



Lesson 4: Various Vectors: Ticks, Fleas, and More—Oh My!

Overview Students are engaged by phenomena involving vectors of disease with the support of the free “Vera vs. Vectors + Viruses” interactive book. They learn about what the organisms need to develop and how to stay safe from them. Then they compare the life cycles and other adaptations of disease vectors such as ticks, mosquitoes, fleas, and flies. Students can use a graphic organizer to help with the analysis, then create arguments from evidence about why the organisms’ traits are the result of their environment. They make a claim supported by evidence about which is the more dangerous organism to humans and why. A short interactive multimedia presentation helps provide an overview of the important concepts and terms. Adaptations / extensions are listed at the end of the lesson, including a simpler activity for younger students.

Subjects: Science, Health, Art, Writing, Speaking & Listening,

Grades: Adaptable for K–12

Duration: 35–75 minutes

Vocabulary

- Behavioral adaptations
- Flea
- Larva / larvae
- Life cycle
- Metamorphosis
- Nymph
- Structural (physical) adaptations
- Tick
- Vector
- Vector-borne disease

Lesson Goals

- Increase students’ understanding of disease vectors and how to stay safe from them.
- Provide students with experience researching, writing, and/or presenting about a relevant scientific topic
- Provide students with experience thinking critically through the process of comparing disease vectors with the support of a graphic organizer.



Ticks grow between life stages after each blood meal.

California Department of Public Health

Objectives

- Students will research and compare two disease vectors with the support of a graphic organizer.
- Students will write about and/or present about their research and create an argument from evidence about which is the more dangerous organism to humans and why.

Standards		Middle School (Grades 6-8)
Next Generation Science Standards (NGSS)	Crosscutting Concepts	<ul style="list-style-type: none"> • Structure and Function • Stability and Change
	Science & Engineering Practices	<ul style="list-style-type: none"> • Obtaining, Evaluating, and Communicating Information • Engaging in Argument from Evidence
	Disciplinary Core Ideas	LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS5.C: Adaptation

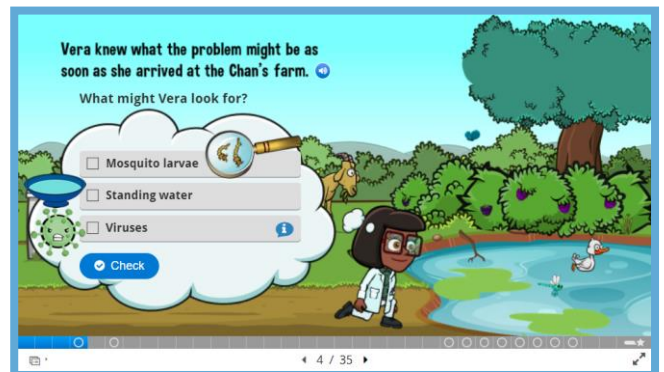
Common Core State Standards ELA	Speaking & Listening	1, 2, 4, 6
	Language Standards	1, 2, 3, 6
	Writing Standards Science & Technical Subjects	4, 7, 10

Materials + Preparation

- Prepare to show the “Various Vectors: Ticks, Fleas, Flies, and More—Oh My!” PowerPoint presentation available at fightthebites.com/education/resources.
- *Optional:* Prepare to show the beginning of the free “Vera vs. Vectors + Viruses” interactive book if it seems appropriate for your level of students: engagingpress.com/vera-vectors.
- Computer and data projector or large monitor to display the resources above
- Science notebooks and pencils for each student
- *Optional:* Copies of the “Comparing Disease Vectors” handout at the end of the lesson or a [Box and T-Chart](#) organizer for each student. Students could also create an organizer themselves on larger paper or in their science notebooks.
- *Optional:* Colored pencils and/or markers for students to share
- *Optional:* Review the additional sources listed in the “Adaptations / Extensions” and “More Resources / References” sections at the end of the lesson to prepare to answer student questions.

Suggested Procedure

1. Engage grade K–6 students by reading the start of the “Vera vs. Vectors + Viruses” interactive book using a data project or large monitor, or you could use the PowerPoint presentation with older students. If you use the book, ask students to take turns reading the “pages” on the screen. (Click the right arrow at the bottom of the screen to advance to the next screen.)
2. After students read the question on slide 4, ask them to turn to a neighbor to discuss it, recording their ideas in science notebooks. Tell them that there can be more than one correct answer.
3. After a minute or two, advance to the next slide. After they read the question on slide 6, ask them to turn to a neighbor to discuss it, again recording their ideas in science notebooks. Tell them that there can be more than one correct answer.
4. After students read slide 8, ask them to again turn to a neighbor to discuss their ideas for what things might be “tiny and terrifying” enough on they pony’s nose to make Vera jump in alarm. They should again record their ideas in science notebooks.



“Page” 4 of “Vera vs. Vectors + Viruses.”



“Page” 6 of the interactive book.

- If students have access to their own devices, ask them to finish reading the interactive book with a partner. If so, circulate through the students to answer questions as they arise, or you could finish reading the book together as a class. (Note that after students finish the interactive book, an assessment page at the end summarizes their results.)
- Whether the class completes the interactive book or PowerPoint presentation, ask students to think about what ticks, fleas, flies, and rats all have in common. After a moment, ask them to turn to a neighbor and quickly brainstorm their ideas. After they've discussed for a minute, ask the pairs to share their ideas. Discuss how all of the organisms are **vectors** which can spread disease, like mosquitoes which they have been learning about.

- Lead an interactive discussion with students using the brief "Various Vectors" PowerPoint presentation. See the Slide Notes for more information which can be shared with students, depending on their age and how much detail you wish to share. For example, on slide 2 discuss with students that if the ticks meet their needs of water, blood meals, and warmth, there will be a **metamorphosis** as they transform from **larvae** into **nymphs** and nymphs into adults. Additional details can be found on the sources listed at the end of the lesson.

- Ask students to compare two disease vectors, such as those listed on slide 10 of the presentation. For example, you could pass out copies of the modified "Comparing Adaptions" Venn diagram organizer at the end of the lesson or a [Box and T-Chart](#) could be used to compare the similarities and differences of potential disease vectors, such as a ticks, fleas, flies, rodents, and mosquitoes, with words and pictures. You might ask the students to focus on areas such as their life cycles, structural and behavioral adaptations, where they are found (both in terms of habitat and geographic distribution), and how they can spread disease. Consider asking them to chose mosquitoes as one of their organisms.
- After graphic organizers are created, students could explain them in writing and/or presentations could be prepared and shared with the class. Ask them to discuss how the organisms' traits are the result of their environment and how they are able to survive in it. They can also include an argument from evidence about

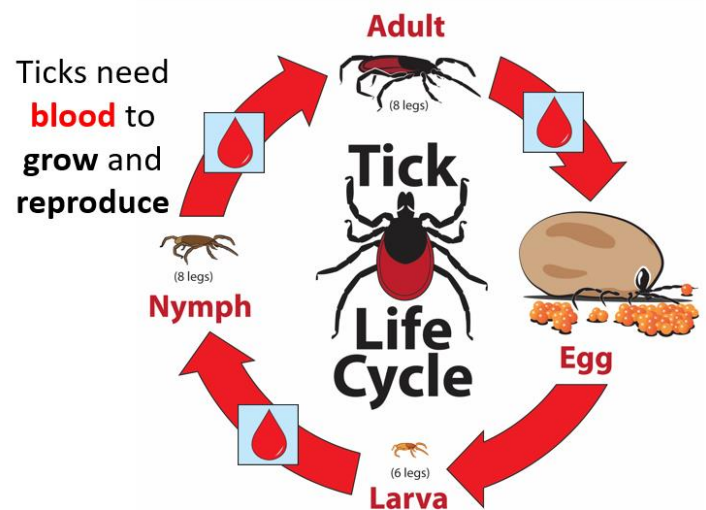


Diagram from the "Various Vectors" presentation
Eric Engh & Rick Reynolds

which is the more dangerous organism to humans and why.

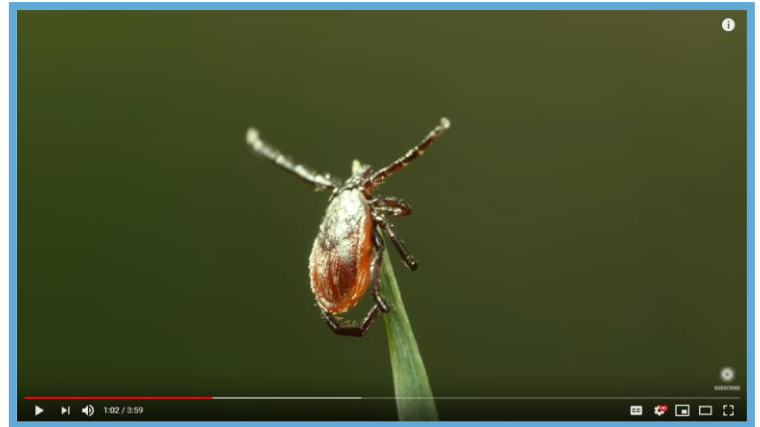
10. Lead an interactive discussion about disease vectors and work with students who researched the particular vectors to answer questions about them, including good ways to stay safe from illnesses which they can spread. For example, they can avoid tick bites when visiting natural areas by wearing light-colored long pants and sleeves, putting repellent on their clothes, and checking for ticks carefully.

Adaptations / Extensions

- **Show and discuss one or more short videos, such as PBS' "Deep Look: How Ticks Dig In With a Mouth Full of Hooks":** kqed.org/science/1920972/how-ticks-dig-in-with-a-mouth-full-of-hooks.

The website includes a detailed article which students can read and discuss, as well.

- **For younger students, start with a basic research project about a disease vector,** focused on one or more categories of information, such as its life cycle, adaptations, and how to stay safe from it. Then they can compare it to another disease vector if time allows.
- **Students can compare 3 different vectors** using a [Venn diagram with 3 circles](#). The template can be used or students can create their own on larger paper or using a computer.
- **Students can write personal stories**—either positive or negative—involving a possible vector. Fictional stories or poems can also be created.
- **Students can create detailed, labeled scientific illustrations** of the organisms they research.
- **Have students research individual vector-borne diseases.** The World Health Organization lists the most dangerous ones here: who.int/news-room/fact-sheets/detail/vector-borne-diseases
- **Use one or more of the educational resources from the Global Lyme Alliance** (includes tech-based): globallymealliance.org/education-awareness/curriculum-educational-activities



Screenshot from PBS' fascinating video "Deep Look: How Ticks Dig In With a Mouth Full of Hooks"

More Resources / References

- “Illnesses on the rise from mosquito, tick, and flea bites.” CDC Vital Signs: [cdc.gov/vitalsigns/pdf/vs-0518-vector-borne-H.pdf](https://www.cdc.gov/vitalsigns/pdf/vs-0518-vector-borne-H.pdf)
- “Diseases spread by ticks, mosquitoes and fleas more than tripled in the U.S. since 2004.” *The Washington Post*: [washingtonpost.com/news/to-your-health/wp/2018/05/01/diseases-spread-by-ticks-mosquitoes-and-fleas-more-than-tripled-in-the-u-s](https://www.washingtonpost.com/news/to-your-health/wp/2018/05/01/diseases-spread-by-ticks-mosquitoes-and-fleas-more-than-tripled-in-the-u-s/)
- Visit Clackamas County Vector Control District’s website for more resources and background about our education program: fightthebites.com/education

Ticks

- “Ticks.” Centers for Disease Control and Prevention (CDC): [cdc.gov/ticks/index.html](https://www.cdc.gov/ticks/index.html)
- “Tick Removal.” CDC: [cdc.gov/ticks/removing_a_tick.html](https://www.cdc.gov/ticks/removing_a_tick.html)
- “Fundamentals of Lyme Disease Prevention.” Global Lyme Alliance: globallymealliance.org/education-awareness/fundamentals-lyme-disease-awareness-prevention
- “Fleas and Ticks” Metro: oregonmetro.gov/tools-living/healthy-home/pest-control/fleas-and-ticks

Fleas

- “Fleas.” CDC: [cdc.gov/dpdx/fleas/index.html](https://www.cdc.gov/dpdx/fleas/index.html)
- “Fleas.” Marin/Sonoma Mosquito & Vector Control District: msmosquito.com/vectors-diseases/vectors/fleas
- Rust, M.K. “Fleas: Integrated Pest Management in and Around the Home.” Univ. of California Statewide Integrated Pest Management Program: ipm.ucanr.edu/PDF/PESTNOTES/pnfleas.pdf
- “Flea Facts for Kids.” PestWorld for Kids: pestworldforkids.org/pest-guide/fleas
- “How Fleas Work.” How Stuff Works: animals.howstuffworks.com/insects/flea1.htm
- Wyrwa, J. “*Pulex irritans*: Human Flea.” Animal Diversity Web. Univ. Of Michigan Museum of Zoology: animaldiversity.org/accounts/Pulex_irritans



A magnified flea
Centers for Disease Control and Prevention (CDC)

Flies + Rodents

- “House Flies: *Musca domestica*.” Penn State Dept. of Entomology: ento.psu.edu/extension/factsheets/house-flies
- “Diseases from rodents.” CDC: [cdc.gov/rodents/diseases/index.html](https://www.cdc.gov/rodents/diseases/index.html)

Name(s): _____ Period: _____ Date: _____



Comparing Disease Vectors

Compare two species using words and pictures. Include similarities and differences in their structural (physical) and behavioral adaptations, as well as their life cycles.

Species 1: _____ Different Adaptions

Adaptations in Common

Species 2: _____ Different Adaptions