



West Nile Virus: ***Controlling Mosquito Larvae with Bacillus thuringiensis israelensis (Bti)***

Vermont Agency of Agriculture
Plant Industry Division
116 State Street, Montpelier, VT 05620 (802) 828-2431

LARVICIDE: *Bacillus thuringiensis israelensis* (Bti)

Bacillus thuringiensis israelensis (Bti) is a naturally occurring soil bacterium that can effectively kill mosquito larvae (the immature form of the mosquito) present in water. Bti is very specific for mosquitoes and black flies, and has some toxicity toward certain other dipterans (including midges). Bti is the primary material used by mosquito control professionals because of its low toxicity to non-target species. Commercially available Bti strains are sold under trade names such as Aquabac, Teknar, Bactimos, and Vectobac*. When community mosquito control is needed to reduce mosquito-borne disease, the Vermont Agency of Agriculture favors use of larvicide applications to the breeding source of mosquitoes. Larvicides are more effective and less toxic than adult mosquito sprays, and the applications are unlikely to result in human exposure.

HOW DOES Bti WORK?

Bti spores that are eaten by mosquito larvae release toxins into the mosquito's gut, causing the larvae to stop eating and die. Bti is only effective against actively feeding larvae, and does not affect mosquito pupae or adults. More information on the mosquito life cycle may be found on USEPA's Larvicides for Mosquito Control Web page (see web resources below). Products that contain Bti are available in liquid, briquette (small block) and granular formulations. These formulations can be applied to water bodies by hand, with a sprayer, or aurally. Bti breaks down quickly in the environment and may need to be reapplied regularly to obtain adequate mosquito control. Depending on the formulation and environmental conditions, Bti may remain effective from 24 hours to over one month.

WHERE IS Bti APPLIED?

Bti may be applied to water bodies where mosquito larvae live. Since mosquitoes generally prefer to breed in standing water, typical locations where Bti may be used include stormwater retention ponds, catch basins and shallow areas of wetlands and lakes that have been identified as a problem source of mosquitoes. Application of larvicides to wetlands is not recommended because natural predators in the wetland ecosystem can control mosquito larvae. If mosquito control is needed, Bti or *Bacillus sphaericus* products are recommended due to their low toxicity to non-target organisms. **Federal laws prohibit the application of Bti to reservoirs that contain drinking water.**

CAN YOU APPLY Bti TO YOUR OWN PROPERTY?

Some products that contain Bti, such as Mosquito Dunks, Mosquito Bits and Bti Briquets, are available for private residential use in Vermont. You do not need a permit to use these products. If using these products, it is important to carefully follow the label instructions and to apply only to waters that will not drain off of your property (e.g., ornamental ponds or other closed systems). If water on private property is connected to, or has the potential to reach, surface waters of the state, then only licensed pesticide applicators may apply the product. In addition, the property owner or the licensed pesticide applicator must first obtain a Mosquito Larvicide Permit from the Vermont Agency of Agriculture. For more information about the permit process for aquatic mosquito control in Vermont, call the Vermont Agency of Agriculture at (802) 828-2431.

(OVER)

For most residences a more effective way to control mosquito populations on your property is to reduce standing water where mosquitoes can breed. The Vermont Agency of Agriculture recommends taking the following steps to reduce mosquito habitat on your property:

- ✓ Empty any container that holds standing water—old tires, buckets, pool covers and toys.
- ✓ Change water in your birdbaths, fountains, wading pools and animal troughs at least twice a week.
- ✓ Recycle unused containers that may collect water—bottles, cans, and buckets.
- ✓ Make sure roof gutters drain properly and clean gutters in the spring and fall.
- ✓ Fix leaky outdoor faucets and sprinklers.

It is also important to limit your exposure to mosquitoes by wearing long sleeved clothing and using mosquito repellent products if you are in an area where you are likely to be bitten by mosquitoes. Mosquitoes feed most actively during the hours from dusk to dawn. **NOTE:** Always read and follow the directions on the repellent label very carefully!

IS Bti HARMFUL TO HUMANS OR PETS?

No measurable health effects were seen in laboratory animals that ingested large concentrations of Bti. Cases involving human health effects following exposure to Bti are extremely rare. Direct exposure to Bti was shown to cause skin and eye irritation in some animals. Cases of eye and skin irritation in humans have also been reported following direct exposure with some *Bacillus thuringiensis* products. Pets are unlikely to experience health effects from exposure to Bti based on the results from numerous studies involving laboratory animals.

IS Bti HARMFUL TO THE ENVIRONMENT?

Bti is nontoxic to mammals, birds, and fish. In laboratory studies, effects were only observed at concentrations much greater than what would occur following a typical application.

WHAT PRECAUTIONS CAN I TAKE TO REDUCE MY EXPOSURE TO Bti?

Since Bti will generally be applied to areas that are inaccessible to the public, exposure is unlikely. Common sense steps, such as avoiding areas during scheduled larvicide applications, will further reduce the chances for exposure. If applying Bti at home, carefully follow label directions and avoid direct contact of the product with eyes and skin. If irritation to eyes or skin occurs, rinse eyes with tap water and wash skin thoroughly with soap and water for 20 minutes. If symptoms persist, seek medical attention or call the poison control hotline at 1-800-222-1222.

NEED MORE INFORMATION?

- **Vermont Agency of Agriculture** - 116 State Street, Montpelier, VT 05620. (802) 828-2431.
- **Vermont Department of Health** - 108 Cherry Street, P.O. Box 70, Burlington, VT 05402-0070. 802-863-7200 or 800-640-4374.

WEB RESOURCES:

- United States Environmental Protection Agency, EPA and Mosquito Control
URL: <http://www.epa.gov/pesticides/factsheets/skeeters.htm>
- National Pesticide Information Center, *Bacillus thuringiensis* General Fact Sheet
URL: <http://npic.orst.edu/factsheets/BTgen.pdf>
- West Nile Information for Vermont - Vermont Department of Health
URL: <http://www.healthyvermonters.info/hs/epi/idepi/westnile/wnvhome.shtml>

This fact sheet was adapted from: Washington State Department of Health, 3/12/2004, West Nile Virus. URL: <http://www.doh.wa.gov/ehp/ts/Zoo/WNV/Pesticides/Bti.html>

* Mention of pesticides is for information purposes only. No endorsement is intended, nor discrimination against products not mentioned. Always read the product label.