

Boston's Response to West Nile Virus

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What Is West Nile Virus?

West Nile virus (WNV) is a mosquito-borne virus endemic to Africa, West Asia, and parts of Europe. It was first identified in the United States during the summer of 1999 when a large number of birds were found dead in the New York City area. Out of a population of more than 7 million, 62 people — or less than .0009% — became ill with the virus, 7 of whom died¹. By comparison, 2,600 people died of the flu in New York City during the same year².

A person can be infected with WNV when bitten by an infected mosquito. Once infected, a person may experience a wide range of symptoms, from what resembles a mild flu to meningitis, encephalitis, or sometimes death. Most who are infected, however, do not develop noticeable symptoms³. Less than 1% develop severe neurological disease⁴. The greatest risk for serious illness is among the elderly and those with compromised immune systems⁵.

West Nile Virus and Boston

WNV was first identified in the Boston area in July 2000 when a dead crow was found near Willow Pond. As of mid-November of that year, a total of 442 birds had died in Massachusetts due to infection from the virus, and one horse had developed severe neurological disease. There were, however, no reported cases in Massachusetts of human infection⁶.

When birds in the Boston area began dying from WNV infection, the response of public-health and other local officials was swift: Suffolk County Mosquito Control began applying pesticides in local neighborhoods and public spaces, and the city set up a hotline to field the public's questions and concerns. Some residents were relieved by the response; others were alarmed at being exposed to chemicals that they believed to be toxic, especially since notification of their use was thought to be inadequate.

The Neighborhood Pesticide Action Committee (NPAC) was born out of the latter set of concerns. This small, but quickly growing, group of residents from the Jamaica Plain area worked tirelessly throughout the fall and winter to educate their neighbors and public officials about WNV, the dangers of pesticides, and the use of ecologically sound alternatives. By early spring, NPAC had urged the Jamaica Plain Neighborhood Council to pass a resolution requesting the Boston Public Health Commission (BPHC) to implement safer alternatives in place of pesticide spraying for the virus.

That same spring, BPHC funded NPAC and eight other community-based organizations to educate Boston residents about WNV prevention. The summer-long campaign consisted of the nine organizations instructing residents about protective measures they could take — from keeping mosquitoes out of their homes to eliminating mosquito-breeding sites around their neighborhoods — as an alternative to pesticide use. BPHC stated that pesticides would not be sprayed as long as

there were no known human cases of the disease; the hope was that, with a well-educated public, the disease could be contained enough such that no people would become infected. The campaign was considered a success: not only was the public well educated in WNV prevention, but no human cases of the disease were reported in the areas of Boston that had been considered most vulnerable to it⁷.

NPAC conducted another highly successful campaign last summer. The community-based organization informed local residents about a little-publicized law that allows residents to request their property not be sprayed with pesticides except in the case of a public-health emergency. NPAC collected well over 500 signed requests from residents living throughout Jamaica Plain. This enthusiastic response to NPAC's "no-spray campaign" forced Suffolk County Mosquito Control to concede by August 2001 that Jamaica Plain had become virtually off-limits to the use of pesticide spraying as the area's method of mosquito control.

About the Pesticides

During the summer of 2000, several pesticides were applied in the neighborhoods and public spaces of the Jamaica Plain area. Scourge, intended to kill adult mosquitoes, was sprayed from trucks, and Altosid, intended to kill mosquito larvae or pupae, was dropped in the form of "briquets" in local catch basins. Permethrin 10EC was sprayed once by hand around Daisy Field.

Although during the summer of 2001 neither Scourge nor Permethrin were sprayed for WNV in the Jamaica Plain area, the larvicide Altosid was again applied to catch basins. Targeted use of larvicides is generally considered safer than spraying adulticides, which kill adult mosquitoes, but it does carry risks. Not only does Altosid contain at least one toxic chemical (see the more detailed description of Altosid below), but in Boston, many of the catch basins into which the larvicide was dropped empty into the city's waterways, including the Neponset and Charles rivers and Boston Harbor.

What They're Made Of

Scourge contains 18% **resmethrin** (the pesticide's "active ingredient"), 54% **piperonyl butoxide**, and 20% **aromatic petroleum solvent**. The remaining 8% are a trade secret⁸. **Permethrin**, **Permethrin 10EC**'s active ingredient, makes up only 10% of the pesticide. The remaining 90% is **petroleum distillate**⁹. Both resmethrin and permethrin are pyrethroids, synthetic versions of the insecticides that naturally occur in chrysanthemums. Pyrethroids retain the insecticidal effects of their natural counterparts but are much longer acting¹⁰.

Resmethrin is said to be "slightly toxic to practically non-toxic" to humans¹¹, and permethrin is described as having "low- to moderate" toxicity to humans for short-term exposures¹². Permethrin, however, has been classified by the EPA as a possible human carcinogen¹³, and both pesticides have been identified as hormone disruptors and as interfering with normal reproduction and development in laboratory animals¹⁴. In addition, pyrethroids as a group have been reported to adversely affect the peripheral and the central nervous systems, some even causing seizures in cases of severe poisoning¹⁵.

Pyrethroids are highly toxic to bees, fish, frogs, and many other organisms, some of which are natural mosquito predators¹⁶. Such organisms are endangered whenever pyrethroids are sprayed

into the environment, since sprayed pesticides inevitably hit other wildlife besides the targeted mosquitoes.

Although when acting on its own the acute toxicity of piperonyl butoxide (PBO) has been reported to be low¹⁷, the EPA has classified it as a possible human carcinogen¹⁸. Within Scourge, PBO functions as a “synergist,” which means that it makes Scourge much more potent than it would be were resmethrin acting alone¹⁹. It does this by inhibiting liver enzymes that are responsible for the breakdown of certain toxins, causing people and other organisms to become vulnerable to them.

The aromatic petroleum solvent found in Scourge can be allergenic and, when inhaled, may cause chemical pneumonia. The components that give the solvent its aroma have been identified as possible carcinogens²⁰.

The active ingredient in *Altosid* is **methoprene**, an “insect growth regulator” that prevents mosquito larvae from developing into mature adults. Methoprene’s acute toxicity to mammals is considered low, but it is highly toxic to amphibians and certain invertebrates. It may also harm fish²¹. Methoprene makes up only 8.62% of Altosid; the manufacturer lists the remaining 91.38% as “inert ingredients”²². So-called inert ingredients identified in other pesticide formulations are known or suspected carcinogens or nervous-system depressors²³.

Ecologically Sound Alternatives

Ironically, widespread use of pesticides creates some of the very conditions it is intended to protect us against: It poses significant risks to our health, especially that of fetuses and small children who are particularly vulnerable to even minute chemical exposures²⁴. Additionally, it may actually increase mosquito populations over the long term by killing natural mosquito predators and developing resistance to the pesticides in the mosquitoes themselves²⁵.

Ecologically sound methods — methods that are safer for both people and the environment — have been put into practice in a number of communities. Targeting mosquitoes at their breeding sites, one of the methods that was used by Boston during the summer of 2001, is the most effective approach and environmentally the least harmful. In some cases, breeding sites can be eliminated altogether; for example, old tires, which collect water, thus creating excellent breeding conditions for some species of mosquitoes (including those that carry West Nile virus), can be discarded²⁶. Sites can also be made inhospitable, for instance, by removing or treating sewage leaks, which also create excellent breeding conditions for these species of mosquitoes. In still other cases, mosquito predators can be introduced. Fish that feed on mosquito larvae have long been used successfully in many parts of the world. Certain insects can also be effective, as are a number of bacteria, fungi, and protozoa. However, even these biological controls must be used judiciously, since they interfere with the natural balance of the environment. Extensive monitoring of infected mosquitoes and a thorough understanding of their habitats are vital to the success of any mosquito-control program²⁷.

Another alternative was tried and proven effective right here in the Greater Boston area. During the summer of 2001, Jamaica Plain’s neighboring town of Newton used *Bacillus sphericus* experimentally — and with great success — as an alternative to the larvicide Altosid. The

bacteria was used in a one-time application in 40 of the town's catch basins. Six weeks following the application, 95 percent of mosquito larvae had been killed and throughout the summer there was no need to reapply the agent. Its cost was about one-third that of Altosid²⁸.

What You Can Do

You can make a big difference in protecting yourself and your neighbors from West Nile virus infection. **To cut down on the number of mosquitoes around your home**, eliminate potential breeding sites: because the mosquitoes that carry West Nile virus breed in standing water, regularly empty or turn over containers such as wheelbarrows, ceramic pots, old tires, and trash bins; clean out roof gutters; and keep swimming pools and birdbaths clean. **To keep mosquitoes out of your home**, repair all screens and make sure they are well attached to their frames. **To prevent mosquitoes from biting you**, avoid going outdoors between dusk and dawn if possible. If you cannot avoid doing so, wear a long-sleeved shirt, long pants, and socks, and apply a mosquito repellent. Repellents that contain the insecticide N-N-diethyl-meta-toluamide (DEET) are generally considered the most effective but not necessarily the safest; use them with caution. A range of safer alternatives is available, from essential oils to commercially formulated products²⁹.

We must also tell public officials about our concerns. **To ensure that pesticides are not used this season**, let public officials know that you would like ecologically sound measures to be taken to protect you and your community from West Nile virus. This includes the application of the alternative larvicide *Bacillus sphaericus* (B.s.): The experimental use of B.s. in Newton last summer was so successful that the Boston Public Health Commission has decided to use it this summer in catch basins that empty into so-called sensitive areas — wetlands, such as Jamaica Pond and the Muddy and Neponset rivers. For budgetary reasons, however, BPHC does not plan to switch over to Altosid entirely until next summer; although B.s. is less expensive than Altosid, BPHC would like to use up the large store of Altosid that it still has on hand. Remind public officials that Altosid contains the toxic chemical methoprene as well as many “inert ingredients” and that you would like to see it replaced throughout Boston as soon as possible³⁰.

You may also want to sign one of NPAC's “no-spray pledge cards,” which requests of the city that your property not be sprayed with pesticides except in the case of a public-health emergency. In doing so, you will be joining more than 500 other local residents who have already made this request. You will be protecting your property from unwanted pesticides and alerting public officials that you would like your community and the city to use ecologically sound methods of mosquito control.

We Must Remain Vigilant

Despite our success in preventing the need for pesticide spraying last summer, WNV did infect three Massachusetts residents, one of whom died. Horses, mosquitoes, and many species of birds were also infected with the virus³¹. By the end of May of this year, WNV-infected birds had already been identified in New Jersey, New York, Pennsylvania, Georgia, District of Columbia, Florida, Virginia, and Massachusetts. As of early September, four Massachusetts residents had contracted WNV from “in-state” exposures³².

WNV is still very much with us, and prevention is an ongoing challenge and responsibility. The risk of human infection is usually low before late summer, according to the Massachusetts Department of Public Health, but Boston residents must remain vigilant: it is important that we take precautionary measures throughout the season to reduce our risk during the summer months³³.

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