Repellents, clothing, netting and other personal protection measures can help prevent mosquito bites and the diseases they carry. Insect repellents are effective, but not entirely safe — they must be used with caution. However, to help prevent mosquito-borne diseases like EEE and WNV, they must be used.

DEET (N, N-diethyl-3-methylbenzamide) is probably the best known insect repellent. It repels both mosquitoes and ticks. It is sold under numerous brand names (Off ®, Cutter ®, etc.) and comes in lotion, spray and many other forms. Concentrations of DEET range from about 5% all the way up to 100%, though after a certain point, higher concentrations do not guarantee greater protection. The federal Centers for Disease Control and Prevention and the American Academy of Pediatrics both recommend using DEET-based repellents to help prevent mosquito and tick bites. The CDC states that DEET-based repellents "are very safe when used according to the directions." The AAP suggests that DEET-based repellents be used to protect against insect- and tick-borne disease and advises parents that products containing up to 30% DEET can be used on children over the age of two months.

As with all repellents, DEET-based products should be applied only according to the directions on the product label.

Picaridin has effectiveness comparable that of DEET. Products with picaridin can be expected to provide better and longer-lasting protection than plant-based repellents. Cutter Advanced® contains picaridin as an active ingredient.

Oil of lemon eucalyptus, or PMD, has been tested against mosquitoes found in the US, and provides protection similar to repellents with low concentrations of DEET. Be sure to check with your health care provider for best use practices if you are pregnant, nursing, or are applying repellent to children under the age of 2 years.

Other Repellents
Repellents derived from plants such as citronella, geranium, basil, garlic and peppermint generally provide only temporary protection from mosquitoes, if any at all.

Bite Blocker ®, a plant-based repellent released in 1997 containing soybean oil, geranium oil and coconut oil, has shown to be a good repellent for up to 3 1/2 hours against *Aedes aegypti* (the mosquito that transmits yellow fever).

Avon's Skin-So-Soft ® bath oil has gained popularity as a mosquito repellent, but its effects are only slight and not long-lasting. Skin-So-Soft ® is not nearly as effective as DEET.

Citronella candles can be mildly effective mosquito repellents. However, there effectiveness is not much greater than that of ordinary candles.

PERMETHRIN

Permethrin is a pesticide rather than a repellent. It is not for use on the skin, but is intended for clothing. Permethrin products are sold in lawn, garden or sporting goods stores under names such as Permanone Repel ®. Permethrin can retain its potency for at least two weeks — even through several launderings. The combination of Permethrin-treated clothing and DEET-treated skin creates almost complete protection against mosquito bites. In field trials conducted in Alaska, Permethrin-treated clothing and 35% DEET on exposed skin provided greater than 99.9% protection.

Safe Repellent Use

DO:
- Use aerosol or pump sprays for treating skin and clothing. These products provide an even application.
- Use liquids, creams, lotions or sticks to more precisely apply the product to exposed skin.
- Wash DEET-covered skin with soap and water after outdoor activity.
- Keep insect repellents out of the reach of children at all times.

DO NOT:
- Apply to eyes, lips or mouth, or over cuts, wounds or irritated skin.
- Over-apply to the skin, or saturate clothing.
- Apply to skin beneath clothing, or to skin that is not exposed.
- Apply more or more often than recommended on the product label

New repellents occasional come on to the market. To check the usefulness and safety of new repellents, go to https://www.cdc.gov/westnile/prevention/index.html, https://www.epa.gov/insect-repellents and http://cfpub.epa.gov/oppref/insect/.