

Joint Statement on Insect Repellents from the Environmental Protection

Agency and the Centers for Disease Control and Prevention

July 17, 2014

The Environmental Protection Agency (EPA) and Centers for Disease Control and Prevention (CDC) are recommending that the public use insect repellents and take other precautions to avoid biting insects that carry serious diseases. The incidence of these diseases is on the rise. This joint statement discusses diseases that are transmitted by ticks and mosquitoes, the role of government in vector control and disease prevention, the history of repellents, how to use repellents as part of an integrated control program, and how to select and use a repellent.

Introduction and Purpose

CDC and EPA developed this joint statement to promote awareness of repellents and to highlight the effectiveness of repellents in preventing mosquito and tick bites. The agencies believe that promoting the use of repellents may reduce the impact of diseases and nuisance effects caused by these pests.

Vector-borne diseases, such as those transmitted by mosquitoes and ticks, are among the world's leading causes of illness and death today. A wide variety of arthropods, including mosquitoes, ticks, fleas, black flies, sand flies, horse flies, stable flies, kissing bugs, lice and mites, feed on human blood. Among these, mosquitoes and ticks transmit some of the most serious vector-borne diseases both globally and within the United States.

Diseases Transmitted by Mosquitoes and Ticks

Mosquito-transmitted West Nile virus caused over 36,000 disease cases and 1,500 deaths in the United States between 1999 and 2012 (CDC, 2012). Mosquitoes also transmit other viruses that cause severe disease in the United States, including La Crosse encephalitis, eastern equine encephalitis and dengue. Globally, travelers and residents outside the United States are exposed to numerous mosquito-transmitted pathogens, such as those that cause malaria, dengue, Japanese encephalitis, and chikungunya. In addition, mosquito bites by themselves can impact health through allergic reactions or secondary infections (Simmons and Peng 1999).

CDC estimates that there are about 300,000 cases of tick-transmitted Lyme disease in the United States each year (Hinckley et al, 2014). Ticks also transmit the pathogens that cause Rocky Mountain spotted fever, babesiosis, anaplasmosis, ehrlichiosis, tularemia, Colorado tick fever, Powassan encephalitis and Heartland virus disease in the United States. (CDC 2011, Savage et al, 2013). Outside the United States, ticks transmit tick-borne encephalitis, relapsing fever, and Crimean-Congo hemorrhagic fever.

Challenges posed in recent years by the introduction and establishment of newly emerging mosquito-transmitted pathogens such as West Nile and chikungunya viruses in the Western Hemisphere; intermittent transmission of dengue virus in areas of the Southern United States; and the increasing incidence of tick-borne illnesses like Lyme disease across the country illustrate the importance of cooperation and partnership at all levels of government to protect public health. EPA and CDC are working closely together and with other federal, state, and local agencies to protect the public from these vector-borne pathogens.

Role of Government

CDC and EPA work within their individual areas of expertise to encourage the use of [Integrated Pest Management](#) to control insects that transmit diseases. Repellents are valuable tools for individual protection and are especially effective when used as part of a community-wide program to combat mosquitoes or for individual efforts to control ticks. For more information on joint efforts for mosquitoes, see EPA and CDC's [Joint Statement on Mosquito Control in the United States](#); for information on ticks, see the [Federal Initiative: Tick-Borne Disease Integrated Pest Management White Paper](#).

CDC, working closely with state, territorial and local health departments, monitors the status of vector-borne diseases and provides advice and consultation on prevention and control of these diseases. CDC works with a network of experts in epidemiology, environmental health, human and veterinary medicine, entomology, zoology, and ecology to obtain quick and accurate information on emerging trends, which helps form national strategies to reduce the risk of disease transmission.

EPA ensures that pesticide products that are registered for use against ticks and mosquitoes are effective, including the individual products (such as repellents) used by the general public. EPA's rigorous pesticide review process is also designed to ensure that registered products, when used according to label directions and precautions, are not expected to pose unreasonable risks to human health and the environment. EPA also educates the public through outreach efforts to encourage proper use of insect repellents and tick and mosquito control products.

State, territorial and local government agencies also play a critical role in protecting public health from mosquito-and tick-borne diseases. These agencies serve on the front line, providing information through their outreach programs to the medical and environmental surveillance networks that first identify possible outbreaks. They also manage the mosquito control programs that carry out prevention, public education, and vector population management. In addition, they provide information about local risks of tick-borne diseases.

While effective community programs can substantially reduce the mosquito population and increase awareness about ticks, mosquitoes, and disease, they are not available everywhere nor do they completely eliminate the threat of vector-borne diseases. Individual protection, such as that afforded by EPA-registered personal repellents, can be a critical piece of individual protection from mosquito and tick-borne diseases. EPA and CDC also encourage nonchemical mosquito and tick prevention efforts, such as eliminating standing water that provides breeding

sites, using predators such as fish to reduce mosquito populations, and designing landscapes that reduce harborage for ticks and mosquitoes.

History

Throughout history, humans have tried to prevent blood-feeding arthropods from biting by using a variety of methods. Such methods included burning plants to produce smoke to drive the pests from indoor or outdoor spaces and applying plant oils or elemental sulphur directly to the skin or clothing to repel the pests (Moore and Debboun, 2007). Eventually, mosquito coils containing pyrethrum oil (the insecticidal/repellent oil from certain *Chrysanthemum* species) were developed in response to a need for effective repellents that could be used inside houses. More refined topical repellents containing synthetic chemicals and improved formulations were also developed in response to a need for personal insect repellents.

Before World War II, commercially available repellents for use on skin or clothing primarily contained one of four main active ingredients: oil of citronella, dialkyl phthalates, indalone and Rutgers 612, all of which were discovered between 1901 and 1939 (Brown & Hebert, 1997). World War II spawned interest in improving personal protection measures and resulted in development of DEET (N,N-diethyl-meta-toluamide) and several other compounds with repellent qualities (Moore and Debboun, 2007). In recent years, a number of new repellent active ingredients have been produced in response to increases in the seriousness of arthropod-transmitted diseases and consumer interest in having a choice when purchasing an insect repellent.

Role of Repellents in Reducing the Risk of Vector-borne Disease

EPA registers repellent products that have demonstrated effectiveness in preventing mosquito and tick bites for varying lengths of time (Fradin, 1998; Fradin & Day, 2002; Goodyer et al., 2010, Bissinger & Roe, 2009). Not only has repellent use been demonstrated to reduce the risk of being bitten by mosquitoes and ticks, but it is also associated with reducing the likelihood of being infected with the diseases they transmit (Loeb et al., 2005; Debboun & Strickman, 2013).

Reduction of the risk of vector-borne diseases is best accomplished using an Integrated Pest Management approach that includes repellents, but also incorporates components designed to reduce the abundance of mosquitoes or ticks and exposure to these pests (*e.g.*, Stafford 2004. CDC 2013). The protection provided by repellents applied to skin and clothing can be enhanced by additional actions individuals can take to protect themselves, such as:

- Wear clothing that inhibits ticks and mosquitoes from biting (such as long-sleeved shirts, long pants, closed toed shoes, and hats);
- Check your body frequently to find and remove ticks;
- Avoid the locations where mosquitoes and ticks are most active and times when mosquitoes are most active; and
- Use physical barriers like window screens or netting to exclude insects, especially when sleeping.

Selection and Use of Repellents

EPA has registered many repellents that use numerous active ingredients and have various performance characteristics. Repellent efficacy may slightly vary between individuals based on factors including an individual's genetics, diet, type of outdoor activity, and clothing choice. While one repellent may work well for an hour on a cool afternoon playing in the backyard, that same repellent may not provide adequate protection while hiking through the woods for hours on a hot summer afternoon. Additional information on specific repellents is available from EPA, along with a tool for searching among EPA-registered repellents (<http://cfpub.epa.gov/oppref/insect/#searchform>). When searching for an appropriate repellent, it is important to note that repellency durations listed on labels may vary slightly because of the factors mentioned above.

EPA has developed a new [Repellency Awareness Graphic](#) to make it easier for consumers to choose a repellent at their point of purchase. This voluntary graphic will display the number of hours mosquitoes and ticks are expected to be repelled when the product is used as directed. By providing this vital information to consumers, this new graphic will help parents, hikers and the general public better protect themselves from serious health threats caused by mosquitoes and ticks. Consumers may see the new graphic on labels as soon as early 2015.

The graphic is intended to provide a uniform, easy-to-read indication of repellent performance to consumers who are purchasing the products. The agency intends the graphic to educate consumers about repellents, just as the SPF (Sun Protection Factor) scale has educated them about the performance of sunscreens. EPA has developed the graphic to:

- Raise consumers' awareness of the efficacy of skin-applied insect repellents through a clear, simple, and easy-to-identify graphic;
- Increase consumer confidence in the repellency claims on labels; and
- Encourage consumers to protect themselves and their families against vector-borne diseases, such as West Nile virus and Lyme disease, by highlighting the information they need to use these products effectively.

EPA is currently promoting the graphic to repellent producers, who can voluntarily apply to display the standardized graphic on their product labels. EPA will determine the minimum number of hours the product is expected to repel mosquitoes and/or ticks when the product is applied as directed. This decision will be based on the agency's review of submitted product performance data for each product that is a candidate to use the graphic.

EPA and CDC believe that this effort will provide clear and readily visible information about repellent products to consumers, and that it will complement CDC's efforts to promote effective personal protection for the prevention of mosquito- and tick-borne diseases once products with the graphic start to appear in the marketplace. For more information on the Repellency Awareness Graphic and EPA's efforts to improve insect repellent labels, visit [EPA's repellent web site](#).

For more information about repellents, choosing a repellent and mosquito and control, please see the following Web sources:

<http://www2.epa.gov/mosquitocontrol>

<http://www.cdc.gov/westnile/prevention/>
<http://www.epa.gov/pestwise/ticks/>
www.cdc.gov/ticks

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