



THE COUNTY OF CHESTER



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Mosquito-Borne Disease Program: Mosquito Surveillance – Traps and Dipping

Chester County Health Department utilizes a variety of sampling methods to collect mosquitoes throughout Chester County. Samples are processed and submitted to PA Department of Environmental Protection for identification and testing for West Nile Virus (WNV). CCHD's primary methods of mosquito collection are the deployment of mosquito traps, as well as identifying habitat where mosquito larvae are present.

From the beginning of May through October, CCHD will be deploying approximately 40 mosquito traps weekly. Surveillance activities are primarily determined based on population density and WNV prevalence. Some traps will be deployed at "fixed" sites throughout the county, meaning that they are deployed at the same location every week for the entire season. Additional traps will be deployed at different locations each week. These will be either in response to mosquito-related complaints or to further investigate mosquito populations or WNV prevalence to determine risk. The data collected from these traps will be used to determine when and where larval and adult mosquito control may be necessary. Below, please find the images and descriptions of the types of traps and sampling methods CCHD uses to collect mosquitoes in all life stages.

Gravid Traps:

The most widely used trap for mosquito collection is what's known as a Gravid Trap. The word "Gravid" refers to a female mosquito who has mated and is seeking a suitable place to deposit her eggs. This type of trap is designed to replicate a source of standing or stagnant water, which is attractive to female mosquitoes in the genus *Culex*, the primary vector of WNV. The trap includes a small toolbox that has been modified to contain a fan and motor assembly, a 6-volt battery to power the fan, and a plastic collection chamber to contain the captured mosquitoes until CCHD staff can retrieve them the following morning. The toolbox is then positioned over a black plastic bin that is filled with foul-smelling stagnant water. Mosquitoes are attracted to the stagnant water in the bin, and as they approach the water, they are drawn up through the bottom of the toolbox by negative pressure generated by the fan. This also keeps the mosquitoes in the collection chamber and prevents them from escaping until the sample can be collected.



Internal components of Gravid Mosquito Trap.

"Protecting You and Your Environment"

Each Gravid trap will be equipped with a label indicating that it is the property of CCHD and is used for mosquito surveillance. The label also has a QR code which, if someone happens to find the trap, they can scan using their smart phone and be directed to the CCHD Mosquito-borne Disease webpage for more information. Gravid traps are deployed in places such as parks, wastewater treatment plants, residential developments with retention basins, etc. Additionally, CCHD staff will use these traps on private property, with the owner's permission, in response to mosquito-related complaints. Below, you will see what the trap looks like in the field. Staff attempts to be as discreet as possible when deploying these traps in order to maintain aesthetic and prevent tampering or damage to the equipment. Out of sight, out of mind.



Example of a Gravid trap in the field. Note that the fan is being directed towards the culvert and standing water.

Gravid traps predominantly collect *Culex* mosquitoes, but some other mosquito species will often be collected as well. However, with this trap we see very little, if any, “bycatch” or non-mosquito insect species collected, as the attractant specifically replicates conditions favored only by mosquitoes. When CCHD staff returns after collecting samples, they perform a preliminary count to determine number of mosquitoes collected. The sample is then processed and prepared for shipment to PA DEP’s lab in Harrisburg. There, the mosquitoes are identified and all *Culex* mosquitoes are tested for WNV. Results are typically made available to CCHD within one week. We then use this information to determine if there is a need for increased surveillance in the area and what control options may be necessary to knock-down infected mosquitoes. Finally, reports containing population data and testing results are also distributed to the municipalities where the samples were collected on a routine basis throughout the season.

BG Sentinel/Host-seeking Traps:

The second type of trap is a BG Sentinel or Host-seeking trap (BG simply refers to the manufacturer, BioGents). These traps are more complex than the Gravid trap and are more obvious in the field. Visually, the trap setup includes a pop-up collection chamber that is similar in appearance to a laundry hamper, 2 external 6-volt batteries and a blue half-gallon drink cooler that is suspended from a nearby tree branch. Seeing the entire contraption in the field is very out-of-the-ordinary and can appear suspicious to someone unaware of its purpose. CCHD typically receives more calls or questions about this trap.



Example of BG Sentinel/Host-Seeking trap in the field

The BG Sentinel trap is designed to replicate a living, breathing host, from which the mosquito can obtain a blood meal. For female mosquitoes to develop their eggs, they need to bite a larger organism like a bird, human, or other mammal to obtain the blood meal which contains the proteins required for egg development. The BG Sentinel uses multiple attractants to lure mosquitoes seeking a host to feed upon.

- **Dry ice** contained in the blue half-gallon drink cooler is used to replicate the carbon dioxide (CO₂) produced by a breathing organism. As the dry ice sublimates from solid form to its gaseous form, CO₂ vapor is released from small holes drilled in the cooler and into the air around the trap.
- A **human-scent lure**, which replicates the body odor of a human, is secured in the collection chamber. Within the trap is a fan that circulates the scent and CO₂ from the dry ice into the air around the trap. This "tricks" the mosquitoes into thinking that a host is standing in the open waiting to be bitten. As the mosquitoes approach the opening of the trap, they are pulled into a net where they are contained until CCHD staff can retrieve the trap the following morning.

When used in combination, the different traps provide CCHD specific information of the types of mosquitoes that are in the field, their populations, if they are seeking breeding/egg laying sites, if they are seeking hosts, and the presence or absence of WNV. This helps CCHD make decisions on when and where to focus treatments for larval or adult mosquitoes if their populations and WNV prevalence reach levels that become a risk to public health. While much of our mosquito control is done through education, habitat reduction, and treatment of larval mosquito habitat, if the human health risk becomes high, CCHD will take steps to control adult mosquito populations.

Adult Mosquito Control:

Adult mosquito control can be carried out in two ways, either in the form of localized barrier treatments using a backpack mist blower or by using a truck-mounted Ultra-low Volume (ULV) device. Both methods of insecticide treatments use EPA registered products. All treatments, whether they be targeting larval or adult mosquitoes, are carried out by CCHD staff who are fully-licensed Public Pesticide Applicators certified by the state of PA to treat for public health pests.

Larval Sampling:

In addition to routine trap monitoring for adult mosquito surveillance, CCHD staff will be collecting samples from any sites where mosquito breeding habitat (standing or stagnant water) is present and mosquito larvae are found. We refer to this sampling method as "dipping" for mosquitoes. To collect larval samples, a simple measuring cup attached to a telescoping pole is used to dip into standing or stagnant water and examine any larvae present. Examples of sites where we would look to obtain larval samples include wastewater treatment plants, yard waste/composting facilities, retention basins in residential developments, catch basins/storm drains, ditches, wetlands, vernal pools, etc.

Additionally, artificial containers such as tires, buckets, open trash cans, abandoned/neglected swimming pools, or other items capable of holding water are all potential mosquito larval habitat, if left unchecked. These often contribute to mosquito breeding at complaints we investigate. It is recommended that any artificial containers be stored away, dumped routinely, or modified to prevent them from holding water to minimize mosquito activity. CCHD staff will collect a larval sample to submit to DEP for identification and then proceed to treat the larval habitat with what's called a Larvicide.

Larvicides:

Bacterial larvicides are derived from soil bacteria, usually *Bacillus thuringiensis israeliensis* (Bti), *Lysinibacillus sphaericus* (Ls), or a combination of both, and are very safe to use in aquatic habitat. They come in a variety of formulations, ranging from granules, water-soluble pouches, briquettes, or liquid forms, and are effective at eliminating mosquito larvae without posing a risk to other aquatic organisms like fish, reptiles, or amphibians. While CCHD utilizes commercial-grade larvicides, there are several brands that are readily available to homeowners and can be purchased at most hardware stores. Additionally, to provide more long-term control of mosquito larvae, CCHD staff may use what's known as an Insect Growth Regulator (IGR) in areas allowed by the product label. IGRs disrupt the mosquito's life cycle by preventing them from transitioning from their pupal stage into their adult stage.



CCHD Environmental Health Specialist dipping for mosquito larvae

We are here to help!

CCHD strives to protect Chester County residents from Mosquito-borne Disease through safe and effective implementation of Integrated Pest Management (IPM). We prioritize using the safest products and methods available when the need for larval or adult mosquito control arises. As stated above, the majority of mosquito control is achieved through public education and the elimination of larval habitat, and we encourage residents to make their homes a Bite Free Zone. If you would like to request copies of the labels and safety data sheets for the products used by CCHD or informational fact sheets about mosquitoes and mosquito control, they can be provided by using the contact info listed below. Feel free to reach out with any questions about our program!

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