

## Adverse reactions

If you suspect that you or a child is reacting to a repellent, wash the skin that has been in contact with the repellent, remove any treated clothing, and call your doctor or local poison control center. If you go to the doctor, take the repellent with you. Launder treated clothing, separately from other clothing, before wearing again.

## Other precautions to take

Repellents do not provide complete protection against Lyme disease and other insect-borne diseases. You should avoid areas with high populations of ticks or mosquitoes when possible, especially at peak biting times; use protective clothing (light-colored, long-sleeved shirts and long pants with bottoms tucked into boots or socks); check yourself, your children and pets daily for ticks; and seek prompt medical attention if disease symptoms appear. Check with your health care provider to determine if the Lyme disease vaccine is appropriate for you.

## For further information

If you have any questions about repellents or their use call the Bureau of Toxic Substance Assessment at the toll-free Environmental Health Information Line at 1-800-458-1158 or check the New York State Department of Health website: [www.health.state.ny.us](http://www.health.state.ny.us)

If you have questions regarding Lyme disease or other insect-borne diseases call the Bureau of Communicable Disease Control at 518-474-4568.

## References

**(Note: The following references are only a partial listing of the available information on toxicity, efficacy and general characteristics of repellents. Additional references can be provided.)**

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# Health Advisory: Tick and Insect Repellents

## Introduction

Tick and insect repellents can be effective at reducing bites and, therefore, may reduce the risk of getting some diseases, such as Lyme disease and certain forms of encephalitis. Repellents commonly available to consumers contain the active ingredients DEET (N,N-diethyl-m-toluamide), permethrin, or botanical oils. A few products containing other active ingredients (e.g. IR3535) are also available.

Using any of these repellents is not without risk of adverse reactions, especially if used in large amounts or applied improperly. Information in this brochure will help you decide when and if a repellent should be used.

Products labeled as insect repellents are regulated by the U. S. Environmental Protection Agency (EPA) and New York State, and are tested for toxicity and effectiveness. The EPA does not require that all botanical repellents be tested or registered before their sale and use. The active ingredients for all products should be stated on the labels.

**Regardless of which repellent product you use, carefully read and follow all directions on the label before each use.**

## DEET and botanical products

DEET products have been widely used for many years but these products have occasionally been associated with some adverse reactions. DEET concentrations range from a low of about five percent up to 100 percent. Skin reactions (particularly at DEET concentrations of 50 percent and above)<sup>1,2</sup> and eye irritation have been the most frequently reported adverse effects. There have been some reports of central nervous system problems, more frequently reported in children than adults, ranging from slurred speech and confusion to seizures and coma<sup>3</sup>. The use of DEET products primarily results in exposure from skin contact, although unintentional exposure by breathing and ingestion can also occur.

By using products with lower concentrations of DEET and by applying as little of the product as needed for your outdoor activities, you can reduce your exposure to DEET.

**The amount of repellent you may be exposed to depends on:**

- The concentration in the product
- In what form the product is applied
- The amount of the product put on the skin
- How carefully and how often the product is applied

**The greater your exposure to the repellent, the greater the risk of health effects.**

### Children, pregnant women and repellents

- Children may be at greater risk for adverse reactions to repellents, in part, because their exposure may be greater.
- Keep repellents out of the reach of children.
- Do not allow children to apply repellents to themselves.
- Use only small amounts of repellent on children.
- Do not apply repellents to the hands of young children because this may result in accidental eye contact or ingestion.
- Try to reduce the use of repellents by dressing children in long sleeves and long pants tucked into boots or socks whenever possible. Use netting over strollers, playpens, etc.
- As with chemical exposures in general, pregnant women should take care to avoid exposures to repellents when practical, as the fetus may be vulnerable.

DEET concentrations as low as five percent have been shown to provide good, but not necessarily complete, protection from mosquito bites for periods up to about four hours<sup>4</sup>. Such lower concentration products may be adequate for activities like yard work or picnicking at times when mosquito activity is low.

Less information is available on DEET's effectiveness in repelling ticks although some data suggest that ticks may be more difficult to repel than mosquitoes. Products containing higher concentrations of DEET or those with controlled-release formulations (a controlled-release product extends protection time from insects by regulating its release) may be useful when in areas with high populations of ticks or biting insects for long periods of time. Skin reactions have been associated with higher concentration products (particularly at DEET concentrations of 50 percent and above).

Under demanding conditions, a two-part approach has been used to help protect people from ticks and other biting insects. The approach uses a repellent product containing about 33 percent DEET in a controlled-release formulation on exposed skin along with clothing treated with permethrin. (See "Permethrin Products" below). This may meet the needs of individuals spending long periods of time in areas with high populations of active ticks or mosquitoes<sup>5</sup>.

Information about DEET's effectiveness in repelling insects comes from laboratory and field experiments<sup>6</sup>. The data are not completely consistent about how long DEET is effective or how completely it prevents insect bites. In general, the more concentrated the DEET product, the more protection (reduction of bites and length of this reduction) is provided. Also, in general, the more DEET exposure, the greater your risk of experiencing adverse effects. To reduce your risk of adverse effects while maintaining sufficient protection, you should use as little DEET as necessary for your situation.

## Recommendations for proper use of DEET products

- 1 Particularly with children, try to reduce the use of repellents by dressing them in long sleeves and long pants tucked into socks or boots when possible or by applying repellent to clothing instead of skin. Use repellents only in small amounts, avoiding unnecessary repeat applications.
- 2 Do not apply repellents directly to children. Apply repellent to your own hands and then use your hands to apply repellent on the child.
- 3 Do not apply near eyes, nose or mouth and use sparingly around ears. Do not apply to the hands of small children because this may result in accidental eye contact or ingestion.
- 4 Avoid use of DEET products on skin damaged by sunburn, cuts, rashes or other skin conditions, such as psoriasis or acne.
- 5 Particular care should be taken to avoid breathing in DEET when applying products, especially spray products. Do not apply repellents in enclosed areas or directly to the face (products can be applied to hands and then rubbed on the face).
- 6 Do not use sunscreens or moisturizers that also contain DEET if the repellent is not needed.
- 7 Avoid prolonged and excessive use of DEET products. Use just enough repellent to cover exposed skin or clothing, and do not treat unexposed skin (skin covered by clothing).
- 8 After returning indoors, wash treated skin with soap and water.
- 9 DEET products can be applied to clothing, but may damage some synthetic fabrics and plastics, especially products with very high DEET concentrations. Launder treated clothing separately from other clothing.
- 10 Frequent reapplication or saturation is unnecessary for effectiveness. Use only what is required to maintain protection.

### Things to consider when choosing a repellent:

- The type of pests present - ticks, mosquitoes, etc.
- The numbers and activity of pests.
- Where you are going - swamp, backyard, etc.
- Whether the area has pests carrying diseases.
- How long you will be in infested areas.
- Your tendency to be bitten.
- Age - child, adult.

## Botanical products

Insect repellent products containing botanical (plant-based) oils, such as oil of geranium, cedar, lemongrass, soy or citronella, are also available. There is limited information on the effectiveness of botanical oils individually and when combined with other ingredients to make repellent products. Available information, however, indicates that, compared to the effectiveness of DEET or permethrin, botanical oils generally do not provide the same duration of protection<sup>7,8</sup>. While two botanical products are reported to provide some protection (one to four hours) from mosquitoes, other products evaluated provided less<sup>7,8,9,10</sup>. Limited, unpublished information on botanical products indicates some protection from ticks.

Because many botanical oils are regulated differently than DEET and permethrin, most have not been tested for their potential to cause short- or long-term toxic or reproductive effects, birth defects or cancer. By following recommendations one through eight listed above for the proper use of DEET products, you will reduce your exposure and, hence, the risk of adverse health effects when using botanical products.

## Permethrin products

**Products containing permethrin are for use on clothing only - not on skin.** Permethrin kills ticks and insects that come in contact with treated clothes. It is effective for two weeks or more if the clothing is not laundered.

There are some health concerns associated with the use of permethrin products, particularly if they are not used according to the label directions. They can cause eye irritation. In addition, animal studies indicate that permethrin may have some cancer causing potential<sup>11</sup>. If used properly, however, the potential for adverse reactions is minimized. Some recommendations for proper use are:

### TREAT CLOTHING ONLY - DO NOT APPLY TO SKIN.

- Read carefully and follow manufacturer's recommendations for application.
- If you accidentally get the product on your skin, immediately wash with soap and water.
- Apply to clothing in a well-ventilated outdoor area, protected from wind.
- Only spray permethrin products on the outer surface of clothing and shoes before you put them on - do not apply to clothing while it is being worn. Only spray enough product to lightly moisten the outer surface of the fabric causing a slight color change or darkening; do not saturate clothing. Do not exceed recommended spraying times. Pay special attention while treating socks, trouser cuffs and shirt cuffs to ensure proper coverage. Hang the treated clothing outdoors and allow to dry for at least two hours (four hours under humid conditions) before wearing.
- Do not treat clothing more than once every two weeks. Launder treated clothing, separately from other clothing, at least once before retreating.
- Keep treated clothes in a separate bag.

Those who frequent tick or mosquito habitats should consider having a set of clothes, preferably long-sleeved shirt, pants and socks that are used only in such settings. These clothes can be treated with a permethrin-containing product according to the label directions, worn only when needed, and then placed in a separate bag when not in use. In hot weather, when long-sleeved shirt and pants may be uncomfortable, pants and jackets made of insect netting (either untreated or treated with repellent) can be worn. Such clothes are available in some sporting good stores and through outdoor equipment catalogs.