

Peggy Keller, MPH
 Animal Disease Prevention Division
 DC Department of Health
 11 N Street, NE
 Washington, DC 20002
 202-535-2323
 202-535-2911, fax
 peggy.keller@dc.gov

PRELIMINARY REVIEW OF THE EFFICACY OF LARVICIDE, IN THE ABSENCE OF ADULTICIDE, TO CONTROL MOSQUITO POPULATIONS IN AN URBAN SETTING

Jamie Hinson, Peggy Keller
 District of Columbia Department of Health

Abstract

Since 2000, the District of Columbia has implemented the use of larvicide, Bti (*Bacillus thuringiensis israelensis*), to control the prevalence of West Nile virus (WNV) among the human population. The District's mosquito control program and policy does not include the use of aerosolized pesticides to control the mosquito population. There are numerous reasons for this policy, including, the high rate of respiratory problems. The District has 2.5 times the national average rate for asthma. With 40% of the land in the District federally owned, aerosolized pesticides can drift to non-target areas and affect non-target species.

Since the introduction of the WNV into the Western Hemisphere in 1999, the District has conducted avian, mosquito, mammal and human surveillance and mosquito control to protect the public health and safety of the residents and visitors in the District. Surveillance data is utilized to predict human risk and to target and evaluate control efforts. Mosquito surveillance is conducted in conjunction with federal entities. Surveillance data indicate that, in an urban setting, the use of larvicidal applications solely can cause a significant reduction in collected mosquito populations.

Methods:

The District Department of Health (DOH) and federal agency staff set CDC Gravid Traps in a grid-like pattern to uniformly cover the entire District, including private, public and federally-owned space. Staff place traps with no more than 1.5 miles between each trap location and target specific areas with significant activity from the previous years. Traps are set and mosquitoes are collected from May 15 through November 1. Mosquito specimens are speciated and tested for West Nile virus and other arboviruses. In response to positive test results, or elevated mosquito populations, DOH staff apply larvicide in catch basins and standing water, within a three square block area surrounding the trap location. For graphing purposes and compiling the data, larvicide is indicated as applied approximately 3 days out from mosquito collection on day 0. Mosquito collections from the same trap location are charted for day 7, 14, 21 and 28.

Results:

Mosquito surveillance began in the District in 2001. The positivity rate for mosquito specimens tested since 2001 has remained relatively constant, with a peak in 2002 (see Table 2). Since 2000, larvicidal control and triggering factors have remained constant.

The number of mosquitoes collected from individual traps diminished over time after larvicide treatments to surrounding catch basins and standing water. (see Table 1). Mosquito presence in traps was reduced in relation to previous levels for several weeks. Data provided was collected between May and August.

Conclusions:

The data shows a remarkable decrease in the mosquito population following larvicidal applications. This decrease is even greater and more sudden than was originally expected. While neighboring jurisdictions apply aerosolized pesticides as a component of their control measures, the unique urban setting of the District provided an ideal setting to monitor the efficacy of a non-aerosolized larvicide program. The use of larvicide as the primary mosquito control method has proven successful within the District of Columbia to control mosquito populations.

Background

- West Nile Virus was first seen in the US in 1999 in New York City.
- DC began surveillance of avian, mosquito, mammal and human populations in 2000.
- Since 2000, there have been 35 human cases with only 3 deaths.

Purpose

- Collect data on the efficacy of a mosquito control program that utilizes non-aerosolized larvicide.
- Compile and graph data to illustrate findings.

Objective

To measure the efficacy of a non-aerosolized larvicide program for the control of mosquito populations in an urban setting

Methods

- All trapping done with CDC Gravid Traps
- Locations based on a grid pattern to uniformly survey the entire 10-square mile District
- No more than 1.5 miles between traps
- Specimens transported and tested at the DC Public Health Laboratory
- Larvicide applied in response to:
 - Positive WNV Result from any surveillance system
 - Elevated mosquito populations trapped

Larviciding

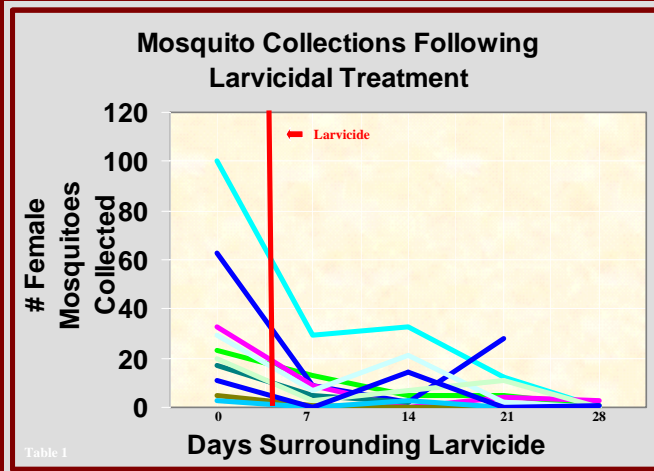
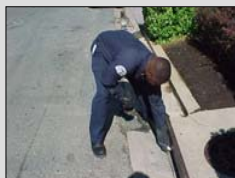
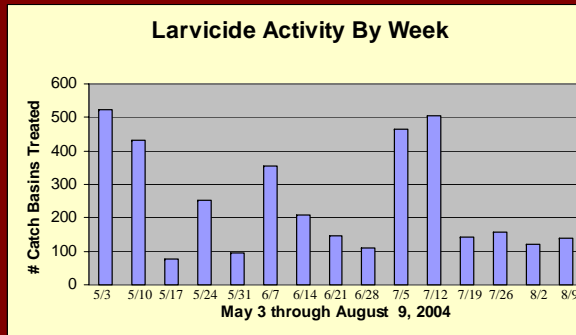


Table 1



Regional Partnerships

- Collaborative effort with Department of Defense, National Park Service and National Zoological Park for mosquito surveillance and control.
- Uniform setting of traps to cover all public, private and federal land in the District.
- Less than 1.5 mi between traps.
- Federal entities responsible for mosquito control on respective Federal land.

Regional Coordination

- Council of Governments (COG) hosts neighboring jurisdictions, federal entities and DC to meet quarterly to discuss regional trends, surveillance methods and control efforts
- Group developed a Regional Arbovirus Response Plan
- Group has crafted a regional message for personal protection

Why Not Spray In DC?

- DC has the highest asthma rate in the US (2.5 times the National Average)
- 40% of the land in DC is Federally owned. Embassies are located on foreign soil.
- DC is home to an endangered species (Hays Spring Amphipod) and a rare invertebrate (Kenk's Amphipod).

DC Department of Health Trap Locations



Human Surveillance 2000-2004

	2000	2001	2002	2003	2004
Tested	0	4	80	43	16
Positive	0	0	31	3	1
Negative	0	4	28	25	15

Table 2 Mosquito Surveillance 2000-2004

	2001	2002	2003	2004
Pools Tested	841	1315	2114	1884
Pools Positive	3	84	49	42
All Cx. Positive	4,368	10,755	20,684	28,929
Positivity Rate	.36%	6.39%	2.32%	2.23%

Results

- The number of mosquitoes collected diminished significantly after the application of larvicide to surrounding catch basins and standing water.
- Reductions in mosquito populations was observed several weeks after larvicide applications.

Conclusions

A mosquito control program utilizing only non-aerosolized larvicide can be effective in controlling mosquito populations in an urban setting.

CDC Gravid Trap



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