

***School intervention for vector-borne diseases in Maine:
Program to educate grades 6-8 on mosquito-borne diseases and prevention methods***

Fight the Bite!

2016-2017



Maine Center for Disease Control and Prevention



Overview: FIGHT THE BITE

GOALS: The goals of this lesson are to:

- ☐ Increase students' ability to identify potential mosquito breeding grounds and ways to reduce potential mosquito breeding grounds around their homes
- ☐ Increase students' ability to demonstrate knowledge of methods of preventing mosquito bites

LEARNING OBJECTIVES: After completing this lesson, participants will have or be able to:

- ☐ Knowledge of mosquito biology and ecology
- ☐ Identification of mosquito habitats
- ☐ Knowledge of diseases mosquitoes can carry and symptoms of the diseases
- ☐ Demonstrate personal protection methods

STRATEGIES/METHODS:

- Facilitator/lecture presentation
- Hands-on group activities
- Individual activity booklet
- Class discussion
- Pre-/post-tests
- Take-home sheet

MATERIALS NEEDED:

- ✓ Computer
- ✓ Projector (if space allows)
- ✓ Dry erase markers
- ✓ Dry eraser/paper towels
- ✓ Markers
- ✓ Buzzer (or bell)

MATERIALS PROVIDED:

- ✓ "Fight the Bite" Mosquito PowerPoint presentation with facilitator notes and vocabulary lists (approx. 20 minutes)
- ✓ Small Group Activities Instructions (approx. 40 minutes total)
 - Mosquito Anatomy & Biology (approx. 10 minutes)
 - Mosquito Vocabulary (approx. 10 minutes)
 - Mosquito Fight the Bite Trivia Face-Off (approx. 10 minutes)
 - Mosquito BINGO (approx. 10 minutes)
- ✓ Mosquito Fact Sheet
- ✓ Teacher Feedback Forms
- ✓ Pre-Test/ Post-Test
- ✓ Answer Key

PREPARATION NEEDED:

- ✓ Print and cut out mosquito anatomy puzzle and labels
- ✓ Print Bingo boards

- ✓ Print Bingo question cards
- ✓ Print and cut up vocabulary cards
- ✓ Print Fight the Bite Trivia Face-Off cards
- ✓ Copies of fact sheet
- ✓ Copies of take-home sheet

RECOMMENDED FORMAT

Maine CDC recommends presenting the “Fight the Bite!” in one-session. Changes can and should be made with the program to accommodate class schedules and needs.

- 1) Give Pre-Test
- 2) Present “Fight the Bite” PowerPoint presentation
- 3) Break into small groups for activities
- 4) Distribute Mosquito Activity Book and Take-Home Sheet and encourage students to share information with their families
- 5) Give Post-Test two-weeks following initial session
- 6) Review answers with class

This presentation fits nicely with the “Don’t Let the Ticks Bite!” education curriculum as there are common skills learned in both curricula.

TOTAL INSTRUCTIONAL TIME:

50 minutes

MAINE LEARNING RESULTS IN HEALTH EDUCATION: A1, A3, A4, B2, C2

MAINE LEARNING RESULTS IN SCIENCE & TECHNOLOGY: E1, E4

FEATURES OF THE PROGRAM

- Free
- Downloadable and printable presentation
- Downloadable and printable activity books
- Downloadable and printable small group activity instructions
- Pre- and Post-Test and Answer Key

FIGHT THE BITE

ABOUT THE PROGRAM

Mosquitoes can spread several viruses and diseases in humans and animals. The two main viruses in Maine that are transmitted by mosquitoes are Eastern equine encephalitis (EEE) virus and West Nile virus (WNV).

The Public Health Corps (PHC) within Maine Center for Disease Control and Prevention's (Maine CDC) Division of Infectious Disease designed and piloted a school-based intervention to educate third-fifth grade students in Maine.

The program provides education concerning mosquito biology, diseases transmitted by mosquitoes, and instruction on ways to decrease the risk of mosquito bites.

Introduction and Overview

1. Open the lesson by saying:

The purpose of this program is to begin to understand that mosquitoes can carry diseases and how you prevent getting those diseases.

2. Continue by saying:

Mosquitoes can spread several viruses and diseases in humans and animals. The two main viruses in Maine that are spread by mosquitoes are Eastern Equine Encephalitis (EEE) virus and West Nile virus (WNV).

3. Talk about:

We'll start with a presentation on mosquitoes, what they look like and where they're found, the diseases they can carry, and how to prevent (or make sure you don't get) the diseases. Then we will break up into small groups and do three activities.

4. Summarize by saying:

We're going to learn about mosquitoes and how you can keep yourself safe and healthy from them. Don't be afraid to ask questions. When you go home today be sure to talk to your family about what you learned.

Before you begin, ask students whether any of them have been bitten by a mosquito and where they were when it happened.

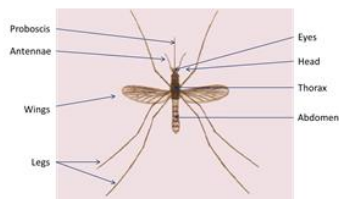
Then distribute the pre-test to gauge students' content knowledge about mosquito biology, mosquito-borne diseases, and prevention methods.

This text accompanies a PowerPoint presentation, "Fight the Bite!" As you read the text, there will be a note about which PowerPoint slides relate to that section of text.

Each slide includes a list of definitions for new vocabulary.

What do mosquitoes look like?

In Maine, there are many different kinds of mosquitoes



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Mosquito biology

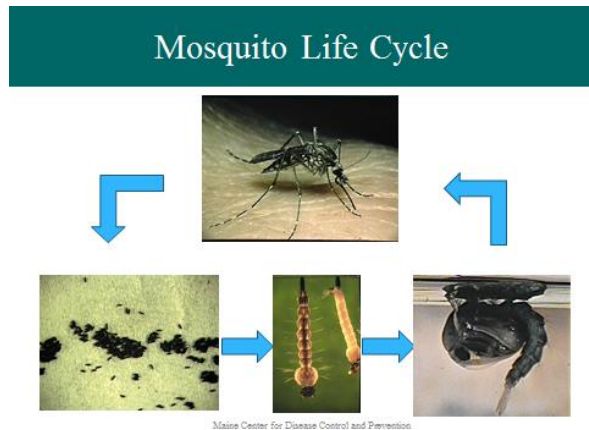
1. What do mosquitoes look like? (Slide 3)

There are 45 different species of mosquitoes found in Maine. Mosquitoes have **antennae** (long, feathery sensory organs on the mosquito's head, used to hear and smell), **proboscis** (long, jagged mouth part on the mosquito's head that is used to pierce the skin and suck out the blood), wings, legs, head, eyes, **thorax** (the part of the mosquito between the head and the belly, where the wings and legs attach), and abdomen (part of the mosquito's body that hangs from the thorax and serves as the mosquito's stomach and lungs).

Only female mosquitoes have a proboscis for piercing skin, and only the females feed on blood. Male mosquitoes typically feed on plant nectar.

Vocabulary:

- **Antennae** (antenna) – long, feathery sensory organs on the mosquito's head, used to hear and smell
- **Proboscis** – long, jagged mouth part on the mosquito's head that is used to pierce the skin and suck out the blood
- **Thorax** – the part of the mosquito between the head and the abdomen, where the wings and legs attach



Abdomen – part of the mosquito’s body that hangs from the thorax and serves as the mosquito’s stomach and lungs, holds the blood that the female takes in, as well as stores the female’s eggs

2. Mosquito Life Cycle (Slide 4)

Mosquitoes grow from immature to adult in a process called **metamorphosis** (meta=change, morph=shape), just like a caterpillar turns into a moth. During their life cycle, the mosquito goes through four different stages: **egg**, **larvae**, **pupae**, and **adult**.

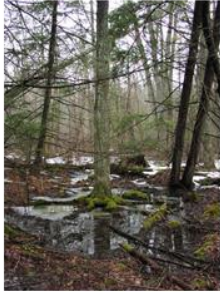
The egg, larval and pupal stages all require the mosquito to live in water.

Vocabulary:

- **Metamorphosis** (“meta” = change; “morph” = shape) - the process of development from immature to adult
- **Eggs** – the adult female mosquito lays between 50 – 300 eggs about every third day of her lifespan. The eggs can be laid as “rafts”, floating on the surface of standing water, or laid on an area of ground that floods on a regular basis. The egg stage lasts for 2 – 3 days.
- **Larvae** (larva) – (also called wigglers or wrigglers) part of the mosquito lifecycle that comes after the eggs hatch. The larvae hang from the surface of water and breathe through tubes. The larval stage lasts for about 1 week.

- **Pupae** (pupa) – (also called tumblers) part of the mosquito lifecycle that come after the larvae stage; pupae are partially encased in a cocoon. The pupa' stage lasts for about 4 days before it becomes an adult mosquito.
- **Adult** – emerges from the pupa and rests on the surface of the water until it dries its wings and can fly away.

Where do mosquitoes live?



Some mosquitoes like bogs and swamps with:

- *Different kinds of plants
- *Clear or tea colored water

This is the favored habitat for mosquitoes carrying Eastern equine encephalitis (EEE) virus

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Other Mosquito Habitats

Some mosquitoes like:

Artificial containers
Catch basins
Flower pots
Discarded tires

Stagnant (motionless)
temporary pools

Holes in trees

These are the favored habitats for mosquitoes carrying West Nile Virus (WNV)



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Mosquito ecology

3. Where do mosquitoes live? (Slide 5, 6, and 7)

While all mosquitoes require water for their larvae to develop, different species like different types of water habitats. Generally, mosquitoes lay eggs in two types of habitats: **permanent water** and **floodwater**.

Some mosquitoes prefer to live in bogs with clear or tea colored water, and where there are different kinds of plants. This is the favored habitat for mosquitoes that can spread a disease called Eastern equine encephalitis (EEE) (more on this shortly).

Man-made containers are also important mosquito habitats. Mosquitoes can use buckets, cans, flower pots, or old tires to lay their eggs. Many of these man-made containers can be found around our houses and are important sources of mosquitoes near our homes.

Some species live in **natural containers**, such as the spots between branches of trees, where water collects; some live in the holes formed in trees when branches break off. These are the favored habitats for mosquitoes that can carry West Nile virus (which we will discuss shortly).

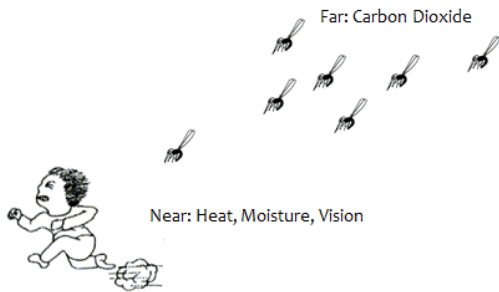
Mosquitos Need Water

- Regardless of the type of mosquito...all mosquitos need water in order to reproduce



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Mosquitoes and People



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Vocabulary:

- **Permanent water** – water sources that are present for long periods of time and can support the growth of different types of plants
- **Flood water** – water sources that alternate between periods of dry and wet, such as when water overflows as a result of a flood or melting snow
- **Man-made containers** – buckets, pail, flowerpots and other containers that can hold water and become part of mosquitoes' habitat
- **Natural containers** – containers found in nature that can hold water, such as the junction in between tree branches where water can collect

Regardless of the type of mosquito, they all need water in order to reproduce!

4. Mosquitoes and People (Slide 8)

All humans and animals exhale **carbon dioxide** when you breathe, which attracts mosquitoes. When a female mosquito (remember, only the female mosquitoes bite humans and other animals) senses carbon dioxide, she flies toward it. As she gets closer, she is attracted by the heat and moisture your body gives off.

Vocabulary:

- **Carbon dioxide** – the chemicals that all animals exhale that can attract mosquitoes from several hundred feet away

Can mosquitoes carry diseases?

YES. Two of the most common diseases in Maine are:

Eastern Equine Encephalitis (EEE) virus

One of the most serious mosquito-borne diseases in the United States

West Nile Virus (WNV)

Occurs throughout the United States

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Diseases mosquitoes can transmit to people and animals and symptoms of the diseases

5. Can mosquitoes carry diseases? (Slide 9)

Mosquitoes can carry diseases and different mosquitoes can carry different diseases.

Mosquitoes can pick up viruses when they bite an animal or bird with a disease (also known as a **host**). They then spread the disease by biting another animal or human.

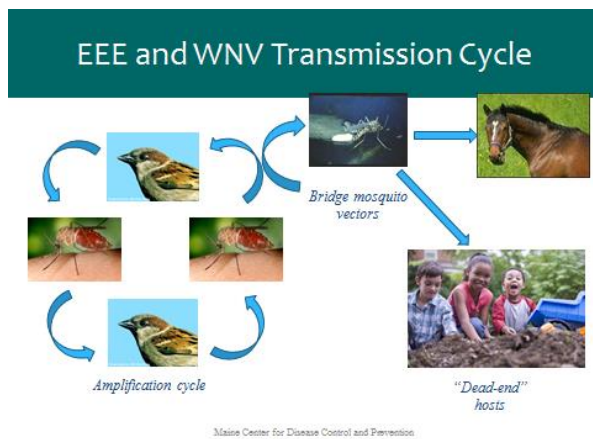
The most common diseases in Maine are: **Eastern equine encephalitis (EEE) virus** and **West Nile virus (WNV)**.

Vocabulary:

- **Host** - The animal in which the viruses live
- **Eastern equine encephalitis (EEE) virus** – EEE is a disease that can be transmitted to humans by the bite of an infected mosquito
- **West Nile virus (WNV)** – WNV is a disease that can be transmitted to humans by the bite of an infected mosquito

6. EEE and WNV Transmission Cycle (Slide 10)

The **Transmission Cycle** is the system where bacteria that cause disease in its host continue to infect other hosts. It consists of the bacteria, the mosquito, and the hosts that become



infected and serve as a source of the bacteria to infect other mosquitoes if they bite the new host.

EEE virus and WNV use birds as **reservoirs**, or organisms that will carry the bacteria but that will not get the disease itself (meaning reservoirs carry the disease but don't get sick from it). These viruses are found mostly in birds.

Normally, what happens is:

The virus infects a bird; a mosquito feeds on the bird; then the mosquito feeds on another bird to keep the cycle going and growing (also known as the **amplification cycle**).

Humans become infected when one of the infected mosquitoes bites them. Fortunately, humans can't infect other mosquitoes, which make them "dead-end" hosts for the disease.

Vocabulary:

- **Transmission Cycle** - the system where bacteria that cause disease in its host continue to infect other hosts
- **Reservoirs** – organisms that host a germ that is not harmful to the host, but can cause illness in a different species
- **Amplification cycle** – the process of replicating something and increasing its production
- **"Dead End" host**- The virus cycle ends with this host. The host cannot transmit the virus to others.

What can happen if a disease-carrying mosquito bites me?

Symptoms can include: fever, head and body aches, lack of energy

MOST people infected with one of these viruses will not have any symptoms

Symptoms can be mild to severe
Appear 3-18 days after infection

Symptoms usually last 1-2 weeks: no treatment, only support

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Travel Related Mosquito-Borne Diseases

- Chikungunya
 - Symptoms include fever, joint pain, headache, muscle pain, joint swelling, and rash.
- Dengue Fever
 - Symptoms include high fever, severe headache, backache, joint pain, nausea and vomiting, eye pain, a “breaking bone feeling,” and rash.
- Malaria
 - Symptoms may include high fevers, shaking chills, flu-like illness, headache, muscle aches, tiredness, nausea, vomiting, and diarrhea.
- Zika
 - Symptoms include fever, rash, joint pain, and red eyes.

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7. What can happen if a disease-carrying mosquito bites me? (Slide 11)

WNV or EEE may start off with symptoms that look like the flu.

A person can get a headache and fever, may vomit, and may be very tired. In most cases, the infection doesn't go beyond those symptoms.

In some people infected with WNV or EEE, more serious symptoms develop. These symptoms can include disorientation, seizures, paralysis, coma, or death.

8. Travel Related Mosquito-Borne Diseases (Slide 12)

Chikungunya, dengue fever, and malaria are three of the most common mosquito-borne diseases acquired during international travel. Zika is on the rise as well.

Local transmission in the United States is not common, but outbreaks of Chikungunya, Dengue, and Zika occasionally occur. Maine currently does not have the mosquitoes that carry chikungunya, dengue, malaria, or Zika, so all cases are travel related.

It's important to use the same prevention measures that are taken at home when traveling along with: staying indoors when mosquitoes are especially abundant, sleeping under a mosquito net when traveling to endemic areas, and taking preventative action before

How can I protect myself?

1. **Wear protective clothing**
Wear long pants and long-sleeved shirts
2. **Use a repellent**
3. **Be extra careful from dusk until dawn**
Mosquitoes that carryEEE and WNV are most active in the early morning and evening



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NOTE: Educators are encouraged to show this website to students and scroll down the page to the section Search for a Repellent that is Right for You and search repellents that repel both ticks and mosquitoes)

<http://cfpub.epa.gov/oppref/insect/>

traveling to areas with a threat of disease.

Mosquito bite prevention methods

9. How can I protect myself? (Slide 13)

The best way to protect yourself from getting these diseases is by preventing getting bitten in the first place. Here are some tips to help you not get bit by mosquitoes:

- Wear long pants and long-sleeved shirts to lessen the amount of uncovered skin
- Use a repellent (also known as “spray”) that is approved by the EPA (**Environmental Protection Agency**) for repelling mosquitos.

When using a repellent, follow the label instructions carefully. You can find the repellent that will work best for you here:

<http://cfpub.epa.gov/oppref/insect/>

- Try to minimize your time outside during early morning and early evening (this is when mosquitoes are most active)

Vocabulary:

- **EPA** (Environmental Protection Agency) – federal agency devoted to protecting human health and the environment

Make Your Yard Safer

*Check door and window screens to make sure there are no tears in them

*Dispose of old tires, cans, bottles and other containers left outside that hold water

*Drain water from gutters, flower pots, pet bowls and wading pools



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QUESTIONS AND FEEDBACK

If you have any questions about “Fight the Bite!” or if you need additional educational materials, please contact Maine CDC Infectious Disease Epidemiology Program by email at dhhs.phc@maine.gov.

Maine CDC requests that you share your pre- and post-test results and instructor feedback forms with us so that we can gauge the success of the program.

Please mail pre- and post-tests and instructor feedback forms to this address:

Attn. Maine CDC Public Health Corps
Infectious Disease Epidemiology
286 Water Street, 8th Floor, SHS 11
Augusta, ME 04333

Other materials are available free of charge from Maine Center for Disease Control and Prevention.

Visit this link to order:

<http://www.maine.gov/dhhs/mecdc/infectiousdisease/epi/order-form-wn.shtml>

Ways to reduce mosquito breeding grounds around homes

10. Make Your Yard Safer (Slide 14)

To protect yourself at home, check your doors and window screens to be sure there aren't any tears or holes in them.

If you don't have man-made containers around your home, the risk of being bitten decreases. Removing un-needed containers from around the home, or placing them so they will not hold water, is one way to reduce the number of mosquitoes. Throw-away old tires, cans, bottles or other containers left outside that might collect water and serve as a mosquito breeding ground.

If containers must be there, like bird baths or pet bowls, empty the water out of them once each week so that mosquito larvae in them won't have time to complete their life cycle.