

Mosquito Protection: Is DEET the best? What about the rest? (Transcript)

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Zika has been in the news. You probably know all about the epidemic [and] the effects on the fetus, and have warned women who are pregnant or are considering pregnancy not to travel to certain areas.

Patients are wondering how to best protect themselves in areas of the United States likely to be affected by the Zika virus. Some of the patients I have seen are worried about side effects and toxicity of mosquito repellents.

What do you tell them? What is effective, and can any of these chemicals be harmful to people—especially children and pregnant women? We decided to take a look to help answer those questions. Here is what we found.

The Centers for Disease Control and Prevention (CDC) has advised everyone, especially in Southern states, to protect themselves from mosquito bites by using insect repellents and also wearing protective clothing.

The repellents should include one of four active ingredients:

DEET;

Picaridin;

Oil of lemon eucalyptus (active agent, PMD);

or IR3535.

Here are some facts you should know about each of these products:

DEET. DEET (N,N-diethyl-m-toluamide) was developed in 1946 for use by the US military. It went to market in 1957 as an insect repellent. It is sold under many brand names, including Sawyer, Repel, and Cutter, and is dispensed in many formulations, including creams, aerosols, pump sprays, and even wristbands. Concentrations of DEET in these products range from 5% to more than 30%. Concerns about DEET causing seizures and other neurologically based symptoms has prompted many patients to ask about alternative products, with an interest in natural repellent products.

Although DEET has been associated with skin irritation, especially with high concentrations, the neurologic effects, such as headaches and seizures, are very rare and have been associated mostly with misuse of the product involving ingestion or chronic use. The CDC, as well as the American Academy of Pediatrics, deems DEET safe, even for babies older than 2 months.

What about the pregnant patient? Unfortunately, few recent studies have assessed the penetration of DEET into the placenta. One larger study^[1] done in Thailand, in 897 pregnant women in their second or third trimesters who used insect repellent with DEET, found that it crossed the placenta in only 8% of users, with no observed adverse effects on the fetus or child after birth. It is felt to be safe enough for pregnant women to use in their second and third trimester.

Picaridin. Another mosquito repellent recommended by the CDC is picaridin. Picaridin is a derivative of piperidine and was first sold in Europe several decades ago. Picaridin is less irritating to the skin, and the smell is not as powerful as DEET.

Oil of lemon eucalyptus. CDC also recommends products containing oil of lemon eucalyptus, with the active ingredient called PMD (para-menthane-3,8-diol). This product is effective at 30% concentration, with some studies showing protection lasting 4-6 hours. However, PMD can only be used in persons older than 3 years. Pure oil of lemon eucalyptus is an essential oil and not formulated as a repellent. This product has not undergone validated testing for safety and efficacy, and is not registered with Environmental Protection Agency (EPA) as an insect repellent. Tell your patients to stick with the repellent formulation found in most stores.

IR3535. The final product recommended by the CDC is IR3535, marketed in several formulations. At a 20% concentration, IR3535 also offers good protection for 7-10 hours against the Aedes mosquito.

Safer Alternatives?

Some patients will ask about mosquito repellents that are safe to use during pregnancy. Unfortunately, none of the non-DEET products (picaridin, PMD, and IR3535) have yet been studied in pregnancy and should not be used by pregnant women.

What about natural oils and devices? Many patients are asking about herbal remedies. The bad news here is that they just do not work, or their repellent effects do not last as long as you need them to. Repellent-impregnated wristbands have not been shown to be effective, either.

Earlier this year, Consumer Reports published testing results for repellents using the CDC-recommended products, as well as a variety of natural plant oils, including cedar, citronella, geraniol, lemongrass, and rosemary. They found that the natural products were simply ineffective.

Other key findings of the Consumer Reports testing:

Products containing 20% picaridin were effective for 8 hours.

Products containing 25% DEET were also effective for 8 hours.

Products containing 30% of the active ingredient of oil of lemon eucalyptus were effective for about 7 hours.

Products containing natural plant oils were determined to be ineffective, with efficacy lasting < 1 hour or failing immediately.

Another interesting note: The plant-based products are exempt from EPA regulations, and therefore, are not even evaluated for safety.

How should we respond when a patient asks about the best protection from mosquitoes? What about the patient who is looking for a natural remedy? Here it is, in a nutshell: It is not all about insect repellents. Prevention is a two-pronged approach.

First, avoid mosquitos—and to do that, wear long-sleeved clothing, and pants that cover the legs. Avoiding areas where Zika is spreading is especially important for pregnant women, and women who may become pregnant.

Another way to avoid bites is to wear permethrin-treated clothing. Permethrin is the synthetic compound that is toxic to the nervous system of insects, but has low toxicity in humans. It is available as a spray and can maintain potency for a few weeks, even after some washings of the clothing. You can

even buy pretreated clothing, which might be easier for some people. Permethrin-coated clothing in high-risk areas is important, as are mosquito nets.

Second, for areas of the skin that are exposed, use insect repellents. DEET seems to be the most effective and [is] safe enough for pregnant women in their second and third trimester. It is also one of the few products that has some research to support safety in these women—but remember, it should not be used in the first trimester. The optimal concentration seems to be 25% for protection lasting 7-8 hours. If a patient wants to use a lower concentration, it should be applied more often, because it will not last as long.

Picaridin at a 20% concentration, or PMD eucalyptus oil at 30%, are also effective. The big takeaway here is that picaridin should not be applied to children under age 2 years, and PMD should not be applied to children under age 3 years. None of these non-DEET products can be used by pregnant or lactating women, and data on their use in children are lacking.

Natural oils in plant-based products have not found to be effective, and they are often not EPA registered [and] so have not been evaluated for safety. Make sure your patient chooses an EPA-registered product as recommended by the CDC.

Lastly, advise your patients not to use those combination sunscreen-repellent products. Sunscreen needs to be reapplied frequently. Reapplying repellents with that sunscreen in high concentrations can be a safety concern.

Remind your patients that prevention of mosquito bites in the first place is the best way to stop Zika as of now. Covering yourself up properly with clothing and repellent will go a long way toward doing that.