimum-risk-pesticides>.

In general, products containing citronella and other botanical oils are inferior to DEET, picaridin, PMD or IR3535, and data for their use in children are limited. The ideal insect repellent should have demonstrated efficacy against a large number of arthropods and adequate duration of effect, should be nonirritating and nontoxic, cosmetically acceptable, cost-effective, chemically stable, and should not stain or damage clothing.

DEET

DEET has been the most widely used ingredient with the most data on safety and efficacy.

It has broad-spectrum efficacy against mosquitoes, ticks, chiggers, fleas, gnats and some flies.

Concentration in products varies from 5%-100%, but there is no evidence that concentrations above 50% increase efficacy. The Academy recommends using products containing up to 30% DEET in children.

Toxic encephalopathy has been reported with prolonged exposure and/or ingestion in infants and young children. Rarely, contact irritant reactions including urticarial and blistering rashes have been reported. Regular application during the second and third trimesters of pregnancy in one study did not result in adverse effects for the fetus (McGready R, et al. *Am J Trop Med Hyg.* 2001;65:285-289).

DEET may damage clothing and plastics.

IR3535

IR3535 is available in the U.S. in concentrations ranging from 7.5%-20%. Studies have shown that the higher concentrations are necessary for efficacy against mosquitoes and that 7.5% is not effective.

Moreover, many products containing IR3535 also contain sunscreen, which might decrease the efficacy of the sunscreen. The Academy recommends avoiding products that contain both sunscreen and repellent since sunscreen should be applied more often than repellent.

Picaridin

Picaridin was approved in 2012 in the U.S. after extensive use in Europe and Australia. It is available in concentrations of 5%-20%. The ingredient is odorless, low risk for irritation, does not damage clothing, and there have been no reports of toxicity. The Academy recommends using products with up to 10% picaridin.

Oil of lemon eucalyptus

Oil of lemon eucalyptus has been shown to be effective against malaria-transmitting mosquitoes for up to six hours. It is not recommended for use in children under 3 years old.

Catmint and other essential oils

These oils have been shown to have limited protection against mosquitoes. Although they have a good safety profile, higher concentrations that might cause skin irritation are required for good efficacy.

Citronella

Citronella provides efficacy against mosquitoes for a short period, usually less than an hour. There is little evidence of efficacy against other arthropods.

AAP recommendations

- Parents should read and follow repellent product instructions carefully to ensure safety and efficacy.
- Products should be applied to clothing and exposed skin only.
- Spray formulations should be applied outdoors to minimize inhalant exposure.
- When children return indoors, the skin should be washed with soap and water.
- Clothing treated with repellents should be laundered before wearing again.

Dr. Cohen is a member of the AAP Section on Dermatology Executive Committee.

Resources

- [AAP News Parent Plus article “Safe use of insect repellents can minimize itching, scratching”](#)
- [Information for parents on the AAP Healthy Children website](#)
- [AAP News story "Fragile but potentially deadly: Mosquitoes transmit illnesses to millions every year"](#)

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