

**School intervention for vectorborne diseases in Maine:
Program to educate grades 3-5 on mosquito-borne diseases and prevention methods**

Fight the Bite!

Maine Center for Disease Control and Prevention



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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 viruses mosquitoes can carry and symptoms of the diseases these viruses cause
- 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 Hotspots (approx. 10 minutes)
 - Mosquito BINGO (approx. 10 minutes)
 - Mosquito Jeopardy (approx. 10 minutes)
 - Mosquito Anatomy & Biology (approx. 10 minutes)
- ✓ Mosquito Activity Book
 - Ten Mosquito Fun Facts
 - Mosquito Vocabulary
 - Find the Hidden Mosquito Message
 - Mosquito Math Problems
 - Mosquito Inspector Checklist

- Answer Keys
- ✓ Mosquito Take-Home Sheet
- ✓ Teacher Feedback Forms

PREPARATION NEEDED:

- ✓ Print and laminate mosquito hotspot pictures (sample included)
- ✓ Print Bingo cards
- ✓ Print Bingo image deck
- ✓ Print Bingo hint list
- ✓ Download Mosquito Jeopardy PowerPoint
- ✓ Copies of activity book
- ✓ 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) Present “Fight the Bite” PowerPoint presentation
- 2) Break into small groups for activities
- 3) Distribute Mosquito Activity Book and Take-Home Sheet and encourage students to share information with their families

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:

60 minutes

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

FIGHT THE BITE

ABOUT THE PROGRAM

Mosquitoes can carry several viruses which can cause 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) Infectious Disease Program designed the school-based intervention to educate third-fifth grade students in Maine.

The program provides education concerning mosquito biology, viruses transmitted by mosquitoes and the diseases they can cause, 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 viruses that cause diseases and how you prevent getting those diseases.

2. Continue by saying:

Mosquitoes can carry several viruses that can infect humans and animals. The two main viruses in Maine that are carried 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 viruses they can carry and the diseases that they can cause, and how to prevent (or make sure you don't get) the diseases. Then we will break up into small groups and do four activities.

4. Summarize by saying:

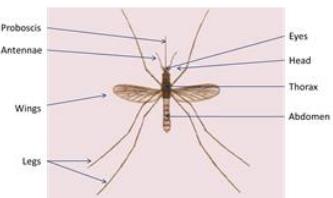
We're going to learn about mosquitoes and how you can keep yourself safe and healthy from them. Don't be afraid to ask questions. When you go home today be sure to talk to your family about what you learned.

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.

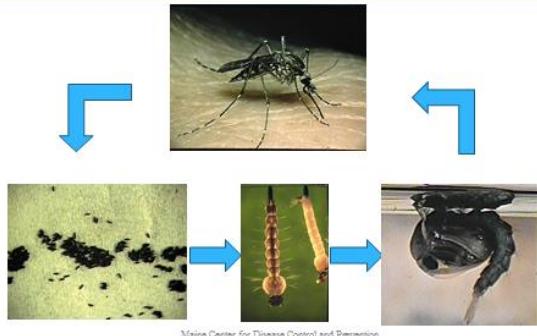
Mosquitoes have **antennae**, wings, legs, eyes, a **proboscis**, a head, a **thorax**, and an **abdomen**.

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

Mosquito Life Cycle



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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Mosquito ecology

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

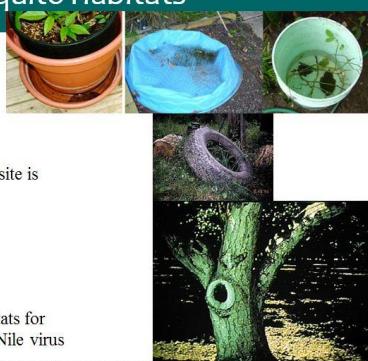
While all mosquitoes require water for their larvae to develop, different species like different types of water habitats. Generally, mosquitoes lay eggs in two types of habitats: **permanent water** and **floodwater**.

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 virus that causes **Eastern equine encephalitis (EEE)**.

Vocabulary:

- **Permanent water** – water sources that are present for long periods of time and can support the growth of different types of plants
- **Floodwater** – water sources that alternate between periods of dry and wet, such as when water overflows as a result of a flood or melting snow
- **Eastern equine encephalitis (EEE) virus** – EEE is a virus that can be transmitted to humans by the bite of an infected mosquito

Other Mosquito Habitats



Some mosquitoes like:
Artificial containers
Catch basins
Flower pots
Discarded tires

The #1 mosquito breeding site is
unmounted car tires

Stagnant (motionless)
temporary pools
Holes in trees

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

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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

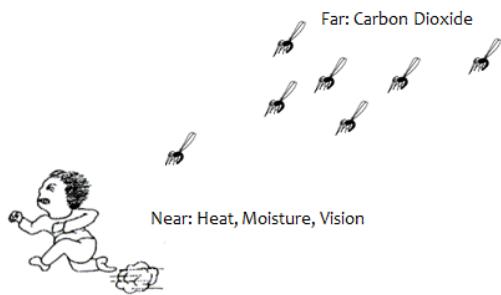
Mosquitos Need Water

- 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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man-made containers can be found around our houses and are important sources of mosquitoes near our homes.

The #1 mosquito breeding site around the home is unmounted car tires.

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**.

Vocabulary:

- **Man-made containers** – buckets, pails, 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
- **West Nile virus (WNV)** – WNV is a virus that can be transmitted to humans by the bite of an infected mosquito

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 they breathe, which attracts mosquitoes. When a female mosquito (remember, only the female mosquitoes bite humans and other animals) senses carbon dioxide, she

Can mosquitoes cause 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

Another disease sometimes found in Maine is:

Jamestown Canyon virus (JCV)

Occurs throughout the United States

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flies toward it. As she gets closer, she is attracted by the heat and moisture your body gives off.

Vocabulary:

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

Viruses mosquitoes can transmit to people and animals and symptoms of the diseases they cause

5. Can mosquitoes cause diseases? (Slide 9)

Mosquitoes can carry viruses that cause diseases and different mosquitoes can carry different viruses.

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

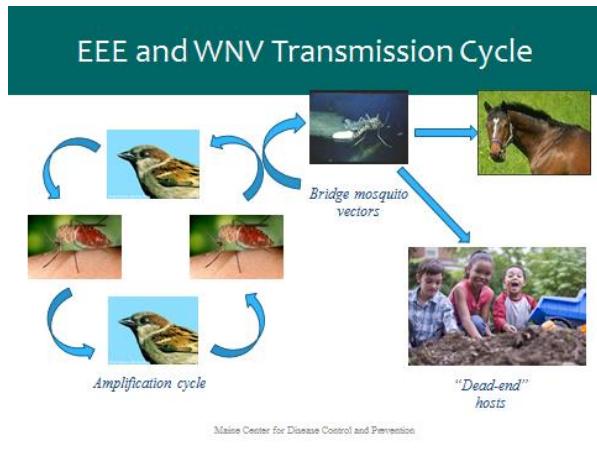
The most common diseases in Maine are: Eastern Equine Encephalitis (EEE) virus and West Nile virus (WNV).

Another virus that some mosquitoes in Maine carry is **Jamestown Canyon virus (JCV)**.

Vocabulary:

- **Host** - The animal in which the viruses live
- **Jamestown Canyon virus (JCV)** – JCV is a virus 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 cycle in which some infected hosts can develop high levels of the virus in their bloodstream and mosquitoes can become infected by biting these infected hosts. The now infected mosquito then goes on to bite someone else.

Birds serve as **reservoirs** for EEE virus and WNV. Reservoirs are organisms that carry the germ but often will not get the disease itself (meaning reservoirs can carry the germ but not get sick from it).

Normally, what happens is:

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

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

Vocabulary:

- **Transmission Cycle** – the cycle in which some infected hosts can develop high levels of the virus in their bloodstream and mosquitoes can become infected by biting these infected hosts.

- **Reservoirs** – organisms that host a germ that is often 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 an infected 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 an infected 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, malaria, and Zika are some of the most common mosquito-borne diseases acquired during international travel.

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.

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 carry EEE 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/>



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, such as anti-malarial medications, before 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 mosquitoes.

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 that transmit viruses in Maine are most active)

Vocabulary:

- **Repellent** – a spray applied to skin to prevent insect bites
- **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 Program by email at phc.dhhs@maine.gov.

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 or recycle 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.