Integrated Pest Management (IPM) in Health Care Facilities Project

Project Newsletter: Fall 2016

In this issue:

Welcome to the Fall edition of the ***IPM in Health Care Facilities newsletter***, published by the **IPM in Health Care Facilities Project**—a partnership of the Maryland Pesticide Education Network and Beyond Pesticides. The Project enables and facilitates a transition to safe pest management practices at Maryland health care facilities. This newsletter is part of the Project's outreach effort to share information with Maryland health care facilities interested in effective pest management that protects patients, residents, staff and visitors from hazardous and unnecessary pesticide use.

Facilities participating in the Project's Partnership Program agree that IPM prioritizes pest prevention and non-chemical interventions as key components to ***greening*** their facilities. Under an IPM approach, only least-toxic pesticides are used as a last resort for pest management. This approach is especially important for patient and long-term care populations, which are especially vulnerable to chemical-intensive pest control methods that can cause or exacerbate the very diseases and conditions that they are being treated.

Feel free to contact us to learn more about how you can improve patient, staff and visitor safety by reducing pest complaints and toxic chemicals in your facility—with no increase in cost.

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Questions? Comments? Please contact Ruth Berlin at 1.410 849.3909, ext. 1

Safe Mosquito Management

The IPM in Health Care Facilities Project shares the growing concern regarding mosquito-borne illnesses such as the Zika Virus and West Nile Virus. As our climate continues to change, such mosquito-borne diseases are anticipated to be an increasing public health challenge for which we must prepare. While pesticides applied from trucks or aerially can reduce flying adult mosquito populations that transmit such mosquito-borne illnesses, they also pose certain risks.

With the apparent mosquito transmission of the Zika virus in Florida, local officials around the United States have been feeling pressure to step-up preemptive mosquito spraying, prior to the virus actually emerging locally in infected mosquitoes. The Zika virus has been contributing to public anxiety in the U.S. for several months and, because of this, the state of Maryland has started spraying with insecticides.

However, the pesticides being used for mosquito management are putting the well-being of residents at risk. As of September 12 2016, there were travel-associated cases of Zika in the state of Maryland.[1] Without a finding of infected mosquitoes in the state, the Maryland Department of Agriculture's (MDA) Mosquito Control Program is focusing its control actions on female (the ones that bite) aedes albopictus, commonly known as Asian tiger mosquitoes, the most common type of mosquito in Maryland that studies indicate "has the potential" to transmit the Zika virus.

MDA's Mosquito Control Program implements the state's mosquito management, which is conducted in accordance with an undefined **Integrated Pest Management (IPM)** program; basing the approach broadly on prevention, monitoring, and control of mosquitoes. As a result, recently, MDA has conducted an increased number of unannounced insecticide sprayings throughout the state.

The spraying of pesticides has long been used for mosquito control, but many experts believe that these methods fail to sufficiently manage mosquito populations.

A Safer Response

Washington D.C., Maryland's neighbor, has taken a different approach over the years, acknowledging the potential adverse effects that chemical usage imposes to human, animal, and environmental health. The D.C. Department of Health has an extensive mosquito monitoring system, having captured and testing over 12,000 mosquitoes this year alone, zero of which have tested positive for any mosquito-borne disease.[2] Of these mosquitoes, less than 20 total have been aedes aegypti, the mosquito most known to carry the Zika virus where it has been found.

During the height of West Nile Virus in Baltimore City in 2002-2003, Baltimore City's Health Commissioner chose to focus on educating all City employees and residents on non-chemical practices to eliminate mosquitoes. This effort proved effective.

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Safe Mosquito Management, *continued...*

Current Methods of Mosquito Management

Most mosquito abatement programs involve widespread aerial and ground spraying of insecticides across urban and rural areas to control disease-carrying and nuisance mosquitoes. Common insecticides used as part of these programs include permethrin, malathion, naled, phenothrin (sumithrin), pyrethrin, and resmethrin (which was withdrawn in 2015, but existing stocks may still be used). These pesticides and application methods target adult mosquitoes and fail to eliminate mosquito eggs, larvae, and pupas. Spraying adulticide pesticides indiscriminately is not effective as only around .10% of the pesticides actually hit the target pest, leaving close to 99.9% of sprayed chemicals to go off into the environment where they can have detrimental effects on public health and ecosystems.[3]

> *According to the CDC and US EPA, the greatest control impact on mosquito populations will occur when they are **concentrated**, **immobile** and **accessible**. This emphasis focuses on habitat management and controlling the immature stages before the mosquitoes emerge as adults.*
>
> *Joint Statement from CDC and US EPA, September 2012, https://www.epa.gov/mosquitocontrol/joint-statement-mosquito-control-united-states*

Many areas that employ such strategies use large scale mosquito control applications that are made with ultra-low volume (ULV) sprays that dispense very fine droplets of pesticides into the air, killing mosquitoes and other non-target insects that come into contact with the fine mist. Because ULV sprays target adult flying mosquitoes, they are only a temporary control measure. The sprayed pesticides do not affect mosquito larvae left behind to propagate another generation of adult mosquitoes, ensuring the need for subsequent spraying.

The impacts of mosquito spraying can also be felt long after spraying has ended as pesticide residues on vegetation, surface waters and soils can last from several hours to months after application and can result in continued exposure for non-target organisms.

Health Effects of Mosquito Spraying Programs

While mosquitoes can pose serious public health threats when they carry diseases such as Zika, West Nile virus and others, a response focused on spraying pesticides can endanger human health and pollinators. On August 28, 2016 **millions of bees died after South Carolina aerially sprayed naled, a neurotoxic organophosphate pesticide, preventively.**

The synthetic pyrethroid pesticides applied by MDA trucks, and most private Maryland pest control companies, are considered possible carcinogens and endocrine disruptors by the U.S. EPA.

The pesticides commonly used for mosquito eradication, like malathion, naled and the pyrethroids, are highly toxic and the widespread spraying of these pesticides fail to sufficiently control mosquito populations, promote their resistance to the chemicals, and kill other species that act as natural predators to mosquitoes. Attempts to stave off mosquito-borne diseases with these pesticides can put especially vulnerable populations at risk from exposure.

Specific short-term health effects from acute poisoning include: asthma attacks and other respiratory problems, and/or dermatological problems.[4] Long-term effects include various cancers and impacts to the nervous and endocrine systems.[5]

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Safe Mosquito Management

Recommended Mosquito Management for Your Health Care Facility:

A safe approach to managing mosquitoes involves an understanding of the mosquito's lifecycle, reducing breeding sites, and targeting larval populations.

An ideal mosquito management strategy adopts an integrated approach that emphasizes education, aggressive removal of breeding sites (such as standing water), larval control, monitoring, and surveillance.

The first step is always removing any and all potential breeding locations – any place that water collects. Even a bottle cap can serve as a mosquito breeding site. This will provide the best long-term control over mosquito populations as it controls mosquito populations before they mature and have a chance to reproduce and transfer disease.

Alternative strategies include introducing mosquito-eating fish to ponds, encouraging predators, such as bats, birds, dragonflies, and frogs, and using least-toxic larvicides, like Bacillus thuringiensis (Bt), in bodies of water that cannot be drained.

Understand Mosquito Biology and Habitat:

- Mosquitoes go through four stages in their life cycle: egg, larva, pupa, and adult. The complete cycle can take as little as four days or as long as one month, depending on temperature.
- Mosquitoes lay their eggs on the surface of slow moving or standing water.
- Only adult females bite animals and require blood meals; males feed on the nectar of flowers.
- There are 175 different species of mosquitoes in the U.S. and only a handful are vectors for disease.
- Zika is spread mostly by the bite of an infected *Aedes species* mosquito.
- Mosquitos are mostly active at 80 degrees F, become lethargic at 60 degrees F, and cannot function below 50 degrees F.[6]

5 Steps for Health Care Facilities To Take To Prevent Mosquitoes *Without* Spraying

1. Remove all potential breeding areas – any place with standing or slow moving water. Remove, puncture or regularly drain all water-retaining objects, such as garbage cans, buckets, holes in trees, clogged gutters, drains and downspouts, and tarps that can collect pools of water.
2. For standing water that you can't drain, use Mosquito Dunks or Mosquito Bits with BTI, a least-toxic biological control. BTI is a bacteria toxic only to mosquito larvae. It lasts 30 days and treats 100 square feet of surface water. Simply apply Mosquito Dunks® or Mosquito Bits to any standing water, or water garden. Mosquito Bits work well for moist areas that can also be a mosquito breeding site. The dunks/bits are ingested by feeding larvae and kills them.
3. If there is an ornamental pond at the facility, stock it with mosquito larvae-eating fish, such as mosquito fish.
4. Fix indoor and outdoor leaky faucets and enhance drainage where needed.
5. Educate staff and the community about safe mosquito prevention. Teach people about the risks associated with pesticides used for mosquito control and promote the use of non-toxic and least-toxic alternatives.

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Safe Mosquito Management *continued...*

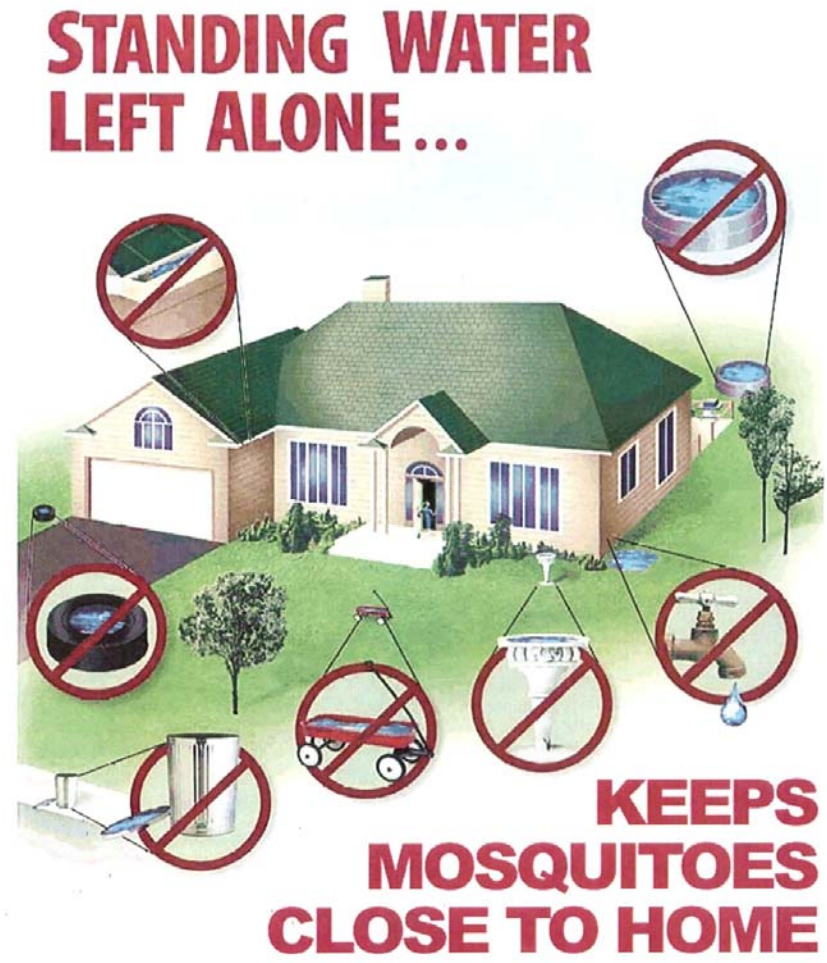
Conclusion

While there is pressure to step-up preemptive mosquito spraying prior to the virus actually emerging locally in infected mosquitoes, it is important to understand that many of these methods fail to sufficiently manage mosquito populations while putting the public at risk from harmful pesticides.

Health care facilities have the opportunity to lead community programs that encourage residents to employ effective non-toxic techniques for eliminating mosquitoes in their communities - especially focusing on eliminating mosquito breeding sites.

A health care facility's integrated approach that emphasizes education, aggressive removal of standing water (eliminating breeding areas), larval control, monitoring, and surveillance for both mosquito-borne illness and pesticide-related illness is the safest and most effective way to manage mosquitoes, prevent the spread of mosquito -borne diseases, and protect public health.

Control of disease-carrying mosquitoes can be successful when emphasis is placed on employee and public education and preventive strategies. Through education of proper cultural controls, and least-toxic and cost effective biological alternatives, the use of hazardous pesticides can be eliminated.



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Chemical Profile: Synthetic Pyrethroids

What are Synthetic Pyrethroids:

Synthetic pyrethroids are synthetic versions of pyrethrum/pyrethrin, which are designed to be more toxic and have longer breakdown times. They are a heavily used class of insecticides, used for control of cockroaches, termites, fleas, and scabies; and are very often the common pesticide used for targeting mosquito populations through ground spraying. Various formulations of these pesticides are often combined with other chemicals, knows as synergists, to increase potency and persistence in the environment.

Synthetic Pyrethroids, which include resmethrin (scourge) and sumithrin (anvil), are common pesticides used to kill adult mosquitoes. They have been chemically engineered to have greater toxicity and longer breakdown times.

Mode of Action

The World Health Organization states that synthetic pyrethroids are neuro-poisons acting on the axons in the peripheral and central nervous system by interacting with sodium channels in mammals and insects.[7]

Synthetic Pyrethroids are often combined with synergists like piperonyl butoxicide (PBO), a petroleum distillate, which increases the potency of the synthetic pyrethroid and compromises the ability to detoxify the pesticide.[8] PBO is most often found in permethrin, resmethrin (Scourge) and sumethrin (Anvil), commonly used for mosquito control.

Possible Symptoms after exposure to the Synthetic Pyrethroid pesticides Anvil (Sumethrin) and Biomist (Permethrin)

Acute Poisoning:

- Effects on the nervous system, such as itching, numbing, burning or tingling
- Respiratory problems, such as asthma
- Hyper excitability
- Irritation of the eyes
- Salivation
- Tremor
- Abnormal facial sensation
- Dizziness
- Headache
- Fatigue
- Vomiting
- Diarrhea
- Irritability to sound and touch

In more severe cases:

- pulmonary edema
- muscle fasciculations

Long-Term Endocrine Disruption Related Effects:

- Cancers
- Obesity
- Fertility problems
- Neurobehavioral disorders
- Immune dysfunction

Chemical Profile: Synthetic Pyrethroids *continued...*

Toxicity

Pyrethroids have irritant and sensitizing properties and act as dermal and respiratory allergens. They are not easily absorbed through the skin, but are absorbed through the gut and pulmonary membrane. Exposure has resulted in contact dermatitis and asthma-like reactions. People with a history of allergies or asthma are particularly sensitive, and children are also most at risk to the effects associated with these pesticides. Other acute symptoms of inhalation include sneezing, nasal stuffiness, headaches, nausea, incoordination, tremors, convulsions, and burning and itching sensations. *The most severe poisonings have been reported in infants, who are not able to efficiently break down pyrethroids.*[9]

Pesticide Resistance

The use of pesticide spraying as a preventive method increases and accelerates the likelihood that mosquitoes will become immune to the chemicals being sprayed once the disease actually arrives in a certain area. The potential for immunity comes from the fact that mosquitoes have a very short life cycle, oftentimes being less than a week. After spraying, each succeeding generation is an opportunity for random mutations to occur that predispose a group of mosquitoes to be immune to the pesticides being used. Spraying of these pesticides also oftentimes kills other species that would have acted as a natural predator to mosquitoes.

Many pyrethroids have also been linked to disruption of the endocrine system, which can adversely affect reproduction and sexual development, interfere with the immune system, and increase chances of breast cancer. Certain pyrethroids demonstrate significant estrogenicity and can increase the amount of estrogen in the body;[10] some pyrethroids are classified as possible human carcinogens by the EPA.

In addition to the toxic effects associated with these pesticides, the synergists used to increase the potency of the pyrethroids increase the risks associated with its use. Petroleum distillates are carcinogenic and linked to birth defects and other illnesses. Animal studies have shown children to be more sensitive than adults and that exposure may inhibit neonatal brain development. They also inhibit important liver enzymes responsible for the breakdown of some toxins, which can increase a persons more vulnerability to a variety of toxics, including the pesticide.[11]

Conclusion

Synthetic pyrethroids used for mosquito control do not eliminate mosquito larvae and kill other species that are mosquito predators. Pesticide drift can impact non-target organisms, such as pollinators, birds, fish and amphibians. Pesticides used to reduce mosquito populations also pose a serious public health risk.

The IPM in Health Care Facilities Project supports a least-toxic approach to mosquito control. Safer mosquito management strategies focus on eliminating mosquito larvae and mosquito breeding sites. For all pests, use an integrated pest management approach to eliminate habitat, food, and water. Use non-volatile least-toxic pesticides, as a last resort.

Additional Resources

Mosquito Management and Insect-Borne Diseases: http://bit.ly/2d5WfJw

Public Health Mosquito Management Strategy: http://bit.ly/1M4Suik

EPA and CDC Mislead Local and State Officials and the Public on Safety of Mosquito Pesticides Used for Zika Virus: http://bit.ly/2cLiXpN

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